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Cluster Policies Whitebook

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2004

Link to publication

Citation for published version (APA):
Andersson, T., Schwaag-Serger, S., Sörvik, J., & Wise, E. (2004). *Cluster Policies Whitebook*. IKED - International Organisation for Knowledge Economy and Enterprise Development.

Total number of authors:
4

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THE CLUSTER POLICIES WHITEBOOK

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International organisation for Knowledge economy and Enterprise Development

VINNOVA

The Competitiveness Institute

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ISBN 91-85281-03-4

© IKED 2004

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Illustrations: Boyan Kostadinov
Published: August 2004
Publisher: IKED
Printed by: Holmbergs

THE CLUSTER POLICIES WHITEBOOK

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FOREWORD

Throughout most of the 20th century, economic policy focused on macroeconomic stability as the key guarantor of growth and prosperity. In the past two decades, however, there has been a growing realisation of the importance of microeconomic conditions. In addition to macroeconomic stability, ongoing structural changes are reshaping societies, summed up in terms such as the rise of the 'information society', the 'knowledge-based economy', globalisation, and so on.

In this context, clusters have received widespread attention as an instrument for enabling firms to overcome internal limitations by joining efforts and resources with other firms, R&D institutions and universities, and public sector organisations in pursuit of a common objective or vision. There is now a general interest in, and receptiveness towards, strategies in support of clustering. This has particularly been fuelled by the growing appreciation of innovation in academia as well as in policymaking, and the perception that initiatives in cluster development may be one of the most effective means available for fostering an environment that is conducive to innovation.

In this *Whitebook*, the focus is on cluster *policies*. Specifically, questions such as whether, when, and how policymakers can and should attempt to enable or strengthen clustering, are addressed. Placing clusters in the wider context of competitiveness and innovation, the report makes a contribution to the literature and discussions on clusters by examining the roles of different actors and the competencies that are needed in a cluster, throughout the cluster life cycle, and how they are influenced by special circumstances.

The Whitebook also serves as proceedings from the 6th Global Conference of The Competitiveness Institute (TCI), on the theme "Innovative Clusters – A New Challenge", held in Gothenburg, Sweden, 17-19 September, 2003. Prior to the event, a *Greenbook* mapping *cluster initiatives* around the world was prepared by Örjan Sölvell, Christian Ketels and Göran Lindqvist. The Gothenburg conference, which was organised by TCI in conjunction with the Swedish Agency for Innovation Systems (VINNOVA), focused on the relationship between clusters and innovation. As part of the conference, 16 miniforums addressed the cluster concept from a number of angles, and were complemented by a number of learning and action workshops. Conference participants were offered the opportunity to become closely involved in fascinating real-world cases of cluster initiatives and policies.

The final day of the conference was devoted to action and how to proceed in the future. At the closure of the event, the International Organisation for Knowledge Economy and Enterprise Development (IKED) was commissioned to produce the "Whitebook" for cluster policies. IKED is solely responsible for the content and conclusions drawn in the report. It is important to note that TCI does not endorse any specific methodologies or approaches, but serves as a neutral platform for dialogue and cross-learning in the competitiveness field, which is still in the early stages of development. Nevertheless, we are pleased with the contribution by IKED, which has filled a major gap in the literature with this report.

We would like to acknowledge the role of the TCI Executive Committee in the conference organisation, and especially Ifor Ffowcs-Williams, at that time the TCI president, and Emiliano Duch, at that time TCI secretary general and vice president Europe, Middle East and Africa, who guided and facilitated the overall process. Thank you for your generosity and sincerity!

Further, we are grateful to Arne Eriksson, AE Consulting, who designed much of the conference and the academic summit, proposed themes and speakers and recruited some of the rapporteurs for the miniforums and learning workshops who contributed to Part II of the Whitebook. In this context we would like to thank Emiliano Duch who designed and organised the learning workshops, as well as David Nordfors, VINNOVA, and Arthur Bayhan, IKED, who identified cluster initiatives for the action workshops.

Also, we would like to thank Lars Eklund, VINNOVA who coordinated the Swedish cooperation with TCI that resulted in this conference and the project manager Erik von Bahr, VINNOVA, for their hard work to ensure the success of the conference. Many thanks also to the team at IKED for their work on the Proceedings and Whitebook on Cluster Policies.

Many organisations and individuals at national and regional levels in Sweden and around the world contributed to the conference. VINNOVA and TCI would like to thank you all for your hard work in bringing about the event.

Alec Hansen
President
TCI

Per Eriksson
Director General
VINNOVA

ACKNOWLEDGEMENTS

The Whitebook draws heavily on the many contributions and deliberations that characterised the 6th Global Conference of the Competitiveness Institute, on the theme "Innovative Clusters – A New Challenge", held in Gothenburg, Sweden, the 17-19 September, 2003. The mandate to produce this Whitebook was a joint initiative by TCI, VINNOVA, and IKED. A team of experts at IKED prepared and produced the book. The work benefited strongly from contributions by TCI and VINNOVA, which both hosted working meetings at which early drafts of the report were presented. The authors are grateful to Alec Hansen, President of TCI and to the conference coordinator in Gothenburg, Lars Eklund, VINNOVA, for their kind support.

In addition, many individuals contributed to the work. We are indebted to Elisabeth Waelbroeck-Rocha, BIPE, France, for her insightful contributions. Mats Benner and Björn Asheim at Lund University provided detailed comments on parts of the report. Further contributions were made by Petter Jönsson, Department of Management and Economics, Linköping University, Sweden; Lars Coenen, Jerker Moodysson, and Martin Svensson-Henning, Department of Social and Economic Geography, Lund University, Sweden; Henrik Mattsson, Department of Social and Economic Geography, Uppsala University, Sweden. They provided summaries for Part II and participated in internal Whitebook workshops.

In addition, the following contributed with summaries for part II: Magnus Lagerholm, Dzamila Bienkowska, Department of Social and Economic Geography, Uppsala University, Sweden; Magnus Eklund, Department of Economic History, Uppsala University, Sweden; Amy Cogan, Ivorytower; Frida Wennerström, Fredrik Waara, Martin Wallin, Linus Dahlander, Johan Brink, School of Technology Management and Economics, Chalmers University of Technology, Sweden; Mattias Lindström, IT University of Göteborg.

The authors are also grateful for comments by Emiliano Duch, TCI and Competitiveness, Bernd M. Thomas, TCI, Ifor Ffowcs-Williams, former president of TCI and Cluster Navigators, and Bernd Hofmeier, University of Halmstad, as well as to colleagues at IKED who provided comments. The authors alone are responsible for any errors and omissions.

Thomas Andersson
President

IKED

EXECUTIVE SUMMARY

Clusters are today recognised as an important instrument for promoting industrial development, innovation, competitiveness and growth. Although primarily driven by the efforts made by private companies and individuals, clusters are influenced by various actors, including governments and other public institutions at national and regional levels. The policy dimension in clusters remains controversial, however.

This *Whitebook* on cluster policies is produced on the mandate of the leading international network addressing the opportunities and issues that arise in the development of clusters, the Competitiveness Institute (TCI), as well as the Swedish Agency for Innovation Systems (VINNOVA). It aims to structure the opportunities and challenges for policymaking raised by cluster development. It provides a framework and approach to help bridge the gap between general features of cluster policies and what should be attempted under specific circumstances. While focusing on the policy challenge, the Whitebook emphasises that cluster development represents above all a private-sector led phenomenon. Part I examines and structures the policy issues whereas Part II presents some of the material developed for the Gothenburg event.

The relevant literature that has led to our current understanding of clusters dates back at least to the 19th century. Fundamental contributions have been made in strands of economic geography, economics, business administration and management literature. The prevailing diversity in perceptions and beliefs counter any efforts to package and present the cluster concept in a uniform and universally-accepted manner. This does not in itself represent a problem. The cluster concept should be addressed and used based on the competencies of how to *adjust* and *customise* it, not the determination to standardise it.

Nevertheless, we need to identify certain key *elements* of clusters. The Whitebook presents seven building blocks: geographic concentration; the core and defining specialisation of clusters; the actors; dynamics and linkages; critical mass; the cluster life cycle; and innovation. Not all these elements must be present in the case of each specific cluster. The absence of one or some of them cannot automatically be seen as a sign of weakness, or as pointing to a need for reform.

The power of the cluster concept rests with the perception of benefits. Clustering is something that has been happening spontaneously throughout time, but is currently taking place on an even larger scale. This is basically because fundamental technical and organisational developments work in its favour. Whereas clusters are associated with a range of potential benefits, clustering also involves costs and risks. Some clusters turn stagnant, closed, and counter-productive. The Whitebook underlines the universal importance of good conditions for innovation in connection with cluster processes. Key features of so-called *innovative clusters* are identified, and it is stressed that conditions should be such that both stable and more radical changes are possible in cluster dynamics and the associated distribution of gains among the participating actors. Given the right conditions, innovation will serve as a forceful instrument to realise the potential benefits of clustering, and to counteract the risk of detrimental outcomes.

After reviewing what can be expected to occur as a consequence of market forces alone, the *rationale* for policy interference in cluster developments is examined. Interactions between different actors influence the outcomes of clustering processes, and need to be taken into account by policymakers. Although the traditional notion of piecemeal market and policy failures continues to deserve attention, *systemic* concerns should be given high priority in cluster policies.

The time has come for policymakers to adopt a *comprehensive* strategy and approach to this field. The systemic approach must not serve as a basis for motivating any kind of measures, but should be adopted in a way that allows policymakers to better identify and address the most critical issues, as well as to act where policy can make the greatest difference in fostering a better playing field for private sector actors. The mere appreciation and understanding by policymakers of the importance of clusters is important, however, for ensuring that market actors can expect solid and stable policy setups. Further, policies need to be designed both with a view to the acceleration of *existing* clusters and to the importance of providing the basis for the emergence of *new* ones.

No single policy instrument applies in all cases. *Broker policies*, *demand side policies*, special promotion of *international linkages*, *training* and *framework policies*, may all generate substantive benefits but are also associated with challenges. Policymakers need to opt for the most effective *combination* of measures overall. It is further emphasised that cluster policies differ from related and partly overlapping approaches, such as *Innovation Systems* and *Triple Helix*. While, in practice, there may be a conflict in the application of these different perspectives, the cluster approach has a natural tendency to be industry- and demand-oriented, and also a distinct focus in striving for customisation. It can thus help educate policymakers to become more aware of the actors in the economy and the importance of the incentives facing them.

In practice, there is often conflict between the different concepts or "schools". However, if governments and the wider institutional fabric of many countries are to be reformed, there can be benefits from achieving greater synergy between the different perspectives. The cluster and the innovation systems approaches are potentially complementary. They share a fundamental drive for putting in place governance structures that are more consistent and comprehensive in sparking innovation and competitiveness.

Part I examines practical issues of what should be attempted, and by whom, in cluster policy. The task requires consideration of what distinguishes real world cases from generalised conceptual models. Three stylised clustering processes are elaborated: i) the engineered, ii) the organic, and iii) the re-engineered process. Further, the Whitebook examines the issues that arise in the four stages of the clustering process: i) Creation of Trust, ii) Linkages, iii) Vision and Strategic Direction, and iv) Implementation. Policy approaches need to be designed with a view to perpetuate "Innovative Clusters" that continuously redefine their vision and strategies.

Governments and public authorities can no longer be viewed as impersonal, impartial guarantors of socially optimal outcomes. Like private institutions, they are operated by people who develop and cherish their special skills, interests and attitudes. Public institutions are present in most main areas when it comes to influencing clusters. The policy strategy

should pay attention to the range of competencies and influences that are relevant for clusters. In particular, policy approaches should be designed with a view to what strategies and mechanisms can put in place reasonable *incentives* for a healthy division of labour between the actors involved, and enable sound continuous learning processes.

On this basis, the Whitebook advances the notion of *coupling competencies* to different phases of the clustering process. Each phase stands to benefit from distinct combinations of competencies, which can be held by several different actors. That is, there is not just one set of tasks that should be completed, nor one group of actors to complete each task. Rather, a set of competencies is required. A partial mapping of competencies beneficial to clustering processes is presented, and a matching of actors outlined. The mapping involves general characteristics, competencies, strengths and weaknesses that characterise each group and their possible role in the clustering process. Four main groups of actors are examined: firms, government/policy-makers, academia, and the financial sector – with note taken of additional sub-groups. The importance of "clusterpreneurs" and "glue organisations" is also addressed.

A central role for policymaking in regard to cluster processes is to foster a dynamic process marked by a favourable division of responsibilities between different authorities and other actors in accordance with their disposition for certain functions and skills. Competencies in governance and communication should be promoted in ways that help reconcile conflicting interests and counter the risk that policy is captured by vested interests. Processes should, to the extent possible, be organised and communicated at early stages, without unduly pre-assigning responsibilities for certain tasks based on actor groups, but in ways that can allow for gradual learning and improvement on all sides.

Attention is further paid to the specific situation of large versus small economies; centralised versus decentralised government; economies with primarily large versus small companies; sectoral differences; cluster development in rural areas; and developing countries and transition economies. Finally, issues of evaluation are addressed, and recommendations presented as to how evaluations should be designed and implemented. Evaluation, of which ex post assessment represents only one stage, should be viewed as a process, encompassing ex ante preparations and communication as well as monitoring ongoing programmes. All cluster actors have a lot to gain from appropriate evaluations. Governments have a special responsibility for putting in place functioning and comprehensive mechanisms. Still, public actors may have reasons not to rise to the task and may instead put their priorities elsewhere. The informed demand of key cluster actors may be essential if public authorities are to make the needed effort to put in place coherent frameworks for evaluation.

PART I

1. INTRODUCTION

1.1 Clusters: The wider context

Many people sense that society is in a state of upheaval. Of course, what is new and what is old is in part a philosophical question which goes back at least to ancient Greece. However, a vast number of people are experiencing rapid, tangible changes in everyday life, at work and in their homes, and also in their relations to other people. Something fundamental has happened to our means of communication - to the way in which we interact with each other. As human beings, we are gaining a new potential to learn from, and influence, other people anywhere in the world. At the same time, so many of our concerns and affections remain local and belong to a specific place.

Referring to society at large, concepts such as *the new economy*, the *information society*, *the learning society*, and the *knowledge-based economy* have become popular. True, contrary to some of the expectations a few years earlier, the new millennium soon showed that the business cycle had not come to an end. In fact, not even at the peak of the new economy hype was there any basis for arguing that productivity growth was on a long-time rise. As far as we can measure, productivity growth was lower in the 1990s than in the 1980s, which was, again, lower than in the 1970s.

At the same time, the economy and society are subjected to fundamental changes. According to indicators of international trade, sectoral growth, and firm performance, products and production processes that engage technology and skills intensively are on the advance (Drucker, 1993). Services are becoming more pervasive; there are rapid quality improvements; and the main production factors are turning largely *intangible* in nature. We observe an increasing weight of total factor productivity in the most successful economies at the high-income end (OECD, 2001*a*), i.e. traditional determinants such as capital or labour matter less for growth. There is also a tendency towards more divergence in growth across countries, coupled with increased income differences within countries (Fagerberg and Verspagen, 1996; Arjona et al., 2001). Further, traditional governance structures are under pressure, as manifested by the backlash in multilateral trade negotiations. Both public and private management structures are struggling to cope with cross-cutting issues that engage diverse assets and interests.

There is little doubt that growth and prosperity now crucially depend on the ability of individuals and organisations to generate, access, and utilise *knowledge* and *information*. Underlying this proposition are fundamental driving forces. Collapsing costs for communication and for diffusing and accessing information account for radically-reduced barriers to exchange between people over virtually any distance. As in the case of previous technical revolutions, the evidence now suggests that Information and Communications Technology (ICT) plays the role of a generic-purpose technology, whose production and use

constitutes a pervasive driving force for productivity growth across a widening range of economic activities (Stiroh, 1999).[1]

ICT in itself cannot explain the ongoing changes, however. Among the fundamental driving forces, there is the intertwined influence of *liberalisation* and the *globalisation* of goods and factor markets. Expanded investment in *human capital* and intensified *learning processes* represent another key factor. Whereas the quantity of education appears to decline in importance (Nehru et al., 1995; Psacharoulos, 1995; Barro and Lee, 1996), quality investment, the processes of life-long learning – and the use of skills – appear to make the difference (Mincer, 1989; Grindley and Teece, 1997; De la Fuente and Dmenech, 2000). Investment in human capital is not uncomplicated but depends on the incentives of individuals and employers (Becker, 1993). At the same time, appropriate investment in human capital appears greatly important for reaping the gains of new technology, including productivity gains from investment in ICT at firm level (Brynjolfsson and Hitt, 2000; Gudmundur et al., 2001). Clearly, there is an intensified interplay between technical progress, diffusion and absorption of technology, and *innovation*.[2] This interplay is critical not only for putting new technology to use, but also for mobilising technology as well as skills and other production factors in response to unfulfilled demands.

The list of relevant change factors does not end there. Management of natural resources and of the environment, and societal changes such as those associated with reduced birth rates and the ageing society, all matter for productivity and growth. In this book, we underline the key importance of yet another factor, i.e. that of *organisational change*. Rather than approached in isolation, organisational change should be conceived of as a response as well as an enabler in regard to a range of opportunities and challenges. In particular, we underline the significance of its connection to human interactions and innovation.

Some studies have explicitly demonstrated an influence of organisational change on the use of skills, technologies and economic performance (Nyholm, 1995; NUTEK, 1998; Caroli and van Reenen, 1999; Bertschek and Kaiser, 2001). The scope of the topic has probably become best known indirectly, however, through the school of thought focusing on *clusters*. Here, the roles of interactions and mutual adjustment to relationships are linked to proximity and the idiosyncratic features of a place.

The importance of geographically co-located activities was recognised by geographers centuries ago, but has been highlighted in analytical and normative economic literature in recent decades. Although primarily managed by the private sector, the driving forces, scope, and implications of clustering are still widely debated. Many policymakers have tried to put it to practical use, with varying results. A range of public measures, at both national and regional level, are being adopted or refined with reference to the cluster concept. This applies to policies traditionally found under different ministerial responsibilities, such as industry support, science and technology policy, competition policy, education and labour market, and social affairs.

[1] Among studies verifying impacts of ICT-use on productivity growth, see Jorgenson et al. (2002), Baily (2002) or OECD (2003*a*).

[2] With innovation is understood the effort through which new commercially relevant processes or products are developed.

Clustering is generally defined as a process of firms and other actors co-locating within a concentrated geographical area, cooperating around a certain functional niche, and establishing close linkages and working alliances to improve their collective competitiveness.[3] The concept is related to, but goes beyond, that of *agglomeration* or *co-location* of related activities. Whereas co-location may be associated with favourable external effects that are not intended but rather incidental (Mishan, 1971), joint strategies and actions motivated by the anticipation of mutual benefits are greatly important in clustering. Until recently, the process was nevertheless viewed as exogenously determined, that is, from the viewpoint of a policymaker, a member of an industry or a resident in a region or a nation; you were lucky if you had it, or were part of it.

"Cluster initiatives" are viewed as conscious actions taken by various actors to create or strengthen clusters. There are multiple relevant actors, and they may relate to each other in different ways. Governments and other public authorities are known to be responsible for most cluster initiatives, although there is a marked geographical variation. For example, in the United States, private initiatives are more common. Yet, even initiatives started or managed by private actors are in many cases dependent on some form of public funding (Sölvell et al., 2003), indicating the significance of "cluster policy" for the outcome of "cluster initiatives". However, the outcomes of clustering tend to be different depending on whether public or private actors are in charge. Studies of cluster processes have concluded that top-down policies often fail. At the core of cluster processes lies the interaction between the individual firms and organisations.

In this *Whitebook*, the focus is on cluster *policies,* which are linked to cluster *initiatives*. For policies to be pursued in the first instance, they should be anticipated to actually work. In clustering, that requires relevance to the actions of the private sector. Perceptions of quality in policymaking influence the extent to which observers "believe" in the virtues of cluster policies. Those who distrust government in general tend to speak against policies in this area. Others who distrust policies such as public support of R&D undertaken by individual firms view cluster policies as a more sensible avenue, as it is seen to be more consensual and less prone to favourism.

It is widely recognised that public policy, whether explicitly directed at clustering or not, may exert a major influence on the formation and development of clusters. There is a notion of the "inadvertent role played by public policy" in affecting cluster formation; "…Evolutionary paths for cluster creation are highly variable. Public sector decisions can affect cluster trajectories in a variety of ways, though the impacts are often unpredictable and often unintended" (Wolfe and Gertler, 2004).

There are varying opinions whether "cluster policy" represents a useful tool. To underpin a constructive policy stance, a sound understanding of the role of the different players involved is required. This applies not only in a general sense, but there is a need for a framework that can help bridge between what may seem to hold in a general sense, and what applies in the case of specific clusters. At the same time, abstaining from policy is not risk-free; it is instructive to reflect on the nature and consequences of inaction. In reality, few

[3] The role of cluster facilitators, "The Competitiveness Institute preparatory course", Gothenburg 16 September 2003, Ifor Ffowcs-Williams, CEO, Cluster Navigators Ltd, New Zealand.

"neutral policies" exist - because public actors are already active and present in so many areas with a direct or indirect bearing on cluster processes. Inaction is not an option.

Broadly speaking, the arguments for cluster policy, i.e. intervention by government or other public actors in regard to the development of clusters, are not yet fully-established. A host of approaches are nevertheless pursued by various policy institutions but motives vary, and are often vaguely formulated. There is a scarcity of comprehensive evaluations of results measured against clear-cut objectives. In other words, the field remains marked by unsettled issues. What is the role of policymakers with respect to clusters? What type of clusters should be prioritised when considering the role of public policy? Which measures should be implemented, by whom, and at which stages? How does cluster-driven policy relate to other approaches, such as those that spring from concerns with national/regional innovation systems, the information society, etc?. What are the guiding principles for public-private partnership, or for deferring responsibilities to the private sector?

The interest in clustering has been given a boost by the combination of disappointments with other policy approaches, the appreciation in academia as well as business and policy circles of innovation, and its perceived links to clustering processes. This book, drawing on the Gothenburg conference, pays particular attention to the connection between clusters and innovation. Clusters based on traditional skills and structures have existed for centuries, and their significance should not be ruled out. Yet, innovativeness is a key aspect of dynamic clusters and a policy concern. Although technical progress and internationalising goods and factor markets give rise to intensified competitive pressures, the mechanisms underpinning innovation are complex. Time, for instance, matters as clusters are generally innovative in their early existence. Their creation is typically based on innovation one way or the other. As clusters mature, however, some become institutionalised and complacent, relying on skills and assets accumulated primarily in the past. For clusters to evolve, and for societies and countries to progress with them, their innovative capabilities must grow over time rather than dwindle.

Various concepts advanced in recent years are now presenting analytical and policy messages which are partly overlapping with those of the cluster approach. Notions such *as innovation systems*, *Triple Helix*, *Learning Networks and Societies* and the *knowledge-based society* provide insights that are complementary to those of clusters. At times, the availability of alternative communication tools may be useful, and there are no absolute demarcation lines between these various concepts. What is referred to as "cluster policy" contains elements that may be reckoned as traditional policy tools as well as relatively new approaches to building a knowledge-based society. Nevertheless, the pursuit and application of concepts gives rise to more or less healthy competition depending on circumstances. Whether the outcome is constructive or confusing in the particular case is not a given. The ultimate value to policymakers and to society of ideas, concepts and insights, depends on whether they can be put to practical and effective use to help solve real problems.

At the same time, the various concepts entail differences. For the purpose of stringency and in order to serve real purposes, some of these should be firmly underlined. The cluster concept or cluster policy should not be extended to embrace the reins of an innovation system. It does not have to, as the cluster approach has a distinct focus and a practical orientation that allows it to make an important and operational contribution to analytical

work as well as to the realms of policy-making. On the other hand, not all innovation systems agglomerate or depend on the features displayed by clusters, indicating that support of clusters should not be seen or used as a panacea for strategies to promote innovation.

1.2 Purpose and outline

The background for the Whitebook is the 6th annual conference of The Competitiveness Institute, *Innovative Clusters a New Challenge*, which took place in Gothenburg in September 2003.[4] It was a large-scale conference, wealthy in material and participants, with leading expertise from academia, policy, communities of cluster practitioners, etc. Prior to the event, a *Greenbook* mapping *cluster initiatives* around the world was prepared by Örjan Sölvell, Christian Ketels and Göran Lindqvist.[5] The Swedish-based VINNOVA, the world's first public authority in charge of innovation systems, served as the main hosting organisation in cooperation with a number of other institutions. One of these was IKED, a Nordic-based international organisation focusing on policy issues raised with the ascent of the knowledge-based economy.

Preceding the event were a two-day academic summit with the world's leading researchers on cluster themes, a preparatory course on facilitating innovative clusters by pioneering cluster practitioners such as Ifor Ffowcs-Williams, Michael Enright, Alec Hansen, and Emiliano Duch, and study visits to clusters in and around Gothenburg. Among the keynote presentations, Stuart Rosenfeld, Lynn Mytelka and Michael Enright addressed different aspects of innovative clusters. Antoni Subirá, honorary Chairman of the TCI advisory board, offered a critical reflection on the way the cluster concept is now put to use. Per Eriksson, director general of VINNOVA, offered an exposé of cluster initiatives in practice. In his keynote speech, Michael E. Porter exclaimed a desire to broaden, systemise and corroborate the cluster concept. There were two large roundtable discussions, one comparing Canadian and Swedish experiences and one discussing the experiences of multilateral agencies in supporting innovative clusters. The main thrust of the conference, however, was divided into miniforums and workshops. There were sixteen miniforums in all, consisting in lectures and discussions with qualified experts, focusing on areas of special importance. The conclusions were presented on posters after the sessions, and summarised by a group of rapporteurs. This material is presented in Part II of the Whitebook, together with the summaries from the learning workshops.

There were nine learning workshops organised around the theme of evaluating mature clusters with more than five years experience in order to generate lessons from their experiences. These included a representation of Emilia-Romagna in Italy, Catalonia in Spain, Scotland, Styria in Austria, New Zealand, Arizona in the United States, Australia, Chihuahua in Mexico and, finally, a European Union inter-cluster initiative. These workshops were followed by seventeen action workshops that allowed representatives from emerging clusters

[4] The Conference program is found in Appendix A. Further information on the conference can be found at http://www.tciconference.org .
[5] A free digital copy of the Cluster Initiative Greenbook can be acquired at the following webpage: http://www.ivorytower.se/greenbook/.

with less than five years' experience to present their experience and to interact with conference participants to generate structured lessons for the future. In order to provide favourable conditions for spontaneous dialogue, these Action Workshops were not documented. The cases in the Action workshops were presented by representatives from such disperse countries as the Czech Republic, El Salvador, Georgia, Hungary, Latvia, Lithuania, Mexico, Mozambique, Slovenia, Spain, Sweden, Tanzania, Turkey and Uganda.

The conference was rounded up with a synthesis provided by Elisabeth Waelbroeck-Rocha, and a plan for the Whitebook outlined by Thomas Andersson. Beyond presenting the main findings of the rich material from the conference, the document aims to take a step forward in structuring the policy issues, i.e. to serve as a *Whitebook* on cluster policies. This creates a need, for instance, to take note of the role of the various relevant stakeholders that are active in clustering processes. These include a range of public authorities, workers, business leaders, business angels, scientists, entrepreneurs, and so on. The Whitebook does not address each and all in detail, but it does provide some principles for how to approach and place them in the policy context.

In much cluster-related policy work, there is a need to sharpen our notion of the rationale for interference by policymakers. This is not only a concern of relevance to government and initiatives taken by other public authorities, notably at local level. The active involvement by policymakers have an impact, positively or negatively, on the scope for, and direction of action by, private sector representatives, such as Institutions for Collaboration (IFCs)[6], entrepreneurs and businesses, and also civil society. The book does not examine cluster initiatives by non-public actors in detail, but emphasises their importance. Governments are not the main actors in clustering, and they should be mindful of promoting an appropriate division of labour. Adopted measures should take account of the inter-linkages between the actors engaged, and they should promote learning. Recommendations are advanced on which constellations and measures deserve priority in the design and implementation of policy under varying conditions.

In Part I of the Whitebook, following this introduction, Chapter 2 reviews strands in the literature that led us to our current notion of clusters, briefly reviewing a number of important contributons. While a strict definition of clusters is refuted, we discuss what comprise key elements of clusters, although not all need to be present in the individual case. Further, the potential benefits of innovative clusters are underlined, as is the presence of costs and risks. The 7th and last element, that of innovation, is dicussed in some detail. Although it is not possible to make a sharp definition of "innovative clusters", innovation is underlined to serve as an important driving force underpinning gains of clustering, and countering the potential downsides.

In Chapter 3, the Whitebook explores the rationale for policy, based on what can be expected from spontaneous developments in the market. The importance of addressing systemic issues and of adopting a comprehensive approach is underlined. Comparisons with other, related concepts, such as triple helix and innovation systems highlight the operational nature of the concept. In Chapter 4, the Whitebook provides a schematic view of how clustering processes evolve over time, and which competencies stand out as beneficial during

[6] For further reading see, p.24.

the various phases. The role of different actors and how they evolve over time matter significantly. The nature of the interplay between them varies greatly depending on specific circumstances. Following a review of such special circumstances, Part I of the Whitebook ends with a review of what can and should be attempted through improved assessments and evaluation methods for cluster processes.

Part II of the Whitebook presents summaries from the miniforums and learning workshops. They present a diverse range of subjects and can be viewed in part as stand-alone pieces with merits of their own. Each miniforum and workshop was summarised by a member of a group comprised of specially selected Ph.D. students from leading Swedish universities in the field (Gothenburg, Linköping, Lund and Uppsala), and some representatives from International Organisations. Each author was asked to follow a standardised structure, consisting of: i) identifying the objectives; ii) summarising the key discussions and conclusions, and iii) highlighting the implications for policy of respective miniforum.

The miniforums, fifteen in total, can be grouped into three major themes. The first concentrates on specific aspects or conditions which affect clusters, clustering potential and dynamics. The miniforums on social capital, e-business and its effect on clusters and clustering, strategic upgrading through foreign direct investment (FDI), the importance of science parks as boundary crossers, gender and clustering, and clustering competencies, all fall into this category. The second can be described as focusing on specific challenges for policymakers with regard to clusters. The miniforums in this group addressed questions such as whether government can catalyze clusters, the difficulty of evaluating cluster performance, and promoting economic development through cluster policies. The third can be categorised as placing the concept of clusters in a more theoretical framework. These miniforums placed clusters and cluster initiatives in the context of regional innovation systems, microeconomic agendas, and collaborative governance or triple helix models. Finally, two miniforums were outside the above mentioned categories and had a specific thematic or regional focus, namely the miniforums on drivers of biotech clustering and on the idea of creating networks of European clusters.

The learning workshops were aimed at providing insights and experiences from so-called mature cluster initiatives, defined as initiatives that have been in existence for at least five years. Thus, in each learning workshop a cluster initiative was first presented by a representative of the cluster initiative; and then specific aspects and the overall impact of the initiative were analyzed or evaluated. One of the purposes of the learning workshops was to lead to conclusions or lessons that might be of use to new or planned initiatives. In summarising the learning workshops, the authors used the Cluster Initiative Performance Model (CIPM)[7] to structure their summaries according to: i) the objectives of the cluster initiative; ii) the social, political and economic settings; iii) the cluster initiative development processes; and iv) the efficiency of the performance of respective initiative. Examples of clusters evaluated in the learning workshops include Emilia-Romagna, Catalonia, and Arizona.

[7] See Sölvell et al. (2003) p.9.

2. CLUSTER-BASED ECONOMIC PROCESSES: CONCEPTS AND KEY ELEMENTS

Main messages, Chapter 2

Clusters are inherently idiosyncratic in nature, with different applications of the concept suiting various situations. In the Whitebook, seven elements have been adopted as key to our notion of clusters: i) ***Geographical concentration****: firms locate in geographic proximity due to hard factors, such as external economies of scale, as well as soft factors such as social capital and learning processes; ii)* ***Specialisation:*** *clusters are centred around a core activity to which all actors are related; iii)* ***Multiple actors****: clusters and cluster initiatives do not only consist of firms, but also involve public authorities, academia, members of the financial sector, and institutions for collaboration; iv)* ***Competition and co-operation:*** *this combination characterises the relations between these interlinked actors; v)* ***Critical mass:*** *is required to achieve inner dynamics; vi)* ***The cluster life cycle:*** *clusters and cluster initiatives are not temporary short-term phenomena, but are ongoing with long-term perspectives, and finally; vii)* ***Innovation****: firms in clusters are involved in processes of technological, commercial and/or organisational change.*

Whereas not all these elements need to be present, nor are they necessarily desirable, in the specific case, innovation is deemed greatly important for generating the potential benefits of clusters. "Innovative clusters" are critically powered by three driving forces: i) New firm creation and technological diversification; ii) Inter-actor network creation; and iii) Cluster formation. Benefits flow from opportunities for innovation coupled with the impetus of enhanced productivity and improved business formation. To make use of all these requires processes of both stable and more radical distribution of gains within cluster processes. Clusters and cluster initiatives are not problem-free though. Risks and pitfalls include: i) vulnerability of specialisation; ii) lock-in effects; iii) creation of rigidities; iv) decrease in competitive pressures; v) inherent decline; and vi) self-sufficiency syndrome. Realising the opportunities for innovation is critically important for avoiding the traps.

2.1 Introduction

While the attention paid to the concept of clusters has enhanced its visibility, confusion persists regarding the meaning and applicability of the term. With the growing popularity of the cluster concept and expanding efforts to put the concept to practical use, there is a risk of blurring not only the definition but also the practical implications. The field needs further structuring, notably in order to link the notion of what is perceived as a cluster and what are its driving forces and benefits, with the efforts and actions that enable them to develop.

Given the richness and diversity of the relevant literature, it is hardly meaningful to aim for a clinically precise definition of what makes up a cluster. Analysts and practitioners may appropriately apply different definitions and terminology depending on circumstances and preferences. In this chapter, we review parts of the literature that have contributed to our current understanding of the subject. While this is not to be seen as an all-encompassing or exhaustive exposé, the aim is to provide a basis for examining relevant approaches to clustering and associated initiatives and policies.

Following a survey of the literature and a few comments on outstanding issues, this chapter focuses on a number of elements that are central to the cluster concept and which, for convenience, are adopted in this volume as our basic notion of what comprises a cluster. The chapter concludes with a critical examination of links between innovation and clustering, and their implications for the ability of firms and economies to realise the potential benefits of clusters.

2.2 Strands in the literature

Various contributions have provided the basis for our current understanding of clusters. A major impetus is the work of geographers on the localisation of economic activities, with the first ideas and theoretical developments brought forward in the land-rent analysis of von Thünen's *The Isolated State* (1826). Assuming that there is one central city in a self-sufficient 'isolated state', and developed before the age of industrialisation, this model explained how agricultural production and land use would specialise or agglomerate in concentric circles around the city. Here, travel time – that is, distance to the centre – and transportation costs explain the agglomeration of certain production sectors in particular areas.

Appearing in economic literature, agglomerations of related industrial activities were first explained in the late 19th century under the heading of "industrial districts" and with reference to so-called Marshalian externalities (Marshal, 1890). This framework established a link between co-location by firms and economic efficiency as firms would cluster in order to benefit from positive externalities associated with their respective activities.

In the first half of the 20th century, several contributors recognised a relationship between geographic agglomeration and scale economies. Weber (1909) explained an individual producer's localisation decision as driven by the benefits of minimizing production and delivery costs, assuming that it is only possible with one production site. Christaller (1933) depicted the demand and supply of goods and services as centralised but also characterised

by spill-overs that diminish with distance. Central regions are surrounded by peripheral border-areas with low market activity. Lösch (1940) proposed that, as an efficient pattern of central places would imply hexagonal market areas, economic activities can only be undertaken at a limited number of locations. Harris (1954) and Pred (1966) spoke of a self-reinforcing process in which the decision of firms to choose a location with good access to markets and suppliers in turn improves conditions for other firms in that place.

Another early influence was the work of Schumpeter (1934, 1939 and 1942), who stressed the role of technological change in industrial development and introduced the significance of innovation, in regard to products, processes and management/organisations. Venturing into the determinants of innovation, he hypothesised that market dominance and firm size provide a basis for handling the costs and risks that are intrinsic to innovative efforts. At the same time, he professed the significance of the entrepreneur as an agent of change pioneering new combinations and playing an important role for creative destruction, i.e. an evolutionary process dismantling obsolete industrial structures.

Arrow (1962) outlined the role of competition in providing incentives to innovate. Kamien and Schwartz (1972) and Nelson and Winter (1982) introduced the notion of an evolutionary and interdependent relationship between market structure and innovation. Among later contributions, Geroski (1990), Acs and Audretsch (1990) and Aghion et al. (2002) provided insights into the tradeoff between market power that provides resources for R&D as well as allows for returns, and the risks of complacency under conditions of dominance by market leaders, and how the relationship varies across industries.

Hayek (1945) explored how imperfections in the quality and amount of information held by actors impede them from identifying or relying on each other, which prevents valuable exchange from taking place. Olson (1965) noted that actors are more able and prone to organise themselves so as to defend their interests where returns are concentrated, whereas when they are diffused, actors tend to be relatively passive. Private associations and lobbying thereby tend to be dominated by considerations to rents for large and strong actors in more narrowly defined interest groups. On the other hand, smaller actors may free-ride on the efforts of bigger ones, which will have to pay the brunt for collective action. In the aggregate, there will be under-investment in collective action, with the greatest efforts made where vested interests are able to dominate.

Nordhaus (1962) observed that the innovation process is accompanied by externalities unrecorded in market transactions. Polanyi (1962) distinguished tacit knowledge from codified information. Some fundamental exchanges are not communicated formally. Knowledge cannot be fully ”codified”, or transformed into a public good that floats or is transferred freely in society, but the ability to use it is to some extent “attached to specific individuals or structures, i.e. “tacit”. Codified knowledge obtains economic importance at the moment it is combined with the specific ability to use it (von Hippel, 1994; Cowan et al., 1999). In parallel, following Coase (1960), the nature of markets versus organisations or hierarchies (and there in between hybrid organisational forms such as networks) have been explored. This kind of analysis has focused on the influence of transaction costs and asset specificity on the advantages of different organisational forms (Williamson, 1985).

Connections between regional space, interaction between economic actors, and innovation were gradually appreciated in industrial organisation literature. Perroux (1950) brought attention to regional growth with his theories of *growth poles* and *abstract economic space*. Later, Perroux and others based the concept on the notions of external economies, agglomeration and linkages. In the move to a post-Fordist economy emphasising flexibility, external economies of scale came into focus.[8]

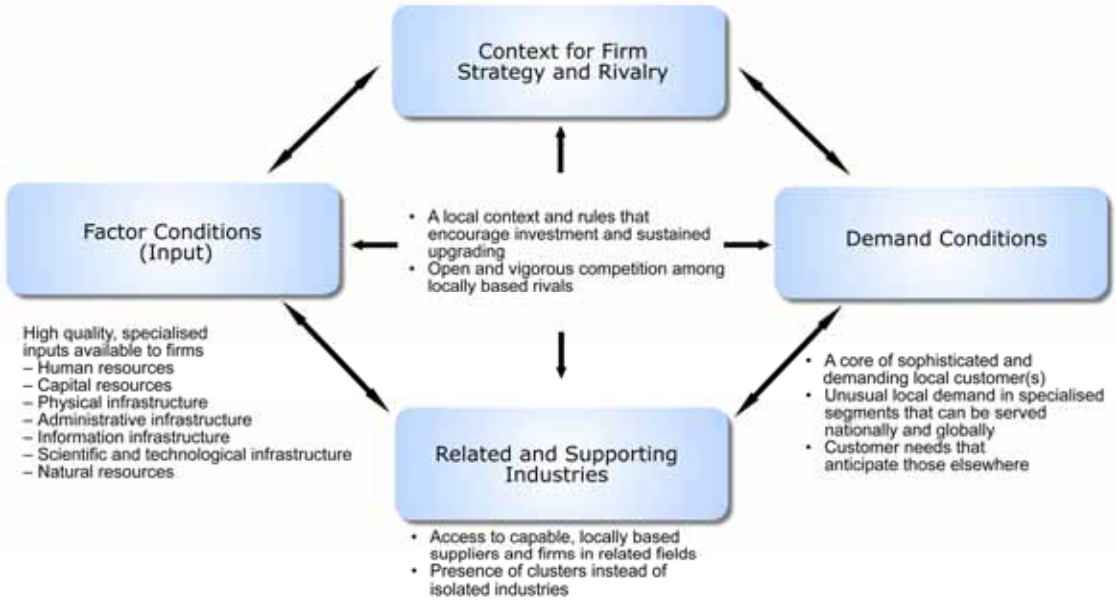
These ideas were picked up in the 1980s with the interest in industrial districts, inspired by observations on the so-called 'third Italy' (Becattini 1987 and 1989; Brusco 1982 and 1990; Garofoli 1984; Dei Ottati, 1994). The concept described the thriving firm structures witnessed in the Northeast and centre of Italy, which contrasted with the stagnation in the poor South ('second Italy') and a recession in the traditionally rich Northwest ('first Italy'). The performance of the Northeast and centre of Italy sparked interest in the economic and social fabric of the region, marked by the concentration of firms clustered in specific localities according to industrial sectors. These clusters were able to establish strong positions in world markets in a number of traditional product categories, including shoes, furniture, tiles, musical instruments, etc. Progress seemed promoted by the capacity of the clusters to innovate in terms of production processes as well as product qualities.

In connection with the interest in the 'third Italy', the literature examined properties in industrial organisation that facilitate flexible structures and specialisation. The focus was on the role of small and medium-sized enterprises (SMEs) (Sengenberger et al., 1990; Loveman and Sengenberger 1991). Not only were strengths attributed to inter-firm collaboration and to the services created by the government and trade associations that facilitated SMEs' access to funding. Inter-firm networking had primarily emerged spontaneously as the result of historical and social peculiarities (Piore and Sabel, 1984; Brusco and Righi, 1989; Becattini, 1990; Best, 1990; Porter, 1990) from the early 1990s onwards with studies of various clusters (Goodman et al., 1989; Pyke et al., 1990; Sengenberger and Pyke, 1991; Cooke and Morgan, 1994; UNCTAD, 1994). Some examined the situation in individual countries such as Germany (Semlinger, 1993), the United States (Saxenian, 1994; Porter, 2001), Japan (Friedman, 1988), New Zealand (Ffowcs-Williams, 1997), Norway (Hauknes, 1999), and, increasingly, developing countries (Humphrey and Schmitz, 1995; Nadvi, 1995; World Bank, 1999). A number of additional studies compared cluster developments in different countries (Carlsson, 1997; OECD, 1999 and 2001*b;* Commission, 2002 and 2003*a*).

A major breakthrough for the cluster concept was Porter's *Competitive Advantage of Nations* (1990) which, conversely to the prevailing US local development objective of promoting diversified economies, advocated specialisation according to historical strength by emphasising the power of *industrial clusters*. Porter highlighted that multiple factors beyond the ones internal to the firm may improve its performance. In his "diamond model", illustrated in Figure 1, four sets of interrelated forces are brought forward to explain industrial dynamics. These are associated with factor input conditions; sophisticated local demand conditions; related and supported industries; and firm structure, strategy and rivalry.

[8] It is commonly argued that there are two types of agglomerated economies (Estall and Buchanan, 1973): urbanisation economies and localisation economies with sector specialisation. The external economies of scale in urbanisation economies stem from the geographical proximity of industries and services in general (Hoover, 1970). In contrast, localisation economies emanate from the geographical agglomeration of related activities.

Figure 1: Porter's diamond model



Source: Porter (2001)

Enright (1992, 1993) emphasised the role of regional and spatial aspects for generating dynamics underpinning competitiveness. A core notion arose that a collaborative, mutually supportive group of actors could enhance regional competitiveness in global markets and thus create growth and other benefits. Following Arrow (1962), who emphasised "learning-by-doing" and the significance of face-to-face exchange and personal demonstration and exchange of experience, the role of geographical proximity for knowledge transfers and innovation has been explored (Jaffe, 1989; Audretsch and Feldman, 1995). Nonaka and Takeuchi (1995) elaborated on knowledge creation and innovation as a social process engaging individuals that exchange tacit and explicit knowledge. Knowledge creation generally begins with efforts aligning individual cognitive perceptions and deriving a group-level understanding as a basis for collaboration. Trust-based relationships and social capital may thus be important for enabling decentralised horizontal cooperation between individuals within and across firms and institutions (Storper, 1999).

Porter (1998) further underlined that local competition creates incentives to emulate best practice and boost pressures to innovate, while also connecting the strengths of competition with the virtues of selective cooperation. The concept of clusters was related to the "competitiveness" of industries and of nations.

> *Clusters are a geographically proximate group of interconnected companies and associated institutions in a particular field linked by commonalities and complementarities. Clusters encompass an array of linked industries and other entities important to competition . . . including governmental and other institutions – such as universities, standard setting agencies, think tanks, vocational training providers and trade associations.*
> (Porter, 1998).

As for related contributions, Dahmén's (1950, 1988) work on development blocks explored interactions between large, established industrial giants on the one hand, and small firms or new entrants on the other. He also examined links between industries and how different industries can complement each other in mutual strengthening of their value chains. The role of joint ventures, strategic alliances and various other formal, informal or structural links for industrial performance and innovation has been firmly established in various studies (Cooke et al., 1997; Camagni, 1991; Maillat, 1991).

That innovation is not undertaken in isolation has gradually laid the basis for more extended policy conclusions, notably in Innovation Systems literature. This has paid attention to the spectrum of national (Freeman, 1987; Lundvall, 1992; Nelson, 1993; Edquist, 1997), regional (Cooke, 1992), sectoral (Carlsson and Stankiewicz, 1991), and firm-level interactions (Kline and Rosenberg, 1986).[9] The richer the links between different value-creating activities, the greater the importance of coordination mechanisms capable of managing the exchange of information, which becomes interwoven with processes of innovation and mutual learning between the participating actors

Strands of literature which picked up on related themes include the so-called "new growth theory" (Romer, 1986 and 1993; Lucas, 1988; Grossman and Helpman, 1991). Unlike traditional "neo-classical" growth theory (Solow, 1956), endogenous growth models emphasise knowledge spill-over as key determinants of growth while exploring how they can be affected by policy. Attempts were made to explain regional variation in growth rates on the basis of differences in exploitation of increasing returns and externalities from knowledge creation. Meanwhile, work on transaction costs and asset specificity examined how these bear on the political and institutional framework in which transactions are embedded (North, 1990; Williamson, 2000). The traditional stovepipes of government have been observed to encounter growing challenges in managing the co-ordination requirements of advancing institutional structures thriving on opportunities for networking and innovation (Andersson, 1998*a*; Hämäläinen, 2001).

These various contributions brought their respective piece to the puzzle that has formed our current notion of clusters. Not all pieces are consistent, or in harmony with one another. Some have focused particularly on the supply side, including the forces driving technical progress and associated innovations. Others have been heavy on the demand side, the pull forces of the market, the role of entrepreneurs, marketing skills and governance. Some have underlined the role of the actors, others that of mechanisms or rules. There are also related concepts, such as those of group-affiliated firms, networks, innovation systems, and so on, whose boundary lines versus clusters may be vague or at times misunderstood.

The following is not an attempt to bring forward an exact definition. There is an ongoing debate on what constitutes a cluster, both among academics and among policymakers, and there are multiple perceptions of kinds or categories of clusters. The multi-faceted nature of the concept may reflect the appropriateness of varying applications depending on the specific context. Having said this, operational definitions are still needed.

[9] For further background on innovation systems, see Section 3.7 and Miniforum 6 "Clusters and regional innovation systems".

2.3 Clusters - structuring the field

Theories around clusters have widened the approach from being an analytical and observational exercise aimed at examining functional or spatial phenomena, towards including operational tools for regional development and involving multiple actors. The performance and characteristics of the observed "classical" clusters, the Third Italy, Baden-Württemberg and Silicon Valley, have been fiercely debated.[10] Questions regarding the number of clusters observed, the nature of their internal as well as external linkages, the extent to which they have proven successful, etc., are often not answered satisfactorily. Whereas part of the reason has to do with data and measurement problems, earlier anecdotal evidence based on case studies has gradually been complemented by analysis applying industrial statistics as well as country surveys and comparative research projects. This has confirmed the extensive and increasing scope of clustering phenomena across countries.[11] At the same time, questions remain on, e.g., the driving forces and determinants of success.

In this section, we review some of the main elements of clusters commonly found in the literature. That is not to say that all these elements need to be present, or should be pushed for, in specific cluster initiatives and policy measures.

i) Geographical concentration

Geographical concentration has been central to the cluster idea from the outset. Even though some approaches have tried to disprove the importance of physical agglomeration, there are both hard and soft aspects motivating why geographical proximity remains at the core of the cluster concept.

First, there are "hard aspects", of which some were identified already by Marshal (1890), associated with benefits derived by firms from co-locating in certain areas:

- The availability of specific natural resources or other unique local assets may contribute to co-location.
- Geographical proximity provides opportunities for lowering transaction costs especially in accessing and transferring knowledge.
- Economies of scale and scope may be optimised most effectively by a limited number of efficient-scale plants in a given geographical area.
- Specialisation of supply from factor markets with respect to labour, capital, or technology sources, may be facilitated within a specific area.
- The means for accessing and sharing information on market and technology change may become more effective within a given area.
- The interplay with local customers triggers learning processes and more sophisticated demand.[12]

[10] On the Italian industrial districts, for instance, see Bianchi (1994) for observations of worsening problems or Franchi (1994) for renewed defence.

[11] See Enright (1993), Nadvi and Schmitz (1994), Isaksen (1996), OECD (2001*b*), Porter et al. (2002) and Commission (2003*c*).

[12] Read more in Miniforum 9, "From cluster initiatives to microeconomic agendas".

For such reasons, firms may experience that their belonging to a set of inter-related actors which - in a given region - can serve to enhance efficiency, underpins productivity growth and raises innovativeness, especially due to better access to knowledge, ideas and skills.

The physical concentration of businesses may evolve in tandem with the rise of locally specialised labour markets. Enterprises can more easily subcontract those orders that exceed their own capacities, which may allow firms to retain valued customers. Clustering can thus encourage specialisation and an enhanced division of labour within a region, while enabling the individual firms to combine the advantages of flexibility that follow from small scale at firm level with economies of scale and scope at the level of the cluster. Buyers and sellers can gravitate to the cluster, while the proximity of firms creates opportunities for efficiency-enhancing collaboration. For example, networks operating within clusters have enabled cooperation on issues as diverse as training, finance, technological development, product design, marketing, export and distribution. The clustering of firms can reduce the unit costs of providing technical services to members of the cluster.

Second, there are the equally important "soft aspects" related to localisation in *social capital*, see Box 1.[13] Geographic proximity between firms and research institutions tends to facilitate informal exchange and accumulation of tacit knowledge. Face-to-face contact remains very important for the exchange of tacit information.[14] In practice, effective human interface may hinge on people sharing day-to-day experiences (Utterback, 1974; Saxenian, 1988). Often, fruitful, creative processes of exchange are associated with the emergence of a special environment, a "meeting place". Attractive conditions for working as well as living may, for instance, play an important role (Florida, 2002). However, which kinds of places play an important role, as well as which values are conveyed and shared, vary. Chambers of commerce, libraries, university campuses, sport arenas, logistical hubs, lunch restaurants, bars, cafés, festivals, churches, beaches, etc., have all bred special traits associated with interactions between the people who go there.

Social capital can be greatly beneficial for promoting joint efforts, but may also lead to immobility, exclusion and resistance to change; in fact, not all network effects and externalities associated with shared values are beneficial.[15] Therefore, questions arise on how socially desirable interactions came to be translated into social capital (Durlauf and Fafchamps, 2004). While social capital is difficult to define and measure, not least due to data availability problems, fundamental cultural influences and institutions may help put in motion a gradually expanding pool of self-enforcing favourable interactions. In the case of the Italian industrial districts, commercial inter-firm exchanges were found to grow out of membership of artisan and commercial associations, labour associations, and various community-based institutions. Information may also be diffused formally as well as informally, as when employees change workplace, take their children to the same school, or visit the same social events. Such spontaneous, market-led and informal communication channels have been instrumental in, for instance, Silicon Valley.

[13] Read more in Miniforum 1, "Building social capital and trust and civic entrepreneurship".
[14] Read more in Miniforum 5, "How is e-business changing clusters and clustering".
[15] In many cases, the situation is a mixture of positive and negative, as exemplified by Japanese labour markets which generated long-term stable improvements under conditions marked by "life-long employment" and "seniority wages" in big organisations, but at the same time reduced mobility and flexibility (Koike, 1998).

Box 1: Social capital

The concept of *social capital* deserves scrutiny, as issues related to social capital may critically restrain – and represent the key to improvements in – knowledge spill-overs, productivity, and labour market earnings (Gomez, 1999). Social capital can be viewed as: i) a factor of production parallel to physical and human capital; ii) a determinant of transaction costs; and iii) a determinant of monitoring costs. It may serve as a facilitator for financing firms in clusters, the formation of which is based on specific interactions among firms and individuals. Entrepreneurs linked by value-enhancing networks may, for instance, be more likely to put in common resources or to seek credits jointly.

The sources of social capital include: i) Family, ii) School, iii) Local community, iv) Firms, v) Civil Society, vi) Public sector institutions, vii) Gender, and viii) Ethnicity. At the same time, the mechanisms for establishment vary. Both formal institutions and informal, interpersonal relationships may play an important role.

According to Putnam (1993, 2000), the central idea behind the notion of social capital is, first, that social networks have a value and, second, that these give rise to an inclination among the members to do things for each other through "norms of reciprocity". Norms of reciprocity or mutual aiding rely on social networks. "Bonding networks" connect people who are similar and uphold particularised (in-group) reciprocity. "Bridging networks" connect people that are different and nurture a generalised reciprocity. Social capital creates value for the members notably through positive external effects from knowledge sharing, pooling of risk, etc. As broader identities and solidarity are encouraged, a "we" mentality is endorsed. While human capital refers to the individual, social capital relates to the social fabric among individuals (Coleman 1988).

Interestingly social capital does not have to be locally tied, but can pass over large geographical distances, as in the case with ethnic social capital. As an example, India is benefiting from financial, commercial and knowledge flows of diaspora groups (Khadria, 1999), and ethnic Chinese groups that are dispersed in almost all parts of the world today benefit from the facilitated interactions among each other.

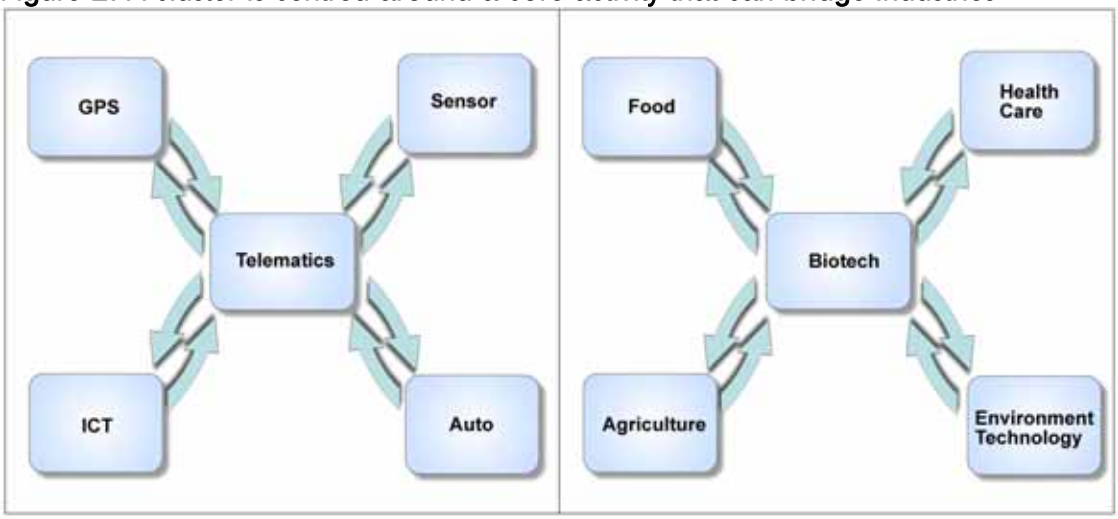
It should be stressed that the spatial dimension does not limit clusters to stay within national borders. Clusters generally engage actors and resources located in multiple countries (Enright, 1999). Whereas there are many examples of intensive interplay between clusters located in various jurisdictions, there is scant evidence so far of successful individual clusters transcending national borders. The automotive cluster between Portugal and Spain, the Dutch-German Twente plastics cluster, the RegioTriRhena engaging French, German and Swiss actors, and the Danish-Swedish Öresund biotech cluster belong to the few that have been able to link actors across borders. An important related phenomenon is the massive networking that has evolved across the Taiwan Straight combining mass production, technology transfers and market-opening activities. In general, however, a number of both "hard" and "soft" factors tend to impede effective cross-border cooperation and restructuring.

ii) The specialisation or common denominator of a cluster

A cluster is traditionally viewed as specialised in the sense that the participating actors are linked together via a core activity, which provides direction towards emphasis on the same markets or processes. Various studies have found that clusters generally have limited transactions among firms within the cluster, i.e. in the form of buyer-supplier relations. The attention has gradually shifted to the significance of knowledge spill-overs and associated aspects. Individuals in the same and in related fields tend to share experiences with each other, formally through professional bonds and informally through the "cafeteria effect", i.e. through different kinds of informal exchanges in, as mentioned, appropriate meeting places. A continuous multifaceted interface in similar but complementary activities potentially accounts for processes of mutual learning, experimentation, and innovation.

Here, we do not view a cluster as necessarily limited to a given product or industry category. A cluster may go beyond relations within a specific sector, or those that develop along an individual value-added chain. It may span numerous sectors, branches and industries. In fact, clustering across traditional sectoral boundaries can be an important source of innovation and future competitiveness. However, effective clustering is likely to entail a strong element of complementary specialisation between actors, each focusing on core business coupled with linkages and the capturing of synergies in learning processes engaging multiple organisations (Audretch, 1995; Dunning, 2000*a*). In Gothenburg, for instance, interactions between actors from GPS-, ICT-, auto- and sensor technology have created the new field of telematics technology, as illustrated on the left-hand side of Figure 2.[16] In fact, today sectoral boundaries are in many cases obsolete as intensive inter-linkages may need to reach into all sorts of fields, including various manufacturing and service industries.

Figure 2: A cluster is centred around a core activity that can bridge industries



Source: IKED

[16] One of the TCI Conference cluster study visits was to the Telematics Valley Cluster in western Sweden, http://www.telematicsvalley.org/.

Another example of changing cluster borders is reported in the Miniforum on Drivers of biotech clustering.[17] Here, biotechnology is described as a border-crossing activity tied to different industries, such as food, agriculture, health, and environment as exemplified on the right-hand side of Figure 2. Knowledge is assimilated from partaking industries to create a new activity, and subsequently novel forms of processed, integrated knowledge are fed back to the originating sectors. In the same way, a cluster can cross-fertilize firms that emanate from different industry segments. The nature of specialisation is not necessarily sectorally bounded. The cluster may evolve in composite directions when subjected to internal or external influences. The interlinked specialised suppliers and qualified customers strengthen the cluster's competitiveness in global markets.

iii) The cluster actors

Firms form the natural and obvious components or building blocks of clusters. However, clustering is also about pluralism, not about single firms. In the absence of such pluralism, an observed agglomeration is likely to consist of an enlarged enterprise[18], where the other companies or units may merely serve as sub-contractors or clients in regard to the main entity. Similarly, group-affiliated firms controlled through formal cross-ownership are not independent and typically subjected to their own costs and benefits.[19]

These distinctions are not trivial. The motivation to reduce transaction costs and friction, e.g., in knowledge transfers between separate firms or other actors, might well motivate common control of operations and, hence, the establishment of single firms. Meanwhile, depending on the cultural set-up, the distinction between separate, independent units and those that are bonded through less formal or planned linkages may be subtle. An example is the traditional family-based, personalised Chinese business organisation, which spread in East Asia over the last century (Hofstede, 1984; Hoon-Halbauer, 1994).

Today, costs of administration, management and control, risk-management, etc., tend to favour a strong focus on core business in single organisations, and the formation of continuous committed relations and learning processes between separate entities. Although the problems of international comparability should be kept in mind, a recent mapping shows that most clusters comprise mainly of a fairly large number of SMEs (Commission, 2003a).

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[17] Read more in Miniforum 3, "Drivers of biotech clustering".

[18] Elisabeth Waelbroeck-Rocha, BIPE, characterises the enlarged enterprise as "a network of enterprises in which one has the prime role" and maintains a tight contractual relationships with subcontractors at different levels. The contractual links are such that these companies effectively all work together towards a certain goal. In contrast, by *filière* the French mean the chain of links between sectors/sub sectors along the value-added chain. The filière thus expresses all the (economic) dependencies between players along the value added chain; however these may not be "tight" contractual relationships, i.e. implying any sort of contract between the supplier and the buyer other than the sale contract itself. One can think of a filière as the chain of inputs in an I-O table. Companies in the filière need not be located together, and the filière encompasses "sectors", i.e., groups of companies performing a certain activity, whereas the enlarged enterprise gravitates towards a given player.

[19] Firms that are group-affiliated through formal, equity-based relations are generally not geographically bounded. They typically enable an easening of liquidity constrains but are also affected by agency problems in the distribution of gains between controlling and minority shareholders. Such issues have been verified in diverse countries, including Japan (Hoshi et al., 1990), Russia (Perotti and Gelfer, 2002), and India (Khanna and Palepu, 2000).

Further, firms are not the only relevant possible actors. Clusters may encompass intensive links and alliances with various institutions such as universities, research institutes, public authorities, consumer organisations, and so on (Roelandt and van Hertog, 1999).

The *Cluster Initiative Greenbook* argues that four main categories of actors – companies, governments, the research community and financial institutions – are vital and normally present in a cluster and active in a cluster initiative, which is illustrated in Figure 3. Of importance for cluster initiatives are also the so-called Institutions for Collaboration (IFCs), defined as formal or informal actors which promote interest in the cluster initiative among the actors involved. The role of an IFC may vary considerably. IFCs may promote cluster initiatives not only internally but also externally and perform a series of cluster actions.[20] It may serve to establish a completely novel set-up and engage numerous organisations, but it may also represent a set of already established actors, such as chambers of commerce, industry associations, professional associations, trade unions, technology transfer organisations, quality centres, think tanks, university alumni associations, and others (Porter and Emmons, 2003).

Individual actors are drawn into cluster initiatives by diverse attractions and incentives. Their capabilities and roles may vary according to the national context, and may also evolve over the course of the cluster life cycle. In some countries, for instance, the public sector will be more important than other actors in the early stages of the cluster life cycle. In others, private actors will dominate cluster initiatives from the outset. Such differences may reflect variations in responsibilities and competencies among actors, including between national and local public authorities. In North America, as well as in Germany, China and India among other countries, states, provinces and regions tend to launch significant initiatives. Meanwhile, in France, the UK, the Nordic countries, and also in most transition economies and developing countries, relevant decision-making tends to be more centralised.

In most countries, however, there is a tendency for regional and local authorities to become more active in clustering initiatives and to gain importance relative to national governments in this respect. Several authors have stressed the significance of the stance adopted by local and regional authorities, including for the establishment of service-centres (Brusco, 1990; Murray, 1999; Pyke, 1992). Nonetheless, national authorities still need to be engaged in cluster policies, keeping in mind the vested interest aspect, and the link to a number of other policy areas which are managed by national authorities and the need for ensuring appropriate broader framework conditions (see further Chapter 4).

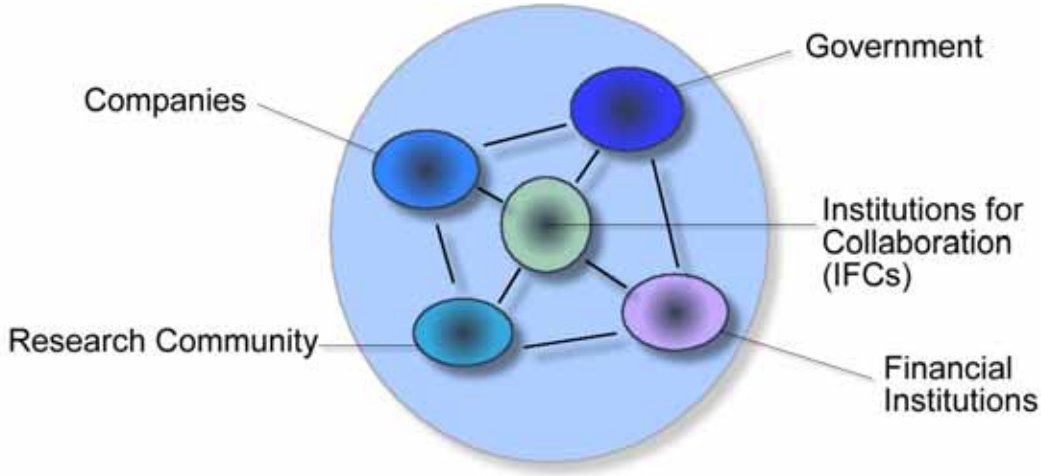
When the cluster concept was first introduced, the focus – of policymakers, researchers and cluster practitioners alike – was clearly on firms. However, as attention has gradually been paid to the challenges that may arise in the sharing of knowledge and skills, a systems approach which underlines the interplay and interdependence of different actors has gained ground. The role of universities, for instance, has increasingly attracted attention. Universities are important not only because of their natural missions in education and research, but also because of their potential to serve as nodes for entrepreneurship and science-industry interplay. The extent to which they are able or willing to fulfil these various functions varies dramatically between countries as well as institutions, however. In some

[20] See Section 4.2.4. for more information on cluster actions.

countries, e.g. in many transition economies, universities have accumulated great strengths in traditional sciences but are not accustomed or open to viewing their role in the context of broader societal needs and functions.

The scope for productive clustering processes and their outcomes is greatly influenced by the extent to which competencies and prevailing incentive structures spur key actors to adjust and reconcile partly conflicting agendas.

Figure 3: Categories of cluster actors



Source: Adapted from Sölvell et al. (2003)

iv) Cluster dynamics and linkages: competition and cooperation

The fourth cluster element relates to the connections and interrelations between the actors. These carry marked features of both competition and cooperation.

Typically, as firms and individuals *compete* with each other, pressures for improvement are generated. Depending on market characteristics, actors may strive to gain advantage by reducing costs or prices, raising quality, acquiring new customers, or entering new markets. Limitations to competition are often costly to society, especially in the long run. Barriers that rule out entry or advancement by newcomers may, for instance, bestow incumbents with unhealthy privileges. This applies also in the relationship between existing firms and in the creation of new ones. Only a limited number of technologies can be backed up within a given organisation, whereas more potential opportunities will be tested when new units are created through spin-offs, giving the chance to embark on experimentation in previously unchartered waters. The importance of competition applies equally between as well as within clusters.

At the same time, on one level, the actors in a cluster may *cooperate* around a core activity, using their key competencies to complement each other. By operating in tandem, firms may also be able to attract resources and services that would not have been available to the

participating firms in isolation. By pooling resources and risks, and by developing complementary functions, firms achieve economies of scale and scope. Clusters tend to have a common identity vis-à-vis the outside world, and a specific way of functioning inside the cluster. An Iranian carpet cluster, for instance, was reportedly created as a response to an exceptionally large request for an order of 5.000 carpets that none of the SMEs in the region could handle individually. By joining forces, they became able to take it on.[21] For other, smaller orders, they continued to compete among each other.

A central aspect concerns the extent to which individuals are willing to engage in the exchange of information and knowledge flows (regarding, for example, technology, management, and marketing). Trust and recognition matter in business collaboration when companies interpret, evaluate and act upon information.[22] Data which are codified but lack tacit elements convey only half the story – this is partly why ICT does not eradicate the importance of *geographically concentrated* clusters. Whereas sharing of tacit knowledge about partners' behaviour, values and strategic choices may widen the set of opportunities, it can also bring costs and risks, especially when information is misused.

In a sense, trust is about sharing a vision and a belief in the stamina of mutually fruitful relations. As is well-known, any human relationship is subjected to short-term strains. The validity of cooperation and information exchange presupposes that the anticipated benefits outweigh the costs. For instance, the prospect of continued interactions may be essential for enforcing cooperative behaviour (Axelrod, 1984). Further, as explored in game theory, outcomes are likely to depend on the strategic interplay between actors (Nash, 1951; Jarillo, 1988; White et al., 1996). Building trust has to do with people enabling other people to believe in their mutual long-term benefit. This may be demanding at first contact or early stages of acquaintances, and especially as new actors enter markets. It is strongly present when it comes to exchanges between people that have diverging history and practices. Yet, because the establishment of social capital and trust carries features of a public good, there is a tendency for under-investment in committed relationships (Coleman, 1990).

Traditional face-to-face exchange hinges on a spectrum of cultural, institutional and practical means to build security and trust (Arrow, 1974). When these are violated, e.g., because body-language and other symbols are used in asymmetric ways, communication fails (Bjerke, 1999). A homogeneous population generally facilitates exchange of tacit knowledge and trust. With high levels of social capital, as noted in Box 1, individuals may act more effectively as a group (Nahapiet and Goshal, 1998). On the other hand, collaborative strategies should not be viewed as a prerequisite for information exchange and positive externalities in clusters. Co-location may generate significant advantages also in situations interpreted as marked by low trust-levels, as in the case of the "no-family-ties" culture of Silicon Valley (Cohen and Fields, 1999). Clusters may be viewed as marked by conditions that are conducive to the exchange of experience and formation of relations, among multiple players, with forces of both competition and cooperation playing a prominent role.

While proximity matters for informal knowledge flows, global linkages are equally essential. Multinational enterprises (MNEs) have in many cases transferred skills and technologies that

[21] Alec Hansen, TCI Conference preparatory course, Gothenburg.
[22] See more in Miniforum 5, "How is e-business changing clusters and clustering".

have been decisive for the development of local clusters (Dunning, 2000*b*). Other mechanisms for sourcing may also play a critical role for accessing state-of-the art knowledge.[23] According to Malmberg, "localized clusters" seldom constitute comprehensive clusters and often have links with actors outside the region.[24] This is likely to be further reinforced with "post-Fordist disintegration" of the production systems. The internal knowledge base of firms is adjusting to a distributed knowledge base of value chains, where much knowledge enters embedded in machinery or through intermediate inputs. There may be extensive interface between industries and firms, irrespective of their respective levels of knowledge- or R&D-intensity. The key may not be industry-specific knowledge, but the ability to traverse technologies, actors and industries (Smith, 2000).

The Greenbook (Sölvell et al., 2003) finds that many successful clusters use global markets to gain access to pools of standardised low-cost labour, codified technology, capital and other tradable resources. According to Larsson (1998), firms with geographically extended patterns of technological collaboration are the most innovative. As markets are global but the labour force normally local, clusters can be conceived of as 'local nodes' in global networks (Maskell and Malmberg, 1999). Different clusters can be connected in a global value chain. As illustrated below in Figure 4, an automotive network may have multiple interrelated nodes specialised in different parts of the value chain. The hierarchy is not necessarily strict and there might be links leaping in various directions, e.g. a personal automotive design cluster in Sweden, an automotive manufacturing cluster in Asia, a headquarter and an R&D-cluster in the US, or a sales and assembly cluster in Latin-America connected to a financial cluster in London. Other examples are provided by the Chinese *guanxi* (connections) which create multiple inter-connected cluster-like networks across East Asia, and continue to spread from there (Lasserre and Schutte, 1995; Bjerke, 2000).

Thus, international links are often crucial. Some of the fastest growing regions benefit from effective hosting of foreign enterprises that have integrated their international competitive system with local partners and clients (Commission, 2003*c*). Another aspect, stressed by the *Clusters of Innovation Initiative* which has mapped an extensive number of clusters in the United States, is that the performance of individual clusters may be critically dependent on the extent to which they engage in processes of specialisation vis-à-vis other clusters, while also in some respects overlapping with them (Porter, 2001).

In conclusion, clusters emanate from the benefits of favourable human interface, in a given location as well as in regard to wider networks. These include the virtues of cooperation, but in ways that do not pre-empt competition, neither within a cluster nor in its relations with the rest of the world.

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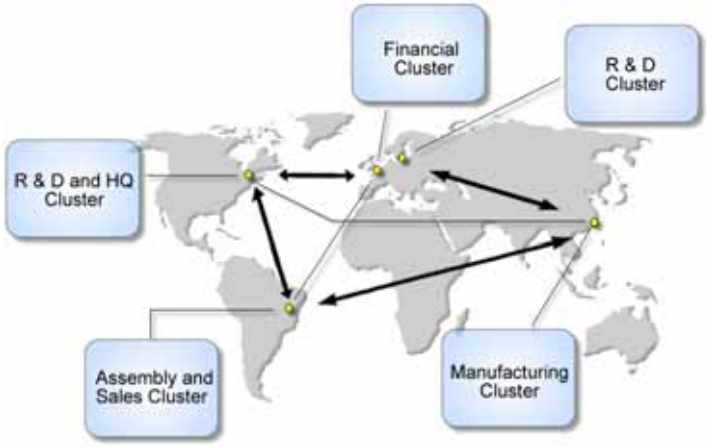
23 See Miniforum 7, "Network of European clusters – a platform for innovation and growth", or Learning Workshop 9 "Chihuahua Siglo XXI: Lessons learned in a decade of cluster-formation processes in Latin America" for more examples on international knowledge sourcing.

24 For further reading see Miniforum 9, "From clusters initiatives to microeconomic agendas". According to Malmberg, the less the spatial dimension influences the "industry cluster", the more it can be described as a 'business network'.

Figure 4: Global cluster networks



Source: IKED

v) Critical mass

In order for a cluster to achieve inner dynamics, it needs to engage numerous actors and reach some sort of *critical mass*. This is a concept that can be used with reference to various assets subject to economies of scale and scope. Bundles may matter for any kinds of skills, as seen from the difference that can be made by a certain minimal concentration of workers, managers, experts, financiers, entrepreneurs, etc. The reason partly has to do with the impetus of multiple interactions, and possible combinations, on learning and innovation processes (Siegel et al., 2003).

The presence of critical mass may importantly perpetuate industrial restructuring in a cluster, possibly within a productive structure that fosters linkages and complementarities between flexible small-scale actors and large-scale resource providers. Critical mass may serve as a "buffer" and make a cluster resistant to exogenous shocks or other kinds of pressures, including "losses" of companies, even when they might be regarded as "key companies", as long as a critical threshold of remaining players is not exceeded. Once such limits are passed, changes that bring structures "over the limit" may invoke huge marginal effects where previous changes had no noticeable impact.

The absence of critical mass or a "thinner" local basis may conversely make a country or a region vulnerable to the loss of specific resources and skills that form essential building blocks in cluster development (Asheim et al., 2003). Another aspect is the notion of *path dependency*, suggesting that future industrial strongholds depend critically on where the assets and skills available today in a particular location display sufficient critical mass. Where that is not the case, future growth trajectories may be shaky.

Having said that, it is less clear what geographical concentration of actors – with complementary and/or competitive assets and skills – is actually needed for enabling critical mass under varying circumstances. The notion of critical mass itself is a fluid one which, in

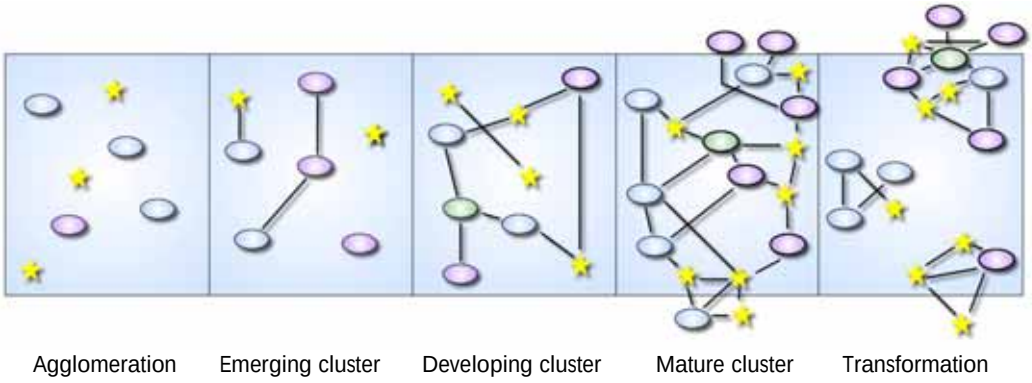
addition, is subject to change. In the case of certain technologies and industries, such as nuclear science, pharmaceuticals, motor vehicles or shipbuilding, achieving critical mass is likely to be extremely demanding. In others, it is much less so.

Where private sector actors engage in cluster initiatives, they will act with consideration to what is required, and with a feel for what can be transformed through processes in the market place. The requirements of critical mass can be altered as a consequence of technical as well as organisational adjustment, including with respect to what externalities are sectorally and geographically bounded and which ones can emanate from much broader interactions. For governments, on the other hand, this is one of the variables whose significance and limitations are utterly difficult to judge.

vi) The cluster lifecycle

Another element of clusters is their structural character as a mode of organisation with a long-term perspective. Clusters and cluster initiatives do not represent temporary solutions to acute problems. They have a sense of direction and inner stability over time. Any cluster will pass through a number of stages. These may not be identical, and the pace of their evolution may vary. Still, there is an inherent logic to the way that clusters develop, which makes it possible to discern certain characteristic patterns. Even though the precise shape and direction will depend on specific circumstances, the life cycle of a cluster can be said generally to undergo the stages below, and as illustrated in Figure 5.

Figure 5: The cluster life cycle



Source: Elisabeth Waelbroeck-Rocha based and SRI International (2001)

i) *Agglomeration*: A region has a number of companies and other actors.

ii) *Emerging cluster*: As an embryo to the cluster a number of the actors in the agglomeration start to cooperate around a core activity, and realise common opportunities through their linkage.

iii) *Developing cluster*: As new actors in the same or related activities emerge or are attracted to the region, new linkages develop between all these actors. Formal or informal IFCs may enter the field. Often a label, website, common connotation, tied to the region and activity, starts to appear.

iv) *The mature cluster*: A mature cluster has reached a certain critical mass of actors. It has also developed relations outside of the cluster, to other clusters, activities, regions. There is an internal dynamic of new firm creation through start ups, joint ventures, spin-offs.

v) *Transformation*: As time goes by, markets, technologies, and processes change, as do clusters. In order for a cluster to survive, be sustainable and avoid stagnation and decay, it has to innovate and adapt to these changes. This can take the form of transformation into one or several new clusters that focus around other activities or simply a change in the ways that products and services are delivered.

Ex ante, the formation of clusters is partly driven by their potential for future strength, and so their capacity to evolve over time represents an inherent element in cluster formation. In this way, clusters in early stages may be more dynamic but also more vulnerable than mature clusters. On the other hand, the success achieved by well-established clusters may lead to complacency which will then inevitably set in motion destructive processes of decay. This analysis can be compared to observations made over the years on the rise and fall of nations (e.g., Gibbon, 1776; Gilpin, 1975; Maddison, 1991).

2.4 General – specific cluster characteristics

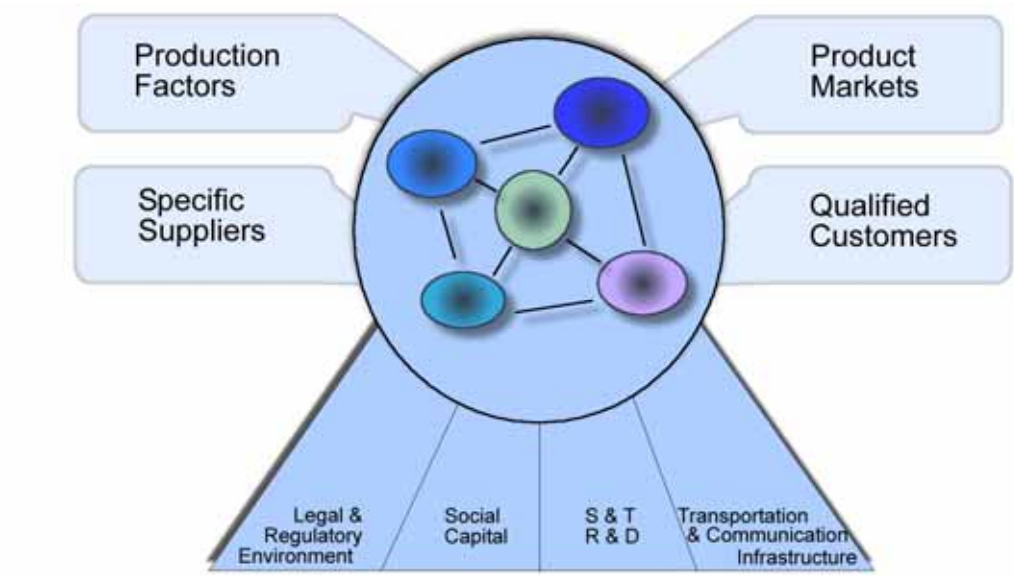
This concludes the first six elements used here to describe clusters. Before turning to the seventh, *innovation*, it is worth reflecting on the context in which clustering takes place. Figure 6 provides one illustration. At the core (centre) lies the *spatially concentrated, critical mass* of *specialised, multiple actors*, which engage in combined *competition and cooperation*. Relations to the left (supply related) and the right-hand-side (demand related) encompass traditional production factors and product markets, as well as intensive specific relations on both sides. Exchanges of information and ideas may leap in "all" directions, fuelling active participation and *adaptation over time* among the various actors that are interlinked through the cluster.

Fundamental to the functioning of the cluster are a number of building blocks that serve as critical enabling factors. Strongly prevalent here are the institutional, legal and regulatory environment deciding the framework for the interplay among cluster actors; social capital that enables value-enhancing inter-linkages and functioning combinations of competition and cooperation; S&T structures providing knowledge input; and transport and communications infrastructure. Success in determining which factors are key to the future prospects of a particular cluster may be decisive for putting the concept to operational use.

The general features of clusters may have limited applicability in the specific case. Clusters are inherently idiosyncratic in nature. Not all the elements discussed above may be present, or even desirable, in the specific case. Some elements may be more critical under certain

circumstances and the connection between elements may vary. On the other hand, it would be premature to argue that missing elements would be unimportant for the performance of a particular cluster. To address such issues one must, however, move beyond the level of generalities and collect whatever information is required for understanding the specific case.

Figure 6: The cluster and its environment



Source: IKED

Certain main categories of clusters can be defined. One categorisation is along the spatial/functional axis. Clusters have a double-sidedness as both functionally-defined systems of inter-related activities and spatially-defined systems of similar and related activities. Accordingly, when differentiating between clusters, the functionally linked systems that are less restricted by narrowly defined regions - in line with Porter's original definition - are commonly referred to as *industrial clusters*. The spatial groupings of similar and related firms and industries are referred to as *regional* or *localised clusters* (Malmberg et al., 1996).

The *industrial cluster* focuses on competitiveness within sectors. It is composed of all the actors, resources and activities that come together to develop, produce and market various types of goods and services. A critical mass in the value chain makes firms more competitive as they benefit from shared labour markets and other factor conditions. The industrial cluster is normally not spatially confined to an urban area. On the contrary, it rather tends to have a broader scope, possibly covering a state or a nation, e.g. the Finnish forest cluster.

The regional or *localised cluster* is a spatial agglomeration of similar and related economic activity that forms the basis of a local milieu that may facilitate knowledge spill-over and stimulate various forms of learning and adaptation. These clusters commonly consist of SMEs, and the core of their success is centred on strengths in social capital and geographical proximity. Another feature is that firms in such settings are generally less directly inter-related than those in industrial clusters. Examples are provided by the Italian industrial districts.

Clusters may also be differentiated according to the degree of knowledge input, which is connected to the idea of a high- and low-development road (Sengenberger and Pyke, 1991).[25] However, with the distributed knowledge base of value chains (as mentioned above) and the extensive interface between industries, firms and clusters at very different levels of R&D-intensity, technical levels are becoming less significant than the ability to interact and exchange knowledge. The ***knowledge-based cluster*** is spatially confined but, in comparison with the regional cluster, the focus is more on innovation and technical progress. Proximity may impact greatly on the creation, acquisition, accumulation, and utilisation of knowledge rooted in inter-firm networking, inter-personnel relationships, and local learning processes.

The success of clustering thus appears to be inter-related with the use of knowledge and innovation for reaping economies of scale, benefiting from economies of scope and value-added upgrading. A cluster can be knowledge-based and innovative in various ways. An illustration can be made with reference to the Nordic countries. Denmark and Norway, which to a certain degree may be considered "low-tech" economies, when judged according to industrial specialisation, have adapted and put to use the most sophisticated technologies in traditional sectors (Maskell, 1998; Lundvall, 2002; Andersson et al., 2004). This exemplifies a possible route for countries with relatively little resources for R&D, that does not necessarily have to become a "low-income road".[26] Added value can be raised through design, organisational change and other strategies which require limited R&D and capital but enhance the quality-image of products. By contrast, in Sweden and Finland, high R&D-investment has been associated with the advance of large internationalised firms. Whereas spin-offs have been promoted consistently in Finland, however, the rise of new technology-based firms to challenge established industry has so far been less impressive in Sweden (Rickne and Jacobsson, 1999; van Beers, 2003; Mariussen, 2004; Marklund et al., 2004).

Clusters may centre on different core activities and parts of the value chain as exemplified in Figure 7. For instance, a tourism cluster in Turkey cooperates around marketing and sales[27], an automotive manufacturing cluster in Hungary and Austria [28] centres around manufacturing, whereas a Georgian cluster focuses on bacteriophage research. [29] The participating firms and other actors can embrace a complete value chain, or they may cover specific segments. The actors may also choose to collaborate in certain areas through cluster initiatives, while abstaining from doing so in others.

[25] There is a simplified notion that industrial clusters would develop along one of two alternative trajectories: (i) the 'high road', characteristic of the successful European industrial districts and synonymous with innovation, high quality, functional flexibility and good working conditions, and (ii) the 'low road' marked by competition on the basis of low prices, cheap materials, numerical labour flexibility and cheap labour.

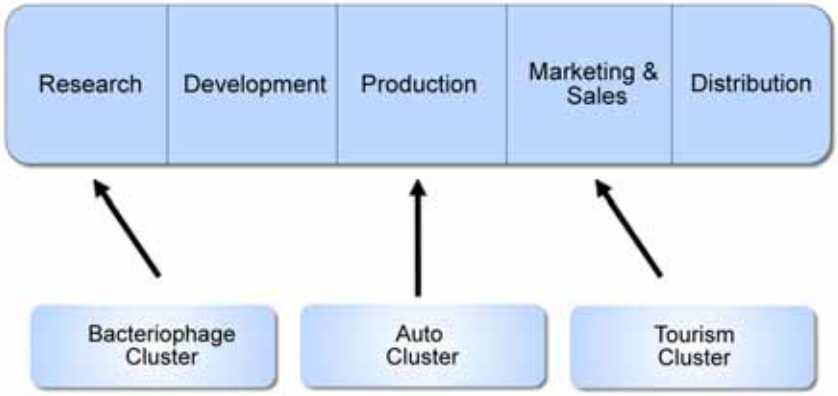
[26] Traditional classifications of high-, medium- and low-technology industries are primarily based on the ratio of R&D-expenditure to output. Industries with a ratio of more than 4 % are classified by the OECD as high-tech. Today, high-tech sectors such as ICT, biotechnology and professional services are often argued to form the future basis of the economy (Hirsch-Kreinsen, et al., 2003). According to the Low-Tech (PILOT) - project (http://www.pilot-project.org), many activities in the EU typically classified as low- or medium-tech may be as innovative as high-tech industries due to, e.g., technological upgrading, high-grade design skills or organisational changes.

[27] TCI Conference Action workshop on Istanbul Sultanahmet Tourism Cluster by Melih Bulu.

[28] TCI Conference Action workshop on the Hungarian Pannon Automotive Cluster and the Learning workshop, From public to private initiative in the automotive cluster in Styria (Austria) Learning workshop 4.

[29] TCI Conference Action workshop on Georgian cluster initiatives, by Dr. Nana Adeishvili.

Figure 7: The cluster in the value chain



Source: IKED

The likelihood that clusters will evolve varies with circumstances. In some regions, it may be nearly impossible for any cluster to materialise. Distant and sparsely populated regions could suffer from an irrevocable handicap in attracting mobile production factors and fostering skill accumulation. Gradually, many such regions appear to be losing out to dense population centres due to emigration and the delocalisation of foot-loose industries, leaving them with a growing dependency on natural resources and a few idealists. This could result from the strong influence of market size on the prevalence of positive external economies (Rosenfeld, 2002). Market size may matter both for the formation of competitive clusters and for competitiveness in high-value added economic activity (Krugman, 1994).

Such conclusions should, however, not be drawn prematurely. Greater emphasis on market openness may compensate for small market size, and clusters have the potential for magnifying those resources which do exist in a location. Clustering may provide the means for exploiting and upgrading local assets more effectively, including in peripheral, sparsely-populated or developing regions. Technical progress, internationalisation and the new communication tools in some cases shift the boundaries of *critical mass*, and may allow clustering to generate economies of scale and scope in new ways. Then again, capturing the opportunities may require that destructive self-enforcing processes, undercutting required social capital and the reliability of future institutions, be halted. The means required for favourable processes to materialise will depend on specific circumstances.

2.5 Innovation

Our final element of clusters is *innovation*. The connection between clustering and innovation is associated with *sticky knowledge* grounded in social interaction (Von Hippel, 1994). Broadly speaking, innovation refers to the effort to commercialise new ideas. In the case of innovation by firms, an often-used definition of innovation is "the processes by which firms master and turn into practice product design and manufacturing processes that are new to them, whether or not they are new to the universe" (Nelson and Rosenberg, 1993).

Here, we are concerned with innovation in a broad sense, incorporating technical, commercial and/or organisational change. Although it is difficult to draw sharp dividing lines between categories of innovation, the heterogeneous nature of the concept should be kept in mind. Innovation may in fact take a number of shapes, ranging from science- and technology-based to new ways of organising activities. In some cases, innovation comes close to "imitation", which may spread particularly fast but may also be associated with rapidly declining returns.

Given the complexity and heterogeneity of the concept, measuring innovation is not trivial. The link between an innovative effort and perceived results may be tricky to trace, for instance, because a number of confounding variables exert a critical influence on the outcome. In the following, we first reflect on indicators of innovation. We then address the way in which innovation may be dependent on enabling conditions, the link to kinds of activities including *innovative clusters*, the driving forces of innovative clusters, the benefits, and eventually take note of how innovation relates to pitfalls and risks in clustering.

Indicators of innovation and economic performance

Various indicators are used for measuring innovation, of which some address mainly inputs (e.g. R&D, patents) and others outputs (e.g. new products, fast-growing firms). The most common, best tracked indicator is that of research and development (R&D), which in effect is often used as a synonym for innovation. R&D involves a fixed cost and typically carries high risk: returns are uncertain, including the extent to which the investor will be able to appropriate the payoff.

Whereas the importance of R&D for economic performance has been verified at both firm- and industry level (Lall, 1980; Mairesse and Sassenou, 1991; Kravis and Lipsey, 1992; Brynjolfson and Hitt, 2000), high R&D-intensity does not necessarily result in innovation or strong economic performance. At aggregate level, it has proven difficult to produce systematic evidence of impacts of R&D (Commission, 2001*a* and 2001*b*). There is, for instance, no simple correlation between R&D and GDP across countries, although significant effects show up in the patterns and composition of growth. There is nevertheless evidence that R&D tends to generate social returns which exceed the returns accruing to the investors, resulting in a tendency towards *under-investment* by market forces alone.[30] This applies particularly to *basic* research, which is less closely connected to commercial activity than *applied* R&D, although there are no clear-cut boundaries between the two kinds.

Data on R&D is collected for sources of funding as well as on the basis of performers. Both public and private actors are engaged across-the-board in all kinds of R&D, both as funders and as performers, although the public role is stronger in public-goods oriented activities, whereas the private sector is more dominating the more mature the stage of commercialisation. The profiles vary across sectors, however, and also between countries, with the private sector playing a more prominent role the higher the development-level of a country, and the higher the overall R&D-intensity. The economic impacts depend importantly on the composition of R&D, including the actors involved and the linkages between them (Bassanini et al., 2000; Guellec and van Pottelsberghe, 2001).

[30] Empirical evidence has been presented by, e.g., Griliches (1992), Hall (1996), and Griffith et al. (2000).

Other often-used indicators of innovation are those of scientific publications, patents, high-growth firms, and the number of firms developing new or improved products. Innovation may also be observed in the form of subtle proxies for organisational change, improved quality, upgraded logistics chains, and so on. Productivity measurement needs to take account of, or control for, rapid quality changes (OECD, 2001*c*). In several high-tech industries, including ICT and biotech where patent-intensities are very high today, the importance of R&D in mature, large firms is rivalled or surpassed in importance by the wide experimentation with various kinds of innovation taking place in, or carried out by, SMEs. In such firms, R&D is generally a poor proxy for innovativeness.

Innovation in the service sector, which accounts for some 60 to 70 percent of the developed countries' economies but only about one third to one sixth of total business expenditures on R&D, is particularly difficult to measure. Still, the share of enterprises in services which introduce a new or considerably changed product or process tends to be only slightly lower than in manufacturing (OECD, 2001*d*). However, because innovation in services may be organisational or disembodied, and span the boundary lines between different products and sectors, there may be substantive measurement problems. The role of services may be as facilitators and supporters within the technological and industrial process, with innovation in services key to the success of entire *bundles* of activities (Howells, 2001).

Enabling conditions

The overall impacts of R&D and innovation are difficult to separate from those of related variables, including *enabling* conditions which need to be in place if potential benefits are to be realised. A crucial driving force for the efforts required stems from rivalry and *competition*. At the same time, for innovation to pay in the first instance, there must be room for appropriating the costs involved. For instance, it is not possible to establish a clear-cut relationship between market concentration and R&D. Innovation is affected by the specific issues that confront individual industries, and may be affected differently by varying combinations of competition and cooperation (Enright, 1991; Symeonidis, 1996).

In parts of the economy, *science* has become a more important source of innovation than was the case in the past. Under conditions of radically reduced costs for diffusion of *information* and an accelerating speed of accumulated scientific discovery, this influence is realised through intensified interplay between disciplines, technologies, entrepreneurial activities, and social and market needs (Berkhout et al., 1997). It has shown up, for instance, in a dramatically increased frequency of publication citations in patents over the last decades (OECD, 2003*b*). Concurrently, it is widely understood that scientific progress and industrial development is not a one-way street, but that progress in both require interactions and exchanges. There has been a marked shift away from the traditional way of looking at science, technology and innovation in a linear fashion[31], towards appreciating the importance of networking and information exchanges in all directions and to regard the innovation process from a more systematic perspective.

[31] The origin for the paradigm referred to as the linear model may have been cast by Vannevar Bush's report to the President. The model describes a sequential translation process where the result from scientific discovery moves via technological engineering to new product creation and then to diffusion (Bush 1945).

Although large institutions and firms are superior in R&D and incremental improvement, innovation is in part interwoven with *entrepreneurship* in young and small firms.[32] Several studies have pointed to the impetus of entrepreneurship and SMEs on competition, the commercialisation of technologies, and innovation (Henderson and Clarke, 1990; Jovanovic and Nyarko, 1996; Baldwin and Johnson, 1999; Audretsch and Thurik, 2001, OECD, 2001*e*). The entry of new plants and the exit of old ones have been found to contribute to higher growth in total factor productivity (Ueda, 2002).[33] Structural change is likely to proceed more quickly in the presence of an active entrepreneurial sector. At the same time, variations in the nature of entrepreneurship need to be kept in mind. In some situations entrepreneurship is "necessity-based" rather than "opportunity-based" (Reynolds et al., 2002), indicating a weak resource and bargaining position for entrepreneurs.

The acceptance of new ideas implies the abandoning of established but outdated methods. Its realisation may hinge on the stamina of "rebels". To occur within an organisation, innovation requires a degree of tolerance and *openness* to new ideas by management. There will be a richer platform for innovation where there is openness to interact with people who can draw on different kinds of experience. An environment in which customers are willing to try out previously-untested ideas similarly represents a great asset for innovators. Meanwhile, the reach of networks expands disproportionately when joined by people with radically different interfaces (Watts and Strogatz, 1998). Clusters that are homogeneous and closed forego the associated opportunities, and are likely to lose out on a variety of influences that could help generate impetus for innovation.

Intellectual capital, or *intangible assets*, are difficult to measure but decisive for knowledge use (Polyani, 1962). The value of such assets is not adequately sustained by traditional financial institutions. As the regulation of intellectual property rights is weak overall, conditions for trade in such assets are poor. This leads to high transaction costs in the market place, and a great part of the value-enhancing exchanges must therefore take place through other channels. Clusters can provide one solution to this problem.

However, the success of clusters presupposes that the basis for arm's length exchange within them is sufficiently strong. If conditions for inter-firm transactions are unsatisfactory, clusters may lose out to other structures, including single firms. Equity-controlled affiliates, and mergers and acquisitions (M&A), constitute mechanisms for internalisation. Whereas group affiliation may relieve financial constraints for participating firms (Hoshi et al., 1991), however, agency problems and costs arise in the distribution of profits. Meanwhile, the spurt in M&As in the 1990s was excessive, in part driven by incentives for managers to dilute the influence of controlling shareholders and raise personal gains, with adverse consequences for profits and competitiveness (Scherer and Ross, 1990; Yermack, 1997; Bebschuk et al., 2002).

Among the factors supporting risk management and experimentation, *venture capital* activity can help overcome agency and information problems among entrepreneurs, innovators and financiers. Venture capitalists generally enter a company only against a stake in ownership

[32] While entrepreneurship can take various forms, as originally envisaged by Schumpeter (1934), the concept is used here primarily with a view to the start-up of new business.

[33] Total factor productivity, in practice measured as a residual, is generally interpreted as caused by elimination of slack in the use of inputs, by adoption of new technology or by various forms of innovative activity.

and an agreement to take active part in management (Admati and Pfleiderer, 1994; Carpenter and Petersen, 2002). In early stages of innovative firm development, potential investors face severe difficulties in assessing the strength of ideas, which tends to rely heavily on specific intangible assets (e.g. brand names, patents, the brain or the stamina of the entrepreneur) or investments (R&D, software or organisational change), and the ability of the venture to acquire an enduring first-mover advantage relative to competing actors and products. Business success at that stage may only be feasible with the engagement of *active* and patient investors, who bring not only financial support but also non-financial assets such as relevant experience, business-related skills, complementary networks, and monitoring capacity.

A well-functioning venture capital market is dependent on a pool of potential investors with relevant competencies and surplus funds to invest in new ideas, and on the presence of exit opportunities for investors. Institutional investors such as pension funds, banks, and insurance companies, may operate through various intermediaries. There have been marked swings in the market over the last decade, but overall the ageing society and the development of the financial markets have led to more diversified instruments and portfolios.

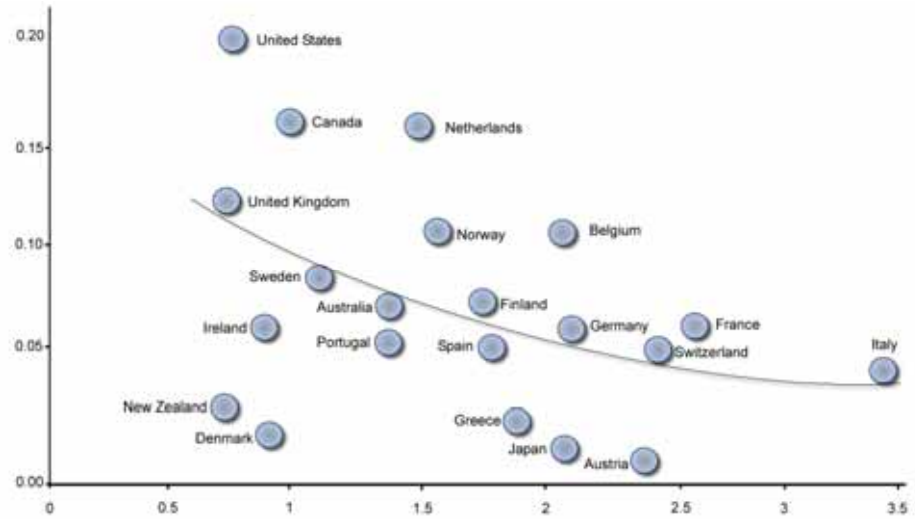
Venture capitalists can bolster cluster dynamics by enabling the rapid expansion of promising, high-risk young firms. Conversely, clusters can serve as a platform for the development of venture capital markets, by creating an environment in which multiple actors with complementary skills can dare to try out new ideas and identify new partners. For the venture capital firm, a cluster may form fertile ground for accessing or deploying information and for advancing entrepreneurs within its field of specialisation.

Entrepreneurship and venture capital activity may be seen as operating on the demand and supply side respectively with regard to resources feeding the formation of new firms. Naturally, there are different kinds of entrepreneurship and great variations across countries in their prevalence (Reynolds et al., 2002). Figure 8 illustrates the presence of a negative correlation between barriers to entrepreneurship and the development of venture capital markets across countries. Barriers to entrepreneurship tend to be accompanied by lower levels of venture capital activity, and vice versa.

The establishment of a virtuous circle between the two is highly desirable but not automatic. Professional venture capitalists do not suffice as the only kind of development funding available to entrepreneurs. In very early stages, the establishment of potential high-growth firms tends to require the support of family and friends, or own-funds available. Wide experience, such as the US Small Business Innovation Research Program (SBIR), demonstrates that the availability of public funding is also essential.[34] However, outright public contributions carry the risk of diverting entrepreneurial energy towards obtaining subsidies and leading to contract problems. Public support must therefore typically be designed and implemented so as to facilitate or catalyse private funding as well. A pool of prospective business angels further helps provide entrepreneurs with viable alternatives, and can thus also support building the basis for healthy arrangements with venture capitalists (Andersson and Napier, 2004).

[34] See further p. 100.

Figure 8: Barriers to entrepreneurship* and venture capital activity, 1995-98**



*Excluding "license and permit systems", "sector specific administrative burdens" (for road freight and retail distribution), and "antitrust exemptions" (for public enterprises).
**Venture capital activity measured as investment in early stages and expansion as a percentage of GDP.
Source: Baygan and Freudenberg (2000), drawing upon OECD International Regulation Database with weights from Nicoletti et al. (1999), EVCA, various Yearbooks, NVCA, various Annual Reports, Canadian Venture Capital Association (CVCA), Asian Venture Capital Journal, and the 2000 Guide to Venture Capital in Asia

Mere specialisation in standardised production today looks increasingly unsustainable across-the-board. Firms across a broadening spectrum of industries and countries seek to move beyond imitation to innovation. The opportunities for upgrading and market access are improving even in the most distant of regions. Today, virtually any village can obtain high-speed internet access wireless, at low cost. Given that community services can be established, human resources upgraded, and market relations developed, radical change can occur. The least developed countries are investing disproportionately in ICT, and some are genuinely leapfrogging older technologies although it is still an open question to what extent there is a closing or a widening of the digital divide (UNCTAD, 2002; Sciadas et al., 2002; Chinn and Fairlie, 2004). Progress in results is connected to regulatory reforms, and the inclusion of ICT in broader strategies for innovation and development.

Innovation in different activities

Innovation is thus a complex function of a broad range of conditions and interactions between different actors. While it may take place in multiple settings, and activities, the nexus represented by clusters can help foster innovation in virtually any industry. The introduction and diffusion of efficiency-enhancing production processes or new qualities, more flexible working practices or adjusted customer demands may all flourish in clusters. This is sometimes depicted as the result of informal contracts where the costs of participation in exchange and joint activities decrease with proximity (Sena, 2004). Benefits may materialise through a combination of efficiency improvements and the introduction of higher value products and services. In other cases, as in the presence of strong traits of

imitation, innovation may be associated with mass production and intensive price competition where a cluster generates returns through competition and economies of scale (Rosenfeld, 2002). This is particularly prevalent in mature industries and standardised production, and has traditionally been the predominant form in developing countries.

Whereas all clusters may have properties that serve to speed innovation, some can be observed to be particularly prone to the task. This has led to the coining of the concept of *innovative clusters*. An innovative cluster innovates in the broadest sense of the definition, i.e. innovation can emanate from improvements in the way that actors organise themselves, products are developed, produced, commercialised, distributed, etc. At the same time, innovative clusters are likely to be marked by certain features.

The innovative cluster is, in principle, evolving constantly, learning from experience and able to adjust to changing circumstances.[35] It is likely to be well-positioned to explore new opportunities beyond its present boundaries and, at the same time, combine flexibility with inner strength, stability and sense of direction:

- Traditional boundaries to knowledge generation and diffusion are continuously changed by establishing linkages to wider and alternative sets of knowledge inputs.
- Products and markets are reconceptualised.
- Mechanisms for seed-funding, risk-taking and entrepreneurship are upgraded.
- Old institutions and organisations are transformed through learning as well as unlearning of earlier habits and practices.

It is well-known that R&D-intensive activities tend to be spatially concentrated and grow faster than the economy in general (Saxenian, 1994; Almedia and Kogut, 1997). At the same time, many clusters are not of a high-tech nature, and innovation is not limited to such activities. In a cluster mapping exercise across the US, R&D-intensity and high-tech activity did not show up as decisive for the ability of clusters to sustain innovation and performance. Benefits were rather associated with processes of mutual specialisation between interlinked, complementary clusters, which served to strengthen unique regional assets (Porter, 2001). An "innovative cluster" does not necessarily belong in a high-tech industry or specialise in high-technology.

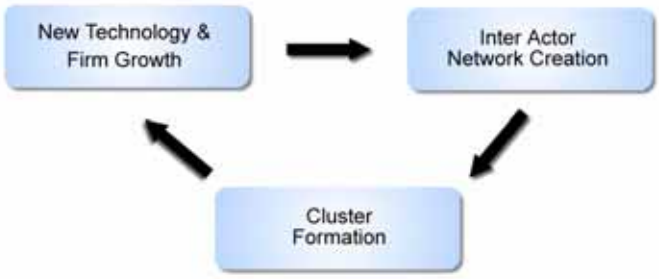
The emergence of any cluster in the first place is intrinsically related to innovation. As clusters evolve over time, however, forces of change both within the cluster itself and its location, and in the external environment, may bring changes that serve to challenge the continued development of the cluster. Success in maintaining strong conditions for innovation is likely to be greatly important for avoiding decay and stagnation, and ultimately for the survival of clusters. It is conceivable that today, and even more likely in the future, all long-living clusters will have to be continuously innovative in one way of the other. While *innovative clusters* may thus be a tautology, the link between clusters and innovation is critically important. The notion of innovative clusters is associated with their connection to the driving forces of innovation.

[35] TCI Forum keynote address by Lynn Mytelka on "Innovative clusters - the role of local frameworks and supporting infrastructures".

Driving forces of innovative clusters

Innovative clusters are typically powered by three driving forces shaping their inner dynamics, as illustrated in Figure 9: i) New firm creation and technological diversification; ii) Inter-actor network creation; and iii) Cluster formation.[36]

Figure 9: Inner dynamic of an innovative cluster



Source: IKED[37]

i) New firm creation and technological diversification. Many innovations originate in existing firms and serve to improve efficiency in business and production routines. Yet, some do not fit the core business of existing firms. Entrepreneurs, vital for exploring alternative routes to commercialisation, may exploit existing technology that flows from R&D results in established firms or from universities, and establish new firms through start-ups. Although dependant on complementary actors and functions, the inherent qualities of entrepreneurs are needed to propel the dynamics of innovative clusters. Spin-offs may or may not be promoted by the established firms. Firms may perceive benefits from testing untried potential opportunities and the emergence of prospective future partners, but also fear the loss of competence and the emergence of future competitors. Some new firms take the form of joint ventures and may be partly supported, and controlled, by established firms.

ii) Inter-actor network creation refers to the process of diffusing information and knowledge in the cluster as well as importing it from elsewhere. IFCs, technology centres, NGOs or industry councils may play a vital role for this function. At the same time, firms' own capabilities, including internal R&D, matter greatly for their capacity to source and exploit external technology for innovation (Andersson, 1998*b*; Cassiman and Veugelers, 2002). The recent expansion and deepening of various kinds of R&D cooperation, between firms as well as between firms and universities or public laboratories, has served to raise firms' ability both to develop and to source technology (Sachwald, 1998).

[36] See further Miniforum 2, "Benefits of innovative clusters".
[37] This figure draws on Mike Best's illustration presented at the Miniforum on "Benefits of innovative clusters", see more in Miniforum 2.

An innovative cluster continuously re-generates internal networks at the same time as it develops new external linkages. There is an on-going dynamic change. Individual companies can meet in best-of-breed arrangements, joining temporary projects or inter-firm networks for pooling of resources. By, for instance, operating in virtual organisations, SMEs may be able to concentrate more effectively on core competencies to achieve individual excellence in specific niches, capitalising from specialisation in their own unit as well as economies of scale at the level of the network (Riemer and Klein, 2003). The flexible combination of individual competencies may also enable rapid adjustments to changes in market conditions (Goldman et al., 1995; Miles and Snow, 1986).

iii) The third inner dynamic is that of cluster formation. Broadly speaking, this is an analytical and cooperative process. Through a formal or informal cluster initiative, the cluster is given a common direction and inner stability. Where the process is formal, a vision and a long-term strategy may be advanced through networking and collaboration, possibly supported by evaluations that serve to inspire continuous improvements throughout the cluster life cycle. Cluster initiative strategic work involves competence audits and foresight exercises in order to analyse strengths and weaknesses, and identify how strategic competence and investment can be attracted, and linkages with international networks be established. Co-marketing in order to create a joint identity of both internal and external value to leverage market access represents another cluster action. In the consumer electronics cluster in Catalonia, for instance, a cluster initiative succeeded in creating collaborative tools for strategic regional change that fitted its specific needs.[38]

The success of clusters with respect to innovation is critically influenced by the *competencies* embodied in factor inputs. According to Rosenfeldt (2002), a *specialised workforce* with its skills and knowledge is the key success factor in many clusters. Whereas some companies become obsolete and vanish, the knowledge their workers possess may find new outlets in other firms, or because they create firms of their own. Firms, research institutions, universities and regions today commonly both invest in the upgrading the skills of the available workforce and develop strategies for the attraction of new *talent,* especially tailored to the needs of knowledge intensive activities. Talent is seeking not only monetary reward but inspiration through places, colleagues, peers, culture and social life, and comprehensive approaches are required if locations are to succeed in meeting high ambitions (Florida and Gates, 2001).

Benefits of innovative clusters

Innovative clusters spur a range of benefits that merit attention. At least three sets of partly inter-related kinds should be noted: i) Improved opportunities for innovation; ii) Improved business formation; and iii) Enhanced productivity. In each category, benefits may materialise through:

[38] See Learning workshop 2, "Evolving policies in consumer electronics cluster in Catalonia".

Improved opportunities for innovation:

- Effective means and channels for communication of potential new sources for innovation.
- Early identification of technology trends.
- An environment conducive to novel combinations of competencies.
- Short start-up times of networks around new products and processes.
- Favourable conditions for pooling of risk.
- Strong outlook for developing the means to penetrate wider markets, broadening the basis for uptake of customer information and improving the possibilities to secure payoff from innovation.

Enhanced productivity:

- Forces of competition that push for effective specialisation within and between interlinked clusters.
- The emergence of customers who are quality-conscious and demanding, raising the returns from high-quality goods and services.
- The availability of specialised factor inputs, such as an upgraded labour-pool in priority niche areas, access to complementary technology, and specialised business services.
- The attraction and recruitment of a skilled labour force readily prepared to change jobs, which enhances the diffusion of information and learning processes.

Improved business formation:

- The accumulation of experience favouring the deepening of seed- and venture capital activities, resulting in greater competencies for handling risk in the formation of new ventures and the cultivation of high-growth firms.
- The replacement of reliance on old merits by the appreciation of efforts and the quality of skills and ideas.
- The dominance of vested interests is weakened and entry by newcomers facilitated.
- Virtuous circles are created by enhanced specialisation in established forms and new firm creation/spin-off activities/joint ventures.
- The establishment of networks and channels that allow for the effective attraction of complementary kinds of skills, technologies and funding from sources external to the cluster.

The actual and potential distribution of benefits matters for the evolution of clusters. There is a need of balance between conditions that allow for the returns from innovative clusters to be shared and the presence of forces that leave the door open to more drastic redistribution. Sound opportunities for innovation require conditions that allow for the orderly sharing of gains from stable advances. Enhanced productivity may likewise be associated with steady progress and broad based sharing of modest gains. In both these cases, however, and even more so in the case of conditions for business formation, dynamism will require that there is

also room for more drastic re-distribution and re-allocation of resources when major breakthroughs materialise, and old skills and organisations abruptly turn obsolete.

In those situations, there will most likely be considerable economic and social transition costs (Freeman and Perez, 1988). Outcomes will depend on a range of factors, including the means for retraining of skills, the security but also incentives provided by social security systems, and the extent to which governance mechanisms, regulations and attitudes allow for profit-making as well as comeback after failure.

Pitfalls and risks

So far, key elements associated with clusters have been identified and their characteristics and benefits reflected upon. However, while clustering can strengthen competitiveness and innovation, it is not immune to pitfalls and risks that may actually reduce competitiveness, *ceteris paribus*, and/or result in stagnation or decay. There may be various kinds:

i) *Vulnerability*: Specialisation can invoke vulnerability for a region. Technological discontinuities may undermine specific cluster advantages, as may shifts in the general economy, trade patterns and customer needs.

ii) *Lock-in effects*: Excessive reliance on local contacts and tacit knowledge in combination with neglect of external linkages and lack of foresight may account for lock-in effects due to dominance of established practices (Amin and Cohendet, 1999; Martin and Sunley, 2001).

iii) *Creating rigidities*: Dense existing structures risk delaying a radical re-orientation or hindering needed structural adjustment. For example, in recent years, Baden-Württemberg, one of the role models for regional clusters, in recent years displayed problems with adapting its dense institutionalised engineering clusters to the flexible demands of international markets.

iv) *Decrease in competitive pressures*: Cooperation can cause a reduction in competitive pressures and hence in the driving forces for innovation. It can create societal inefficiencies as tight-knit groups of actors block entry by newcomers.

v) *Self-sufficiency syndrome*: Growing used to past successes, a cluster may fail to recognise changing trends. Harrison and Glasmeier (1997) suggest that industry clusters respond best to incremental changes in technology and market demand. In the presence of significant changes, clusters could hinder adjustment at odds with learning accumulated collectively through previous success periods.

vi) *Inherent decline*: Just as social capital may be essential for shaping the basis for the development of clusters, the latter may undermine and even destroy the social fabric that underpinned it in the first place. As a successful cluster will generate higher factor costs, the neighbourhood may experience increased property prices and exclusion of outsiders (Portes and Landholt, 1996).

These points underline the significance of continuous innovation as a key to the sustained success of clusters. Indeed, there is an inherent tendency for wages and costs to rise in established clusters, in itself altering the effectiveness of given technologies, bringing pressures for migration, and making adaptability a prerequisite for continued prosperity. The ensuing chapter addresses the policy issues. How should cluster policies be designed and be implemented, and by whom?

3. THE ROLE OF CLUSTER POLICY

Main messages, Chapter 3

Potential benefits from cluster initiatives do not in themselves suffice as rationale for policy intervention in clustering processes. Individual firms and organisations are the prime actors in cluster processes, and cluster policy is about consistently paving the way for conditions that are conducive to people's engagement in joint efforts, and the realisation of mutual benefits. Yet, government policy impacts on the preconditions for clustering under all circumstances, whether willingly or un-willingly. The understanding and attitudes of policymakers thus matter greatly for what can be achieved through cluster initiatives and cluster actions.

The realisation of an identified policy objective does not necessarily require a public policy measure. In some instances, private actors will, and should, undertake these roles spontaneously. As for outright policy intervention, the fundamental question is whether and how policy can be expected to add value beyond what other actors achieve independently. There are three main rationales for policy involvement, related to market failures, government/policy failures and systemic failures. While all need to be taken seriously, cluster policies should adopt a comprehensive approach.

Given the presence of multiple imperfections in markets and prevailing institutions, there is a potential for policymaking to generate benefits, both by accelerating the growth of existing clusters and by creating conditions that are favourable for the formation of new clusters as well as the re-engineering of old ones. On the other hand, policy intervention may also give rise to risks and turn costly. Policy may, for instance, counteract natural adjustment processes and distort which activities develop or which actors attain the dominant position in clusters.

Among the various approaches available, ***broker policies*** *should aim at strengthening the framework for dialogue and cooperation by the various relevant stakeholders involved in clusters, and not favour individual players.* ***Demand side policies*** *should seek to increase openness to new ideas and innovative solutions.* ***Training policies*** *may be targeted at upgrading skills and competencies which are essential for effective clustering of SMEs. Measures for the* ***promotion of international linkages*** *should be designed with a view to enhancing the interplay between foreign and domestic actors.* ***Framework policies****, finally, should put in place an over-riding playing field marked by effective and consistent rules for inter-actor transactions. Both hard-defined aspects such as social capital and attitudes, and habits that support trust in transactions should be taken seriously by policymakers.*

3.1 Introduction

As discussed in the previous chapter, the complexity of technologies, inputs, products and services rewards conditions that allow for the kind of continuous exchange between actors which is conducive to effective learning processes and innovation. The realisation of mutual benefits, and a sense of trust that relationships will be adhered to even in the face of short-term frictions and temptations for deviation, form part of the picture. At the same time, in order for the potential benefits of mutual effort and efficiency gains to prevail, the pressures and inspiration generated by competition are indispensable.

The forces of competition and cooperation thus join together in what we associate with clusters. For various reasons, however, organisational adjustments may not take place spontaneously under a given set of institutional and market conditions. Pooling of risk in R&D or coordination of production or marketing efforts may be viewed as too costly for individual firms to engineer. Joint efforts by firms that compete in product markets may be hindered by competition policy. Public funding for R&D may be "locked in" within artificial sectoral or geographical boundaries, although breakthroughs may hinge on the opportunities for broader alliances. Multiple conditions influence the extent to which actors are motivated or able to engage in the exchange of information and cooperation that characterises clusters.

The perception of potential benefits from clustering now entices governments and other public actors to launch cluster promotion policies. In one sense, designing and implementing effective policies is not a straightforward task. On the other hand, the adoption of cluster policy may serve as a trigger for government and public authorities to alter outdated governance mechanisms. The approach may help customize innovation and traditional policies to real world structures and relations. They can serve as a tool to advance dialogue and awareness on innovation, identify reforms that are needed to remove obstacles and what polices can add value, and to work more proactively in support of private sector initiatives. Cluster policies may thus spur learning processes and push policymakers to upgrade relevant competencies. Across a spectrum of domains, governments may see the need to reshape institutions and playing rules in support of clustering processes and innovation.

This chapter reflects on the scope for spontaneous cluster actions and subsequently on the rationale for cluster policy. Which kinds of measures may be entailed in cluster policy, their pros and cons, and the question of how cluster policy compares with related approaches such as innovation policy or triple helix, are considered. The chapter ends with comments on the issues arising in the implementation of cluster policy.

3.2 The scope for spontaneous action

The presence of potential benefits from cluster initiatives does not in itself suffice as rationale or justification for policymakers to interfere. The key question is whether and how policymakers can add value through appropriate measures, beyond the outcomes that markets and market actors produce on their own. Any analysis that issues recommendations for policy must adopt a non-biased and critical stance. Without it, policymaking is likely to be the captive of vested interests, a risk that can nevertheless not be ruled out and that

requires that various checks and balances are in place. Putting high requirements on the rationale for policy is essential for restraining the use of measures that are not desirable, as well as for keeping up pressures for identification and implementation of those measures which are most effective in achieving policy objectives. On the other hand, the notion of clusters, as well as that of innovation systems, implies that the missions of policymakers, institutions, and market actors are not independent. It should be kept in mind that the behaviour of governments, as well as public sector agencies more broadly, inherently influences clustering processes, and does so in multiple ways.

On the role of policy in cluster development, various notions abound in the literature. One commonly stated view is that public authorities should refrain from creating clusters. Attitudes are generally more favourable with regard to instruments for supporting existing or emerging clusters and, indeed, a number of governments around the world - irrespective of ideology - apply cluster policy with focus on the latter. Likewise, many clusters have gone through initial stages of mostly spontaneously generated clustering followed by a stronger element of conscious policy-support. Yet, if clusters are so beneficial to the participating bodies, and spring out of particular historic, cultural and societal circumstances, why are policies needed? Which policies? Undertaken by whom, and how? Would not policy be expected to make a greater difference in cases where clusters would not otherwise emerge?

There are, as we will see, good reasons why certain policies should be pursued both to accelerate existing clusters and to ensure sound conditions for the formation of new ones.[39] There are also the benefits of governments and public authorities thereby customising, reviewing and reforming outdated practices. While cluster policies have a potential for generating benefits, however, there are also costs and risks. Policymakers may hinder as well as support beneficial clusters. They may counter natural adjustment mechanisms and inadvertently distort which economic activities develop or which actors attain the dominant position in cluster processes.

As in other fields, cluster policy should be guided by general economic rules tailored to specific circumstances. Local conditions display great diversity, with regard to the availability of specific assets as well as types of enterprise agglomeration. A cluster may include public or private research institutes, be dominated by a small number of key enterprises or by none, have no experience of inter-firm collaboration or a significant history of cooperation, contain industries allowing significant or only limited vertical integration, etc. Further, policymakers do not have perfect information, and their actions will be influenced by various considerations. Such factors influence the anticipated usefulness of policy options.

Finally, policymaking is inter-related with fundamental economic and social developments. Liberalisation, technical changes, and the use of ICT are concurrently altering the scope and depth of markets. Changes interact in enhancing transparency, reducing transaction costs, and altering both the benefits and the barriers to cluster processes. They may also alter the degree to which benefits of clusters are exploited spontaneously.

[39] For further reading, see Miniforum 10, "Can government catalyze clusters? examples of government intervention", and Miniforum 2, "Benefits of innovative clusters". See also Section 4.2 and Section 4.3.3.

3.3 Cluster policy rationale

There are several motives for pursuing cluster policies. Examples of affluent regions containing dynamic clusters provide inspiration. Disappointment with the accomplishments of other approaches also spur an interest (Enright, 1991; Storper, 1992). This includes the failure of policies targeting specific firms, both the ones that favour the expansion of large firms and those that target SMEs, e.g. through funding of R&D in the latter. Another driver of cluster policy is the recognition that large firms are increasingly foot-loose and independent of individual locations. SMEs, on the other hand, are viewed as more connected to specific regions and increasingly capable of achieving world-class competitiveness, given an ability to engage in mutually beneficial collaboration with other firms and actors.

Contributing to the renewed interest in cluster policy are also questions of how to best manage *globalisation*, now raised in developed and developing countries alike, as well as the perception of new benefits from *innovation*.[40] As technologies evolve and mature at much faster speed than previously, and under conditions of much fiercer competition and greater mobility of production factors, locations find themselves in need of nurturing their unique assets if they are to serve as the basis for high value-added activities. According to the available evidence, industries that are relatively open to international competition display more favourable use of new technologies and greater innovativeness. SMEs appear prone to innovation in new ways but are also subjected to sharp competitive pressures (OECD, 2002*d*). Putting in place domestic institutions and structures enabling firms to innovate and act in relation to globalisation, not only in a *reactive* but also a *proactive* manner, now appears an urgent prerequisite for capturing the new opportunities for the very survival of industries and the well-being of regions.

Launching cluster policies, however, requires that the basis for intervention is clear. Some of the policy measures taken in the past with a view to cluster objectives have in fact turned out ineffective or counterproductive, and few have been subjected to rigorous monitoring and evaluation processes. Policies must be based on an expectation of added value, i.e. the outcomes generated by policy must be superior to the alternative avenues, including spontaneous market evolution.

i) Market failure

Mainstream economics long ago cast market failure as a fundamental rationale for policy action. This remains an important motivation for cluster policy as well. Knowledge creation, for example, is strongly affected by market imperfections in the form of asymmetric information, externalities and free-rider problems and economies of scale. Government policies motivated by specific market imperfections include subsidies or tax incentives aimed at stimulating R&D by private firms since its social rate of return is expected to be higher than the private gains accruing to the individual investors, or the provision of venture capital

[40] Beyond the term "internationalisation", the term globalisation depicts not only that more and more factor and product markets are opened up to international competition, but that the strategies and decisions of private and public players are increasingly influenced by considerations to what is happening around the world, i.e. countries and markets are becoming increasingly "interdependent".

because risk-averse investors shun individual projects while society as a whole can gain from pooling risk.

Cluster policies may also be directly motivated by the inability of markets to initiate or sustain inter-linkages that are potentially favourable from a societal perspective. For market failure to serve as a guide for interference by public authorities, however, it is necessary to have an understanding of why markets are unable to ensure desirable outcomes. Information failure presents a case in point. Individual companies may lack information on the potential benefits of cooperation that are available or the competencies that are needed for capturing them. But market failure also arises because of coordination problems and associated externalities. There may be "prisoners' dilemma" situations in which individual firms are reluctant to cooperate with others despite potential gains because of foreseen temptations to grab the surplus once it arises and run with it, making cooperation unreliable in the first place.[41] It may also be that gains cannot be appropriated by the firms making the decision to cooperate due to the presence of spill-over to other actors. This results in "under-investment" in capacity-building for cooperation, including capabilities to network and to build joint platforms for inter-linkages with external players such as customers in world markets.

ii) Government/policy failure

Some prevailing market imperfections reflect constraints levied by governments on the operation of markets. An economy can further malfunction because governments fail to deliver public goods in key areas, such as science, basic education, product regulation or the judiciary system.

As was well understood long ago, governments and other public bodies are not necessarily efficient or impartial. Clearly, market failure should only be addressed if governments can be presumed to do better than markets. This includes not only taking account of administrative costs and policy errors within individual programmes, but also the risk that public involvement is influenced by vested interests, which distorts private behaviour in a wider sense, and/or perpetuates itself over time.

Where the benefits of policy intervention are concentrated to limited groups of people, it is relatively easy for them to organise themselves so as to exert pressure on governments to favour their special interest. This will then come at the expense of broader groups which will have to bear costs that are spread relatively thin (Olson, 1965). Examples are found in various domains, such as trade or environment. In these cases, small groups of producers tend to benefit from protectionism or lack of environmental protection whereas much greater numbers of customers and citizens suffer from the demise of public goods - the negative effects of which, however, are spread thinly on everybody.

In fact, due to deficiencies in information, institutions and public competencies, including the susceptibility of public authorities to the influence of relatively well-organised vested

[41] The seriousness of this problem is reduced in repeated gains, where reputation effects become more powerful in punishing players that deviate from the common good. See, for instance, Axelrod's (1984) classic demonstration of improvements in outcomes as an interactive game is known to be repeated many times.

interests, government or policy failure occurs frequently, in turn generating an additional rationale for corrective measures. Some of the answers have to do with re-organisation of public responsibilities, between ministries, or between national and local levels. The objective is typically to arrange a closer connection between decision-makers and those who are affected by the decisions. On the other hand, care is needed, for instance so that such reorganisation does not in effect increase the dominance of specific interests. Other responses include putting in place better mechanisms for monitoring and evaluation of outcomes.

In the case of industrial policy, traditional subsidies supporting individual firms and industries have in principle been denounced long ago, except in cases where measures are effectively limited to temporary support of *infant industries* or to enable needed restructuring of established industries. Such support has nevertheless been protracted on a massive scale in many countries, albeit often under other labels, such as *regional support*. In addition, policies supporting R&D through direct subsidies as well as indirect tax incentives have commonly failed, especially when targeting SMEs. In these as well as in many other areas, policies easily run into serious *contract* or *agency problems*, which are associated with problems of asymmetric information.[42] In those cases, policy measures may target the wrong actors, or distort behaviour so that agents adjust their behaviour so as to become eligible for support.

While cluster policies are not immune to such risks, their focus on building linkages and extending support to broader groups of firms is seen by many as a remedy to existing failures in old industrial policies. Cluster policies are also argued to help addressing institutional rigidities, e.g., in universities and research institutes, and to increase the mobility of workers.

At the same time, there is the risk that cluster policies themselves are susceptible to the influence of vested interests in specific regions or sectors. There are, indeed, cases in which support to clusters clearly exacerbated existing failures rather than corrected them. There are also many examples in which attempts to create new clusters created distortions and proved costly. Rosenfeld (1996) argues that cluster policies have an inherent tendency to encourage over-specialisation and excessive vulnerability in regions. A common pitfall is for public agencies to promote "high-tech" clusters even when the necessary preconditions for their success are lacking in a region, i.e. chasing "white elephants". Not only are policymakers often over-ambitious in support of high-tech sectors; they seem to choose the same clusters - ICT, medical technology or biotechnology - resulting in even higher global costs.

Inconsistencies may further arise as many authorities encourage economic diversification, which may run counter to cluster policy instruments. Also, there is the danger of targeting clusters with inappropriate policies, e.g., aiding an idea-based cluster with enhanced science or innovation support when its main problem is related to weaknesses in conditions for entrepreneurship. Boekholt and Thuriaux (1999) underline the importance of practices that reduce the risk of targeting the "wrong" clusters. Roelandt et al. (1999) emphasise the importance of policy shifting away from direct intervention towards indirect inducement.

[42] In the case of *moral hazard* and *adverse selection*, public intervention may be inefficient or counterproductive because of unwanted effects on the behaviour of the targeted subjects, or errors in which subjects are targeted by policy.

In short, consideration to government/policy failure serves as a factor that can both discourage and motivate cluster policy. Measures are needed to reduce the risk of distortionary or inefficient outcomes. The costs of public initiatives may also outweigh the benefits, resulting in drainage of resources from other policy areas. On the other hand, governments and other public authorities are already influencing conditions for clustering in multiple ways. An active policy stance is needed to disclose and learn from mistakes.

iii) Systemic failure

Both the market and the policy failure approach serve to identify individual suboptimal outcomes that motivate policy correction. It has gradually become obvious, however, that governments and policymakers impact on actors in the economy in multiple and partly inter-related ways. This applies particularly with respect to innovation, which is influenced by interactions between a number of functions and actors, in the market as well as in the public sphere (firms, the science system, public research institutes, managers, entrepreneurs, venture capitalists, etc.).

Systemic failure occurs when there is a mismatch or inconsistency between these interrelated institutions, organisations, or playing rules (Metcalfe, 1995). Both public and private institutions produce knowledge and products that are of a public as well as private nature. Shaping appropriate and effective conditions for the two kinds requires interaction and coordination between different kinds of institutions (Nelson and Romer, 1997). Market conditions, firms, public institutions, etc., interact, and failures may arise because of contradictions or inconsistencies in their capacities and playing rules.

Cluster processes are characterised by interactions between separate actors as well as between different driving forces. Policies addressing weaknesses in just one area may be ineffective, if other problems are left untouched. Further, such reforms may not be politically attainable, because of resistance by vested interests. Coordinated, broader reforms may increase the number of winners and help overcome resistance, making reforms both more effective and feasible to implement (David and Foray, 1995). A realisation of the importance of clusters may facilitate a unifying strategy and comprehensive approach across different ministries and public authorities.

The dynamics of a cluster may be impeded by conditions in the broader economic environment. Failures in so-called "framework policies" easily multiply in micro-level failures. For reforms to rectify the situation, a portfolio of corrective actions which includes elements at both levels may be necessary. At the same time, actors responsible for key macro or micro institutional framework conditions, e.g. competition rules or fiscal affairs may be subjected to contradictory obligations and ways of thinking that are not susceptible to concerns for innovation, entrepreneurship and cluster development. In effect, this may block prospects for consistent and effective cluster policies, raising formidable challenges for policy implementation (see below).

The importance of adopting a systemic perspective should be underlined. The processes through which institutions and markets foster capabilities and incentives underlying innovation are interrelated, so that reforms and improvements in individual areas may be

ineffective unless supplemented by measures in other areas. This has fundamental implications for policymaking, which could become more effective if able to identify and address bottlenecks, repair or establish inadequate parts of infrastructure in order to surpass enabling thresholds, or implement packages of mutually complementary policy measures. Meanwhile, the mere appreciation and understanding by policymakers of the importance of clusters is important for a number of nitty-gritty policy decisions. It could clearly be greatly important for enabling market actors to anticipate reasonably solid and stable pre-conditions in areas which influence their readiness to engage in the delicate processes and linkages that comprise the heart of clustering.

3.4 Types of cluster policy

A large number of measures may fall under the heading of cluster policy. While practically any policy may affect cluster processes, in order to be meaningful and deliberate, the concept of cluster policy needs demarcation lines and appropriate scope. In practice, the concept is now applied in a disparate way, encompassing a fragmented set of models and descriptions of principles and processes, ranging from subsidies to the provision of public services, support to chambers of commerce, the set-up of IFCs, discussion forums, or internet portals.

Before categorising cluster policies, it is worth reflecting on their relationship to the cluster concept, as well as to cluster initiatives. Operational distinctions are needed between clusters, cluster initiatives and cluster policies.[43] Expanding from Chapter 2, clusters can be viewed as ecosystems with inter-related, complementary elements, comprised of actors that make their own, albeit inter-related, decisions. Cluster initiatives are systematic efforts aimed at influencing and creating clusters, with cluster actions making up discrete steps thereof.[44] Some merely have the objective of promoting inter-linkages within clusters or to the outside world.

Focussing on "innovative clusters", the Greenbook distinguished between six categories of objectives for cluster initiatives: (i) cluster expansion; (ii) innovation and technology; (iii) education and training; (iv) commercial cooperation; (v) policy action; and (vi) research and networking. Whereas the government is in control of cluster initiatives more frequently than private sector actors, more than a third were found to be jointly-controlled by public and private actors. Although the Greenbook concluded that most cluster initiatives are dependent on public funding, and frail without it, a private sector lead may be crucial for effectiveness and performance (Porter, 2001). Where private actors acquire control, the orientation of initiatives tends to be different, e.g., driven more by concerns for productivity and profitability and with greater scope for innovation and expansion.

The concept of *cluster policies* is narrower than that of cluster initiatives as the latter include measures undertaken by various kinds of actors beyond the public sphere. On the other hand, the notion of cluster *policies* may comprise a range of measures and strategies normally not reckoned as "cluster initiatives". Many actions taken by authorities influence clusters

[43] Subira, keynote speech at TCI Conference.
[44] See Section 4.2.4 for further information on cluster actions.

inadvertently, without an explicit purpose of that sort. In theory, cluster policies are pursued by public actors for the purpose of increasing socio-economic benefits through the creation or further development of clusters. Other policies impact on clusters indirectly, e.g., education systems, competition laws, public procurement practices, public funding of research and product development, IPRs, regulations influencing universities' ability to form holding companies for the commercialisation of new ideas, and so on.

Some government measures block opportunities for cluster development or erode the efficiency of actual cluster initiatives. How, then, should cluster policy relate to those policies that are not encompassed by the concept, but which still matter crucially for the development of clusters and the effectiveness of cluster initiatives and cluster policies?

Competition in product markets, the attraction of investment and other mobile production factors, access to global knowledge flows, and international specialisation in support of efficiency and competitiveness, are not a given in cluster processes. Some clusters turn inward and become protected and closed. Such sheltering against external pressures may appear lucrative in the short term and the web of a cluster may still enable a good performance for some time. In the medium to long-term, however, there will be creeping inefficiencies, stagnation, decay and the ultimate demise of the cluster once the world has evolved and defensive practices do not hold up anymore.

Especially at times of stagnation, clusters may effectively perform a function of cushioning pressures for restructuring. While this can be greatly beneficial for the participating firms and helps prevent wasteful economic and social decay, the blessing is a mixed one since processes of structural change normally are the most encompassing in situations of low aggregate growth. It is critical that clusters do not shelter themselves against competition and reneweal. Responsible actors – public or private - should ideally limit defensive actions to what can help bridge transitory slack in markets or catalyse needed structural changes in clusters. They should refrain from taking steps that allow clusters to distance themselves from the overall productivity frontier.

In the following pages, we address five kinds of approaches which fit more or less clearly into the category of cluster policy: i) Broker policies; ii) Demand side policies; iii) training policies; (iv) Measures for special promotion of international linkages; and v) Framework policies.

As will be seen, many of these are complementary to specific cluster actions, and in no case constitute, or are able to lead to the creation of, successful clusters per se. But, appropriately used, they can accelerate the clustering process and make it more likely to succeed and be sustained over time.

i) Broker policies

Success in cluster processes will critically depend on the nature of engagement by the various relevant stakeholders directly involved. Indeed, most policy measures targeting the development of clusters are concerned with the framework for dialogue and cooperation between firms, as well as between firms and relevant public sector actors (particularly at local

and regional level) and/or non-governmental organisations. Measures in this area are generally referred to as Broker policies.

The aim of Broker policies is to enable value-enhancing dialogue and collaboration beyond what would be achieved in the absence of such initiatives. They may be rationalised by the spectrum of market, government and systemic failures. Market forces may under-supply certain interactions or the emergence of supportive services, but there may also be counter-productive activities on the part of public actors and inconsistencies in the interplay between constituents.

The following represent specific categories of Broker policies. However, it should be noted that some of these are not specifically "cluster policies", as they may be implemented for other motives as well. Also, as already indicated, the realisation of the implied policy objective does not necessarily require a public policy. In some clusters, private actors indeed undertake these roles spontaneously. Nevertheless, the policies listed below are part of the toolkit of broker policies that can be applied to foster cluster development:

- Public authorities can support the establishment of linkages between firms through the creation of platforms for dialogue, such as meeting places and support to IFCs; encouragement and facilitation of networking; support to external connections; export networks and co-ordinated purchasing; promotion of cluster identity and awareness through support to creation of joint cluster brand; and joint marketing initiatives for external and internal promotion.
- Measures that strengthen science-industry interplay, e.g., by allowing specialisation and local adaptation in university-industry linkages including experimentation with reward systems and other incentive structures so as to promote linkages to local industry. Intellectual property reforms may be reformed so as to provide both the institutions and the individual researchers with an incentive to collaborate with industry. New partnerships can be developed between public research and the business community, support services for the development of new technology-based firms fostered, knowledge-creation in response to societal demands cultivated, and so on.
- Support of knowledge-enhancing organisational linkages through public-private partnership. Specific measures may encompass a variety of cooperative relations or activities in terms of size, objectives and design features. Proper partnerships - as opposed to more casual, arms-length or hierarchical relationships - depend on arrangements as regards: institutionalisation of relationship, i.e. formal/informal; the constellation of partners involved; arrangements that ensure shared interests and clearly identifiable public interests, e.g. health, environment, defence, competitiveness; and appropriate arrangements as regards active involvement and co-investment of resources (OECD, 2004).
- Finally, standard statistics fail to cover many structures and linkages that are crucial for measuring and understanding cluster developments. There is a rationale for specific public efforts to collect and organise relevant statistics. This may include supporting analytical work by public or private researchers to map the development of clusters, examination of their constituents, and communication of their properties,

> in effect, spurring awareness of opportunities for firms and individuals and thereby strengthening the preconditions for realisation of the benefits of clusters.[45]

Broker policies can operate through various instruments. For example, one means for systematically mapping cluster competencies is that of visualising a *competence system,* which may be seen as a tool for policymakers and/or cluster facilitators to foster growth in a particular region. This may help generate and diffuse increased knowledge of core competencies among regional actors. Learning circles and support of extension services may be applied to combine means for networking and knowledge diffusion. Further, *science parks* can help build platforms for bridging the barriers between academia, entrepreneurs, and financiers.[46] *Business incubators*[47] are related entities devoted to the establishment and the growth of young entrepreneurial companies (Lavrow and Sample, 2000). Designing, implementing and managing incentive schemes that promote the realisation of such results is far from straightforward, however.[48]

Local and regional authorities tend to attain an increasing role in Broker policies (Murray, 1999; Pyke et al., 1992). Many facilitate clustering through the provision of real estate, or through the expansion of attractive housing or other local facilities. In the United Kingdom, the central government has created a "clusters and incubation challenge fund" (administered through regional development agencies). The French government has promoted and financed the creation of *Local Productive Systems* (SPLs) through calls for tender. In Sweden, VINNOVA has launched a cluster initiative as a means to push for new ways of approaching regional policy more broadly. Through the so-called *Vinnväxt* programme, VINNOVA is attempting to inspire enhanced competition and experimentation through a contest over which region is able to advance the most competitive clustering alliance in a particular field. Similar programmes have been launched elsewhere, e.g., in Germany (BioRegio, EXIST, InnoRegio) to support only those regions that display real growth, innovation and know-how potential, although this was done in part to avoid that regions artificially create clusters in activities merely because they are fashionable (European Commission, 2003*b*).

ii) Demand side policies

A common strength of clusters is their ability to pool resources and efforts so as to reach markets more effectively. However, whereas business people and clusterpreneurs often focus on identifying and meeting demand, which is generally critical from an enterprise perspective, this is an area in which policymakers feel they have little to contribute beyond making data and information on markets (and eventually technologies) available (den Hertog and

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45 See Miniforum 15, "Clustering competencies".

46 For further reading, see Miniforum 8, "The role of science parks as boundary crossers".

47 Read more at the US National Business Incubation Association (NBIA) website: www.nbia.org.

48 Based on the experience of UK Business Incubation, Ecotec (2003) suggests that four practical steps are required when developing incubators: i) the development of ideas - minimising physical and organisational barriers and allowing entrepreneurs the freedom to innovate; ii) nurturing the idea - supporting the innovator through providing time and resources to develop the idea; iii) formalising the development - creating a business unit; and iv) 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.

Brouwer, 2001). Yet, "public policy" demand-side instruments do exist, such as *public procurement*, which no doubt can be powerful given its volume in most countries. If properly used, public procurement has a strong potential for developing and strengthening clusters, especially when pursued consistently over extended periods of time. Although public procurement strategies are now regulated by international trade agreements, and also by other national and supra-national laws as in the European Union, their potential impact as cluster catalysers remains huge.

There are many examples of cases in which public procurement has played an important role in spurring new forms of collaboration and also generated innovative goods and services. Beyond subsidies and R&D financing, the US defense industry and associated public procurement campaigns greatly contributed to the spurt of US high-tech industry in the 1990s. The Silicon Valley and Route 128 successes benefited from public meeting platform for joint projects and pools of long-term funding. The National Institute of Health similarly channels major resources to the Boston Area research institutions and hospitals. In the Nordic countries, the procurement strategies of public authorities in the areas of health, transport and telecommunications provide other examples of value-added in terms of strong industrial development, the boost to the growth of Ericsson and Nokia and the early development of their mobile communication technologies providing one example. In the case of science-industry relations, the European Framework programs for a joint European research area have explicitly applied a demand strategy for shaping new interlinkages between disciplines, sectors and across the national borders of the European countries.

The risk remains of excessive intervention or mis-qualifying the criteria that will promote the development of clusters through public procurement, as well as that of making clusters over-dependent on public demand. Another critical aspect concerns the quality of demand. Sophisticated, forward-looking customers spur innovation and may stimulate creative links between actors at different stages of the value-chain. Public actors display an uneven record in this respect. Problems may arise due to a combination of lack of strategic/technical knowledge and inappropriate incentive structure within the public sector, which can lead to chasing of "white elephants" through public financing. There is also the risk of inefficiencies due to poorly formulated demand specifications. Public projects can be susceptible to vested interests, which may result in procurement driven more by political interest than justified needs. The public sector further has a track record of problems in overspending and failure to phase out support of unsuccessful projects. Finally, despite improved transparency in recent years in procurement practices, there are still problems with corruption in many countries.

Fostering the development of observatories and expanding the range of information and data readily accessible to firms is another example of a demand side policy that can usefully contribute to the development of successful clusters. It is, in fact, often one of the first action undertaken by IFCs. Such 'information gathering and information sharing' structures can also cover technologies, intelligence on competing clusters/regions, etc.

Beyond competition and growth policy, a key to high-quality demand resides in the establishment of educational programmes and other initiatives that can stimulate broader knowledge and understanding of others' perspectives, and underpin attitudes of curiosity and openness to new ideas, including on the part of customers. Some measures reckoned as part

of broker services are applied in ways that can help underpin the demand side. Policymakers can for instance catalyse, or play a part in strengthening, demand for network services, preferably in regard to market-driven objectives.

iii) Training

There may be a rationale for policies aimed at upgrading skills and competencies which are essential for effective clustering of SMEs. Apart from catalysing inter-firm networks and university-industry linkages, cluster processes may strengthen the incentives for SME to upgrade their internal competencies, in part because needs and payoffs become more apparent. Special programmes may still be needed to realise and sharpening such efforts (Forfas, 2004). The rationale is a combination of imperfections in information, credit constraints in SMEs coupled with indivisibilities in competence upgrading, and the lack of universities and other public or private training institutions providing educational services tailored to the specific needs of SMEs.

Some such efforts take the form of vocational training programmes. These activities fall outside the formal cycles of schooling. Entry requirements and the intensity and duration of training vary. Often there is often a strong practical element. Whereas most such programmes target unemployed workers, the more successful one tend to be those that have assisted in the upgrading of skills for employed workers, including through on-the-job training. A great number of both developed, developing and transition economies have created extensive programmes of that kind. Successful programmes tend to have well organised public information services about existing programmes, while ensuring competition and pluralism in terms of providers, including with strong private sector participation. Some countries, such as Finland, Germany and Ireland, technology and research institutes have developed specialised departments well designed to be receptive and responsive to such SME needs.

A common problem, however, is that the needs of skills upgrading for individual firms and workers are highly idiosyncratic and do not fit easily with the agendas of established educational programmes or existing providers of business intelligence. Transition economies are faced with special challenges in retraining highly skilled specialised workers. In the case of clusters, there may be more of a critical mass of related needs for upskilling, providing a better platform for matching that demand with tailored responses from the supply side. Public initiatives may combine measures which stimulate SMEs to identify and articulate their needs with assistance in packaging them and brokering supply arrangements in educational institutions which would otherwise stay focused on the more straightforward task of developing broader more general programmes.

At the same time, publicly organised supply of business services commonly puts a cap on the demand for private services, which may stifle the development of private business services more generally (Dar et al., 2000). In order to avoid such outcomes, it is important that public services are limited to providing information which is of a public good nature, i.e. diffusing broadly basic information so as to raise the level of awareness, making actors in the market place aware of what they do not know, and thus become more capable customers of specialised information services.

In practice, such crowding out effects are often neglected. Publicly instituted service providers are sometimes requested to generate their own funding and encouraged by governments to keep information secret and channel it exclusively to those that are willing to pay the most. This inevitably leads to public entities occupying the sphere of private service provision, a task that is best taken care of by specialised market actors, not by public authorities, weakening the prerequisites for competitive clusters.[1]

iv) Promotion of international linkages

A distinct area of cluster policy is that of *promoting international linkages*. This is not really a new policy, but it may be seen as an extension of instruments traditionally applied in industrial policy. The elimination of trade barriers and strengthening of transport and communication systems, along with the harmonisation of market regulations have, however, greatly improved conditions of resource flows and enhanced specialisation of value chains across national borders (Forsyth, 2000; OECD, 2001*a*; Brandt, 2004).

Yet, progress has been uneven, and important areas have been subject to much less impressive advances (Pryor, 2002). The failure to put in place consistent rules for the protection of intellectual property rights provides one conspicuous example. While the speed and scope of international knowledge flows have expanded tremendously, there are not yet orderly trading rules for intangible assets, and there is sharp competition in building the conditions that are required for benefiting from the new opportunities.

Of special importance for transferring skills and technologies are long-term investments by MNEs to either establish new firms on foreign ground or take control over already existing foreign firms, i.e. foreign direct investment (FDI). Flows of outward FDI typically enable an economy to induce growth in areas marked by relatively high productivity. Outward FDI amplifies the competitive position of domestic firms, including through enhanced international specialisation of their operations, allowing better market access, adaptation of products to foreign markets, and tapping into low cost resources for standardised production. Positions in foreign markets are deepened through the provision of local service and product customisation. Experience suggests that expansion abroad tends to be accompanied by higher competitiveness, productivity and R&D in home operations as well, (Åkerblom, 1994; Van Pottelsberghe de la Potterie and Lichtenberg, 2001).

In Porter's (1990) approach to clusters, inward FDI was basically thought to lack strategic capabilities reserved for headquarter operations. In reality, foreign affiliates fulfil various functions depending on firm organisation as well as country characteristics. Increasing needs to tailor products to specific markets and customers have gradually strengthened the standing of many foreign affiliates (Pine et al., 1993). Further, inward FDI typically strengthens domestic competition, raises buyer sophistication and involves spillovers from transfers of technologies, operational practices, and skills not otherwise available locally. This is reflected in patterns of systematically higher productivity in foreign-owned firms relative to the average domestic company, as well as in observations of spillover-effects resulting in higher productivity in domestic firms within industries with extensive foreign ownership.

There is also a tendency towards intensifying competition between countries and regions for the attraction of FDI. Public cluster initiatives tend to include the attraction of FDI as a priority instrument to strengthen the resource base, access front-edge technologies and skills.[49] Common practices are to diffuse information about the locational advantages and partnerships that can be offered by existing clusters, often with some targeting towards foreign investors believed able to contribute assets that are complementary to local capabilities.

Again, however, impacts of inward FDI are not a given nor a substitute to domestic private-led initiatives within clusters, but depend on investor strategies as well as local conditions and policies.[50] Like other sources of international knowledge flows, ranging from trade in goods and services to turnkey contracts and licensing agreements, FDI sets in motion adjustment processes that are responsive to economic fundamentals. In the absense of a multilaterally accepted framework for investor rights, the terms for investment are often influenced by investment treaties negotiated on a bilateral basis (UNCTAD, 2003). A range of policies impact on the scope and nature of outcomes. Of great importance is the relationship between foreign and domestic investors.

In fact, a number of studies have demonstrated that spillover effects from FDI are influenced by the capabilities of domestic firms (Wang and Blomström, 1992; Pavitt, 1998; Moran, 2001; UNCTAD, 2001). Cluster policies may thus strengthen the resource base and skills of domestic suppliers, especially SMEs, boosting both their attractiveness as partners to MNEs and their bargaining power relative foreign investors. Public science and technology projects, supplier-customer networks, offering of attractive infrastructure, industrial relations facilities, etc., can serve as complementary measures.

Apart from attracting and spurring benefits from inward FDI, policymakers should be mindful of the benefits from outward FDI serving as spearhead into foreign markets as well as pools of technology and skills. With many existing institutions and traditions discriminating against international knowledge-flows and exchanges, cluster processes can greatly benefit from networks such as those established through public educational programmes, mutual recognition of educational degrees awarded by foreign institutions, managerial or professional exchange programmes, and so forth.

Beyond FDI attraction policies, other means to promote international linkages is through support to SMEs or newly started firms that would otherwise be unable to penetrate wider markets. Examples of measures include export networks, support of delegations to international trade shows, public sponsoring of joint branding and marketing campaigns, etc. The provision of export credit and financing services represent another popular tool which raises concerns about free and fair competition. They are subject to agreements and understandings within the framework of the OECD (subsequently integrated into EC law) as

[49] Read more in Minforum 13 "Strategic upgrading through the inflow of FDI".

[50] Positive impacts of FDI cannot be taken for granted. Whether outward FDI serves as a complement or substitute to home operations is an empirical question (Svensson, 1993; Lichtenberg and van Pottelsberghe de la Potterie, 1996). Likewise, outward FDI may be motivated by sourcing instead of exploiting proprietary technology (Mudambi, 2002), which may cause adverse effects for host countries through reversed spillovers (Driffield and Love, 2002).

well as to an EC Directive on harmonisation of export credit insurance for transactions with medium and long-term cover.

v) Broader framework conditions

Broader framework conditions equally influence the success factors for clusters and innovation. Relevant framework conditions include *macroeconomic stability*, well-functioning *product markets* (goods and services), *factor markets* (labour and financial markets), *education systems*, and physical, institutional and judicial *infrastructure*, including a *governance* system that is able to sustain effective and consistent playing rules for innovation, the existence of an appropriate *communications and transport infrastructure*. *Social capital* and *attitudes* that influence trust in transactions may likewise be included. The shaping of such factors naturally goes beyond the domains of cluster processes and cluster policies.

Cluster policies may or may not, however, be viewed as inclusive of "*framework policies*", i.e. policies that target infrastructure and institutional conditions that are fundamental to the functioning of clusters. Some argue that cluster policy should be defined in the broad sense of including "all policies that impact on clusters". Since most things are related one way or the other, such a definition becomes utterly unpractical. Nauwelaers (2003), for instance, observes that practically all instruments traditionally found under the three parent policies of industry, technology and regional development, may impact on clusters. Many influence the forces of restructuring and renewal more broadly (Rosenfeldt, 2002). The only instrument sometimes argued to qualify as entirely cluster specific would be support for *cluster platforms* or *animators*, which usually is motivated only on a limited scale and on a temporary basis.

One way to delimit cluster policy in a way that is nevertheless inclusive of some framework conditions, is to embrace those measures and reforms which are warranted for the purpose of influencing cluster processes. Deficiencies in physical or legal infrastructure, weaknesses in schooling and conditions for life-long learning, regional insularity, etc. may for instance be effectively addressed with reference to their impact on conditions for clustering. Features of corporate governance have likewise been shown to have practical consequences because they influence the objectives of firms and managers, and the evolution of financial and equity markets, in ways that favour some forms of business relations and economic specialisation at the expense of others (Carlin and Mayer, 2002; Maher and Andersson, 2002).

As further discussed in Box 2, framework conditions have been subjected to far-reaching changes around the world in recent decades. This is related to the fundamental changes we associate with globalisation, liberalisation and technical progress. Although there have been sweeping rounds of reform, and framework policies in some respects have become more similar across countries, for instance as regards macroeconomic policy, there continue to be marked cross-country differences in most areas. Many countries continue to display weaknesses in framework policies which crucially limit the basis for clustering, indicating that measures in this area merit high priority in a comprehensive cluster policy. Basic regulatory conditions, educational practices and other institutions will for instance influence the effectiveness of market transactions versus transactions within firms, or the ability of individuals to engage in entrepreneurship versus employment or in high-risk ventures versus relatively stable business activities.

In practice, there is no sharp dividing line between cluster policy in a narrow sense and broader framework conditions, but there is a grey zone in which different kinds of interests and concerns try to extend their influence. It will be greatly important to what extent governments are able to coordinate their means across a broad spectrum of policy-domains and -levels in order to shape more consistent and comprehensive conditions for dynamic cluster processes and innovative clusters.

Box 2: Influence of framework conditions

In recent decades, there has been a tendency of global congruence in policy frameworks. Several previously strongly regulated markets, such as telecom and energy, have been deregulated consistently in a range of both developed and developing countries. Educational reforms have been undertaken, trade barriers lowered or removed, capital markets liberalised and internationalised, and competition policies upgraded. In most countries, the government has become less prominent as manager and owner of firms. Labour market laws have generally become more flexible. Social and related cultural framework conditions have received increased attention. This applies to poverty and empowerment aspects as well as gender issues, with potentially important consequences for the diffusion and use of knowledge broadly in society.

These developments have brought sweeping changes in terms of market access. Business opportunities and the availability of standardised as well as specialised factors of production, such as financial and human capital, have been expanded. At the same time, the influence of framework conditions on clusters continues to vary markedly across countries. For instance, the policy frameworks of North America, Western Europe, the transition economies in Central and Eastern Europe, and East Asia display distinct profiles in a number of respects, with weaknesses that are specific to each country and region for historical reasons.

There are inherent difficulties in designing a policy that is horizontally consistent with respect to the institutions and incentives affecting innovative behaviour (OECD, 1998). Developing and transition economies display specific weaknesses in institutional conditions as well as with respect to the access to resources to secure public goods functions underpinning the development and diffuse of knowledge (World Bank 1999/2000; Batra et al. 2003). They also feature a complex interplay between *formal* (contracts, formal hierarchies, and public regulations) and *informal* practices (norms, routines, traditional authority, and spiritual expectations) in this area. Critical issues include whether there is conflict or complementarity between formal institutions and informal value systems, and how the latter can best be shaped so as to facilitate a favourable development of informal practices.

3.5 Cluster policies today

No official data or other statistical information available today make it possible to count or classify clusters around the world. Nevertheless, multiple agglomerations or networks of businesses clearly exist in practically all countries. What specific fraction of these comprise full-fledged clusters depends on how stringent definitions are employed but, again, most countries and regions of certain geographical size typically reckon that they possess a number of mature clusters as well as candidates in the making. As for cluster *initatives*, the Global Cluster Initiative Survey identified about 500 around the world, mostly in Europe, North America, Australia and New Zealand (Sölvell et al., 2003).

Cluster policies have likewise become widespread since the early 1990s. Given the number of measures encompassed, and the difficulties to define sharp limitations for relevant policies, no attempt is made here to estimate what number of policy interventions exists, or to provide any exhaustive survey or assessment of their nature. Beyond examples of which measures are pursued across countries, however, in this section we do indicate some general patterns for cluster policies pursued across countries, as regards their strengths and weaknesses. Table 1 provides one specific overview for certain kinds of failures, and whether policy responses in a general sense are observed across countries.

Table 1: Cluster-based response to systemic and market failures

Systemic and market failures	Policy response	Countries' focus in cluster-based policy making
Inefficient functioning of markets	- Competition policy and regulatory reform.	- Most countries.
Informational failures	- Technology foresight.	- Netherlands, Sweden.
	- Strategic market information and strategic cluster studies.	- Canada, Denmark, Finland, Netherlands, United States.
Limited Interaction between actors in innovation systems	- Broker and networking agencies and schemes.	- Australia, Denmark, Netherlands.
	- Provision of platforms for constructive dialogue.	- Austria, Denmark, Finland, Germany, Netherlands, Sweden, United Kingdom, United States.
	- Facilitating cooperation in networks (cluster development schemes).	- Belgium, Finland, Netherlands, United Kingdom, United States.
Institutional mismatches between (public) knowledge infrastructure and market needs	- Joint industry-research centres of excellence.	- Belgium, Denmark, Finland, Netherlands, Spain, Sweden, Switzerland.
	- Facilitating joint industry-research cooperation.	- Finland, Spain, Sweden.
	- Human capital development.	- Denmark, Sweden.
	-Technology transfer programmes.	- Spain, Switzerland.
Missing demanding customer	- Public procurement policy.	- Austria, Netherlands, Sweden, Denmark
Government failure	- Privatisation.	- Most countries.
	- Rationalise business.	- Canada.
	- Horizontal policy making.	- Canada, Denmark, Finland.
	- Public consultancy.	- Canada, Netherlands.
	- Reduce government interference.	- Canada, United Kingdom, United States.

Source: Roelandt and den Hertog (1999)

As for more specific observations, the Danish, Dutch, and Finnish governments belong to the pioneers in brokering programmes with strong SME components. Austria, Australia, Canada, Finland, France, Germany, New Zealand, Norway, Spain, Portugal the United Kingdom and the United States have high-calibre public authorities, most of them with strong programmes addressing human capital and innovation issues connected to clustering. China and China Taipei above all pursue broker policies related to science parks and incubators. Thailand explicitly promotes SME cooperation whereas the Philippines have more traditional institutional infrastructure to support SMEs. Japan has downplayed previous R&D-support to SMEs by replacing it with measures to support innovation within clusters on a broader scale.

Many countries use the cluster concept as an instrument for focusing attention on, and to some extent for marketing, specific regions and locations domestically as well as with regard to foreign investors. Australia, Finland, Ireland, the Netherlands and Chile belong to those that have developed ambitious strategies supporting upgrading of domestic subcontractors and other domestic firms partnering with MNEs.

The list does not end there. A range of other countries in all parts of the world, including in developed, developing and transition economies, have implemented certain reforms with reference to cluster processes. Traditional public programmes for the provision of export subsidies and services have commonly been reoriented towards a focus on providing information that can plug into networks of SMEs and cluster structures.

The cluster concept is further closely studied by a range of countries, e.g. in Central and Eastern Europe, the Middle East, and South Asia in search of lessons for how to promote industrial competitiveness. Promoting clusters is widely seen as an attainable way forward towards enhanced competitiveness also in many situations marked by incomplete markets and rigid institutional conditions. Across a broad range of countries, clusters are attaining growing importance as an instrument for communicating the significance of organisational change and intensified cooperative efforts as building blocks for putting in place a more dynamic, entrepreneurial and innovative society. In this context, the concept is complementary to the attention paid to innovation systems.

On the other hand, there is also disappointment in some countries because of perceptions of failed outcomes. Some specific measures or programmes may have been lacking results because they represented partial and incomplete measures. Alternatively, they may have been unrealistic or met with resistance. In some countries, the cluster concept has become less topical, losing ground to complementary frameworks such as that of innovation systems, whereas it has continued to gain ground in others.

Another aspect is that many countries continue to pursue labour market regulations, investment and tax policies, and offer special incentives which distort competitive conditions between foreign and domestic investors (and sometimes even between domestic investors) in ways that counter healthy clustering processes. In a few cases, countries have broadened the cluster reform agenda into the realms of such framework conditions. Australia, Denmark, Finland, Ireland, the Netherlands and the United States have adjusted competition law, governance legislation, research funding and regulations, or labour market rules, with a view to cluster processes.

A great number of countries have been inspired to make adjustments to educational programmes and to review training and adult education services. One approach, commonly referred to as "the dual system" and greatly relevant in cluster development, has been developed particularly in Germany. Public schools and private employers are mobilised to provide, and share, the costs of vocational education and occupational training simultaneously. The approach demonstrates the value of joint public and private funding and shared commitment for enhancing the quality and relevance of vocational training. Surveys imply that this is best achieved by the political will to reduce the government's role in vocational training stated by the provision of clear financing rules that encourage rather than crowd out private initiatives (Dar et al., 2000).

S&T policies more generally include a broad range of measures where cluster considerations often are greatly important. This is the case in the strive for more effective university-industry linkages (OECD, 2002*a*), and technology parks and technology incubators are now flourishing in developed and developing countries alike. In several countries, changes to patent legislation and the distribution of intellectual property rights between institutions and individuals were made in recent years for the purpose of strengthening conditions for science-industry links and the commercialisation of research. The extension of patent protection to publicly funded research in the United States has for instance had a significant impact on technology transfer (Jaffe and Lerner, 1999). At the same time, as already mentioned, there has been scant progress towards the establishment of more uniform international policy frameworks for intellectual property rights.

Some countries pursue campaigns of various sorts to facilitate the valuation and promotion of intangible assets. A few explicitly seek to catalyse experimentation by firms and organisations to upgrade their appreciation and governance of such assets, e.g., through public campaigns or in the context of public procurement. The Danish and British authorities, and private firms in Denmark, Finland, Sweden, and the United States belong in that category. Broadly speaking, the interest in collecting and diffusing more sophisticated information on firm-specific assets, and their social ramifications, are on the increase. [51]

Scientific and technological breakthroughs that emerged from public funded research contributed strongly to the strong US performance in the 1990s as regards high-tech industry, ICT and overall productivity growth. Not only the federal support programmes were important, but so were the support for physical infrastructure, and the fabric developed for public-private partnerships strongly embedded in cluster processes. The advances in ICT, with computer time-sharing, the internet, artificial intelligence and virtual reality, in turn changed the dynamics of networking and clustering itself. With the advance of the internet and electronic commerce, new investments in physical and electronic infrastructure are made by public and private actors alike, based on the understanding that the further evolution of such processes will be greatly important for future competitiveness.[52]

[51] One area concern the attempts by policymakers highlight good and bad effects by firms on the environment and on social values. Some of this work has been undertaken multilaterally, e.g., through the UN-led Global Compact and Global Reporting Initiative (GRI), and the OECD guidelines for Multinational Enterprises.
[52] Apart from expanded electronic highways and broadband capacity, strategies for promoting digital transactions and the commercial use of ICT include measures to support digital security such as electronic certificates, while avoiding technical lock-in and allowing for interoperability of systems and open access (IKED, 2004).

Among other framework conditions, social capital is generally not meaningfully promoted in a top-down fashion. Governments are traditionally viewed as "third-parties", or bystanders (Paldam and Tinggard Svendsen, 2000). Governments as well as other public authorities nevertheless do pursue a range of actions in this area, although generally not with a view to impacts on clusters. The key relevant task, i.e., to facilitate the establishment of bottom-up, self-enforcing processes of confidence-building, is more or less well served. So far, governments still frequently back incumbent institutions and firms, fortifying privileges to established actors, including public service providers, unions or specific work categories.

The approach to cluster policies keeps evolving, however. Current cluster and networking programmes are able to draw lessons from earlier experience. Gilsing (2001) speaks of a first and a second-generation of approaches, where the latter has become better at handling demand conditions and framework policies, plug into societal processes so as to "manage expectations", and practice evaluations.

On the other hand, weaknesses remain. Too little attention is paid to non-technical innovations, e.g. innovations in services, and international linkages are often not sufficiently appreciated as most programmes still tend to be overly domestic. There is still insufficient co-ordination across different relevant policy domains and learning from past experience is mostly piecemeal. Thus, whereas a broad menu of cluster policies has been pursued over the last decade, the available empirical evidence suggests that comprehensive strategies are still far and few in between.

It should be noted that successful policy intervention often addresses several of the fundamental failures, which provide the rationale for action - including various kinds of market, policy and systemic failure. Unsuccessful policies often seem to address only a few of them. This suggests that cluster policies should not be too narrow in their scope of intervention. Given the complexity of cluster processes, piecemeal approaches addressing components one-by-one are unlikely to produce much of a result - a systemic approach is warranted.[53] Governments have a responsibility to put in place a comprehensive form of governance, based on a clear view of objectives and an ambition to tailor the pros and cons of different instruments in regard to the task at hand.

The somewhat fashionable stance of "doing nothing" may be perfectly viable when it means not providing public support to a particular local consortium or private service provider. True, most cluster initiatives are apparently dependent on public funding, but this in itself serves as a guide to when policymakers should provide support or how much – the guiding principle must be firmly rooted in a stringent application of sound rationale for interference, as discussed above. On the other hand, given the complex interplay between public and private actors in clustering, the understanding and attitudes of policymakers towards clusters and private cluster initiatives irrevocably matter, including for the willingness of "clusterpreneurs" to engage in the first place.

[53] See Learning workshop 1, "Redefining cluster policy in Emilia-Romagna".

3.6 International policy cooperation

In parallel with increasing application across a number of countries, the cluster concept has been examined and advanced in multilateral policy cooperation, under the aegis of several agencies. In the OECD, the Committee for Scientific and Technological Policy (CSTP) and its Working Party for Technology and Innovation Policy (TIP) embraced it from the early 1990s. Gradually, it was complemented by other approaches and increasing importance was attached to knowledge-enhancing interactions and innovative capacity.

In the late 1990s, there was a bridging between these innovation and knowledge economy perspectives and the more traditional economic analysis undertaken notably by the economics department. [54] Among other parts of the organisation, the Territorial Development Service (TDS) championed considerations to local conditions and undertook a number of cluster studies.[55] In the first OECD Conference at Ministerial level addressing SME-issues which took place in Bologna, "Enhancing the Competitiveness of SMEs in the Global Economy: Strategies and Policies", clustering processes represented one of four main themes recommended by governments to improve conditions for SMEs (OECD, 2001*f*).

The OECD shifted from a traditional top-down approach to the subject towards focus on multi-stakeholder engagement. In parallel, the World Bank and UN institutions such as UNIDO and UNCTAD embraced the notion of cluster strategies as operational for developing countries. This was accompanied by the promotion of a change in mind-set with regard to private sector development. There is both a search for opportunities to catalyse actual cluster initiatives in developing countries and efforts to inspire developing country authorities to adopt a more congenial approach. [56]

At the same time, multilateral as well as bilateral donor organisations pursue broad-ranging agendas with great attention paid to issues, which tend to be viewed as much more urgent than the long-term evolution of clusters. Endorsing private initiatives and bottom-up development efforts does not comply easily with the priorities of many programmes. In addition, developing countries are confronted with gaps in institutions, regulations and markets which give rise to considerable challenges for cluster processes, the overcoming of which is likely to require special efforts.

It soon became obvious that international donors as well as public authorities in developing countries would have to go through a considerable transformation in order to address the task effectively. Ellerman (2001) underscored the difficulties faced by multilateral institutions, including the World Bank, to transform traditional "church-like" approaches to assistance by methods promoting self-learning on the part of local communities.

[54] The Directorate for Science, Technology and Industry (STI) agenda led onto assessments of innovation and technology diffusion policy in the technology part of the OECD Jobs Study (1998), the National Innovation Systems project (OECD 2001*b*), and the OECD Growth Study (2001*a*). The last of these was closely co-ordinated with macroeconomic and structural analysis through joint work with the Economics Department and the Directorate for Education, Employment, Labour and Social Affairs (DEELSA).
[55] The part of TDS specialised in cluster issues has been the so-called "LEED-programme" which since 2002 has been reorganised along with other parts of the OECD directorate but continues work in the area.
[56] UNIDO's private sector development branch, for instance, has applied a cluster and network approach to support SMEs since 1993, see http://www.unido.org/doc/4297.

Nevertheless, virtually the entire range of multilateral institutions, including the OECD, the World Bank, and UN-institutions such as UNIDO, UNDP and UNCTAD, have opted to push the concept of clusters with a strong connection to the virtues of innovation.

In short, international policy cooperation has evolved from an autocratic approach towards embracing a participatory one. Problems of how to implement it and who can champion it most effectively remain, however. Many of the barriers to cluster processes, private sector development and bottom-up initiatives are found outside the relatively narrow realms of policy responsibilities represented by those directly in charge of relevant ministries and authorities. A participatory approach necessitates comprehensive, cross-cutting organisation of the policy task that can combine the efforts of several ministries and policy domains in forming an agenda that is consistent and credible.

BOX 3: Examples of multilateral work related to networking and cluster policy

- OECD best practice assessment of innovation and technology diffusion policy (OECD, 1998), national innovation systems approach (OECD, 2002*c*).
- UN cluster development approaches: UNIDO (Humphrey and Schmitz, 1995; Nadvi 1995; Ceglie and Dini 1999; Ceglie 2003); UNCTAD (UNCTAD, 1994 and 1998); and UNU (Mytelka and Farinelli, 2000) applied in reviews of individual countries.
- World Bank Knowledge Assessment Methodology (World Bank Institute, 2000), the knowledge-based economy paradigm, the World Bank and the OECD (Dahlman and Andersson, 2001).
- Knowledge Economy Development Gateway, diffusion strategy (World Bank, 2003).
- K4D, Knowledge for Development Community (World Bank, 2003).
- Global Knowledge Partnership, established as NGO based in Malaysia, from 1999.
- International Network for Small and Medium-sized Enterprises (INSME), based in Italy, from 2000.

3.7 Related concepts

Originally, the cluster concept was a tool for analysing industrial fabric rather than directing policy, and many still view cluster policies not as a new policy approach but as a combination of instruments from traditional policy fields (Nauwelaers, 2003). What matters most, however, is not the "cluster policy" label itself but that it de facto provides guidance to policymakers in ways that help bringing about the 'cluster benefits' discussed in the previous chapter. For this to be possible, cluster policies need to have their special characteristics.

A series of related concepts have arisen in recent years, providing alternative approaches for how to structure and examine the issues related to industrial renewal and innovation. In particular, the notion of innovation systems (Freeman, 1987 and 2002; Lundvall, 1992, 1998*a* and 1998*b*; Edquist, 1997) has gained ground and is now commonly applied. Dahmén's (1988) theory of development blocks emphasises the favourable interplay between complementary interrelated actors, including large and small firms. Stressing the forces of

experimentation and learning in exchanges between various actors, including private and public, Eliasson (1998) speaks about "Competence Blocs". Triple Helix is another term popularly applied to capture the interrelated roles of the public sector, private enterprise and universities (Etzkowitz and Leydesdorff, 1997). Whereas some use these concepts in an overlapping manner, there are also distinct differences.

The notion of innovation system puts an explicit emphasis on innovation as the summoning force driving competitiveness and performance. It has inspired a literature that has dwelled into mapping and examining the way different actors and institutions impact on conditions for innovation. At the same time, most of the studies professing the concept of innovation systems have so far failed to derive concrete or operational recommendations. For one, there is no easily defined "national system", but also equally important global, regional and local aspects. In addition, it is far from straightforward how to translate insights regarding the nature of cross-linkages into lessons for reform.

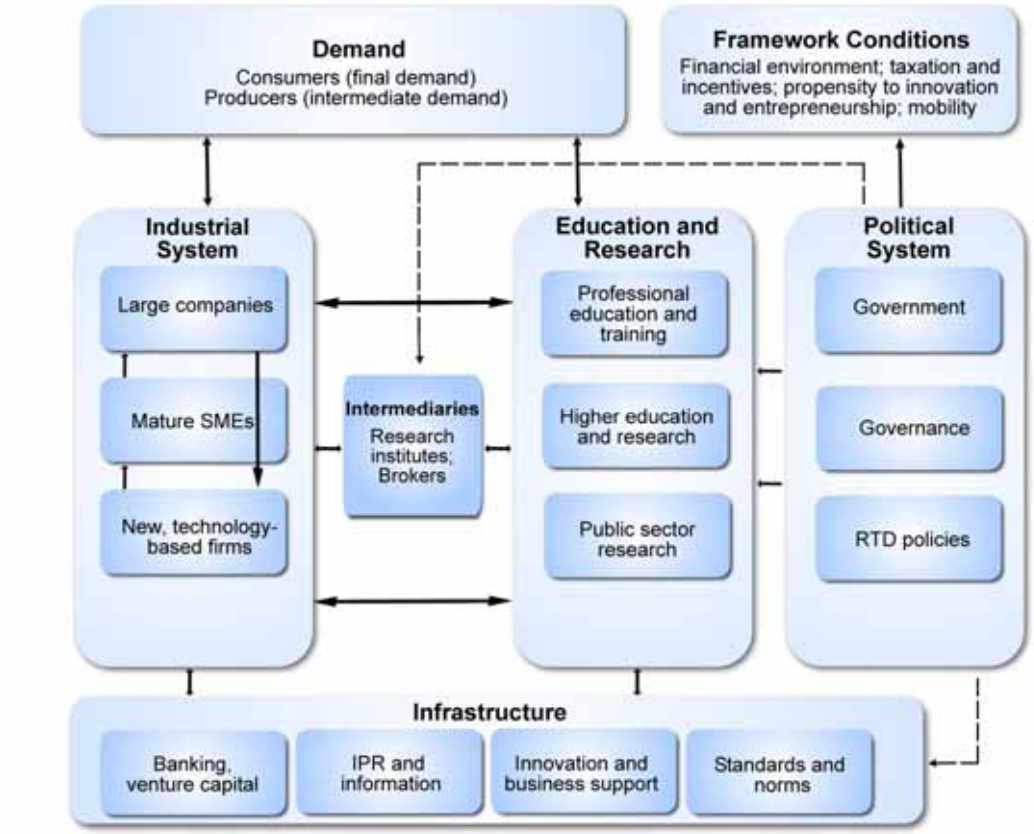
In part, the innovation systems approach aims to broaden the scope of the policymaker to encompass the factors and reforms that may be most important for freeing up the potential for innovation. It has contributed to an understanding of innovation as a process by paying attention to linkages between different types of institutional arrangements, organisational forms and configurations of relationships among individuals as well as organisations. Some of these are related to diverse forms of knowledge, finance, and other inputs for innovating firms (Cooke, 1992, Nauwelaers and Reid, 1995). Even though it has features in common with the cluster approach, applying especially to the Regional Innovation System (RIS) approach[57], the different approaches have their respective pros and cons and they should be treated separately.

In one sense, the cluster concept is narrower in its definition than that of innovation systems, since it is functionally delimited. While a cluster consists of co-located, interconnected actors *in a particular field,* an innovation system serves as a framework for the creation of capabilities for firms *in a variety of sectors and activities.* Furthermore, the cluster concept is generally viewed as having a more demanding definition (a high density of functionally related firms, etc., cf. Chapter 2) while the notion of an innovation system is so loose that it may be interpreted as appearing almost everywhere. Figure 10 provides one illustration of what is commonly considered to be part of an innovation system, and some of the ways in which these components are taken to be inter-related.

Clusters and innovation systems may clearly co-exist. While an innovation system may contain several clusters, however, it need not itself be a necessary ingredient in a cluster. Clusters often play an important role in innovation systems, serving as the basis for their perhaps most effective and intensive interactive processes. The most important difference, however, is probably that the concepts place the attention differently. That of clusters focuses on the way that micro interactions occurring day-by-day shape competitive relations, taking account of markets, suppliers, partners, etc. That of innovation systems, on the other hand, focuses on the mechanisms for generating innovations, including both the overriding macro framework and incentives structures between institutions that are highly specific for innovation.

[57] For further reading see Miniforum 6, "Clusters and regional innovation systems".

Figure 10: The innovation system



Source: Kuhlman and Arnold (2001)

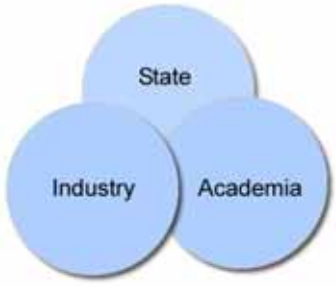
From this follows that the cluster approach has a natural tendency to be industry- and demand-oriented, whereas the innovation systems approach is concerned with a spectrum of intrinsic issues which complicate the driving forces underlying innovation. Proponents of clusters thus tend to be more prone to emphasise spontaneous interactions and concrete efforts by firms whereas proponents of innovation systems are likely to place relatively greater weight on the role of public institutions and framework conditions. Such differences may or may not show up or have practical implications in the specific case. Which group of practioneers and analysts have chosen to embrace one concept or the other within a particular community matters, though. Depending on the definitions chosen and lessons learned, and reflecting circumstances and the distribution of interests between specific groups, proponents of each perspective may or may not be in conflict. In reality, both perspectives add value to addressing the issues that arise with the advent of the knowledge-based society. They are potentially complementary in forging a better, more consistent policy framework for stronger competitiveness and economic performance.

The "Triple Helix" [58] model illustrated in Figure 11, provides another concept which is partly overlapping and partly complementary with those of clusters and innovation systems. Its

[58] See further Miniforum 11, "Collaborative governance – the Triple Helix".

focus is to distil in which way industry, universities and public actors serve as interrelated nodes in processes sustaining new firm creation and the establishment of critical mass. The Triple Helix is a spiral model that is non-linear, non-static and that focuses on the interplay between, within and overlapping the actors to explain innovation. It is a model similar to the iron triangles, but where the university replaces the military. The Triple Helix sees organisational overlapping and increasingly flexible roles for the actors. The university is a firm founder through incubator facilities; industry is an educator through company universities, and government is a venture capitalist (Etzkowitz and Leydesdorff, 1997). Similarly to the process in the private sector, some new firms spring from public sector privatisations or down-sizing in the form of public officials who discern opportunities through their specific knowledge of changing supply and demand relations.

Figure 11: The Triple Helix



Source: Etzkowitz (2002)

3.8 Policy implementation

In principle, clustering is the task of business sector representatives striving to achieve competitiveness, whereas the role of policy-makers is subordinated. Although some would still think of the role of governments as superior, and as showing the way, governments should act as a midwife, not as a parent, in regard to clusters.

The existance of imperfections is not sufficient for motivating policy action in a specific case. For polices to pay, interventions must be anticipated to actually work. Whereas satisfactory information often is available on what should be done, it may be less clear how measures can actually be implemented, which includes overcoming political resistance in the first place, and to make policy adequately resistant to unexpected flims and counter-productive deviations. Piecemeal measures will have only a modest effect on their own unless they are consistent with and complemented by broader reforms. A policy that looks good on paper can in fact be detrimental if market actors anticipate it soon to be overturned.

For policy to be consistent and credible, broad support within (and outside) governments for long-term objectives is important, as well as the presence of mechanisms to underpin long-term commitment to these objectives. This will require co-ordination of decision-making across different policy spheres crossing traditional delineations of administrative competences. Policy packages, when spanning a number of areas, can strengthen political backing, partly by increasing the number of winners and weakening the position of groups

which have to pay for the reforms by giving up their previous privileges. At the same time, decentralisation can help bring policies closer to its constituents. Finally, private-public partnerships as well as broader information campaigns can anchor policies more broadly in society and also help underpin policy design which is more responsive to real needs. Many governments are now seeking means to make policies easier to implement and maintain.

Appropriate incentive systems are needed to engineer policy co-ordination. Financial pressures can be used creatively to spur change in governance, and to adopt assessment mechanisms designed to induce innovative behaviour. Checks must be put in place against government failure, such as institutions furthering their own special interests, and adopting a partial rather than an economy-wide perspective. The benefits of awareness and transparency may be magnified by "audits" and international benchmarking of how policy organisation and formulation relate to economic behaviour and performance, inducing a critical process of self-examination in governments.

The chances that individual policies will be able to improve conditions for innovation can increase if they form part of broader packages (OECD, 1998). In order to ease transition problems, measures should be developed in consultation with the social partners. Meanwhile, policies that promote broad-based upskilling and lifelong learning may support the mobility and employability of workers and mitigate the costs of job displacement. Social security programmes and transfers protecting social cohesion may form crucial support for sentiments that are favourable towards risk-taking, innovation and creativity. At the same time, policies must not undermine incentives for work, upskilling, and organisational change.

If major changes are to be feasible, in most societies concepts such as innovation systems, clusters, and the advent of the knowledge-based economy must be more widely understood as different facets of the same fundamental societal transformation, and how that motivates adjustments to the mechanisms and principles for existing governance structures. One strategy is then to begin with those measures which appear the most feasible, universally supported and whose benevolent effects are likely to be the most evident. Once these measures have been in existence for some time and their effects have been evaluated, necessary corrections can be implemented and more difficult decisions be pushed through. Policy frameworks in Finland, Iceland, Japan and the Netherlands have been able to evolve along these lines. Even when "big bang" policies have been introduced, reforms generally evolved gradually over a period of decades (e.g. New Zealand).

On the other hand, the ability to advance may hinge on the political will to execute certain difficult decisions. Experience shows that major progress will be greatly facilitated in the presence of sanctioning by the highest level of authority. In the knowledge-based economy, where the challenge partly is about providing room for initiative and creativity from bottom-up (Kelly, 1998), the need for the top to embrace that principle is particularly important in autocratic societies. In some countries, a crisis situation has helped muster support for reform (*e.g.* Finland, Japan). It is important that policymakers exploit such opportunities as they arise, thereby preventing conditions from deteriorating to a degree which makes it very difficult to repair the damage.

4. FROM THEORY TO PRACTICE

Main messages, Chapter 4

The task of policymakers with regard to clusters is not simple. In the development of cluster policies, the allocation across governmental departments of tasks and responsibilities that fundamentally pertain to different fields of public policy, and the sharing of responsibilities with other actors, is often complex to organise, due to overlaps and potential conflicts with other policies. The way each actor relates to the roles played by other actors should thus be designed with a view to their varying competencies and practical abilities to influence the outcomes of clusters and cluster policies.

The clustering process can be described through stylised models: the engineered, the organic and the re-engineered clustering processes. Although all tend to go through the same stages of development, each displays varying features, and has a different entry point. The combinations of competencies that are required at each phase of the clustering process to ensure a successful outcome, however, vary. There is, therefore, a need for policymakers to take into account the specific characteristics of clusters and tailor competencies and learning processes to the specific needs of these clusters at the given development stage.

There is also a need to understand how each given situation may differ from "normal" cluster processes. That is, clustering is not about performing one given set of tasks, through a model process. Nor is it about implementing a given set of policies that would carry the label of 'best practice'. Nor does it even involve a pre-determined group of actors to complete all tasks. Rather, a set of competencies should be sought at each stage of the clustering process.

This chapter presents a partial mapping of competencies beneficial to clustering processes, and outlines a matching of actors involved in a cluster. The four main groups of actors considered are firms, government/policymakers, academia and financial actors. The mapping of these actors involves general characteristics, competencies, strengths and weaknesses that tend to characterise each group and thereby helps define each group's possible role in the clustering process.

Within this framework, a key role for policymakers is to foster governance that provides for a favourable division of responsibilities between different authorities and other actors. Competencies in governance and communication should be promoted in ways that help reconcile conflicting interests, and counter the risk that policy is captured by vested interests. To the extent possible, processes should be organised and communicated at early stages, without unduly pre-assigning responsibilities for certain tasks based on actor groups, but in ways that promote gradual learning and improvement on all sides.

Adaptation is needed depending on specific circumstances which affect the nature of clustering processes. Many developing countries and transition economies, for instance, need to foster strategies with a view to a legacy of resource constraints, opaque regulatory conditions and unfavourable attitudes to entrepreneurship, placing special demands on trust-building mechanisms. Evaluation should be viewed as a process where the government has special responsibility, but where the engagement by other stakeholders may be crucial for motivating improved outcomes.

4.1 Introduction

The previous chapters have presented the concept of clusters in the wider economic context, reviewed the key characteristics of clusters, the potential benefits and risks attached to cluster processes, introduced the rationale for policy responses and given examples of possible policy measures to promote clustering. We now switch from general discussion to more practical issues of what should be attempted, first and foremost by policymakers, but also by the other actor groups, with regard to cluster processes. This section also includes some consideration of what distinguishes certain concrete cases in the real world from the generalised conceptual model, notably in terms of alternative objectives and actions. We conclude the chapter with some observations on the role of evaluation and how it could be implemented in regard to cluster policies.

The vast realm of knowledge and practical experience on clusters is, in fact, quite dissipated. The same applies to the practical literature on clustering.[59] One of the first examples of a *handbook* character, containing a rich set of examples and recommendations organised in terms of best practices, is the "Practical Guide to Cluster Development" by Ecotec (2003). Of interest is also the literature on regional development.[60]

In most of the literature, however, there is a fairly developed and consistent view on the process that cluster formation entails, its relevance for the main kinds of clusters known to exist, and which actions are typically involved. This chapter will synthesise some elements of consensus, but will also attempt to go beyond that. Following the previous chapter on the balance between opportunities and risks in cluster development, we move a step further by exploring what objectives may be held by different actors and what approaches are most appropriate under varying circumstances. In this context, we will present the notion of different competencies which may be mobilised to influence outcomes through the various phases of cluster processes. The varying competencies will also be used as a guide to explain the differences between the "special cases" confronting us in real world situations, and the generalised case of the "normal" cluster process.

4.2 Clustering

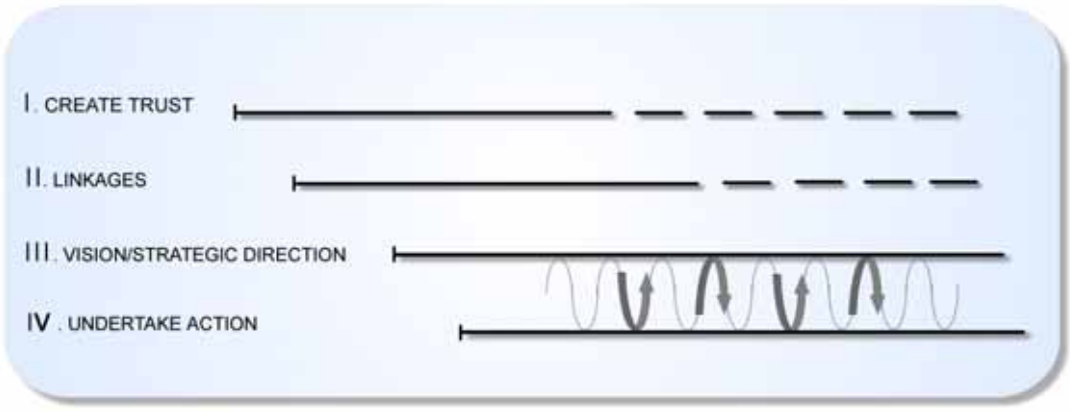
Many clusters evolve spontaneously and take shape gradually over extended periods of time, with more conscious actions – cluster initiatives – developing at a particular stage when parts of the foundations are already in place. The first two phases depicted in Figure 12 (creating trust and building linkages) are likely to evolve without a conscious cluster initiative or policy act setting it off. Regional and cultural variations are likely, however. In Japan, for instance, collective efforts may be the natural result of high trust in closed communities marked by,

[59] For insights into work of cluster consultants and practitioners, see the learning workshops at the end of Part II, or www.sri.com, www.competitiveness.com, www.ecgroup.com, www.monitor.com, www.clusternavigators.com.

[60] Although not specifically geared towards it, this literature often pays great attention to cluster development. Examples include the US Department of Commerce's Economic Development Administration's Strategic Planning in the Technology-Driven World: a Guidebook for Innovation-Led Development. Another is Chrislip and Larson's (1994) *Collaborative Leadership: How Citizens and Civic Leaders Can Make a Difference.*

e.g., feudal structures and/or dominated by clans (Fukuyama, 1995). On the other hand, outsiders may have great problems in such situations, which may make clusters closed and difficult to enter. In rural, peripheral areas around the world, there is commonly suspicion against dense networks. There, individuals engaged in entrepreneurial activities at a local level commonly serve as critical agents of change, to the extent that they are able to break the ice and win acceptance for strategies embracing inter-firm relations and clustering (Gomez, 1999). At the same time, explicit cluster initiatives, including those resulting from public policies, have often contributed to processes of trust-building, which is vital for the success of induced cluster processes.

Figure 12: Timeline of the four phases in clustering



Source: Waelbroeck-Rocha (2003)[61]

When does a proper cluster initiative set in? It has been observed that many develop as a response to the notion of crisis. The triggering factor may be an act by the government, responding to crisis by enacting changes in policies targeting a specific region or sector.[62] It may also be that a single individual, who has a sense of urgency as well as a vision of how to address the situation, sprints to action. A group of individuals may likewise take action to seek out a better future for their region. Nauwelaers (2003) observed that some regions (e.g. Basque country, Scotland, Flanders) display strong driving forces behind cluster policy, emanating from a widely shared interest among the population or among influential groups, to create a 'regional identity' and become more autonomous politically. Sometimes, the cluster has evolved over time as a result of economic or technological path-dependency and specialised demand, or particular dominating natural and specialised production factors.

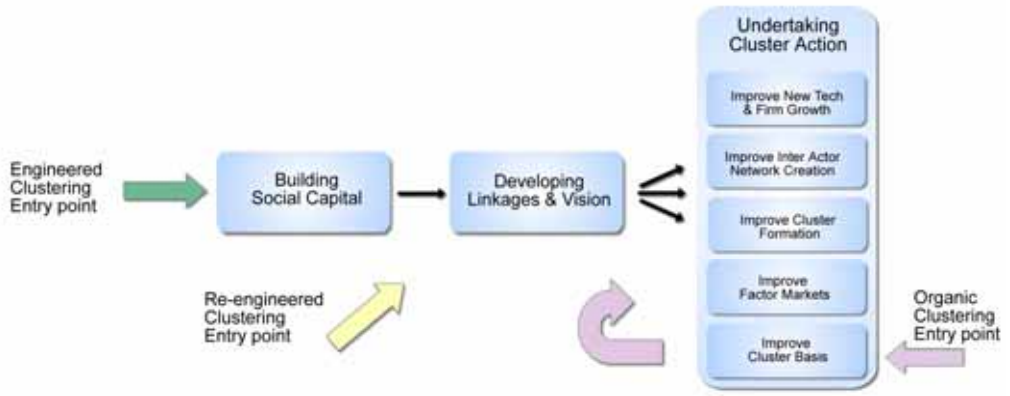
Overall, there is no v*ade mecum* for how clustering processes can be triggered. In the following sections, three alternative clustering processes are described: i) the engineered, ii) the organic, and iii) the re-engineered processes. Each goes through the same general phases,

[61] Elisabeth Waelbroeck-Rocha, BIPE, provided input to the development of this model at an internal IKED Whitebook seminar (2003).
[62] Emiliano Duch, from Preparatory course of the TCI Conference.

as seen in Figure 13, yet with different entry points and other specific characteristics influencing the process.

The *engineered clustering process* is generally a top-down approach for developing clusters. In Europe, policymakers typically lead whereas in North America, private individuals are relatively more important. In transition economies, both these spheres are the source of strong, albeit very different, cluster processes. In developing countries, there have been fewer private sector founded initiatives, but several governments and multilateral organisations back clusters in selected areas. International donor organisations likewise try to strengthen leading clusters. The initial catalyst of an engineered cluster process could be a given investment opportunity, a dynamic leader, or a regional/national economic crisis. The general approach then follows: form or develop of existing social capital to anchor the cluster idea, maintain or establish new mechanisms for building trust, formulate a vision and strategy, and then undertake action.

Figure 13: Clustering processes and entry points



Source: Elisabeth Waelbroeck-Rocha and IKED[63]

Alternatively, the *organic process of clustering* is a bottom-up approach. Multiple actors in inter-firm collaboration, the tightening of regional networks or the introduction of supportive framework conditions are among the factors which may trigger the organic formation of clusters. These clusters initially display spontaneous developments towards the establishment of linkages and joint strategies.[64] From this platform of continuous or recurring instances of cooperation, the notion of a cluster initiative or a more structured cluster development process evolves, as the intensification of links between players within the cluster creates a sense of identity. Informal linkages formalise, and more structured/pro-active cluster actions result.

[63] Background information for this model was provided by Elisabeth Waelbroeck-Rocha, BIPE, at an internal IKED Whitebook seminar (2003).

[64] Examples are provided by the Belgian technological clusters in Wallonia and VIS in Flanders, see Nauwelaers (2003).

A third process is that of *re-engineered clustering* which is, in effect, a hybrid of the previous two. An existing cluster (engineered or organically-developed) is viewed as having specific competitive significance or potential, but is hindered from progress for some critical reason. Key linkages are broken, or imbalanced, or there are other crucial delimiting factors within the cluster itself or its surroundings that are blocking its dynamism. For such reasons, the beneficial forces of clustering no longer apply, or apply insufficiently. In this case, the process is started (or re-iterated) through corrective action of some sort, e.g., acts of re-establishing key linkages, dismantling or breaking of adverse rigidities, or through the communication of a new vision and strategy for the development of the cluster. International organisations in several cases played a role in *re-engineering* clusters in developing countries, where historically-vivid traditional clusters are today subjected to forceful pressures for change due to local resource constraints coupled with intensifying competition.

Irrespective of the entry point, the general phases of the clustering process are generally the same. In a stylised sense, they amount to: i) building social capital and creating trust; ii) developing strategic linkages; iii) defining a strategy and vision; and iv) undertaking cluster action. The degree to which these are formalised varies in practice, and the way they are handled will also be influenced by the specific actor in charge.

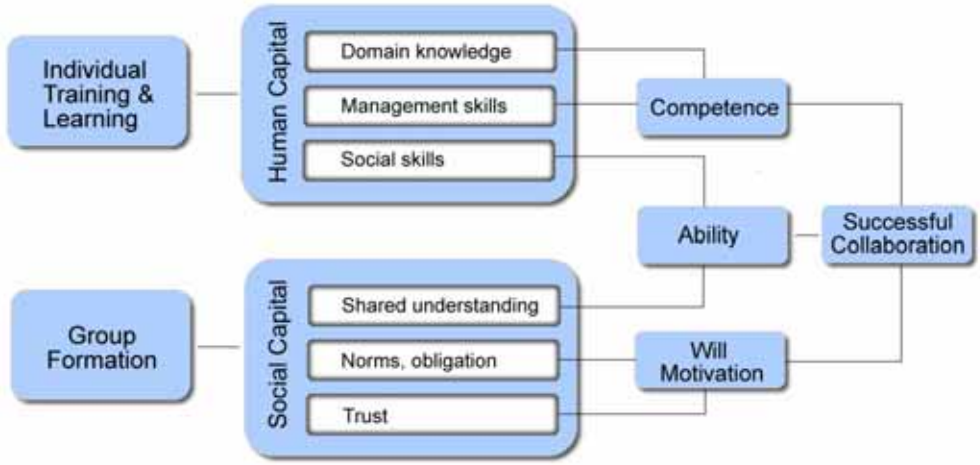
4.2.1 Building social capital and creating trust

In a general sense, the first step is to *prepare the ground* for the cluster initiative. The communication process is begun by establishing awareness of potential mutual benefits from clustering among the key relevant actors. Again, there is no sharp demarcation line vis-à-vis spontaneous processes of cluster formation where beneficial externalities occur without conscious cluster initiatives. Open communication/transparency between the key actors is a building block both for such natural processes and for a cluster initiative, as it is essential for *building trust*. In many cases, however, success requires overcoming hurdles. This is especially the case where there are strong traditions of reliance on individualistic and independent business strategies, as in many rural areas (Duncan, 1999). A conscious strategy is typically needed if such legacies are to be overcome. Cluster initiatives may particularly be required to nurture trust by broadening the scope of information-sharing and the establishment of advanced knowledge networks. This can be a demanding task since technological management represents a subtle balancing act between which information to share and which not to share with counterparts who are both partners and competitors.

In successful clusters, this task of nurturing trust typically succeeds in broadening the number of committed actors and keeping the cluster open, outward-oriented, and prone to incorporate more than just a limited group of actors. This way, the contribution of the group becomes much bigger than that of the individual firm, with each participant coming out as a winner on balance. One aspect of this is that the cluster reaches critical mass in knowledge creation and uses it more effectively, while managing to avoid self-sufficiency. However, when *trust* has been achieved, it must still be *sustained*. One method of sustaining trust is to avoid capitalising on joint ideas and efforts if they are to the detriment or expense of other actors in the group. In order for trust to be sustained, the cluster must achieve a balance of competition and cooperation.

As described in Figure 14, the interaction between social capital and human capital is vital, with the two compelled to serve as complementary factors. It is through the process of group formation that individual competencies are put to use as well as made to grow.

Figure 14: Social capital as a necessary complement to human capital for successful virtual organisation collaboration



Source; Riemer and Klein, (2003)

However, difficulties in initiating the cluster initiative process should not be underestimated, as the risks and costs that firms confront if they are to participate in a cluster initiative may often be perceived as impossible to surmount (Boekholt and Thuriaux, 1999). Cluster facilitators should be aware of problems perceived by firms which hold them back from becoming directly involved in cooperative projects, and from active participation in initiatives directed towards bringing together firms for collaboration on strategic aspects of their business operations. It is often forgotten that a request for firms to collaborate is also placing certain demands on firms. Cluster facilitators should remember that running a firm-to-firm network is a complicated and time-consuming task.

On this basis, it may be that many firms, and particularly SMEs: 1) hesitate to spend time and effort on a network with vaguely defined objectives; 2) fear losing strategic assets and information to other network members, especially large firms; and 3) are more likely to start with less strategic alliances before entering into complicated R&D collaborative efforts. As discussed in Chapter 2, the conditions underpinning innovative clusters tend to allow for – and encourage - entry by newcomers, leading to a potential re-distribution of gains, for example when radical restructuring and technological renewal is prompted.

4.2.2 Developing strategic linkages

The next phase of the process involves defining and developing strategic linkages. The initial step can be thought of as *formalising linkages*. It is typically at this point that the *Cluster Initiative* is formalized, which may occur through the establishment of an IFC. The actors may obtain structured routines for interactions, and form their cluster vision and strategy. In many cluster initiatives, the development of cluster linkages occurs through the process of a *competence audit* – mapping the competitive advantages of the region, identifying the competencies of the participating companies/organisations, and determining the gaps that exist.

This competence audit may later be visualised by a *competence system*[65] matrix, which aims to provide an enhanced overview of core competencies to improve competitiveness through a bidding process for local companies, or to stimulate the creation of local relationships among firms, universities, research institutes, and related industries with the intention of stimulating economic growth. A competence system can serve as a means to overcome networking problems among firms and guide potential partners to more quickly identify cooperation possibilities for R&D, sales, procurement offers, etc. It can also serve to connect the IFC with firms within the cluster. Finally, it can be used by individual firms as a sales argument that allows them to display their enhanced network potential to customers.

The degree of formalisation of the competence system can vary. In organic clusters, informal links between actors in the cluster often make the development of formal competence systems unnecessary. In new clusters, the explicit mapping of competences can be a required element to establish the value of clustering.

4.2.3 Defining a strategy and vision

Through structured processes, cluster initiatives can *develop a shared vision, goals, and strategy*.[66] A regional analysis can help structure the "starting point" for the re-engineered cluster, helping an already-established cluster initiative to transform or innovate. During this third phase, the importance of quantitative measures comes into play. Some possible methods, including qualitative approaches, are presented in Box 4. It is useful if goals and the baseline for possible future evaluation are put in place at this stage. An IFC, for instance, will have more of a sense of direction if the appropriate coverage and scope for the evaluation process, as well as clarity regarding which kind of metrics are to be used has been defined. Further, for a cluster initiative to be viable, it must become self-sustainable.

After key competencies have been identified, strategic analysis forms the next natural stage. A number of methods can be applied both to estimate the current situation and to project possible future developments. Available methodologies include interviews with knowledgeable experts, Delphi surveys, critical lists and expert panels, workshops, brainstorming, mind mapping, trend extrapolation, simulation modelling, cross-impact analysis, system dynamics, roadmapping, relevance trees, morphological analysis, on-line methods, scenario workshops, SWOT analyses etc. (Economic Development

[65] See Miniforum 15, "Clustering competencies".
[66] Read more in Learning Workshop 4, "From public to private initiative in the automotive cluster in Styria".

Administration, 2001; FOREN, 2001; Toivonen, 2002). A method that has become increasingly popular is Foresight exercises, which tend to involve networks of knowledgeable agents and key stakeholders. Organising a foresight exercise in a participatory manner may be useful for gathering knowledge from, and reflecting on the insights and special interests of the cluster borne by the people who will be critically engaged in its interactions. Bringing together decision makers in a process that develops anticipatory intelligence, when applied to a concrete case of cluster development, can provide information for strategic decisions, as well as facilitate commitment and engagement among the actors involved. It can also contribute to building a milieu that is more robust to changing circumstances (Miles, 2003; Berkhout and Hertin, 2002) – and even allows for anticipating and preparing for changes in circumstances.

BOX 4: Cluster identification

The simplest form of a competence audit is a ranking of the most successful companies (as measured by revenue or net profit) in a region. Nesta et al. (2003) enumerate several approaches for identifying clusters, which can also be used for competence audits. Three quantitative approaches and one qualitative method are described here.

The first applies to gathering detailed firm level information on industry, location and economic data (e.g., employment and revenue) to identify where certain industries are concentrated along with their core competencies. One problem with this approach is that the activities in clusters are not necessarily well-reflected in industry statistics.

The second uses input-output data to identify relationships between relevant industrial sectors. One of the problems with this approach is that, almost invariably, it does not have a regional focus. One of the main advantages is that it lends itself to graphical representation, facilitating intuitive understanding of the links between industries.

The third quantitative approach is to use detailed firm-level information from surveys.

The qualitative approach for cluster identification relies more on the knowledge of experts than on statistics. Three criteria are essential: i) the structure of clusters (firms and interactions amongst firms); ii) the competences held (in terms of scientific and technological content); and iii) performance rates (income level and other performance measures).

After defining the cluster initiative's vision and strategies, the next step is that of implementation. As clusters should continuously redefine their visions and strategies in order to stay innovative, the goals and action plans will also require adjustment, responding to changing circumstances and market feedback. In this way, the third and fourth phases of the clustering process should be viewed as iterative and inter-related rather than consisting of sequential, discrete steps. Redefinition of the strategy is essential in a stagnation phase when a cluster initiative appears to fall apart. The actors may agree to stay linked but redirect the focus of their joint actions to other market segments, or the cluster may naturally fall into

smaller units, or decompose – if the benefits of collaboration have ceased to exist. A cluster initiative is, indeed, not an end in itself.

4.2.4 Undertaking action

The three phases discussed above serve to prepare the implementation of a cluster action plan by creating a common platform and setting out a strategic direction. To carry out the different objectives formulated in the strategic phase, a number of cluster actions will be required. The cluster actions structured below typically serve several purposes and may be undertaken throughout the life cycle of a cluster. They are applied in order to strengthen the cluster initiative itself, as well as to improve the competitive environment surrounding it.

Table 2: Possible cluster actions

Improve Cluster Dynamics			Improve Cluster Environment	
New Technology & Firm Growth	Inter-Actor Network Creation	Cluster Formation	Factor Markets	Cluster Basis
New Technology. - Organise seminars, meetings, workshops to facilitate the diffusion of technology within the cluster - Establish centres to develop and test new production technologies and processses - Create an observatory of technical trends - Establish hubs for technology transfer *Firm Growth* - Support cluster-based incubators - Encourage entrepreneur networks - Provide business assistance - Launch marketing and image campaigns to attract new firms - Improve FDI incentives - Improve financing conditions for spin-offs through regulatory changes or the set-up of special financeing mechanisms or investment funds	*Networking* - Form cross-agency cluster teams - Foster firm networks - Foster the sharing of personal networks - Facilitate external connections *Commercial Cooperation* - Form export networks - Compile market intelligence - Coordinate purchasing - Establish technical standards *Joint R&D Projects*	*Cluster Analysis* - Conduct a competence audit - Undertake a strategic study & analysis - Model and amplify systematic relationships - Conduct benchmarking analysis - Organise and disseminate information in the cluster *Actions for Engagement and Service Delivery* - Create or formalise IFC and communication channels - Improve firms' cluster awareness - Facilitate interaction between different areas of government and cluster actors *Cluster Marketing* - Create brand for region - Actively promote cluster - Target inward investment	*Specialised Labour Supply* - Provide management & technical training - Use clusters as context for learning - Establish cluster skill centres - Support regional skills alliances - Attract talent to region *Specialised Capital Markets* - Prioritise investments in cluster projects - Give incentives or set aside funds for multi-firm projects. - Promote joint financing, the creation of special investment funds, or the provision of credit guarantees - Encouage mutualisation of risk across cluster actors - Improve access to and usage of natural resources	*Legal Framework* - Improve framework conditions - Evaluate competition policy *Infrastructure* - Develop new or existing infrastructure through joint actions and new financing models - Conduct private infrastructure projects *Social Capital* - Foster the expansion of personal networks - Foster inter-firm communications and networks *S&T, R&D Framework* - Mutualise the realisation or financing of research and development projects

Source: IKED

Actors participate in a cluster initiative based on different and sometimes contradictory objectives (e.g., a firm might be motivated by the opportunity to access complementary skills in another firm, a regional policy-maker by the prospect of local growth, and a politician by the expectation of reputation effects and gaining additional votes). Some of these can be related to straightforward economic returns, but social esteem and personal non-pecuniary rewards also matter. Generally, however, and contrasting with some common advertising of the approach, it will not be sufficient that the various actors share a common overarching objective of improving the foundations for economic activity (the cluster environment) and of improving the conditions for cluster/sector development (cluster dynamics). Sharing such overarching objectives is not unimportant, and some specific potentially useful sub-objectives and actions can be derived as is further discussed below. For the strength and dynamism of a cluster to endure, however, each of the participants needs to experience an acceptable risk-return ratio. This is particularly the case in markedly "innovative clusters", where technological and market opportunities may move fast.

Cluster actions can be sorted in different ways according to their objectives or to their form (Sölvell et al., 2003; Rosenfeld, 2002). Here, cluster actions are differentiated in accordance with the focus of their impact, e.g., objectives aimed at improving internal cluster dynamics or objectives aimed at improving the external cluster environment. Specific actions are then grouped under the main sub-objectives, as illustrated in Table 2. Cluster actions are generally defined as those jointly undertaken by groups of actors within the cluster, or by an IFC, for the purpose of directly or indirectly enhancing the competitiveness of the participating actors. Table 2 offers a crude classification of cluster actions in terms of the objective categories mentioned and the possibility of the actors in the cluster to pursue them.

4.3 Actors and competencies

There is neither a standard recipe for success in clustering or cluster initiatives, nor a simple set of best practises that would work in all cases. All situations are unique, and most processes involve trial and error. Further, clusters are not an end in themselves, but represent one tool among many which can be employed in an effort to promote increased competitiveness, innovation, and economic growth. As stated by Antoni Subirá:

> "(Policy-makers) *can influence or support certain characteristics of a cluster, but cannot act on the void* (of clusters). *Other techniques exist and have to be used* (in these cases)."

Since clusters are specific, policy interference may give rise to mixed results. First, no two clusters engaged in a given activity – such as electronics or leather processing – are the same. Each is characterised by its own history, actors, interlinkages, individuals and preferences. Second, information on the dynamics of a cluster, including the anticipated behaviour of the participating actors in response to policy, is often imperfect and incomplete. Third, although the nature of cluster policy is likely to make it less prone – compared to policies supporting individual firms, to problems of moral hazard or adverse selection – costly policy mistakes cannot be ruled out. This is particularly the case as policymakers, as well as other actors

participating in a cluster initiative, have their own interests and objectives. What information is available, as well as the capacity to process it, varies markedly between actors. From a policy perspective, the choice of *agent* in cluster policy is thus a critical variable, along with the other decisions of what measures to take, when and how.

Yet in a general sense, national governments, local authorities, private sector representatives, clusterpreneurs, IFCs, and so on, can all be associated with different set-ups of strengths and weaknesses. *National authorities* generally have a better overview and, compared to *regional authorities*, the coordinating capacity to address factors that affect all clusters in different parts of a country. They are also less susceptible to pressure from influential, individual local businessmen. On the other hand, the latter tend to have a better understanding of which specific local assets have development potential, as well as where the concrete impediments to interaction and cooperation reside.

Private sector representatives have a better understanding of the market and how research and production can be linked to changing commercial opportunities. However, they typically prioritize their own interests, which sometimes conflicts with the overall long-term interest of the cluster, as may be the case if they anticipate that the cluster process will grant them special support and protection from outside competition. An IFC or other service provider, if properly organised, should balance these kind of contrasting strengths or weaknesses.

While it can be useful to differentiate actors according to their likely characteristics, one should be careful not to jump to conclusions when it comes to assigning tasks or responsibilities within a given cluster. A fundamental challenge in cluster policy is to formulate strategies with a view to what competencies are available or can be generated among the relevant players engaged in clustering processes:

> "*Competence, as such, may be seen as the overall concept covering all aspects affecting the ability to perform a given task, and exists both at the individual level and at the collective or organisational level* (Løvendahl, 1997). " [67]

Ideally, the policy objective should be that of acting in order to maximise the prospects for positive results for the region and for the broader society, while minimising the risks of costly mistakes. This entails putting in place an effective division of labour and responsibilities in the governance for cluster policies and initiatives.

Each phase of the clustering process requires different combinations of skills. These skills, or competencies, can be held by several different actors within a cluster. That is, there is not just one set of tasks that should be completed in order to implement clustering, nor merely one group of actors to complete each task, but rather a *set of competencies* should be sought to underpin and provide guidance during the process.

In the following, we will introduce a set of competencies that may be viewed as useful at each step of the clustering process. We will also undertake an initial mapping of the actors involved in a cluster that can potentially match these competencies. This mapping aims to facilitate an understanding of the way in which the specific competencies of actors should

[67] From Mäkinen, H. (2000), p.3.

help determine their roles in the context of cluster policy. In addition, it illustrates the fact that there is no *one* actor or group of actors that should necessarily have the responsibility for taking on a specific set of tasks. Finally, we will discuss the roles of various actors under some specific circumstances.

4.3.1 Mapping competencies required in cluster initiatives

Using the engineered clustering process as a basic guideline, we now focus on what should be done, and by whom, in cluster policies and initiatives. We argue that cluster policy requires customisation. It needs to be based on sound principles but should aim to tailor responsibilities to particular goals and types of clusters and actors. Policies that have appeared optimal, or suitable, in one setting might turn out sorely inappropriate in others. Connecting specific actors to specific stages of the clustering process will lead to confusion, because the competencies of actors vary. Rather, the more meaningful question concerns which competencies are required to support beneficial outcomes at each phase of the clustering process. We refer to eight competency groups as follows:[68]

- Leadership
- Integrity
- Enabling capabilities
- Interpersonal skills
- Knowledge and vision
- Management skills
- Analytical skills
- Resources

In a stylised clustering initiative, the competencies crucially needed at different stages may be characterised as follows. In the first phase (*Building Social Capital*), leadership, enabling capabilities, and interpersonal skills are of highest importance. In the second and third phase (*Developing Strategic Linkages and Defining Strategy and Vision*), knowledge and vision, management skills, and analytical skills are crucial. In the fourth phase (*Undertaking Action*), interpersonal skills, management skills, analytical skills and resources are particularly called for.

The different phases, and the competencies connected to them, are described in more detail in Figure 15. Naturally, this does not represent a universally applicable, exhaustive effort to identify optimal pairs. The purpose is to illustrate what may help guide governance efforts in the planning and implementation of cluster policy. The task will require extensive adaptation in specific real world cases. There is also a case for empirical application and testing.

[68] The analysis has benefited from the input from Elisabeth Waelbroeck-Rocha, and draws upon working seminars at IKED. The work by Hallencreutz, et al. (2002) has further provided useful impetus. Previous reflections in the literature include notably Løvendahl (1997: 81-83), and the Canadian government (1999). See especially the Interdepartmental Committee on Competency-Based Management, Government of Canada, Joint initiative between the Treasury Board of Canada Secretariat and the Public Service Commission, December 1999, "Framework for Competency-Based Management in the Public Service of Canada". http://www.tbs-sct.gc.ca/hr-rh/tld-fap/CBHRM/framework_cbm/fcbm1_e.asp.

Figure 15: Competencies and clustering phases

	Phase 1: Build Social Capital				2. Develop Linkages		3. Define Strategy and Vision				3. Action
	1.Prep. the ground	2. Start bldg trust	3. Achieve/ nurture trust	4. Sustain trust	1.Audit of competencies	2. SWOT	1. Def. cluster, strategic direction	2a.Def. steps to take	2b. Def. eval. Method.	2c. Set up formal cluster org.	Launch and implement cluster actions
Leadership											
Accepted leader											
"Naturally" legitimate											
Knowledge of Local Culture											
Independence and Neutrality											
Independent											
Neutral - not having vested interests											
Enabling Capabilities											
Facilitative Skills											
Ability to generate consensus											
Negotiation capabilities											
Communication capabilities											
Interpersonal Skills											
Devotion or sense of service											
Social											
Inclusive											
Patient											
Respectful of hierarchy											
Knowledge & Vision											
Technical Knowledge											
Business Knowledge											
Market Knowledge											
Visionary											
Management											
Will/bulldozer											
Ability to challenge hierarchy											
Power											
Thick-skinned											
Pro-activeness											
Analytical Skills											
Analysis/reflection											
Flexibility or capacity to re-evaluate											
Resources											
Ability to secure funds											
Time											

Most important competencies required in phase

Source: Elisabeth Waelbrock-Rocha and IKED[69]

[69] Input to this figure was provided by Elisabeth Waelbroeck-Rocha and by contributors to Part II at internal IKED Whitebook seminars in 2003.

The notion of competencies required in different phases shares commonalities with the work on regional development of Henton et al. (1997) on the role of a *civic entrepreneur* as a catalyst who creates and connects collaborative networks between business, government, education and "civic" community. A civic entrepreneur not only runs his or her own projects but is also a person who crosses borders and who can connect the interest of different actors, possibly operating on the border between the public and private spheres. He or she may serve as a critical agent of change in local development processes. These can be divided into four different phases: i) initiation, ii) incubation, iii) implementation, and iv) renewal.

Even though Henton discusses the civic entrepreneur as an individual, this actor can also consist of many different persons, with varying competencies, as required in the various development phases. Henton sees eight distinct roles and competencies required during the process: in the initiation phase, it is the *motivator* and the *networker*; in the incubation phase it is the *teacher* and the *convener*; in the implementation phase it is the *integrator* and the *driver;* and finally in the last phase, it is the *mentor* and the *agitator*. Characterising the process this way draws attention to what is attempted in cluster policy and what it takes to succeed. It may also help clarify under what circumstances success can be anticipated. After all, cluster policy is not an exercise of mathematics, but of psychology and managing human relations.

On this basis, we emphasise a commonly neglected task for policymakers, which should be seen as one of their key objectives with regard to cluster processes. That is, the role to foster competencies in governance and communication in ways that can underpin an effective division of labour while helping to reconcile conflicting interests, and hindering policy from being captured by vested interests. In this way, cluster policy should be pursued with consideration to limitations in governance, transparency and impartiality. What is needed and how the process is to be organised should be communicated at early stages, without pre-assigning responsibilities for certain tasks based on the actor group to which each member of a cluster initiative belongs.

To further examine what can and should be done, we now turn to the actor groups present in cluster initiatives, and the competencies, strengths and weaknesses that typify each group. We discuss four actor groups: *firms*, *government/policy-makers*, *academia*, and the *financial sector*. Additional important kinds of actors, such as IFCs and clusterpreneurs, are also addressed. Firms are divided into large firms and SMEs. Government/policymakers are divided into international, national, and regional/local. Academia includes universities, other institutions for higher education, and research institutes. For convenience, the financial sector is divided into venture capitalists and "other financial institutions" (commercial banks, insurance companies, etc.). Figure 16 provides a stylised illustration of which competencies each actor group may be expected to hold.

Although we present generalisations about the role these different actors are expected to assume in clustering processes, we will be highlighting the limitations and dangers of "locking-in" specific roles to an actor group.

Figure 16: Actors and competencies

	Firms		Government/Policymakers			Academia	Financial Sector	
	Large Firms	SMEs	International	National	Regional	Universities	Venture Capitalists	Other Fin. Insti.
Leadership								
Accepted leader		■		■	■			
"Naturally" legitimate	■							■
Knowledge of Local culture		■			■			■
Independence and Neutrality								
Independent			■	■	■	■	■	
Neutral - not having vested interests			■					
Enabling Capabilities								
Facilitative Skills								
Ability to generate consensus			■	■	■			
Negotiation capabilities	■	■	■	■	■		■	■
Communication capabilities	■	■	■	■	■	■	■	■
Interpersonal Skills								
Devotion or sense of service			■	■	■			
Social		■					■	■
Inclusive			■	■	■		■	■
Patient								
Respectful of hierarchy	■		■					■
Knowledge & Vision								
Technical Knowledge	■	■				■	■	
Business Knowledge	■	■				■	■	■
Market Knowledge	■	■			■	■	■	
Visionary			■	■				
Management								
Will/bulldozer	■		■	■	■		■	■
Ability to challenge hierarchy			■					■
Power	■			■	■	■	■	■
Thick-skinned	■		■					■
Pro-activeness	■		■	■	■			■
Analytical Skills								
Analysis/reflection						■	■	■
Flexibility or capacity to re-evaluate	■	■	■	■	■		■	
Resources								
Ability to secure funds	■		■	■	■	■	■	■
Time	■		■	■	■	■	■	■

■ Competencies generally held by actor

Source: IKED[70]

[70] Input to this figure was provided by Elisabeth Waelbroeck-Rocha and from contributors to Part II at internal IKED Whitebook seminars in 2003.

4.3.2 Firms

Firms are obviously central to cluster actions and policies. They are characterised by direct involvement in technical, business and market processes, and possess outstanding practical capabilities. Firms are not independent or neutral but need to be viewed as pursuing their own interests, whether in the form of profit-maximisation or other objectives.

Traditional cluster literature professes the importance of collective understanding among actors of the benefits of inter-firm cooperation, e.g., for factor resource management and the potential to improve value chain integration methods. Firms should recognise the value of location based on competitive advantage, and of participation in a cluster initiative as a competitive asset and an advanced tool to improve sales and profit growth (rather than as a socially beneficial public service contribution undertaken for PR purposes). Given the right conditions, the individual firm assumes an active role in improving the competitive environment, through communication of needs and desires to the local research and education system. The firm will actively participate in cluster activities to identify issues of common concern and opportunities for mutual gain (Porter, 2001).

At the same time, firms may have perfectly valid reasons to shun cooperation, such as legitimate fears that their ideas or resources will diminish relative to competitors if they disclose their assets in collaborative ventures. On the other hand, because firms lack complete information, especially on what behaviour can be anticipated by other firms under various scenarios, they may forego potential benefits of cooperation. Their means for overcoming such cooperation failure in part hinge on their own attitudes, and their confidence in working out relations with other prospective counterparts in ways that will generate mutual benefits.

It is generally recommended that private actors assume the leading role in cluster initiatives, with the public sector playing a more catalytic role. Even when firms or individual persons have initiated a cluster process, however, it is often difficult for them to maintain a leading role given their time and resource constraints. In addition, they can have difficulty ensuring a competitive environment within the cluster while remaining independent. Hence, if one or a few entrepreneurs can play a leading role in phase one (Building Social Capital), a broad involvement of a representative group of firms in Institutions for Collaboration is highly recommended from phase two onwards. There are examples of clusters where the leadership role has rotated among members during the first and second phases of the clustering process (building social capital and defining strategic linkages), but one should be careful not to derive universal conclusions or recommendations from such individual cases.

On the point of whether large or small firms should play a leading role, there is no unique answer, yet most agree that active participation by SMEs is vital, even if they do not play the leading role. Large firms, and especially MNEs, have greater capability to carry fixed costs and thus typically offer stronger analytical competencies than SMEs. Relative to SMEs, however, large firms may also be in a market-dominating situation and have greater bargaining power in inter-firm relations. This has consequences for balancing between the virtues of competition and cooperation. If there is only one large firm in a cluster, the cluster dynamics are likely to be adversely affected, as the critical mass of power resides with that

large firm, rather than being shared among all the firms. SMEs tend to be more flexible and niche-oriented. This may enable them to provide specific knowledge and quicker reactions to market demands, helping the cluster as a whole to be more responsive.[71] Much of the decentralised organisation of a cluster is compatible with typical characteristics of SMEs. A cluster initiative may serve the purpose of compensating for the lack of critical mass within each of these companies.

Many successful clusters nevertheless have at least one large firm functioning as an anchor company. Such firms tend to support cluster development by acting as magnets for other major companies (Porter, 2001). Large firms can play a catalytic role in several respects, as they may help build a critical mass of experienced managers and workers, provide a customer and supplier base, and have a multiplier effect in terms of a region's local economy for materials and services (Ecotec , 2003). In many cases, SMEs start out as subcontractors to large firms, or they may be formed through spin–offs from the large firm. SMEs may also benefit from large firms' market channels and technological and market knowledge, both as a resource and as a source of learning and inspiration (Berggren and Brulin, 2002). Much of Silicon Valley's success came from the organic entrepreneurship of former co-workers at Fairchild Semiconductors who went on to form their own firms and compete fiercely against each other, while at the same time co-operating on occasions. Among these companies are Intel and around half of America's 85 leading companies in the semi-conductor business. Similarities in work culture facilitated collaboration.

Schumpeter (1934) points to the role of entrepreneurship for "breaking the circular flow" and disturbing the current equilibrium. The contributions of entrepreneurs and the capability to break established ways matter for innovation. Small firms and the role played by individual entrepreneurial efforts for clusters therefore need to be recognised. As conditions for entrepreneurship, and especially the ownership of high-risk ventures, are unfavourable in many countries (Lundström and Stevenson, 2001), this may represent one of the *bottlenecks* for cluster development. For some categories (e.g., in the case of women who make up half the population), opportunities for entrepreneurship and for entry to established business associations, which may hold the key to clustering, are severely limited in countries such as Japan and Korea, and somewhat impeded or distorted in many others (OECD, 2001*g*).

Reliance on local face-to face and tacit knowledge may make local networks more vulnerable to lock-in of established ways of thinking and doing things (Martin and Sunley, 2001; Amin and Cohendet, 1999). While clusters may be capable of responding to small, incremental changes in technology and market demand, when it comes to larger changes, they can display collective resistance to the adoption of new processes (Harrison and Glasmeier, 1997). Entrepreneurs may serve as a counterforce to such lock-in dynamics. Innovative clusters should also possess the means required for coping with more radical change.

Accordingly, it is essential for firms and regions to engage in competence-building not only as a means to fully benefit from new technology and to innovate, but also in order to be able to invest appropriately in 'low-tech' learning and incremental innovation (Maskell, 1998).

[71] In the Miniforum on drivers of biotech clustering, one conclusion was that the participation of large enterprises is not a necessity, and that dedicated biotech firms play an important role in terms of scientific breakthroughs and innovation.

The need for such investment is underlined by the fact that, today, handling and developing mundane day-to-day operations, such as resource management, logistics, production organisation, marketing, sales, distribution, industrial relations, etc., has become utterly demanding (Malerba, 1989).

4.3.3 Government / policymakers

Sölvell et al. (2003) found that the government is slightly more frequently in control of cluster initiatives than private sector representatives. They also observed that most cluster initiatives are dependent on public funding, and frail without it, although dependency can decline over time.

Governments may have a broader vision and goals than the private sector. In addition, government's position brings leadership, legitimacy and consensus-building assets. These competencies are most important in the initial phase, and at the beginning of the second phase of the clustering process. It becomes government's role, then, to "see the big picture" and provide the macro-level foundations and infrastructure needed to support growth and competitiveness. Exerting an influence on prioritisation, between both clusters and cluster actions, must be anchored in specific criteria and appropriate analysis, however. In practice, governments cannot be viewed as the school-book neutral defender of social benefit. There is an inherent tendency for benefits that are concentrated in space and time to gain an upper hand in political influence. In addition, the way that governments organise their inter-sectoral responsibilities matters greatly for outcomes. This applies strongly in the case of innovation, which as already discussed, represents a genuinely cross-departmental concern.

The role of government in innovative clusters

There are sharp differences between countries in the way that innovation policy is designed and implemented. Some of these depend on the political "colour" of governments, including the extent to which they favour market-oriented or government-sponsored programmes. In addition, and sometimes overriding the dichotomy of political orthodoxy, innovation policy is subjected to systematic differences between the influences of traditional policy perspectives. Figures 17-20 provide schematic illustrations of alternative situations. Given a "traditional positioning", the responsibility of innovation policy (purple domain) is placed somewhere between the ministries (in green) in charge of education, research and industry. Some countries practice an "implicit" approach, where responsibilities are relatively more diffused, resulting in a shared sense of ownership but also typically certain coordination problems. A newer, and generally more successful approach is that of arranging with an "explicit" responsibility. This needs to be arranged so as not to be dominated by any traditional policy domain, but so as to have sufficient clout to allow for coordinated concerns and initiatives across ministries. As the final chart shows, there is not only the task of bringing together departmental interests, but also allowing for, and orchestrating, the impetus of multiple relevant stakeholders. In the case of an explicit responsibility, this task can be assumed "head on" and in a transparent manner. The previous chapter already discussed some of the issues that are decisive for enabling a successful implementation of this kind of approach.

The application of different approaches influences the weight attached by national governments to different kinds of issues and concerns. A direct influence by the Ministry of Industry, for instance, tends to account for high priority on public-private partnership and a greater say by private sector interests even in government-led cluster initiatives. A more active role for the Ministry of Finance will account for greater emphasis on indirect, horizontal policy instruments rather than public funding or fine-tuning with incubators or science parks. A strong engagement by the Ministry of Education in research and innovation will place priority on basic, rather than applied research, and will likewise emphasise longer-term supply-side aspects of human capital accumulation rather than the demand side. In between the extremes, shared forms of responsibility will produce outcomes that, in part, depend on the leverage these different actors are able to exert.

Figure 17: Traditional positioning of innovation policy

Figure18: Implicit positioning of innovation policy

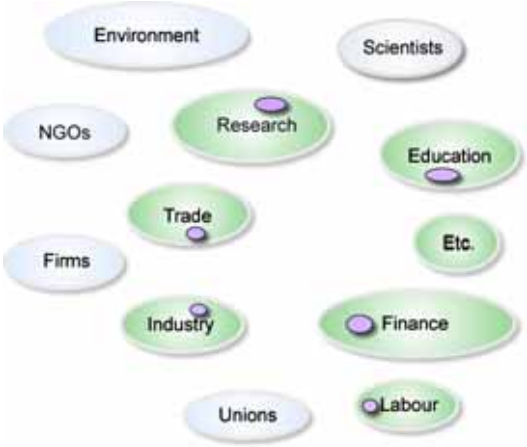
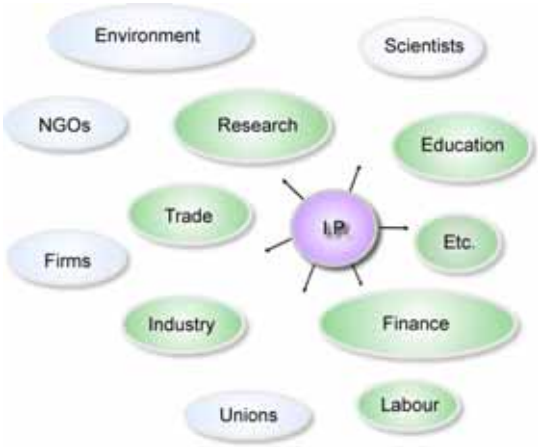
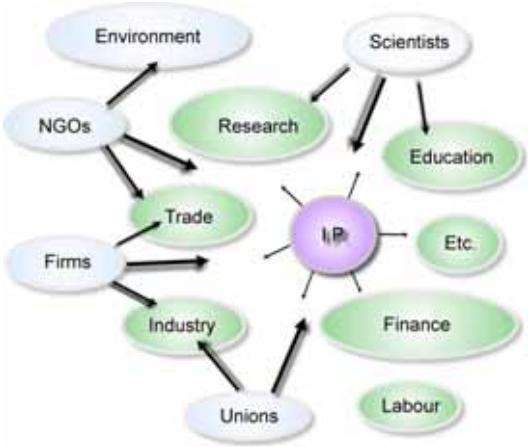


Figure 19: Explicit positioning of innovation policy



Source: IKED

Figure 20: Explicit positioning of innovation policy with interactions



Governments typically have difficulties in gauging the strengths and weaknesses of these different models or in recognising the significance of asymmetric influence by one ministry. In many countries, the choice of innovation policy positioning or governance is not conscious or deliberate. Nevertheless, government officials tend to be well aware of the balance of power within given models, and of their ability to influence decisions.

Other actors are also likely to be aware of biases inherent in the particular organisation of innovation policy. To the extent that they are closer to the field, they are witness to practical consequences of such policy biases. These actors may thus try to push for compensating mechanisms, or undertake actions which are better handled by government. Approaches that encourage the learning and accumulation of skills among the different players, and which allow them to raise the quality of their contributions, can be greatly significant for achieving a better allocation of responsibilities.

Thus, irrespective of the way in which national governments organise the cross-cutting horizontal aspect of cluster and innovation policy, priority should be placed on designing incentives that encourage systematic learning for the different stakeholders and on constructively refining and raising the level of their contributions to clusters.

Government role in creating clusters

It is often proclaimed that governments should abstain from "creating clusters" but focus on playing a catalytic and supportive role in the further development of already-existing clusters. This reasoning is based on a strict definition of cluster policies. There may be valid motives for governments to take action both to foster new clusters and to strengthen existing ones. However, the time dimension varies markedly between the two kinds. New clusters cannot be counted on to evolve in the near future, while existing clusters are here today. National governments must care for both and ensure that the fundamental infrastructure, including the institutional and regulatory conditions required for new clusters to evolve as well as for existing ones to grow, are in place.

The government agencies that shape framework policies need to be aware, and engaged, for the sake of safeguarding that opportunities for the emergence of new clusters in the future are not foregone. Government representatives concerned with science-industry interplay, the establishment of science parks and incubators, etc., tend to be most preoccupied with existing clusters. Similarly, industry ministers and authorities generally focus their attention and efforts on existing strongholds, as backing entirely embryonic or non-existing clusters is treacherous and affords few political gains. Conditions should be framed so as to enable both the development of existing clusters and the rise of new ones. The need to strengthen conditions for one or the other type of cluster will depend on the specific context.

As noted, a common pitfall in policymaking is that public agencies choose a policy strategy of promoting "high-tech" clusters. When the same sector is given priority in many locations, there is an obvious risk of over-supply. An example of this can be found in the numerous examples of countries or regions seeking to promote or establish a biotech cluster.[72] A

[72] TCI Forum Key Note Address by Michael Enright on "Competitiveness, innovative clusters and positive externalities".

related aspect is that women entrepreneurs are generally under-represented in incubators due to the prioritisation of high technology and technical products – areas in which women have been less likely to launch a business.[73] Systematic favouring of high-tech ventures may, in this way, lead to exclusion and undesirable effects for specific groups.

Supporting or promoting entirely new clusters may also undercut the ability of other pre-existing economic activities to develop. At the same time, in regard to existing clusters, there is a risk that governments are pushed to target "national champions" or "sunset sectors". Attempts to re-engineer sunset clusters are often seen to prevent dynamism in new growth areas. It may be argued that the priority of government should be to ensure healthy conditions for newly established or embryonic clusters rather than boosting those that are already well-established, or sustaining clusters that ought to re-engineer themselves to adapt to a changed external environment.

Lyons (2003) speaks of a tendency towards under-supply of potential entrepreneurs in the market. In practice, attitudes, opportunity costs, risk-reward ratios and education critically influence whether people choose to become entrepreneurs. Lyons recommends that entrepreneurship programs should focus on persons and not companies and that entrepreneurship training should be determined with a view to levels of knowledge and maturity. Thus, entrepreneurial skills needed for preparing a start-up differ from those required for navigating a company in a growth phase, which in turn may differ from the entrepreneurial competencies necessary for managing a medium-sized firm. An additional observation is that many current programs tend to focus on what services are to be provided, and not on the specific interests and needs of the entrepreneur.

Clustering for its own sake may lead to artificial forms of cooperation and, from an economic welfare perspective, an inefficient allocation of time and resources. The mere availability of public funding in support of cluster development will spur some cluster initiatives simply for the purpose of gaining access to those funds. The result may be the rise of "imagined" clusters well-advertised by those who have skills in communicating their need of funding and support. Such programmes and efforts come at the expense of real, entrepreneurial clusters where participants are tied up in urgent, tangible commercial needs. Fritz et al. (1998) argue that policymakers should view local industrial specialisation in terms of a risk-return tradeoff, weighing the risk of ossification against the higher returns gained from clustering.[74] The difficulty is that neither the probabilities nor the levels of costs and benefits are a given. There is also the concern that cluster policies may prevent needed structural adjustment. Schumpeter's classic concept of creative destruction, and the importance of mechanisms that allow resources to be reallocated from old to new modes of production, is still relevant. These points illustrate the dangers of cluster policies promoting artificial and other resource-inefficient forms of cooperation that may, moreover, crowd out more productive activities. More generally, this section has highlighted the danger of viewing clusters and clustering, as an end and a policy objective in itself.

[73] For further reading see Miniforum 14, "Gender is innovative clustering – how to include vast potentials".
[74] Compare with Conroy (1975), who made a similar point in regard to regional specialization versus regional diversification.

The persistency of the government role

A sound framework for cluster policy requires a clear formulation of rationale and the adoption of a systemic approach, both to the problems identified and the solutions envisaged. It must also be based on the application of stringent evaluation practices, and agreement that the public sector generally should let the private sector lead in cluster-development initiatives, with the public sector playing a catalytic role. At the Gothenburg conference, some speakers further emphasised the importance of clusters becoming sustainable on their own, and thus for public support to be provided on a temporary basis. An *ex ante* disposition for an effective *exit strategy* is today frequently seen as an essential element of public subsidy programmes across the board.

The public sector influences clustering in a number of ways, necessitating a strengthened understanding of its logic and societal significance. Private actors leading cluster initiatives are greatly helped by a well-grounded message that public structures and playing rules will not be altered capriciously, and that years of investments and hard work will not be wiped out by political whims or outbursts of impatience to change rationale. It is thus desirable that governments formulate clear-cut goals as well as metrics with which to measure success and failure, and both communicate and adhere to a consistent formula for what can be expected over time. In principle, that should amount to respecting and backing established clusters in a long-term perspective, whilst providing clarity as to when to stop support measures that serve a catalytic purpose. Governments must avoid being locked into counterproductive measures and propping-up clusters that are not viable.

Some cluster initiatives represent a macroeconomic or meso-level top-down tool for regional development. When this is the case, the objectives and performance measures of the cluster initiative tend to be defined politically and macroeconomic considerations dominate structural and private-sector considerations. The precise features will depend on the governmental set-up as described above. This kind of set-up may be strong in terms of taxing criteria for government intervention. On the other hand, it may be weak on checks and balances associated with bottom-up dynamics. The public's perspective and lack of private sector interface and experience, rather than socio-economic interest, may crowd out private sector insights and talent alike, as clustering tends to be defined predominantly as a public service responsibility.

As a consequence, academic research and teaching in connection with such clusters may not appreciate micro-economic functions and entrepreneurial potential. Frameworks for cluster policies risk being regarded as given and not a result of concrete real-world initiatives. Under such circumstances, there are commonly disincentives towards linking to the practical business community of SMEs, trade associations and the banking community.

Role of national government versus local authorities

Again, the public sector goes much beyond the national government, which has the overview and the coordinating capacity but which lacks the proximity to local clustering and innovation processes. The public sector involvement in clustering should balance a broader macro agenda with specific micro-level analysis and prioritisation. On the one hand,

local/regional level policy-makers are better placed than national ministries, for example, to collect information on competitive sectors/companies in their domain. On the other hand, they may be more susceptible than national governments to vested interests and thus stand the risk of being pushed to chase white elephants.

The priorities and skills of local authorities are not a given. In most societies, governance includes an act of balancing between national and regional authorities. The fabric for allocation of national funds to the regional or local level, in support of infrastructure, jobs, education, etc., should be designed with a view to fostering rather than counteracting the build-up of relevant local skills. In particular, attention should be focused on how to upgrade local assets so as to harness growth rather than specialise in attracting public subsidies. In this sense, the key to effective engagement by local authorities in cluster policy is not concretely defined. It calls for incorporating awareness of the importance of this subject into the design of the wider framework for policies promoting regional and local development.

Table 3 enumerates failures and problems related to clusters, and the alternative measures which are available to policymakers to address them. The table presents instruments for tackling different cluster problems, which in turn are sorted along the lines of how this may affect the cluster dynamics or the cluster environment.

International organisations

Apart from national, regional and local policymaking, public actors also operate at the international level. The community of *international organisations* is more or less active in clustering processes, notably in developing countries. International organisations are unlikely to introduce cluster initiatives, but may play an important role in the second and third phases of clustering. Generally, they assume a role as facilitator in situations where national governments are lacking resources, normally providing financial assistance along with assistance in technology diffusion and serving a brokering function (e.g., by creating platforms that can link public research actors with business and government). Organisations such as UNIDO and USAID[75] work to broker between domestic actors, especially for the purpose of supporting global knowledge and competitiveness strategies. Similar efforts can be observed within the EU where substantive funds are allocated to regional actors in support of a broad-based modernisation of infrastructure and involvement in transnational R&D cooperation.

The impetus of cluster initiatives by international organisations, and also supranational contributions such as those of the European Union, exert an indirect impact in developing countries and transition economies that goes beyond the resources and specific activities involved. International organisations should be aware that initiatives may inadvertently affect

[75] From Miniforum 12, "Donor funding of competitiveness initiatives: results to date and future".

Table 3: Cluster policies and tools

Improve Cluster Dynamics			Improve Cluster Environment	
New Technology & Firm Growth	Inter-Actor Network Creation	Cluster Formation	Factor Markets	Cluster Basis
Firms cannot access or identify strategic knowledge *Support cluster-based retrieval and spread of information; Organise dialogue on strategic cluster issues* - Set up cluster specific information and technology centres - Establish platforms to explore market opportunities - Conduct technology foresight exercises - Conduct strategic market information and strategic cluster studies - Support cluster-based incubators - Provide business assistance Firms do not utilise the expertise of knowledge suppliers *Collaborative R&D actions and cluster specific R&D facilities* - Set up cluster-specific technology and research centres/initiatives - Subsidise collaborative R&D and technology transfer Lack of critical mass *Promote Firm Growth* - Promote spin-offs and expansion of existing firms through framework incentives - See to provision of pre-seed venture capital	Firms do not take opportunities to collaborate with other firms *Encourage and facilitate inter-firm networking* - Support brokerage & networking programmes: form cross agency cluster teams; foster firm & personal networks; facilitate external connections - Catalyze commercial cooperation: support export networks & co-ordinated purchasing - Establish tech. standards - Initiate public procurement for consortia and innovative products - Give incentives or set aside funds for multi-firm projects only Institutional mismatches between (public) knowledge, infrastructure and market needs. *Joint industry-research centres of excellence.* - Facilitate joint industry research cooperation - Support specialisation and local adaptation in university-industry linkages, e.g. incentive structures to encourage local linkages - Develop human capital - Initiate technology transfer programmes	Limited interaction between actors in innovation systems *Actions for engagement and service delivery* - Establish platforms for dialogue, e.g. broker and networking agencies and schemes, by creating or formalising IFCs and communication channels that facilitate networking Information failure *Cluster Analysis* - Conduct competence audit & mapping exercises - Sponsor strategic studies & analysis - Model and amplify systematic relations - Conduct benchmarking - Organise and disseminate information in cluster - Consider complementing national statistics by cluster-based frame of reference Lack of cluster identity & awareness *Identification and public marketing of clusters* - Externally promote cluster - Create brand for cluster - Conduct external/ internal promotion of cluster members' competencies - Have local, regional and national authorities disseminate cluster information throughout the business community	Lack of crucial elements in clusters *Attract or promote growth of firms in clusters* - Focus investment promotion efforts on linkages within a cluster which are considered weakest - Target inward investment (eg. gaps in the chain of local suppliers) - Improve FDI incentives - Attract major R&D facilities - Attract new firms - Support start-up firms in particular cluster Shortage in specialised labour supply - Provide management & technical training - Use clusters as context for learning - Establish cluster skill centres - Support regional skills alliances - Attract talent to region Missing demanding customer - Encourage public procurement policy Capital market failure *Promote specialisation in capital markets* - Attract new VC firms - Set-up specialised investment funds that provide co-financing on strict market principles - Improve FDI incentives	Government regulations hamper innovation, competitiveness, or efficient functioning of markets *Identify regulative bottlenecks* - Organise cluster platforms and focus groups to survey needs for tax & regulation reform (e.g. environment, labour markets, financial markets, competition policy) Inadequate infrastructure -Ensure provision of adequate infrastructure, communications and transport - Consider land-use planning in a way that strengthens identified clusters Lack of social capital - Foster & support personal & firm networks Shortages in S&T, R&D framework *Strengthen S&T Base* - Co-locate complementary public investments with related concentrations of private investment. (e.g. if investing in public technical institutions, these could be built in the vicinity of related concentrations of firms) - Improve education and skills - Institutionalise joint partnerships between research institution and firm partnerships - Invest in joint cluster R&D

Source: IKED

countries' own internal governance structures, possibly hindering reforms that are needed because their ability to put in place comprehensive cluster or innovation policies is reduced. External meddling may alter delicate domestic power balances in unexpected ways. Intercultural skills and talented facilitators may help offset or handle such wider

consequences ex post, but programmes should, from the outset, explicitly attempt to avoid unwanted effects of that kind. There is a compelling need for international organisations, the EU, and also bilateral donor organisations, to broaden their knowledge on the way in which support schemes may relate to reform efforts of recipient countries and communities.

4.3.4 Academia

What is here referred to as Academia (Universities, Public Labs/Research Institutes) is generally characterised by *in-depth knowledge* and analytical competencies, coupled with independence and specialised communication skills. These competencies put academia in a position to take on supporting roles throughout the clustering process: facilitating trust and building social capital; anchoring the cluster initiative's strategic direction and actions with proof and analysis; and driving actions (especially in the areas of innovation and network creation). Academia can also play a role in the continuous evaluation of objectives and actions, including by challenging the chosen path by re-examining the cluster initiative's direction, actions and results with frequent intervals. Sölvell et al. (2003) found, however, that few cluster initiatives are started by universities and even fewer financed by them.

Concerns to be voiced are that academia in many countries has weak incentives to engage in commercial undertakings, limited experience of the practicalities of entrepreneurship, and is unable to communicate directly to parts of the business community. These limitations hamper the extent to which academia can assume a leading role within cluster initiatives. Furthermore, academia generally lacks the acceptance and legitimacy required for that kind of task. While the contributions of academia nevertheless are viewed as important to the re-engineered as well as to the organic clustering process, fulfilling their potential may hinge on adjustment and the accumulation of new skills or functions by academics and universities.

Before Humboldt founded the University of Berlin in 1809, universities' sole mission had been to provide students with a broad education and to prepare for a church or public service career. Humboldt challenged this view with the idea that professors should be both researchers and teachers, which was well-received and spread globally. With the growing weight of the knowledge-based economy and the focus on knowledge as a key input to production, the importance of universities for the economy and for regional development is on the rise. Partly under pressure due to changes in public funding schemes, universities worldwide are moving towards adopting a "third mission", in parallel with the historical two of education and research, namely to diffuse technology and participate in economic and social development.

These ideas are not really new. In the early 20th century, MIT emerged as an entrepreneurial university, and is now widely seen as a model for others. The ideas behind science parks similarly have their origins in the university world, with the Stanford Research Park in California, established in 1951 and the breeding ground out of which Silicon Valley grew, regarded as the genesis.[76] The same applies to business incubators. In 1942, Student Agencies Inc., located in Ithaca, New York, was created to incubate student companies. In 1946, Massachusetts Institute of Technology (MIT) president Karl Compton and other

[76] See further Miniforum 8, "The role of science parks as boundary crossers".

alumni founded the American Research Development (ARD) incubator (Lavrow and Sample, 2000). The first documented incubator outside of the academic environment was the Batavia Industrial Center (BIC) located in Batavia, New York. However, the extent and pace with which changes are now enacted account for an accelerating transformation in many countries.

There are examples where academia has played a key role in cluster processes by providing the stimulus for new thinking, and the analytical resolve to challenge the *status quo*. In Sweden's Blekinge region, the software cluster around the Soft Center Science Park in Ronneby was catalysed by the entry and strength of the Blekinge Institute of Technology in 1989, which co-located with private firms in the premises of the science park. In this case, the university continuously introduced new labour with specific skills and provided an incubator environment which increased the number of start-ups. Meanwhile, regional clusterpreneurs were successful in attracting companies like Ericsson to the cluster. Academia's contribution was crucial for reaching the accumulation of a critical mass, in part through achieving the pull-effect enabling the attraction of skilled labour to the region.

More recently, the importance of universities and/or research institutes as nodes of cluster development has spread to more countries. The most dramatic example is that of China where the previously strictly government-controlled science and technology system from 1985 was subjected to a marked change in both administration and human resource management, opening up for the transformation of previous research institutes into outright enterprises (Tang, 2003). Meanwhile, their contributions have been underpinned through the ambitious national programmes for science parks and incubators. At the other end of the spectrum, Russia provides an example of a strong science base which so far provided scant impetus of that kind.

Even though much of the focus, especially in knowledge-intensive clusters, is on universities, clusters may benefit from involvement by representatives of the K-12 education system.[77] As an example, firms in the packaging cluster in Northern Italy, such as Tetra Pak, emphasise the importance of labour with technical skills, although not necessarily a university degree, and with the ability to adjust to the needs of special processes. A cluster may benefit from collaboration with K-12 schools that can provide specialisation in later years by working with regional employers, and thus provide education that is in demand. At the same time, it will be important that skills do not become "too limited", thereby locking workers into jobs and career paths that risk leading to a *dead end*.

4.3.5 Financial actors

Although currently-available data identifies government and industry as the main sources of financing for cluster initiatives,[78] their evolution has increased the need for financial actors to be involved. The idea of the venture capital firm once originated in a cluster-like environment. According to Etzkowitz (2003), the desire in New England in the early 20th

[77] This term is used to describe primary and secondary levels of the education system, or the parts of the education system that are responsible for schooling up to eighteen years of age.
[78] According to Sölvell et al. (2003), new cluster initiatives receive primarily public funding whereas mature ones have more varied sources.

century to renew its industrial base led the New England Council (a group of actors from industry, universities, and government) to formulate a knowledge-based innovation strategy in the 1930s and 1940s. A key component of this process was the invention of the venture capital firm, with the mission to provide early stage financing and business advice to academic inventors. In the 1990s, following a range of reforms and the establishment of second-tier markets, venture capital took off in a majority of developed countries. Although the recession after the turn of the millennium brought disappointments and forced a consolidation in all countries, a process of skills accumulation in how to invest and add value in high-risk ventures has now been thoroughly diffused around the world, and continues to evolve.

Financial actors are not likely to launch a cluster initiative, since it does not fit within their natural agenda, but the competencies they hold are of great use to the clustering process, notably in phases two and three, especially in supporting the inner dynamics of the cluster. Thus, the "risk capital mindset" of venture capitalists can be applied both in the *identification* of clusters meriting investment or prioritisation by the public sector, in the establishment of cluster initiatives' *goals/strategies/actions*, as well as in *evaluation* of cluster initiatives. As cluster initiatives mature, a measure of success is the start-up of new firms, which is important for launching new technologies or addressing new market niches/demands. It is at this point in the clustering process (in its re-iterative stage) that the engagement of financial institutions is most critical. Providing seed finance, helping in the initial stages of spin-offs, coordinating the set-up of special funds targeted to the specific needs of the cluster are all actions that can be launched and coordinated by financial actors. These are, in fact, well placed to provide input and judgements on which ideas and innovations deserve the support and attention, and could make it the whole way towards market introduction.

There are different types of financial actors. Banks, insurance companies, public pension funds, investment funds, business angels, venture capitalists, etc., all have their objectives and limitations, time lines and preferred portfolios. Institutional investors such as pension funds, banks, and insurance companies, may operate through various intermediaries, with some funds diverted to venture capital. While they are generally unwilling to be exposed to high risk, their long-term approach coupled with a strong presence in local markets and well-developed networks make them important players in cluster initiatives. Knowledge of key players in clusters and of their specific competencies creates trust and reduces the perception of risk, compared to more distant financing structures such as capital markets. Financial actors are unlikely to take the lead, however, or to make strategically decisive contributions. In times of crisis, their risk aversion threatens to make them the "weakest of the links". This however underscores that their approach and attitude to clusters matter greatly.

Professional venture capitalists, on the other hand, are specialised in exposure to risk and in resolving principal agent problems. Venture capitalists generally assume active ownership in high-risk ventures. Venture capital funds often contribute funding that is raised from both private and public sources. Furthermore, they can play a vital role in providing the actors in a cluster with competencies that are in short supply. While channelling financial resources, the real contribution of venture capitalists is human capital, notably in risk management complemented by organisational, production, management, marketing and/or sales knowledge in the particular niche where they are managing risk and business development. They can be seen as brokers who are able to match not only the supply of finance with the

demand of entrepreneurs, but also to add other lacking capabilities and networks to the process.

The availability of venture capital is important also because it can reshape the way that the public sector engages in handling risk. Venture capitalists are instrumental in establishing effective investment syndicates where the public sector can trade its responsibility for supporting high-risk technology against co-investments with venture capitalists and other private sources of funding (Paija, 2000). This provides an example of a mechanism where governments are granted a set-up that allows for combining public functions in research with the efficiency that comes from operating under market conditions and the drive to maximise returns on investment.

The relationship between the various actors engaged in funding early-stage risk is far from harmonious. Venture capitalists and entrepreneurs, for instance, commonly have conflicting interests. Through investment by a venture capitalist, an entrepreneur is bound to lose influence. Possibly, control is shifted altogether. In this case, the aim of fulfilling a long-term vision may be replaced by the pursuit of quick returns so as to enable the investor to make an early profitable exit. Despite such differences, however, entrepreneurs and venture capitalists need each other. The intensive engagement by multiple professional and experienced actors on both sides of the market allows for putting the best of a depth and wealth of viable opportunities to the test.

As part of forming this area, however, there is a definite need for public engagement. The provision of adequate seed or "blue sky" capital for early stages in the commercialisation of new technology is marked by fundamental confidence gaps between the actors involved, and without public funding and institutional support, a dynamic private market can hardly evolve. In the United States, for instance, the public sector played a significant role in the early development of the venture capital market, and today it continues to provide extensive support for new high-tech firms, as well as offering tax incentives for businesses and individuals that donate money for such purposes. At a federal level, the Small Business Innovation Research Program (SBIR) runs a series of relevant programs.[79] Ten federal departments and agencies are required by SBIR to reserve a portion of their R&D funds for award to small business. A competition is engineered where the winners are awarded some USD 100.000 to help finance companies' activities for six months. In a second competition, stage-one winners can obtain another USD 750.000 in support for another 24 months. The experience is also that by winning the first phase it becomes easier for a company to attract external funding more generally, due to the prestige of having passed a thorough examination.

4.3.6 The "clusterpreneurs" and "cluster engineers"

Individual effort and initiative is central to clustering. At the TCI conference, speakers stressed the importance of leadership by individuals in cluster initiatives. For successful clustering, these individuals may, however, need to combine multiple competencies, such as being *visionary*, *facilitative*, *analytical* and *excelling in networking*. A cluster entrepreneur, or *clusterpreneur*, typically needs to encourage synergies and build consensus, maintain the

[79] See more at http://www.sba.gov/sbir/indexsbir-sttr.html.

balance of achieving short vs. long-term benefits and focus on concrete action plans for specific cluster initiatives. Another role filled by the clusterpreneur is that of *cluster engineer*. This individual takes on the role of broker – coupling firms with firms, firms with universities, government agencies with cluster initiative members on a continuous basis. The qualities of the individual clusterpreneur, including his/her inherent competencies, can crucially influence the success of the cluster initiative. Clusters are, like individuals, unique, in part because they build on and extend from the particularities and skills of the people that they bring together.

There is no general pattern as to whether such a person emanates from industry, government or academia, nor which or how many competencies/roles he or she will have to draw on or perform. However, a universal prerequisite appears to be that a successful clusterpreneur must know how to appreciate options to expand network contacts both within the cluster initiative and externally. It is worth stressing that cluster growth and transformation is dependent on constantly looking outside the cluster initiative for new risks and opportunities.[80] The successful "cluster engineer" is normally an actor that can support that function with authority.

Hallencreutz et al. (2002) argue that a locally anchored clusterpreneur has the greatest chance to succeed in acquiring acceptance from firms in the cluster. According to their experience, external consultants may serve complementary functions such as formulating the vision and initiating the process, but the daily work and leadership is most-successfully undertaken by a locally anchored actor. It appears useful, however, for a clusterpreneur to have spent some time outside the cluster and thus obtained a broader experience and networks that enable effective connections to other regions.

The clusterpreneur is obviously not alone. Various kinds of supporting functions need to evolve. Different individuals and organisations hold different competencies and their usefulness for the cluster may vary during the course of the cluster life cycle. The IFC may, for instance, consist of several diverse actors that can complement each other. An individual clusterpreneur may likewise be backed by a group of advisors or peers. Some sort of steering or reference committee, representative of key stakeholders, is often observed. Finally, it may be that the person, as well as function responsible for the cluster development, should be changed during the cluster life cycle, which raises a host of issues (Hallencreutz et al., 2002).

4.3.7 Hybrid or "glue" organisations

Another actor category that cannot easily be included within any of the traditional ones outlined above is that of hybrid organisations. Hybrid organisations include *incubators* (university-industry hybrid), *trade associations or chambers of commerce* (government-industry hybrid), and various sorts of *government councils* e.g. research/science, innovation, etc. (comprised of representatives from all three elements of the triple helix). This group of actors can make contributions in linking and helping to integrate the roles and functions of others. A growing number of hybrid organisations are today active in cluster initiatives. As the spheres of the triple helix become more flexible and overlapping, multiple forms of

[80] TCI Forum Key Note Address by Lynn Mytelka on "Innovative clusters - the role of local frameworks and supporting infrastructures".

bilateral collaborations develop. Success requires certain convergence of interests and pro-active conflict management (Etzkowitz, 2003).

Today, trade associations often adopt a local and cluster-oriented perspective, exploring opportunities to encourage cluster development among their members. These organisations were originally set up to serve the special interest of their group through lobbying and formulating demands on other actors and the public, rather than spurring value-enhancing cooperation. They may even altogether lack the competencies and mandates to undertake the collaborative work required in clusters. Naturally, there may be changes in set-ups, orientations and competencies. Individuals, e.g., in the form of clusterpreneurs, can emerge in or from these organisations and make them embark on a new course of direction. In the absence of such personal initiative, however, changes tend to be slow in this area.

To sum up, the division of responsibility between actors engaged in cluster initiatives should not be taken for granted. Cluster policies should try to exploit and promote a division of labour which takes into account the natural roles played by actors, including their respective competencies. Moreover, competencies should not be viewed as a given. Rather, learning processes matter greatly, and an interplay should be sought which provides the incentives for all relevant actors to evolve towards mastering their parts of an appropriate division of labour. There is also the need to guard a sound balance between them, including the presence of appropriate checks and balances should things go wrong one way or the other.

4.4 Specific circumstances

Whereas the previous section discussed the general competencies and roles of different actor groups, specific circumstances may account for divergence from the "norm". Further, there are alternative ways of launching a cluster initiative or accelerating innovation in a cluster.

In this section, we reflect on the special cases of large versus small economies; centralised versus decentralised government; economies with primarily large versus small enterprises; industry-specific conditions; special issues arising in rural areas; and special issues for developing countries and transition economies. Rather than presenting an exhaustive characterisation of special conditions applying in each case, the aim is to provide some illustrations of how specific circumstances may influence the role of strategies and/or actor competencies with regard to cluster policies.

4.4.1 Large versus small economies

Country size impacts the conditions for clustering because of its influence on critical mass and diversity in domestic markets, and thus on international trade and resource flows. The United States, for instance, has multiple strongholds in R&D activities and a formidable record in attracting foreign capital and human talent. Large economies can afford more experiments and are less dependent on export markets, inward FDI and the attraction of complementary resources. At the same time, they may be less exposed to competitive

pressures and be more introverted.[81] The larger the domestic economy, the greater means governments may thus have available for developing and injecting their strategies, yet the less prone they are to playing an independent facilitating role in support of cluster processes.

Technological change in ICT, combined with deregulation and globalisation, may reduce some of the scale advantages of large countries which, at the same time, experience rising costs from failure to enhance flexibility and adjustment processes. France, Germany and Italy, for instance, are hosts to clusters that have traditionally been leaders in international competitiveness but which lately have shown signs of weakening that mirror the slow-down in their overall economies.

Small economies, on the other hand, are more dependent on access to global markets. They may have fewer clusters, less resources in absolute terms and a more narrow spectrum of specialised workers. They face disproportionately high costs in maintaining institutions (e.g. in education and science) that cover a broad range of subjects to be taken up by the business sector. Innovators likewise meet with receptive business firms and competent financiers in fewer areas.

On the other hand, the cluster notion may fit well with countries that have to prioritise due to limited resources and that are open to exporting as a means to achieve economies of scale. A stronger motivation to internationalise operations rapidly may likewise account for greater exposure to new ideas and better understanding of the virtues of specialisation. The innovation systems of small countries are thus more often focused on capturing the benefits of inflows of technology, although some big countries may be in a more favourable situation to serve as the basis for front-edge production and research facilities, and also to attract foreign students. Some successful small countries, such as Finland, Ireland and Korea, may have benefited from being relative latecomers in terms of heavy technology-based institutions, further reducing their inertia to adjustment and facilitating a re-orientation towards new priorities and growth areas. Irrespective of country size, however, success always risks giving rise to complacency.

Table 4: Country size and clustering process

Large countries	Small countries	Consequence for clustering process
Large population with several densely populated cities/areas	Fewer densely populated areas	A more narrow range of cluster initiatives can be developed in small countries.
A broad representation of sectors and areas of possible competitive advantage	A limited representation of sectors with a distinct competitive advantage	
Larger public and private sources of funds	Less critical resources and fewer skilled employees	
Larger domestic market - less reliance on foreign trade	Small domestic market - high reliance on foreign trade	Smaller countries more accustomed to "looking outward" for economic growth possibilities - higher readiness to collaborate in a clustering process

Source: IKED

[81] For further reading see Miniforum 13, "Strategic upgrading of clusters through the inflow of FDI".

Possible influences of country size on clustering processes are exemplified in Table 4. That smaller countries are more accustomed to, and more reliant on, looking outside their borders for opportunities, indicates that the initial trust-building phase may be shorter and possibly require less effort. The participants may be more accustomed to interact with groups with different types of social capital, i.e. be more used to bridge between complementary skills and assets. This may, for instance, increase the probability that transnational clusters can develop, and facilitate the establishment of linkages with inward FDI. The intensive networking between China Taipei and Mainland China shows, however, how both kinds of economies may get engaged. In smaller countries, authorities are likely to face particularly severe constraints in terms of harnessing clusters with critical mass, motivating a greater coordinating effort at national level. Cultural and sociological factors, coupled with country size, will influence the extent to which emphasis is put on reputation effects and incremental improvement, or scope for risk-taking, entrepreneurship and radical redistribution. This has implications for, for instance, what competencies and roles may be associated with the different financial actors.

4.4.2 Centralised versus decentralised government

The level of government centralisation can greatly influence the dynamics of clustering processes. In a country with a high level of centralisation of public institutions and decision-making power, the national government's role becomes relatively more important than the local/regional level, and vice versa.

Given that the central government exerts control not only over general rule-making but also keeps a firm grip on executive powers, there may be little room for local initiative and dynamic clustering processes. A cluster, per definition, necessitates decentralised decision-making capabilities. It may also be that a centralist state enforces a heavy concentration of resources. In decentralised countries, on the other hand, regions/states/provinces can be compared to small countries, which stand to benefit from pursuing cluster policies as a way to improve their local economy.

Beyond this generalisation, however, the question is which functions are centralised or decentralised. Centralising coordinating capabilities at a national level, while ensuring that local conditions allow for pluralism, may be favourable for clustering. In order for potent clusters to evolve, however, resources need to be raised and allocated locally, without having to be approved by national officials. Coordination and harmonisation across administrative units must be balanced with appropriate room for local stewardship and ownership of initiatives.

Whereas regional authorities are likely to possess superior insight into unique features of the local/regional economy, they may lack understanding of, and skills necessary to foster, private sector efforts. They may be too close to cluster programs and thus more easily captured by a hidden agenda for "picking winners", or be overly influenced by pre-conceived views of market potential/strength and weaknesses of the cluster. It is thus important that local actors are confronted with incentives to carve out niches for *specialisation*.

Local universities, with limited resources, have difficulty in developing internationally competitive research and tertiary education across-the-board, but may become greatly successful in niches. Prevailing funding and incentive schemes, however, tend to push each location to strive for obtaining a full-fledged university with all imaginable skills and functions believed to be part of an institution for comprehensive high-level education and research. Such forces run counter to prerequisites for critical mass in skills accumulation, and hinder universities to fulfil their role in, e.g., stages of analysis and building linkages.

4.4.3 Economies with primarily large versus small companies

Large companies typically enjoy an advantage over SMEs in many respects, including market power, access to funding and independency as larger parts of the value chain are in-house. They also have access to a deeper pool of human resources and expertise with strategic capabilities. They undertake greater investments in R&D and tend to be much more international in their uptake of resources and market reach.

Whereas the vast population of SMEs is greatly heterogeneous, the scope for more radical innovation is interwoven with risk-taking, flexibility and entrepreneurship. Whereas SMEs may enjoy an edge here, clustering and the associated cooperation with other firms may provide them with the crucial means to compensate for their lack of economies of scale at firm level. Success in that respect requires conditions that allow for a strong presence of complementary factors, such as a supportive business services sector and healthy conditions for the provision of seed and venture capital.

Economies with predominantly large companies naturally tend to obtain a stronger impetus from these in cluster initiatives. Focusing on the development of already-established core business, large firms can be expected to be highly selective and demanding in shaping external linkages, to keep their prices down and transfer development costs to their suppliers. Countries or regions where the majority of firms are directly linked to one company may thus not be well-suited for deploying cluster strategies. Chances for success will be improved by private sector business organisations that take on the role of establishing trust while maintaining SME integrity.

In Mexico, the Maquiladoras in Chihuahua[82] enabled the attraction of foreign capital that helped foster the formation of new firms. Partly due to the introduction of cluster initiatives, the region has, since the first introduction of Maquiladoras that had little connection with the Mexican economy, evolved from only undertaking manufacturing jobs to attracting higher value-added and knowledge-based operations, such as design offices. The pool of skilled labour has since risen substantially. In less developed countries, however, clustering processes critically require institutional conditions that can support organic and socially balanced internal growth processes based on the cultivation of traditional knowledge capital (Finger and Schuler, 2004). Intellectual property rights reforms, for instance, will hardly be of much use in the absence of institutions providing, e.g., micro-funding and other business services adapted to special local capabilities.

[82] See Learning workshop 9, "Chihuahua Siglo XXI: Lessons learned in a decade of cluster-formation processes in Latin America".

An illustration of the possible consequences of the dominance of big versus small firms is provided by the experience of East Asian countries. Japan, Korea and Singapore pursued successful industrialisation for decades through the promotion of large-scale manufacturing conglomerates, whereas the autonomous development of SMEs met with formidable barriers. This contrasted markedly with Hong Kong and Chinese Taipei where SME-based networks and clusters flourished. As conditions changed and crisis struck in the 1990s, the latter structures demonstrated their aptness for responsiveness. One of the subsequent priorities for reform in the relatively sluggish countries has become the search for ways to strengthen the performance of SMEs and independent firms, including through clusters.

4.4.4 Sectoral differences

Whereas clusters cooperate in various segments of the value chain, diverse competencies are required in different segments. In a cluster that centers around joint marketing and sales, communicative competencies are likely to be more important than in an R&D-based cluster, where technical knowledge tends to take priority. Business-oriented clusters may need to be complemented with more idea-generating competencies, whereas idea-based clusters may rather need the impetus of real entrepreneurs. However, the critical linkages that may need strengthening have to be determined in the specific case.

The critical source of knowledge likewise varies between sectors. As an example, the significance of the science base and its links to industry are vitally important in pharmaceuticals or nuclear physics. Industries are also marked by varying requirements in terms of "deep" competencies, capital requirements and sunk costs, competition in factor and product markets, mixture of speed and maturity in product development, influences of the demand side such as that of business requiring intermediate products versus end-users, the speed of adjustment and hence for skills upgrading, and so on. Some broad categories are shown in Table 5.

Table 5: Industry and competencies

Manufacturing	High-Tech	Health Care	Energy	Finance	Services
- Organisational Skills - Creativity - Ability to Deal with Ambiguity - Ability to Influence or Persuade - Communication Skills	- Interpersonal Skills - Ability to Influence - Technical Knowledge - Flexibility - Ability to Lead or Manage	- Analytical Skills -Knowledge of Business -Willingness to Learn -Ability to Lead or Manage	- Organisational Skills - Technical Knowledge - Flexibility -Willingness to Learn - Ability to Influence	- Ability to Influence - Ability to Lead or Manage - Creativity - Technical Knowledge	- Ability to Influence - Interpersonal Skills - Technical Knowledge - Ability to Deal with Ambiguity

Source: Watson Wyatt Research Study on Competencies (1998)[83]

There are obvious differences between high-tech sectors and those that are relatively more dependent on standardised production. The former are reliant on orderly national policies for science and technology enabling critical mass and front-line research, as well as for long-term and high-risk funding. They further need first-rate educational institutions and dense

[83] http://www.watsonwyatt.com/research/resrender.asp?id=W-99&page=3.

labour markets marked by high levels of mobility. The latter may be well-supported by more traditional bank-based financial systems and industry-based research institutes. Competence centres may need first and foremost to support appropriate functions for technology diffusion, but the connection to innovation remains important.

Even for industries with low R&D-intensity and where low labour costs represent a distinct advantage, there are now generally important opportunities for dividing and specialising different parts of the value chain. This may lead to the evolution of separate but linked clusters, located in different countries or regions which operate under conditions of sharply different costs, e.g., in terms of finance, wages, or logistics costs. The ability to reorganise operations in such ways and to develop, absorb and make use of new technology in all stages increasingly account for a decisive edge.

4.4.5 Cluster development in rural areas

While clusters thrive in labour markets with large pools of specialised resources within core activities, a rural, peripheral area may provide fewer opportunities. In some regions, it may be nearly impossible for any cluster to evolve. This could be the case in some peripheral areas displaying a high dependency on public sector services and subsidies, and where attitudes are unappreciative of entrepreneurship, risk-taking and cluster initiatives (Duncan, 1999). Marginal improvements in process technologies are generally embraced, but innovations that hinge on more radical experimentation and outsourcing tend to meet with resistance in such regions.

Rural regions are faced with other challenges as well. Physical distance from resource-rich areas makes information and knowledge harder to acquire (Lyons, 2003). Vicious circles of industrial relocation are common as industries migrate along with losses of the young and technically most susceptible community members, and there is a weakening of local demand. A cluster strategy may constitute one of the few viable counter-strategies in such regions, which face a compelling need to concentrate remaining resources in complementary activities. On the other hand, if resources are thereby misallocated, all may be lost. Attempts to concentrate and focus in such regions must be careful to draw on sufficiently attractive local assets, and work out innovative ways to keep strengthening them.

The quality of local governance matters greatly in this context. Unfortunately, for many years the main strategy in rural development has been to reassure the local population of sympathy and assistance, by offering social programmes and public ventures or backing for attempts to attract large-scale firms. However, large firms increasingly tend to locate in major agglomerations with a well-educated labour force and proximity to other strategic capabilities, including central policy-making (Florida and Gates, 2001). Lyons (2003) suggests that peripheral, rural areas must give priority to the upgrading of local business and entrepreneurs as the main vehicle for a revitalisation of their economies. SMEs tend to purchase a larger share of their inputs locally and be less-prepared to transfer production facilities, should conditions change. On the other hand, unless competitive units can be established, they will provide no basis for lasting prosperity.

Reviewing the empirical evidence, it is obvious that sparsely populated rural areas are not universally subjected to stagnation. Nor are they devoid of clusters which, on the contrary, may be important for turning downward trends around. Skills and innovations that emanate from the special features of peripheral regions can sustain clusters in the production and marketing of high-value-added products and services. Examples of unique capabilities of the north include cold-proof automobile equipment in Iceland or offshore-oil drilling in cold seas developed by Norway (Andersson et al., 2004). Rather than stemming from R&D, some innovations consist of new ways of responding to demand for space and untouched scenery, or by packaging services in exotic and unique bundles (e.g. the Icehotel of Jukkasjärvi[84], or the formation of an art and artisan cluster in southern Sweden).[85] With the appearance of ICT, competencies that are missing locally can be brought in through distant partners, who may also provide new marketing channels.

On the other hand, at closer scrutiny, some of these examples of what at first appears to be a cluster seem rather to reflect effects that are connected to the extraordinary effort of individual actors, with less profound cluster processes set in motion. This suggests that not all impacts are pervasive in the long run. In Atlantic Canada, for instance, the significance of apparent cluster initiatives has been found to be exaggerated (ISRN, 2002). While the potential of positive contributions from clustering in such regions should not be dismissed, one must thus not be led to underestimate the difficulties.

Although authorities should avoid "picking the winners" in terms of which firms and industries merit support in a specific country or region, they do need to prioritise investment in infrastructure and support of public goods, e.g., in science or education underpinning certain activities. In distant regions with "thin" resources, such choices are inevitably sharp if critical mass is to be ensured. With innovation coming into focus, "propping up" faltering specific existing ventures must be avoided. There is ample experience of local development in different countries showing that "letting go" of sunset industries tends to be pivotal for revitalising new ways forward. Only then can positive energy and creativity be brought back, and human resources be "freed up" to develop new ventures.

Cluster policies need to include considerations to the availability of attractive living or office facilities, educational opportunities, meeting places, social activities, etc. Specific networks of human relations are essential (Asheim and Isaksen, 2002). These may be partly local and partly national, international or global. However, what can be done in a specific region to develop its nodes as well as to hook them up to the outside world is *best known locally*. It is only at that level that a specific competitive edge could be made to emanate from the available unique combination of cultural and technical skills and traditions residing in the work force, specialised suppliers, demanding customers, and so forth.

4.4.6 Developing countries and transition economies

Clustering processes in developing countries and transition economies are marked by a high level of heterogeneity. In the context of developing countries, for instance, one commonly distinguishes between three kinds of clusters with sharply varying prospects: i) those that

[84] For further information on Icehotel, see http://www.icehotel.com/
[85] Östra Skånes konstnärsgille, http://www.oskg.nu/

include many small firms that are mainly surviving; ii) clusters organised around large-scale production; and iii) clusters based on transnational corporations (Meyer-Stamer, 1998). The first of these cluster types is commonly mired in difficulties, confronted with few opportunities for technological upgrading and subjected to sharpening competition. Firms belonging to this category are often important for employment and income distribution. Improvements may be attainable under conditions marked by strong economic growth and domestic demand, and given a sufficient drive for upgrading efforts by the entrepreneurs themselves, but often prospects are dire. The second and third categories have better prospects to upgrade technologies and access expanding markets, but represent fairly low numbers with the exception of a few - generally large - developing countries.

This kind of characterisation conveys important insights regarding the diverse conditions facing firms, clusters and other actors in developing countries and transition economies. At the same time, there are some important commonalities with implications for cluster development in developing and transition economies. The classic weaknesses experienced by SMEs, for instance, tend to be particularly pronounced in developing and transition economies. This applies to the reliability of transactions and the underdeveloped supply of relevant professional services in market intelligence, logistics, technology absorption, and so forth. The reasons partly have to do with the state of regulatory conditions and undeveloped markets, but also traditional value systems and attitudes which continue to account for misallocation in education and training, and less diversified financial markets which sharpen resource and liquidity constraints.

Overall, in developing countries, interactions between firms or firms and other relevant actors are impeded or complicated by the fact that fundamental institutional, regulatory and market conditions are unstable, underdeveloped, and/or unfavourable. Poorly functioning institutions and framework conditions have far-reaching, and in many cases very negative, impacts on cluster processes in these countries.

Another factor shared by many developing countries and transition economies is the potentially large influence of external impulses on transactions, resource allocation, clustering processes and, ultimately, economic growth and competitiveness. These impulses may come from international organisations, bilateral donors, creditors or MNEs. In this section, we examine some of the specific challenges that tend to characterise or affect clustering processes in developing countries and transition economies.

The importance of the level of development

Although much of East Asia and especially China, as well as a few additional countries such as Chile in Latin America or Botswana in Africa, have developed strongly, most developing countries are struggling as reflected by persistent resource constraints and skills shortages. The income or development level matters greatly for several factors influencing the viability of cluster initiatives, and for related policies. These factors include the qualities of the regulatory framework and its implementation, including basic requirements of law and order; physical infrastructure; the sophistication and depth of financial markets; the quality of educational institutions and labour skills; and the protection of intellectual capital. Arm's-length transactions may be unreliable and costly, favouring the expansion of individual firms

or groups of firms with tightly controlled affiliates. In developing countries, such internal markets have been seen to improve resource allocation (Amsden, 1989; Chang et al., 1999). On the other hand, where institutions are weak, those firm structures also involve costs (Rajan et al., 2000).

Often reforms have not been lacking, and waves of deregulation and liberalisation have made product and factor markets more flexible. In the Middle East, for instance, this applies to the efforts of Algeria and Egypt to integrate science and technology with their development policies, while countries such as Morocco, Tunisia, Jordan and Kuwait applied more demand-oriented processes and have had greater success (Aubert and Reiffers, 2003; Schackmurove, 2004). Still, a lack of coherence and ability to focus on the real impediments limit what progress has been made. In many developing countries, heavy regulations concur with a lack of orderly market conditions and corruption (Djankov, 2001; Batra et al., 2003).[86] This, combined with the exploitation of weak groups, such as women and the young, drive entrepreneurs into the informal economy. Few enjoy social protection or pension schemes, and entrepreneurs abstain from reporting profits or undertaking investments in order not to draw attraction from lawmakers. There is also a lack of mentors and organised structures for counselling to help show younger entrepreneurs the way.

In regard to SMEs and entrepreneurship, priorities for reforms in developing countries include: 1) making it easier to start a business; 2) easing labour regulations in order to make it more flexible to employ or reduce employment as a response to changing market conditions; 3) improving legislation for contract enforcement; 4) enhancing programs to facilitate access to credit; and 5) improving legislation and practices for closing down or restructuring business (World Bank et al., 2003).

Conditions for innovation are similarly deficient. In this respect, Mytelka and Oyeyinka (2003) identify five types of systemic weaknesses common in developing countries, which crucially need to be addressed:

- Organisational rigidities and obsolete or inappropriate institutions which hinder adjustments conducive to acquiring knowledge.
- Sub-optimal knowledge networks accounting for limited, if any, interactions between critical actors.
- Path-dependent systemic failure, with inertia resulting from self-reinforcing obsolete networks that fear change.
- Organisational ineffectiveness accounting for, e.g., weak connections between research and training facilities and the surrounding society. This makes the supply of skills and knowledge production unresponsive to societal needs. Whereas many organisations need reform, including policymaking institutions themselves, the competencies required for implementing it are largely lacking.

[86] One indicator of corruption is the *Corruption Perceptions Index* compiled by Transparency International, http://www.transparency.org/index.html

- Fundamental institutions and playing rules such as transparent rules of the game, enforcement of contracts, intellectual property rights, etc., are largely lacking. This creates huge gaps and severe inefficiencies in innovation systems.

Raising competencies and clustering

The overall policy framework naturally matters crucially and, as noted in Box 5, in this respect there have been major but diverse changes across countries. These have also been related to the extent to which FDI has brought in capital and technologies from abroad. There are examples of FDI relating effectively to, and further strengthening, local clusters as in the Baltic countries (van Beers, 2003). Meeting demands of just-in-time and total-quality-management production systems may combine pressures for investing in supply networks and upgrading of small suppliers with information on how to do it (Humphrey and Schmitz, 1995). Chile provides an example of a country explicitly supporting clustering by upgrading competencies and capabilities to absorb technology in subcontracting firms, notably SMEs.

Whereas many of the needs for reform are known, progress is notoriously difficult. The actions by the various key societal actors matter greatly. Firms themselves critically need to strengthen their internal capabilities (Sonobe et al., 2002). Cluster processes and relations may provide an alternative way for them to build a platform for such upgrading, in contrast to interactions with inefficient and/or unfriendly public authorities.

In developing countries, the cluster approach may be particularly crucial for enabling SMEs to overcome barriers to export markets while building required complementary competencies. By joining forces, SMEs can strengthen their bargaining power and obtain the critical mass needed for enabling the development of supportive professional business services or the means for expansion. As exemplified by the carpenter cluster of Nakuru, Kenya, (Sverrisson, 1992) the organisation of business networks may offer a way of flexible specialisation for small local firms, enable more diversified output, specialised technical configurations and flexible labour organisation. Social rather than technical means are often crucial as stepwise technical upgrading must be accompanied by adjustment in local attitudes and working habits. Within clusters, traditional methods for collective resource use can be applied in a modern setting, for instance, with machinery flexibly distributed and applied. Here, clusters also tend to offer better-than usual opportunities for marginalised workers, including women and youth.

Cluster initiatives can also help compensate for deficiencies in intellectual property rights. In traditional knowledge exploitation, it can be virtually impossible to ascribe certain rights to any person or organisation in terms that would have the slightest chance of being defended internationally. A cluster approach can be used to promote a region and brand it in ways that enhance its originality by way of exploiting its products, e.g. "champagne" becomes associated with a region. From the resulting awareness among customers springs the basis for value-added in the form of a specific image which is very difficult for competitors to imitate or undermine. Examples include Caribbean and African music, or arts in the Pacific Islands (Finger and Schuler, 2004). A cluster organisation may help develop alternatives for protecting forms of traditional knowledge that are under pressure, through means sharpened by collaboration among multiple players in a specific region.

Box 5: On the evolution of development perspectives

Proponents of *balanced growth theories*, such as Rosenstein Rodan (1943) and Nurkse (1953), claimed that developing countries should promote a range of industries simultaneously. This was related to the idea of the *Big push* (Nelson, 1956). Meanwhile, Prebisch (1950) claimed that international trade only reinforces under-development and that it creates a *center-periphery* relationship. Protectionism in trade and *import-substitution* strategies were put forward as the basis for a self-sustaining development path. Hirschman (1961) argued for the inducement of entrepreneurship and investment decisions through backward and forward linkages. His theory of *unbalanced growth* opted for a policy of promoting a few key sectors with strong linkages, then moving on to other sectors to correct the disequilibrium generated by the initial investments.

Many Latin American and African countries have, for decades, followed strategies of import substitution and used protective barriers in order to support domestic industries, often referring to arguments such as protecting *infant industries* and allowing for *learning by doing*. In general, results were poor. By contrast, many Asian countries embraced strategies that have a stronger element of outward-looking export strategies. While they also promoted the expansion of certain sectors, they opted for capturing economies of scale in production, and attaining competitiveness through expansion in international markets.

The attitude of inward FDI was mixed at the time. Whereas MNEs were seen as a prolongation of colonialism, developing countries were eager to maintain the profits generated by FDI, if necessary through expropriation. However, this was gradually realised to discourage investment, as expounded in the theory of *obsolescing bargaining* (Vernon, 1977). As an alternative means to magnify local gains, many levied *performance requirements* on MNEs in the 1960s and 1970s, requesting contributions by MNEs to the local economy through trade, technology, employment, and so forth.

The effectiveness of those instruments was also called into question, however, and increasingly viewed as distorting investor behaviour in unwanted ways. In multilateral negotiations under the auspices of the WTO, countries have agreed to rules strongly delimiting the scope for levying such requirements on investors. Inward FDI has generally become seen as an important instrument for obtaining needed capital, technologies, and capabilities in market access. At the same time, FDI has remained concentrated in a few developing countries, and the gains have been uneven. Strategies of developing countries have shifted to enhancing the business environment for FDI as well as domestic firms, and to boosting the absorptive capacity of the latter as a means to induce greater transfers of technology and skills (Mudambi, 2002).

Whereas comparative advantage favours labour-intensive industry, ongoing industrial restructuring across South Asia, Africa and Latin America provides no strong expansion of manufacturing production and employment in that direction. Some capital-intensive industries fare better but their contributions are generally modest at best. Where the business sector makes significant contributions, SMEs now play an important role and expanding industries are able to demonstrate technical upgrading and enhanced innovativeness, including in services.

Transition economies

The situation of transition economies is often radically different from that of developing countries, although the heterogeneous nature of both groups should be kept in mind. Since 1989, their situation has hanged dramatically over a very short period. Transition economies are nevertheless still marked by their history of stark public ownership and dominance over resource allocation, with property rights concentrated in the hands of a few central planners. There is the experience of substantive investment in basic science, education and training of certain kinds, whereas access to other skills used to be withheld. There is also the common heritage of massive past expansion of heavy industries, whereas many consumer products were sorely lacking.

The classic weaknesses experienced by SMEs tend to be particularly pronounced in transition economies. This applies to, for instance, the reliability of transactions, or the underdeveloped supply of relevant professional services in market intelligence, logistics, technology absorption, and so forth. The reasons partly have to do with regulatory conditions and the way red tape is maintained or finding new expressions. Many officials still lack the skills and training that would allow for effective reforms and institutional support of market mechanisms, and changes in government often bring unexpected alterations in the playing rules. Traditional value systems and attitudes continue to account for misallocation in education and training, and less-diversified financial markets which sharpen resource and liquidity constraints.

Transition economies have a marked history of adverse sentiments in regard to entrepreneurship, although it existed and sometimes even flourished under harsh circumstances (Kornai, 1992). Today's entrepreneurs in these countries carry that heritage. To some extent, they comprise the survivors of the old file and ranks. In others, they constitute the young whose practices contrast sharply with the old ways. In both cases, they may still confront widespread suspicion in their societies. This has implications for trust and networking, and the viability of top-down versus bottom-up approaches (Smallbone and Welter, 2001).

In the transition economies in Central and Eastern Europe, similarly to prosperous developing countries, SMEs have contributed strongly to an impressive economic performance. Nevertheless, the official figures show that SMEs and entrepreneurs operate under severe financial constraints coupled with heavy distortions. Finding forms for reinforcing clustering processes is now viewed as greatly important. Notably Slovenia, Hungary and the Czech Republic have embarked on policy programmes, including public investment, for that purpose. It will be crucial to let go of national control, and carefully anchor trust-building exercises among multiple, relevant stakeholders. It will also be important not to be flooded by external impulses but to proceed with broadly-based skills upgrading at home. The next few years present special opportunities as well as challenges for SMEs now engaged in the rapid opening of new markets through the integration of their domestic markets with the European Union (Schwaag Serger and Hansson, 2004). More effective cross-border linkages need to be combined with measures to strengthen the reliability of the domestic business environment.

International engagement

Again, several of the multilateral organisations, e.g UNIDO, UNCTAD, the World Bank, USAID, and the Inter-American Development Bank, are now professing a cluster approach for both developing countries and transition economies to enhance the development of SMEs, technology upgrading, employment and growth.[87]

Actors with global experience may bring in an outsider's point of view, and provide inspiration on the basis of knowledge of competitive strategies in other countries. Such an outsider may also take on the role of a neutral broker between domestic actors, given that it is able to appear as more independent and neutral. It can, for instance, help arrange with sound monitoring and evaluation practices while enabling financing of otherwise unattainable knowledge transfers and resolving critical bottlenecks. At the same time, the experience of other regions or societies cannot easily be emulated. Drawing lessons from elsewhere requires intercultural skills and talented facilitators.

UNIDO does not view its programmes as a panacea but tries to inject elements that can enhance responsiveness to demand in cluster policies targeting already established networks. Incentives are not purely financial, but UNIDO consistently uses study tours with visits to "best practice regions" and training programmes. It further practices that cluster initiatives should refrain from forcing formal systems onto networks that had better remain informal in order to support established success factors. In this way, donors can help build competencies and aid policy-learning processes, instead of building technological capability. Donors can provide valuable knowledge through networks for north-south as well as south-south dialogue. They can support processes of foresight and assist in strategising activities to support local centres of excellence (Mytelka and Oyeyinka, 2003). An external actor performing such functions should exercise long-term commitment, given the time it may take for learning processes to produce tangible results in developing countries. UNIDO estimates that three years is a minimum for expecting positive changes to come about following engagement in a project.

As indicated above, traditional means practiced by international donor organisations have tended to form dependency relations that are difficult to break for bilateral and multilateral development agencies alike (Drazen, 2000; Ellerman, 2001). The impetus is worsened because outside expertise is offered below costs or "for free". A developing country's needs are always immediate and pressing. The sheer size of foreign aid creates a prize for interest groups to fight over (Alesina and Weder, 2002). Further, development institutions are tempted to appear to always "have the answers". Funding and management pressures in development agencies push for quick and easily monitored solutions of giving out the "answers" to the clients' problems as opposed to the time-consuming, difficult, and hard-to-monitor process of helping clients to learn how to find the answers themselves.

Development assistance in the form of knowledge does not "travel" as well as money or material aid, but assistance should shift focus from transferring codified towards raising tacit knowledge. In a codified description of a "best practice" case study, the uncodified tacit

[87] Miniforum 12, on "Donor funding of competitiveness initiatives: results to date and future", describes some of these initiatives.

knowledge is often "the rest of the iceberg". Some tacit knowledge might be transformed into codified information which can be transferred by conventional methods, but the remaining part needs to be transmitted by special methods such as apprenticeship, secondments, twinning relations, and guided learning-by-doing. Cluster initiatives can serve as a platform for operational knowledge transfers, learning processes, and innovation. In order to use this instrument effectively, however, development agencies need to upgrade, and anchor more broadly internally, their own competencies in this area.

MNEs, finally, are major players in many developing countries and transition economies, and their contributions to build-up of local research facilities, for instance, may make a tremendous difference. It will be important for the long-term prospects of these firms in their host countries to arrange such contributions in a way that is seen as honest and productive. At the same time, these firms are commercially-based and cannot be expected to provide major grants to countries they invest in, even for goodwill purposes. They are also faced with a credibility problem which makes it difficult or even dangerous for them to assume a lead role in local cluster initiatives. MNEs should be mindful to move in a responsible manner and assume a supportive, constructive stance in regard to local cluster initiatives in these countries, realising that they may lead to the emergence of stronger and better-informed local competitors but also to more competent local partners. At the same time, they should try to stay neutral in regard to such initiatives.

Implementation and evaluation

The development level further influences conditions for the actual *implementation* of cluster policies, e.g., through skills and institutional mandates. In many developing countries, and especially LDCs, very limited research is undertaken in the private sector whereas most universities and traditional faculties are marginalised. Critical issues concern how to combine a drive for academic excellence with openness to science-industry interplay. There is also the widespread influence by vested interests over political decisions. This makes room for political discretion at the expense of SMEs and under-privileged firms, and worsens the presence of agency problems in public funding as well as in foreign financial contributions (Scleifer and Vishny, 1994; Mauro, 2002; Tangkitvanich, 2004).

Because of the rudimentary stage of financial markets in developing countries, there is a need for pro-active brokers, a role that is sometimes assumed by international donor organisations (Ceglie and Dini, 1999). Reliance solely on public funding, even if attainable, is generally not desirable as this most likely will result in heavy distortions, imbalances and agency problems. Market cost recovery programmes that could be offered to private Business Development Service (BDS) providers represent one vehicle to ensure that beneficiaries do not get accustomed to subsidies, or that companies do not become dependent on unviable service providers.

Whereas there are weak prospects for policies in developing countries directly supporting the creation of new clusters, shaping conditions that are nevertheless conducive to the emergence of clusters, e.g., through the impetus of revamped infrastructure - physical and institutional – is important in countries where the influence of vested interests is strong. This is not least relevant in transition economies where innovation policy is also battling a

cumbersome, protracted challenge of how to partly (re)construct social capital. There is the need for re-orienting the way some well-established, and in many respects most capable, institutions work and relate to society. There is the task of re-skilling generations of scientists who resist letting go of past formulas for rigid compartmentalisation of their institutions. Transforming university to industry links in a piecemeal manner may be a slow process.

Compared to drastic reforms in funding practices, which may cause serious decay of potentially valuable resources, cluster processes can help set in motion spontaneous change. Cluster initiatives can activate actors locally for common development purposes, diffuse responsibilities and muster commitments more widely than among politicians or a few business people. In developing countries, however, cluster policies are generally top-down and real impacts will require a fundamental change. UNCTAD (1998) stresses that policies should be tailored to local conditions based on a participatory, demand-driven, bottom-up approach.

Evaluation and monitoring is warranted not only for measuring the efficiency and effectiveness of cluster policies, for understanding causal links between activities and outputs in order to provide strategic information, but also for purposes of underpinning broad commitments to objectives and strengthen incentive effects. In developing countries, evaluations may be particularly needed in order to:[88] i) support policy learning, especially on institutional networking and cooperation; ii) disclose dysfunctional elements of the economy and the institutional set-up; iii) increase the visibility of entrepreneurs that join the cooperative efforts and the impact of the cluster initiative on their businesses and the local economy; iv) improve understanding of impacts on poverty alleviation and income distribution; v) make progress in project implementation; and vi) identify/understand connections between the evaluation of clusters and governance structures. In the next section, approaches to evaluation are discussed more extensively.

4.5 Evaluation

Evaluation is basically understood as a set of systematic tools through which actions and processes can be measured and assessed. Given the absence of market outcomes to guide policymaking, evaluation is particularly important as a means to guide public actions. Ex post assessment of outcomes represents only part of the required framework, however.

There is no 'one model' for cluster policy or for cluster evaluation. This type of policy is based on an element of 'trial-and-error' which, however, makes evaluation more rather than less important. Resources and expertise available for evaluation are scarce, especially in developing countries, and approaches should be designed with a view to what findings are most important and most conducive to policy learning.

Most fundamentally, basic knowledge of clustering processes is often lacking. There is a scarcity of relevant official statistics. Identifying clusters, especially in their infancy, as well as

[88] Studies of Colombia, El Salvador, Honduras, Jamaica, Jordan, Mexico and Nicaragua offer examples of useful lessons (Ceglie and Dini, 1999; Fox, 2003; Competitiveness Team, 2003).

obtaining data on regional and cross-border flows, is notoriously difficult. For such reasons, policymakers need better information and knowledge of patterns and processes with regards to:

i) The volume and intensity of cluster development: number of firms, employment, production, exports, performance, etc., and the growth of these variables;

ii) Cluster impact: creation of new firms, growth in output, profits and exports, the number of innovations produced in cooperation, etc. However, the well-known attribution problem seems to preclude the establishment of causal links between the existence of a cluster and such effects. Using a control group of non-clustered firms could be one response to this problem;

iii) Cluster policy impact: existing studies generally use the same variables as above, coupled with satisfaction enquiries with beneficiaries of policy instruments, to approach the policy impact question. Usually, insights are limited to policy effectiveness. Overall, this area of policy evaluation is still largely undeveloped.

Meeting these demands is in part a matter of improved monitoring. The mere awareness of processes and objectives can assist in shaping more favourable government attitudes and strategies. As the entire field for scientific discovery and technological development and diffusion has evolved, internationalised, and become subjected to much more fierce competition, governments around the world have become mindful of how to improve policies, and also susceptible to critical scrutiny of current practices. This has led to the parallel launching of new programmes in North America, Europe and the Pacific (Meyer-Krahmer and Montigny, 1989; Osborne and Graebler 1993; OECD, 1997; Ruegg, 1998; Georghiou, 1995).

Although evaluation is needed to help guide resource use and end-results, more is not always better. Practices and methodologies should be adopted with a view to the benefits as well as the costs involved. The latter includes the burden of time requested from market actors to respond to interviews and fill in questionnaires. The benefits conversely depend on the willingness and ability of policymakers to make use of the results. As the topic of evaluation is a technical one, and not high-profile in political terms, it seldom gains full attention at the highest levels of decision-making. Insufficient attention may also, however, be caused by insufficient capacity to receive and process the results of evaluation. That may particularly reduce the returns from sophisticated measurement techniques generating complex insights.

Meanwhile, it is difficult to measure under what conditions cluster policies generate favourable results for society, as opposed to merely *backing the winners*. Assessments of clustering, and the associated economic importance of collaboration and partnership, do not always lend themselves to meaningful quantitative estimates of socio-economic impacts. Benefits are often indirect and diffused among stakeholders. The time horizon renders difficulties since some benefits materialise only in the long term. Cluster policies to some extent attempt to move away from the suboptimisation and lack of relevance in traditional policy approaches. Experimentation, customisation and adjustment of traditional measures are part of the goal.

Evaluation must thus come to terms with the nature of clustering and find ways to address economic outcomes more broadly. The task is partly to measure the specific contribution of collaborative action as opposed to the outcome that would have been observed in the absence of a clustering initiative, i.e. to measure *additionality*. Given the systemic nature of the policy challenge, it is also about being able to add up observations of individual programmes to the level of overriding *effects*, where policy consistency and first best solutions can be gauged.

As part of this, evaluations should increase understanding of issues that arise because of externalities and problems for actors to internalise payoffs. The participatory as well as systemic nature of the cluster process requires understanding of behavioural responses and opportunity costs for the actors involved. Input-output tables can be calculated to measure the nature and intensity of cluster interactions, especially with regard to market transactions and in the case of external linkages (DeBresson and Hu, 1999). Other techniques, including questionnaires and case studies, may be applied to gauge linkages that are informal and internal to clusters.

There should be explicit examination of relevant overt or covert conflicts. This may include both private firms that refrain from potentially beneficial cooperation, and policymakers or public authorities in charge of domains and institutions whose functioning displays inconsistent features. Are there problems of moral hazard, so that actors adjust to policies in ways that are undesirable?

These kinds of concerns contribute to new developments and experimentation in the evaluation of cluster and innovation policies. Networking and increased exchanges of experience, and also the mobility of people between jobs, regions, and traditionally-separated social spheres such as the public and private sectors, are studied as possible means to remedy weak links in innovation systems. Attention is now paid to the value of networking and mobility in socio-economic assessments. Attempts are made to treat networks as assets in themselves. Australia has measured changes in "research culture". Austria has tried new ways to measure additionality in the delivery of public services promoting collaboration in pre-competitive research or innovation (OECD, 2004).

Various procedures should be followed to ensure that the potential of evaluations to underpin effective policies is fulfilled. Sloppy evaluation aiming at mere advertising must be counteracted. Advanced techniques, such as full-fledged cost-benefit analysis, use of control groups, and calculation of societal returns, should be applied when possible and reasonably effective. Already before a policy is implemented, it should be clear what is to be measured and how.[89] There should be proper communication early on. At the same time, evaluations should relate to continuous monitoring schemes. Interim evaluations could be used to assess whether processes are on track, and to muster collective reflection and inspire adjustment of behavioural codes and decision parameters.

As for indicators, publications, patents, new products, or new firms, may be preferred as intermediary indicators of success. Variables such as profitability, job creation, growth, or welfare, ultimately need to be in focus. A combination of methods, with consideration to

[89] From Miniforum 4, "Evaluation of cluster performance".

data-availability, is normally preferable. Evaluations should also be pursued in ways that are consistent with a portfolio perspective, i.e. experimentation is useful and individual cases must be allowed to fail.[90] External, independent players should be in charge, but cluster actors should be engaged in collecting information, including information on their interface with other components and agents involved in the programme. They could also be encouraged to identify new, relevant indicators during the course of the project.

In short, ex post assessment represents only one stage of the evaluation process. The necessary stages include the: i) ex ante formulation of objectives and of the framework for implementation of the policy measure as well as of the evaluation; ii) selection of evaluation criteria, levels of observation, etc.; iii) monitoring of the programme over its lifespan; iv) the ex post assessment; and v) feedback, communication of results, and the implementation of the lessons learned. In this cycle, evaluation goes beyond serving as a tool for measurement to comprise a process and a policy instrument in itself, although views differ on the extent to which strict criteria should be applied or room be granted for gradual adjustment and discretion in learning. Evaluations can be used to help sharpen and communicate objectives and shape incentives for actors engaged in programmes. Correctly arranged, they can help broaden the understanding of, and the support for, what a programme is trying to achieve.

Although evaluations should not become general, and their results must stay operational, the achievement of narrow, short-term objectives as a result of individual policy actions in principle deserves less attention than impacts attained through a broader strategy over a longer time period. At the same time, assessments should address what is realistic with a view to what clusters can achieve as well as with consideration to what can be measured and at which cost. What is most essential in the wider policy context is what learning can be extracted for key actors. This includes the learning process for policymakers themselves, so that their ability to make use of the results of evaluations increase. The framework should stimulate an *evaluation culture*, and counteract shallow use of evaluation of clusters for marketing purposes.

Thorough evaluations of specific cluster initiatives and cluster actions are in fact few and far in between, and have been fully developed only in a handful of countries (European Commission, 2002; Shapira and Kuhlmann, 2003). Few solid attempts have been made to assess whether first-best results are obtained, go beyond efficiency in use of given resources to encompass economic results, or take into account interactions and synergies in the performance of different actors. Further, most evaluations of cluster policies pursued still focus on single tools, which fits poorly with the systemic notion of cluster policy. On the other hand, in developed and developing countries alike, today one can come across a wealth of studies that provide interesting insights into various aspects of cluster initiatives and cluster policies, as well as how they can be identified and measured. In Sweden, VINNOVA has embarked on an ambitious evaluation scheme in cooperation with IKED, on the development of a guide for evaluation of systemic innovation policy.

Apart from government, the other actors engaged in clustering naturally benefit from measuring the effectiveness of their own investments, but few have the incentive to devote resources to assess socio-economic outcomes. They inevitably rate performance on the basis

[90] Mats Benner, internal IKED Whitebook seminar (2004).

of their survival or results in terms of profitability, etc. This is not to say that they should leave the task of evaluation to policymakers. Pressures for critical evaluations can be equally effective coming from various directions. In this way, the actions taken by various players may help build awareness and mobilise the needed efforts.

An IFC, for instance, may improve chances for strengthened performance if engaged early on to develop statistics for gauging and communicating effects on performance and competitiveness for firms in the region, as well as benefits of cluster initiatives and associated policies for society. Media, by educating and putting on-line skilled journalists who can relate to and raise interest in long-term community values, can be the key to a better informed general public and to broadened participation by firms or other stakeholders to the clustering process. Indeed, there is a range of private actors who are likely to be similarly reassured by knowing that socio-economic effects are measured and that public actors and the general public will be kept informed of the value of ongoing programmes. The informed demand of key cluster actors themselves may be essential if public authorities are to make the effort to put in place frameworks for comprehensive evaluations.

PART II

This second part of the Cluster Policies Whitebook presents summaries from the miniforums and learning workshops held in Gothenburg. Each miniforum and workshop was summarised by a member of a group comprised of specially selected Ph.D. students from leading Swedish universities and some representatives from International Organisations. The summaries present a diverse range of subjects and can be viewed in part as stand-alone pieces with value of their own.

In compiling the summaries of miniforums, the authors were asked to comply with a framework of: i) identifying the objectives; ii) summarising the key discussions and conclusions; and iii) highlighting the implications for policy of the respective miniforum. The summaries are largely included in their original version as they were submitted. Editing has with a few exceptions been limited mostly to stylistic and grammatical changes.

The miniforums, fifteen in total, can be grouped into three different themes: i) The first theme centres around specific aspects or conditions which affect clusters, clustering potential; ii) The second theme can be described as focussing on specific challenges for policymakers with regard to clusters;, and iii) The third set of miniforums can be categorised as placing the concept of clusters in a more theoretical framework. Finally, two of the miniforums were outside the above mentioned categories and had a specific thematic or regional focus.

There were differences in the target groups of the miniforums, as reflected in the themes and also in the representation of the miniforum participants. Even though the miniforums were geared towards different groups, and the resulting discussions occasionally were biased towards certain actor categories, most conclusions are of general interest to all cluster actors. Each summary ends with a section that focuses on outcomes and implications of relevance to policymakers.

The learning workshops were aimed at providing insights and experiences from so-called mature cluster initiatives, defined as initiatives that have been in existence for at least five years. Thus, in each learning workshop a cluster initiative was first presented by a representative of the cluster initiative; and then specific aspects of the initiative and the overall impact of the initiative, were analysed or evaluated. One of the purposes of the learning workshops was to lead to conclusions or lessons that might be of use to new or planned initiatives. In summarising the learning workshops, the authors used the Cluster Initiative Performance Model (CIPM)[91] to structure their summaries according to: i) the objectives of the cluster initiative; ii) the social, political and economic settings; iii) the cluster initiative development processes; and iv) the efficiency of the performance of the respective initiative. [92]

[91] See Sölvell et al. (2003) p.9.
[92] See Appendix B for the Learning workshop evaluation form.

MINIFORUMS

1 BUILDING SOCIAL CAPITAL AND TRUST AND CIVIC ENTREPRENEURSHIP

Introduction: David Wolfe, University of Toronto, Canada
Facilitator: Björn Terje Asheim, Lund University, Sweden and University of Oslo, Norway
Summary: Lars Coenen, Department of Social and Economic Geography, Lund University, Sweden

1.1 Objectives

This miniforum explored the topics of social capital, trust and civic entrepreneurship. Particular attention was paid to whether such assets can be consciously created or developed. Social capital and trust refer to various "soft" but fundamental features of the organisation of a region, such as the presence of shared norms and values that facilitate coordination and cooperation among individuals, firms and sectors to their mutual advantage. Understanding innovation as interactive learning implies that cooperation is necessary to make firms and regions competitive. Therefore, building social capital is a key instrument in promoting cooperation within firms, in clusters of firms and in regions.

Social capital can be rooted in civicness but can also result from organisational and institutional innovations. The latter are most relevant in this context, as they can be consciously shaped or achieved, while the former type – civicness - only can be built upon.

The existence of social capital depends on the ability of people to associate with each other, and the extent to which their shared norms and values allow them to subordinate their individual interests to the broader interests of the community. It secures the conditions that enhance the benefits derived from more tangible investments in physical and human capital. As outlined above, the concepts of social capital and trust help us understand why certain kinds of economic activity tend to cluster despite the opposing trend towards dispersal brought on by the spread of globalisation.

1.2 Key discussion and conclusions

Introduction

As indicated above, social capital refers to the intangible aspects of the social organisation of a region or cluster that facilitate collaboration among economic actors. Social capital is a community-based asset shared in and by the cluster or region. It is considered an externality for the individual actor, as it has no price and cannot be purchased, yet its value arises from its facilitating cooperation and knowledge flows under certain conditions.

The existence of social capital is partly rooted in a communitarian notion of historical and cultural factors in a given region. As such, social capital can be a problematic concept in North America where such historical background is lacking, at least in comparison with Europe, which can result in lower trust. However, examples from Silicon Valley make the case that '*swift trust*' can be established based on the performance and dense interactions between economic actors. Through social organisations, institutions for collaboration and informal organisations, such swift trust can therefore be created, underpinned by a common economic agenda.

Discussion

It is contended that '*soft development factors*' are a critical component of social capital build-up as they yield social knowledge at the community level which in turn stimulates learning-by-learning. A "soft" development factor, like for example talking, is essential between economic actors in order to align and create mutual interests and arrive at a common definition and perception of the opportunities that lie ahead. However, talking between economic actors is not as straightforward as may appear at first glance. It involves a genuinely different role for public sector agencies shifting from a command and control mindset to a position of mere participation or just being one of several actors in a process, or to a position of facilitator and/or coordinator between economic actors.

Concrete ways to bolster soft development factors are by stimulating community leadership, civic entrepreneurs, stakeholder roundtables to develop broadly supported visions and strategies, and creating multi-year orientations to identify strengths and weaknesses in cluster development. An example is given by Canada's National Research Council that in recent years shifted away from being a pure public research institute to one that transfers technology into the economy. However, this example also illustrated that recipients and stakeholders need to have an absorptive capacity, which emphasises the need for social capital and soft development factors in general.

Based on the above, the question arises as to what a region can do? It is argued that human and social capital should be combined and build upon each other through broad participation of firms and employees in cluster initiatives. Organisational innovation as a mechanism for fostering social capital and trust is also important to enhance the performance of a firm and/or the competitiveness of a region. This is illustrated by the implementation of ICT which, to a large extent, hinges on the adoption of complementary organisational change. If you have or can build social capital, technical innovations can thereby be made more efficient.

How can policy-makers support the accumulation of social capital within a cluster? One possible entry-point is that of industrial associations. Most such organisations have traditionally focused on advancing vested interests, but today encounter new pressures and challenges. If they display a disposition to become agents of change, as opposed to limiting their action to one of lobbying and protecting status quo, they may be effective in strengthening social capital in a cluster. One should, however, be aware that industry associations ruled by large firms can be under significant pressure to withstand cluster initiatives with a SME focus, or may seek to dominate the process. Another possible

drawback is the fact that sectoral organisations such as industry associations are often nation-based and do not focus on the community level. Yet, to build social capital, facilitating community-based leadership is of prime importance. It is thus argued that leadership in social capital enhancement efforts may be undertaken by different types of actors, even if a preference for non-industry, non-governmental actors can be noted. It is decisive that the leadership manages to create certain consensus among the actors in a cluster. In this context, informality can serve as a major enabling factor, as it can reduce transaction costs and, if rightly used, may help overcome vested interests that form a barrier to the advocacy of change.

The role of social capital in transition countries deserves special attention. As transition economies are moving towards a shift from national focus in policymaking towards both paying more attention to the global economy and cultivating local assets, new opportunities arise at great speed. These arise due to the historical context, which is marked by strong technical and cultural skills that may serve as effective building blocks for social capital, although commercial skills have been lagging. Bottom-up, hands-on actions and interactions between local players (for example through stakeholder conferences) facilitate the creation of collective awareness that can pave the way for increased mutual trust.

Social capital can, however, also be social inertia. In other words, one has to distinguish between change-inductive and the change-hampering social capital. Examples of change-hampering social capital are vested interests and conservative norms and attitudes. It is therefore important to realise when old approaches and structures do not work any longer in order to avoid a collective cluster lock-in. That is one reason why cluster openness is crucial.

Firms can benefit from inspiration on how to do things differently, based on examples showing how others managed to adapt successfully to changed circumstances. Cluster leaders can contribute to that process: apart from mediating between the various actors they may identify skills gaps and establish specialised training programs to facilitate the restructuring process. An example is provided by a cluster in Georgia based on bacteria-based research for antibiotics. In this cluster, three to four leading laboratories had ended up in cut-throat competition which threatened the survival of the entire industry. Unless synergies could be captured between them, there would hardly be any future for the field in this region. It took one year to bring these laboratories together but it resulted in a statement to work together on common problems, including cooperation in bringing in experts from outside. In the end, all laboratories performed better. However, to overcome short-term conflict it was essential to start the discussion on an informal level about the broader situation, enabling each of the laboratories to define its issues in a way that was not threatening to others.

From the above it can be concluded that the management of the social process matters for the development of social capital in a cluster. Individual firms need to form their own opinions on the advantages of cooperation and whether it is in their interest. In the building process, the local/regional context must be taken into account. Otherwise social capital formation will be attempted through preaching, which will hardly bring any firm on board for serious effort.

Once the required social capital is in place, there is a challenge to sustain it. The task is related to quality of life and to civicness. For example, in Silicon Valley, the most critical issues for firms once the cluster process was well established became affordable housing, education and traffic congestion. So not only for the initiation but also in the sustainability of social capital, an important facilitative role is played on the community level and by the public sector. This is an area in which the public sector's responsibility is directly engaged to ensure that economic foundations are made, then kept, sound and do not become a cause for rivalry or distrust.

1.3 Implications for policy

In the context of social capital as glue for cluster development, policy-makers wanting to take the lead in the process need to realise that this calls for a mediating and coordinative role for policy. Social capital and trust can be built through interaction between economic agents but it is a time consuming activity requiring organisational innovation and associative policy-making. Nonetheless, it is a powerful underpinning for firm collaboration in a cluster initiative.

The task of building social capital is markedly context-sensitive. It typically requires broad, bottom-up participation by firms as well as individuals. In a sense, social capital formation can be seen as a paradigm shift in business thinking. Firms cannot be "educated", but need to believe in the advantages of collaboration. It is therefore essential that policies and inivatives in this area adopt a 'hands-on' approach, guided by a strong, pro-active, facilitative leadership in cluster development, dedicated to establishing a consensus based on a collectively supported cluster vision and strategy. The framework in which social capital building initiatives take place may vary but informal organisations appear to be salient platforms of change that facilitate firms to overcome parochial thinking and raise the awareness for collective action. Policy-makers should therefore stimulate informal cluster organisations to create a venue in which firms exchange information, meet socially and learn to trust each other.

Finally, once social capital building is initiated it also needs to be maintained. In this context, quality of life plays an increasingly important role, which can be seen as an area in which policy-makers have considerable agency for change (e.g. in the field of housing, public education or traffic).

2 BENEFITS OF INNOVATIVE CLUSTERS

Speaker: Mike Best, University of Massachusetts University Lowell, USA
Bagie Sherchand, Likando Mukumbuta, ZATAC - Zambia Agribusiness Technical Assistance Center Project, Zambia
Facilitator: Ifor Ffowcs-Williams, Cluster Navigators Ltd, New Zealand
Summary: Johan Brink, Industrial Dynamics, Chalmers University of Technology

2.1 Objectives

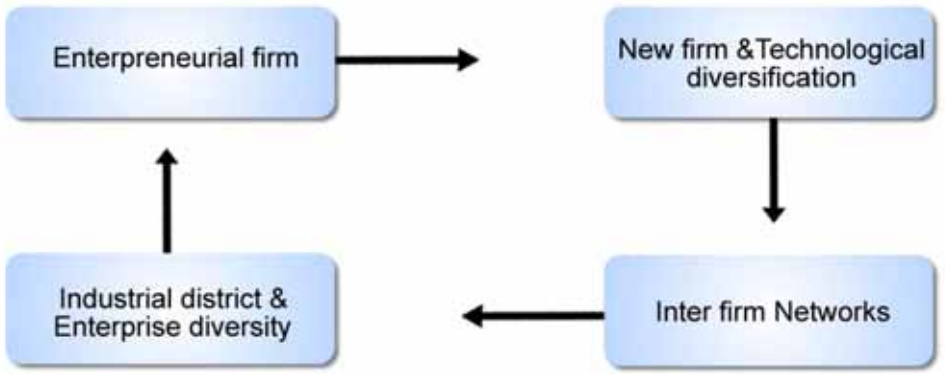
This session was based on two cases which both dealt with the concept of innovative clusters. The two cases are quite distinct but unified by the innovative aspects. The first is an example from the USA with a focus on technological diversification and innovation. The second case is from Zambia and presents a new and innovative initiative for establishing clusters developing new production capabilities from existing resources.

2.2 Key discussion and conclusions

The US case described the rise of a cluster of technology-based firms in Lovell, Massachusetts replacing a declining industry. A set of conditions was described which contributed to increasing the region's productive responsiveness to market opportunities and technological change. In summary, Mike Best concluded that it is seldom possible to leapfrog cluster and technological development. Instead, local capabilities in production, technology and organisation must be gradually upgraded. Also, to develop new products and processes in response to new markets, both firms and regions must develop dynamic capabilities. They must be able to innovate and capture emerging opportunities. This implies that entrepreneurial firms develop unique capabilities and continuously upgrade these in interaction with the market through spin-offs, the creation of new firms and technological diversification.

On a regional level, firms can benefit from existing business networks. For example, in Massachusetts, the cluster development process benefited from a pro-active approach to regional industrial development. The first step was an audit of existing capabilities, which consisted of developing a technology classification system with the degree of granularity required for technology-clusters auditing. This resulted in a more disaggregated level than SIC codes identifying the actual technologies applied by individual firms. The audit revealed a cyclical pattern starting from entrepreneurial firms, then leading to diversification, networks development and eventually to cluster formation, then spurring the emergence of new entrepreneurial firms – as illustrated in Figure 21.

Figure 21: Cyclical behavior revealed by the audit



To sustain innovation, the cluster must continuously renew itself and be able to cope with, and adapt to, uncertainty. For individual firms this implies experimentation, flexible ad hoc organisations, alliances and outsourcing. For public policy this entrepreneurial behaviour is, however, more problematic since governmental experimentation is long term and costly, reorganisation of public policy takes time and is difficult, and outsourcing is seldom an option.

The Zambian case also started with an existing but declining industry, namely mining. The innovative 'cluster initiative', supported among others by US Aid, was aimed at reorganising former miners. The case highlights a shift from traditional cluster approaches, which typically focus on a renewal of the existing production and value chain.

One of the main characteristics of globalisation is to bring international competition into local markets. For Zambia, an African country which tends to compete through cheap labour and a depreciating currency, this creates a problem for small-scale businesses. The 'cluster initiative' described by Bagie Sherchand and Likando Mukumbuta aimed at developing the local agricultural sector, drawing on the existing infrastructure from the mining period.

The 'cluster initiative' established strategic alliances between a number of players, including farmers and local firms and sought to optimise multiple value chains, by identifying and then finding ways to reap economies of scope across various agricultural products, and economies of scale across firms. Indeed, exporting to international markets typically demands a minimum scale. The 'cluster initiative' realises synergies of local horticulture production, balancing investments in paprika, which produces nearly immediate cash flow, and in coffee, which is more profitable in the long run but has a long payback time.

The role of the cluster coordination organisation is to provide access to resources and knowledge. Networks between agricultural processing firms and producers are established. Farmers share their knowledge and are linked to a local agricultural R&D station; however there is no direct link to universities. The collaboration between local farms and small and medium sized agricultural processing firms in the agricultural 'cluster' also gains momentum

by providing a unified front towards banks and investors. Traditionally the agricultural sector has been of low interest for local investors due to the heterogeneity and small scale of the businesses.

The Zambian agro-food cluster, however, faces a number of challenges, similar to other innovative cluster initiatives. In particular, the lack of experience limits the speed of development. The lead organisation or cluster coordinating organisation also has to address governance issues, and a clear exit strategy for the 'cluster coordinating organisation' has to be drafted and scheduled. Specific challenges in the Zambian case also include the shifts in international commodity markets and the need for sustaining small-scale producers and SMEs to be equal members of the alliance.

2.3 Implications for policy

The two cases emphasise innovation as a source of new opportunities and renewed economic growth. However, innovation and economic growth is a path dependent process which has to build on existing resources. A step in preparing for the build-up of innovative clusters therefore consists in auditing the existing capabilities and resources.

Both cases stress the need for upgrading capabilities to renew the local business sectorial specialisation. The role for policymakers and the lead cluster initiative thereby becomes one of providing full system support and helping to identify - and where necessary to fill in - the gaps in the existing setting. This opens up the floor for small firms to participate in the cluster as equal actors, as well as it promotes the value of collaboration and Private-Public Partnerships.

The two cases also demonstrate the importance of overcoming the rigidity of governmental aspects when dealing with innovative clusters.

3 DRIVERS OF BIOTECH CLUSTERING

Introduction: Anders Östhol, ITPS - Institute for Growth Policy Studies, Sweden
Elisabet Juan, Competitiveness, Spain
Facilitator: Philip Cooke, Cardiff University, UK
Summary: Fredrik Waara, Service Management, Chalmers University of Technology

3.1 Objectives

The main objectives of the *Drivers of biotech clustering* session were to identify key drivers of biotechnology clustering, and to come up with useful tips and generic knowledge relevant to various stakeholder groups. The stakeholders in question are primarily people in business, universities, governments, and local governments. This section covers the main points that emerged during the session.

3.2 Key discussion and conclusions

The seminar started with an introductory speech by Professor *Philip Cooke* from Cardiff University in the UK. He started by describing the biosciences' value chain and its many areas. One main point was that biotech should be considered as an immense industry. Cooke also described the important role of dedicated biotech firms (DBFs). As large firms become even larger (e.g. due to mergers and acquisitions), they usually do not increase their amount of scientific discoveries to the same extent. In fact, there is data showing that they typically experience a decreasing number of discoveries. Many of their discoveries are also slight adaptations of existing drugs rather than the development of new drugs. Instead, many new ideas are coming out of smaller, dedicated, biotech firms located in clusters or mega-centres. So, one could say that big pharmaceutical industry is dependent on such firms. Furthermore, Cooke talked about the value of attracting star scientists and research funding. Successful universities are in many cases able to transform an entire region into a major pole of attraction not only for scientific research but also for associated entrepreneurial activities. He also identified venture capital as an important resource for biotech clusters. If private venture capital is lacking, the public sector may intervene and create its own venture capital funding. This approach has been successful e.g. in Israel. Finally, Cooke emphasised that there are niches within the value chain where regions can be successful and biotech clusters can evolve. However, this demands strong vision, focus and leadership.

Elisabet Juan, from Competitiveness in Spain, gave the second presentation at the seminar, in which she raised some important questions, primarily from a European perspective. Juan began by questioning if biotechnology in Europe is truly innovative, pointing out that the market is demanding results. She compared results from the biotech cluster in Munich with results from the biotech cluster in Massachusetts, USA. The comparison showed differences in terms of output, measured for example by number of patents, and showed that the results in Europe are arguably relatively weak. Furthermore, Juan said that most European biotechnology clusters seem to have been artificially created rather than being truly market-driven. This could also be true for the US as well, but in another way. She also questioned

whether there are not too many regions in Europe trying to launch biotech clusters, hinting that the limited funding should perhaps be spent more wisely. Finally, she questioned whether or not it is possible or even desirable to replicate the cluster conditions in the US. Perhaps Europeans should do something else?

In the third presentation, *Anders Östhol* from ITPS, the Swedish Institute for Growth Policy Studies, shared some reflections on strategies and partnerships for biotech regions. Östhol's speech was based on a report dealing with strategic considerations on competitiveness and technology-based economic development, cluster activities, regional development and innovation capacity.[93] A main feature of the study was a comparison between North Carolina in the US and Sweden. A number of similarities can be identified between these two regions, such as strong geographic concentration of biotech resources and intensive cooperation between companies and universities. Östhol emphasised some conclusions emanating from the study. These were: (*a*) encourage regional and interregional co-ordination, (*b*) support initiatives to form public-private partnerships, and (*c*) support 'policy intelligence' on strategies and partnerships. Yet he also pointed out some differences concerning models for partnership in the two regions. In Sweden, emphasis is put on innovation systems, program-driven policies, public dominance and relatively strong co-ordination. In North Carolina, on the other hand, the emphasis is on start-ups and venture capital, market-driven policies, private dominance and relatively weak co-ordination.

The discussions which followed focused on five key areas of biotech clustering. First, the big value chain was discussed. There seemed to be confusion about what the biotech industry is and what it is not. Some people erroneously consider biotech as just a narrow elite science for a few people. It could be argued that biotech, instead, is part of a large business and as such is tied to several other industries such as food, agriculture, health care, and environmental technologies. Altogether, these industries constitute a large share of GDP in most countries, and there are a lot of opportunities for regions to develop biotech clusters in non-elite areas. The first conclusion was therefore that the biotechnology industry should be regarded as an immense industry.

The second area under discussion is closely related to the first one. Given that the value chain is vast, there is a need to focus on certain niches. One participant said that policy-makers must obtain a deeper understanding of the industry before they can decide whether they think they have a chance with any part of it. Thus, identifying a suitable niche within the biosciences value chain, and at an early policy stage, emerged as a major issue. The second conclusion was therefore that specifying the niche to be focused on at an early policy stage is important.

The third area under discussion was the current profitability of the biotech sector. Several participants said that one of the major problems in the biotech industry today is that very few companies are profitable. On the other hand, it was pointed out that we are looking at an extremely long pipeline, and many of the companies whose profitability has been analysed are young. The biotechnology industry has a very long term perspective, and is therefore not the right sector to focus on if there is a need/desire for quick results. So, the third

[93] Östhol, A. and Lembke, J. (2003), Strategies and Partnerships for Biotech Regions: The Regional Innovation and Partnership Project, A2003:005, ITPS (Swedish Institute for Growth Policy Studies), Östersund, Sweden.

conclusion is that biotechnology initiatives demand long-term thinking, which can be a strategic challenge for many stakeholders. The North Carolina example, however, shows that it can be beneficial to be patient.

The fourth area of discussion was the role of small, dedicated, biotech firms. These firms lead in important parts of the biotech field, especially in healthcare biotech. In the food biotech industry the reverse is true, however, as it is large companies which account for the bulk of innovation. One reason is that companies within food biotech have a much longer tradition of hiring biologists. So if a region is interested in the agri-food business it will probably be much harder to generate activity around a university because the region must attract some part of a big company. Health care therefore appears to be a much better segment to focus on. Here, small firms are doing the research, even though they often depend on funding and support from big firms. The fourth conclusion was that big companies are not a necessity, and that dedicated biotech firms play a significant role in terms of scientific breakthroughs and innovation.

The fifth area could be referred to as the human capital factor. There seemed to be a strong belief that star scientists play a significant role in the biotechnology industry. So, what are the possibilities to establish a platform of first-rate human capital capabilities? Starting from scratch will indeed be a challenging path, so it was suggested that stakeholders at least identify some strength that they can build on. In addition, regions must have a system that allows star scientists to exploit their results. If the regulatory system is inadequate it can act as a deterrent, and people will not go there. One participant also pointed out that it is not only a matter of regulation but also a matter of culture. Furthermore, having a top university is of course helpful. Universities often play an important role in creating biotech spin-offs. The worst case scenario, though, might be a region without the necessary infrastructure or supportive surroundings. However, does this imply that only those regions that have a top university are able to attract and benefit from scientists? One solution to such a challenge is to assign star scientists, or research teams that are connected to a university but are working on site. In Finland, for example, small and medium sized cities put some money together and hired professors who were connected to a university in a bigger city. The fifth conclusion was that the human capital dimension appears to be a key driver of biotech clustering.

In essence, there is a need for scientists (brain power), focus, research funding for the scientists, and venture capital funding in order to reach the market place.

3.3 Implications for policy

The main conclusions of this session suggest that understanding the value chain, focus, human capital, and in many cases small dedicated biotech firms are key facilitators of biotech clustering.

The objectives of a cluster initiative, however, are not the cluster in itself, but regional development and economic growth. So, what are the implications for policymakers? There seems to be some confusion about the activities that are entailed and the business opportunities that the biotech industry incorporates. Indirectly, this suggests that

stakeholders may not always fully understand the industry. Therefore, policy-makers should increase their knowledge about the industry and its opportunities. Governments, both national and regional, may also have a role in providing venture capital, if private initiatives are missing. The notion of star scientist emerged as an essential issue for biotechnology clusters, and here universities, governments and companies must collaborate in order to create the infrastructure that is necessary. To sum up, biotechnology clustering initiatives are strategic issues. Does a certain region have enough patience to wait, maybe decades, for results? If not, biotech might not be the right way to go.

4 EVALUATION OF CLUSTER PERFORMANCE

Introduction: Claas van der Linde, Institute for Strategy and Competitiveness, Harvard University, USA; Claire Nauwelaers, MERIT, Maastricht University, Netherlands
Facilitator: Anne-Christine Strandell, ITPS - Institute for Growth Policy Studies, Sweden
Summary: Magnus Lagerholm, Department of Social and Economic Geography, Uppsala University.

4.1 Objectives

Drawing from experiences at Harvard's Institute for Strategy and Competitiveness, Claas van der Linde appraised four cluster evaluation methods. Data-driven evaluations, used in the Cluster Mapping Project, utilize public and proprietary datasets. Literature-driven evaluations, used in the Cluster Meta-Study, employ published and unpublished third-party literature. Survey-driven evaluations, as used in the forthcoming Cluster Competitiveness Report, draw on surveys of a multitude of cluster practitioners in participating clusters, and finally van der Linde mentioned a fourth method using interviews.

Claire Nauwelaers, from the Maastricht Economic Research Institute on Technology and Innovation, discussed cluster evaluation from a policy perspective. Nauwelaers underlined that evaluation approaches and methods need to be tailored to the type of cluster considered, and to the specific aim assigned to cluster policy. She provided a brief overview of EU practices, assessing the state of development of this field and highlighting the main challenges for the evaluation of clusters in the policy practice.

4.2 Key discussion and conclusions

Claas van der Linde presented four different cluster evaluation methods used at the Institute for Strategy and Competitiveness (ISC).

The first method, a data-driven evaluation method, was used in a recent cluster mapping project by researchers at the Institute for Strategy and Competitiveness. To identify regions containing existing or emerging clusters, ISC used different quantitative information such as the number of establishments, average wages, productivity, exports and imports, and patents. Using this methodology not only allows one to identify clusters, it also paints a geographical picture of the cluster's location and measures the cluster's impact on the regional economy. This is done through a calculation of correlations of employment in bundles of branches compared to these branches' national average. Using a large amount of data coded into variables makes it possible to differentiate between traded clusters, local clusters and natural resource-driven industries. Van der Linde's research shows that the traded clusters in USA share of employment is around 32 percent, the average wage is significantly higher than in the local clusters or the natural resource-driven clusters, an index of 134 to be compared with 84 and 101 respectively. The number of patents per employee is also much higher in the traded cluster than in other clusters.

The literature-driven evaluation employs published and un-published literature. It takes advantage of existing analysis, both qualitative and quantitative. The main reasons for doing such a meta-study are to understand cluster competitiveness and to find the reasons for cluster establishment. In total, van der Linde´s research team found information from 833 clusters around the world in 49 countries through studies of books, reports and articles. The most common reason for the establishment of clusters was factor conditions, according to the findings in the literature study.

The third method mentioned by van der Linde is survey-driven. The method was used in "The Cluster Competitiveness Report" where a survey of a multitude of cluster practitioners in participating clusters was carried out collecting both qualitative and quantitative information. The aim is to reveal the competitiveness of the studied clusters through highlighting the strong and weak sides of the cluster and showing changes and trends. By making a number of studies of different clusters with the same method, the results can be compared between clusters and regions. It also tries to measure the impact of cluster-based policy.

Van der Linde concluded his introduction by summarising both the benefits and caveats of cluster evaluation. The benefits are, for example, a better understanding of the cluster structure, the identification of areas in the cluster that need to be developed, and the setting of actionable and measurable goals for cluster initiatives. A couple of warnings are, however, important to keep in mind according to Mr. van der Linde, e.g. the inadequate definitions of cluster, and over-reliance on qualitative and quantitative data, incomplete, not up to date or even wrong data.

Following Claas van der Linde's presentation, Claire Nauwelaers, MERIT, Maastricht University, talked about "How can policy-makers assess cluster (policies) success?". Nauwelaers had four main themes trying to answer the question: cluster policies as "systemic" innovation policies, the versatility of the cluster concept, state-of-the art in cluster (policy) evaluation and finally the way forward.

In discussing the cluster policy for innovation theme, Nauwelaers pointed to a difference between what policy says and what it does. Among other things, she called for policy to work with "context-specific" solutions and not with "best practices". Thus, policies should be fine-tuned to address specific system failures and not use methods that worked in another cluster without modifications. Moving on to the real nature of cluster policies, Nauwelaers stressed that cluster policy is an effort to improve policy interface and not a new policy arena. It is a mix of instruments originating from technology, industrial or regional policy toolboxes. Nauwelaers argued that cluster policies should be used as a means to reach goals, rather than as an end in themselves, and that this makes evaluation of success absolutely critical.

Nauwelaers' second topic related to the cluster concept. Nauwelaers identified three different categories of clusters: the Mega Cluster, the Local Network Cluster and the Knowledge-Based Cluster.

The Mega Cluster's focus is on competitiveness within sectors. Important policy levels are macro and meso. The presence of a critical mass of firms in the value chain makes the firms

more competitive. The industry benefits from shared labour markets and other factor conditions.

The Local Network Cluster is strong on regional and territorial competitiveness. Containing mostly small and medium sized companies, the core to success is social capital and geographical proximity, epitomised by the Italian industrial districts. The micro level is important for successful policies.

The Knowledge-Based Cluster's objectives are innovation and technological development. Whereas knowledge flows matter greatly, the specialisation of firms along with the regulatory and institutional framework influences to what extent enterprises connect with research centres in an efficient way. The three categories of clusters have different strengths; the Mega Cluster – competitiveness; Local Networks – thickness; Knowledge-Based Cluster – innovations.

Having identified three cluster concepts, Nauwelaers turned to the state-of-the art in cluster (policy) evaluation. Nauwelaers observed that cluster evaluation is in its infancy and that cluster benefits are still too often taken for granted rather than analysed. Policy evaluation seldom uses empirical techniques in a systematic way. The focus on local linkages is often disappointing and intra-cluster linkages are seldom as strong as anticipated. In evaluations, competition as a main driving force is often neglected and there is a major focus on cooperative and supply-chain relationships.

In the fourth theme, Nauwelaers shared some reflections on the way forward. Focus on innovative combinations of activities (cluster v. sector) is not always enough. Some empirical methods (e.g. location quotient) are not sufficient to cover the cluster. Un-traded interdependencies (innovation, social capital, talent) are important in order to understand the cluster system. This is something analyses based on input-output tables fail to measure. Political boundaries rarely follow the firms' limits. Using the dynamic boundaries of the firm might give a better distinction of the cluster. It is necessary to examine external and internal connections, since a combination of both is central for clusters' success. Another way forward is to assign clear goals to the policy and to measure the success against the expected benefits.

Nauwelaers identified two key challenges for cluster evaluation. One is to concentrate evaluations on the clustering processes and trajectory rather than on static measures. Possible measures are FDI, firms' displacement and creation or people mobility, employment growth and role of key actors or events. The second key challenge is to focus evaluations on immaterial flows rather than material flows. This can be done through innovation, technology licensing, patents citations or by looking into managerial and entrepreneurial skills.

Nauwelaers' final message to cluster policy-makers and the audience was that evaluations are needed to unveil the policy artefacts from the true clusters. There is much high-tech myopia in cluster policy; building clusters takes decades and the most effective policies for clusters are not necessarily cluster policies.

After the main presentations there was time for a brief discussion. The first question related to the dynamics of the different methods, and to whether existing methods make it possible to follow changes in the cluster? According to van der Linde, the survey method is more like a static picture of the circumstances. But several surveys made at different stages of the process can show changes in the cluster development. In the data-driven analysis there is more of a time-line showing trends and changes. The data is collected at different points in time.

Another question was about the possibility to measure immaterial flows within a cluster. This is very hard to measure through mapping or data-driven evaluations. By using surveys one can formulate the questions to capture interesting results about immaterial flows. The material flows can be traced and examined with the data-driven method, according to Mr. van der Linde.

Nauwelaers emphasised the importance of separating between the evaluation of the cluster and of the cluster initiative. It is the initiatives that are important to evaluate, whereas the cluster would develop anyhow. What matters is whether policy has had an impact. Van der Linde disagreed and saw the value of measuring both. Evaluating the cluster sends signals of how the policy is working and using multiple methods can enable a better handle of the effectiveness of development strategies.

4.3 Implications for policy

Three main conclusions and policy implications stand out:

i) Policymakers need to define what is to be evaluated and be aware of what is actually measured. Is it the cluster that is being evaluated or is it the cluster initiative?

ii) Setting the boundaries of the cluster and deciding what definitions to use makes it a lot easier when it comes to evaluating clusters or the cluster initiative. Setting clear goals simplifies the process.

iii) A combination of methods should be applied. Relying on a single method will not be enough and will not reveal the development of the cluster initiatives. The application of several methods provides different measurements which will help disclose if the initiatives are working in the right direction.

5 HOW IS E-BUSINESS CHANGING CLUSTERS AND CLUSTERING?

Introduction: Dr. Holger Schiele, h&z Unternehmensberatung AG, Munich and University of Hanover, Germany
Facilitator: Trish Brimblecombe, Computing Whitireia Community Polytechnic, New Zealand
Summary: Petter Jönsson, Department of Economics and Management, Linköping University, Sweden

5.1 Objectives

How will the increased impact of e-business influence clusters? Some of the important functions included in the e-business concept are e-procurement, e-sourcing, and e-supply chain management. In the following, the emphasis is on the Internet's influence on marketing and branding and the consequences for clustering.

5.2 Key discussion and conclusions

The main characteristics of a dynamic cluster are specialised and advanced factors of production, such as human capital, financial capital, linkages with universities and research institutes, sophisticated and demanding customers, and an intense rivalry between competitors. All these factors speed up the pace of innovation and thus increase the competitiveness of the cluster. With the new IT and telecom technology it is now possible to exchange information with anyone anywhere in the world at a very low cost. The question discussed in the mini-forum was: how will these new possibilities influence the role of clusters? What part does local environment play in a world where information is spread globally?

Two key points deserve attention:

- First, e-business is not altering some key advantages clusters are offering, such as a chance to exchange tacit knowledge, profit from a local labour-pool and develop supporting institutions.
- Second, globally competitive regional clusters can even increase their advantage by engaging in e-business: in order to establish electronic linkages between firms, substantial investments have to be made. These investments require a stable and trusted relationship, which are likely to be found between firms from the same cluster.

Expected e-business scenarios and today's outcome

E-business is much more than the Internet only. Other activities that require attention include e-procurement, e-sourcing, e-supply chain management, and e-engineering. E-procurement is used to arrange the supply of products via electronic catalogues. E-sourcing

means electronic support is used in the selection of suppliers. E-supply chain management uses electronic tools to organise the company's value-chain, and E-engineering comprises electronic tools facilitating the product development with special suppliers and customers. All these activities contribute to more efficient procedures between suppliers and customers.

When the possibilities of information technology became known, utopian scenarios of how a new type of business was going to develop were envisaged. Today, as the business world has become accustomed to the new e-business functions for some years, it can be stated that many of the utopian scenarios, describing the development of the new business, have not come true. Neither are they likely to come true in the future. This is due to the fact that there are significant differences between the information being spread in the local area and the information being spread on the Internet, and also how information is received.

In the early days of e-business, the expected influence on companies' business behaviour was that the importance of geographical positioning of the company would decrease. The ideas behind this expectation were that when information about products is free to download, and using electronic tools when ordering and handling products, the level of misunderstandings and uncertainty would decrease to a minimum. Eventually, a market with complete information would exist, which meant that companies would start to genuinely compete on a global basis. The transaction costs would be levelled out between suppliers positioned in different geographical locations. In line with this argument the geographical dimension of clusters would become less important. Also, the information flow advantages of a cluster would decrease to a minimum.

These scenarios have not come true. On the contrary, e-business has lead to the opposite effect. Due to the large initial investments in electronic infrastructure and software application needed to build up e-business functions, the switching costs between the companies increase. As a result, companies only establish e-business solutions with well-known suppliers and customers. Building up trust is a process that lasts for a long period of time, where the trustworthiness is created and improved in small incremental steps. So, the emergence of the e-business concept has increased the importance of trust and having a track record between the supplier and customer. This leads to more imperfect markets, and what can be seen in e-business is that, instead of making the market more transparent, e-business has had the opposite effect.

In the cases where e-business has been established, the communication between the customers and suppliers has been intensified. The reasons are that e-processed transactions need to be planned, implemented and tested in advance. Unlike an ordinary transaction, where the parties only need to agree on the product or service specifications, the e-processed transaction requires larger organisational adjustments, i.e. implementing the same planning systems and using the same project management tools. So, if using the tools of e-business in a maximising way, the two companies involved may become more organisationally alike. Since no business relations are identical, procedures are difficult to standardise. Unique software adjustments are needed in every implementation of e-processed transactions. This is the main reason why the initial implemental cost is large.

After having implemented e-business, process administration costs between different suppliers and customers will decrease. This means that in a more digitized world, other

characteristics of companies will have greater importance, such as quality and innovativeness. However, the cost of switching partners will increase, which means that a company will run the risk of being locked in, in an uncompetitive supplier or customer relationship. To avoid this situation, companies establishing e-business procedure must work intensely and actively with the relationship to make sure it stays on the competitive edge.

E-business and the Internet

E-business and the Internet are obviously not the same thing. Internet forms part of e-business, whereas e-business includes many other tools and functions. Most e-business activities are relevant primarily for clusters in manufacturing industries. For service-oriented clusters, such as in tourism or the film industry, just using the Internet is a powerful tool, especially for branding and marketing activities. These activities are difficult and expensive to handle by the single company. When coming together and marketing a specific geographical region, companies in that area can gain reputation and credibility just by being part of the region. Marketing a whole cluster makes it possible to offer a very wide range of products and services suitable for a wide range of different market segments. Business partners looking for a specific product or service can then be confident that there is always some company in the cluster that will match the own company's needs. By collectively marketing the region under a certain name, the cluster organisation can work as a hub that matches and brings suitable business partners together. This is especially true using the Internet, where it is possible to give an Internet portal the cluster name.

Conclusions

The findings indicate that E-business has not opened up the world for new relations between companies irrespective of their geographical position and historical background. On the contrary, e-business has raised new demands for trust and recognition, which matter greatly in all business collaboration. These aspects play an important role when companies receive, evaluate, and make use of information gathered. Companies which have established satisfactory trust, on the other hand, are able to share knowledge and transfer technology between each other with great efficiency thanks to the electronic means.

The knowledge necessary to create trustful and reliable relations is to a large extent tacit, and therefore different from the knowledge and information that can be spread via the Internet. It is knowledge about the business partners' behaviour, values and opinions that creates trust. This is impossible to fully express in words and can therefore only be collected in personal relations. A high concentration of shared tacit knowledge is one of the main characteristics of a sound cluster environment, and this does not change with information technology. Colleagues in the same and related businesses share experiences with each other, and some of this sharing will result in new ideas and new businesses.

E-business activities enable efficient procedures between companies, but do so at the expense of flexibility. This implies that the companies that stand to gain most from e-business procedures are the ones handling fairly well-known products with incremental development. Companies in more innovative ventures, with a lot of serendipity involved in the innovation process, need to cultivate more flexible relations with suppliers and

customers. Also, the investment needed for digitalisation creates thresholds for specialised companies with low-volume products.

5.3 Implications for policy

The most distinguished characteristics of clusters, for example the creation and diffusion of tacit knowledge and knowledge spill-over, will not disappear or diminish in importance due to the influence of e-business. On the contrary, the results indicate that e-business solutions will intensify the relationships between the participating companies and contribute to the further formation of an environment where spill-over and tacit knowledge-sharing keep expanding. For cluster facilitators, the challenge is to support electronic infrastructure and joint e-business systems in ways that allow the participating companies to reduce their initial costs for using e-business tools. This can be extra valuable for small and medium-sized enterprises, where the initial costs are the main threshold for implementing e-business solutions.

Implications for business companies are to establish inter organisational e-business solutions with trustworthy customers and suppliers. A successful implementation of e-business tools can result in great business advantages, such as efficient process administration, but there are also large risks related to e-business, i.e. becoming too dependent on a few suppliers or customers. E-business tools are vital when ordering industry standard products that demand a super efficient administration process to reduce the costs. Companies in clusters producing such goods could profit most from e-business as soon as it matures. Cluster-companies produce at lower costs, enjoying the advantages their proximate environment offers, while being able to supply the goods on a worldwide scale.

A challenge for academia is to understand the whole complexity of e-business and not just look at the effect the Internet has on business. Of special interest is to understand the inter-organisational changes between companies caused by e-business, i.e. how differences in size and bargaining-power between companies affect the outcome of e-business implementation.

6 CLUSTERS AND REGIONAL INNOVATION SYSTEMS

Introduction: Meric Gertler, professor at the University of Toronto
Peter Phillips, professor at the University of Saskatoon
Facilitator: Frédéric Richard, Strategic Research and Economics Branch, UNIDO.
Summary: Jerker Moodysson, Department of Social and Economic Geography, Lund University, Sweden

6.1 Objectives

Discussions on clusters and cluster policies among academics as well as policymakers too often suffer from immense conceptual confusion with respect to scope and scale. For example, the cluster concept is often confused with innovation systems. There is a need for conceptual clarification in order to understand the complex constellation in which innovation systems and clusters are included and interrelated. This clarification is not just urgent among academics who tend to deal with the concepts from a theoretical standpoint, but it is also a necessity for those forming and implementing "cluster policies". The issue addressed here concerns the relationship between clusters and innovation systems. The presentation concluded with some policy lessons for clusters' and innovation systems' coordinators.

6.2 Key discussion and conclusions

Clusters and regional innovation systems are closely related but build on fundamentally different ideas. While a cluster should be regarded as an industry specific phenomenon, an innovation system is defined as a broader framework affecting the innovative capacity of firms in a variety of sectors.

Nevertheless, there are some similarities between the two concepts. Both have attracted growing attention to what might be called the knowledge economy, and both are instinctively associated with the concept of innovation. The core question that founds the discussion on policies aiming at stimulating both clusters and innovation systems is: *How can one support firms to become more innovative and thereby more competitive?* There is clearly no universal answer to such a question. However, one can say without doubt that the actions from society aimed at supporting innovativeness among firms and regions have to be handled at different levels – local and regional as well as national and international – within specific sectors as well as across sectors. One way of dealing with this complex issue is to resolve the conceptual confusion and identify the logics behind innovation systems and clusters respectively.

Starting on a macro-level, theories on innovation systems were introduced some fifteen years ago. These were defined by its founder Bengt-Åke Lundvall as "a collection of institutions and organisations which interact to support the production, diffusion and use of new knowledge." One might thereby say that innovation systems provide a broader framework within which governments form and implement policies to influence the innovation process. The underlying logic behind the innovation systems' approach was a shift in the way of

viewing innovation processes. Contrary to older theories of linear knowledge creation and innovation, the innovation systems approach contends that innovations are created through cumulative, iterative and interactive processes with a variety of actors and factors involved.

Due to this strong emphasis on the role of institutions, most research on innovation systems 10-15 years ago was done at the national level (since most of the formal regulative institutions in focus are governed at the national level). The kinds of institutions considered in the *national innovation systems* approach are, not surprisingly, many of the traditional components of a science policy. Among these are for instance public production of research, policies for education and research, policies to induce private engagement and investment in research, policies affecting the commercialisation of research (e.g. rules governing intellectual property) etc. However, the logic behind national innovation systems actually goes beyond that of policies directly aiming to support science and innovation. When studying the function and performance of a national innovation system one must take into consideration the "background institutions" that shape firms' behaviour. Such institutions are for instance labour market regulations that affect labour mobility and stability in a very powerful way, and thereby have a direct impact on business spending on training and education. Another example of background institutions are industrial relations regulations that directly affect workplace organisation and thereby have an impact on worker participation in technology design for example, as well as on the potential for learning-by-doing (which is seen as a key to incremental innovations). Corporate governance and capital market regulations are other aspects affecting the innovation system by shaping the incentives for investments and risk-taking. Other broader institutional factors considered in the national innovation systems approach are immigration policies and trade policies, which are believed to affect the overall industrial environment in the nation and thereby impact the function and performance of the innovation system.

However, neither these formal institutions nor the regulatory environment can serve as a complete explanation of firms' behaviour, and thereby give the whole clue to the functions and performance of an innovation system. As indicated above, given the importance of interactive processes to foster innovation, it is not only the quality and capacity of the actors and organisations involved in an innovation system that matter, but also the relations between them. Some of the formal institutions listed above certainly aim at stimulating interaction by reducing insecurity in a regulative manner, but for actors in the system to interact smoothly, they must also to some degree share a common culture. Even though this common culture is often nationally defined, cultural characteristics might be distinctive to certain regions even within a nation. The ways in which policies are pursued by regional governments also give a distinctive identity to the particular region, and this identity is further sustained by the flows of information among the members of the regional community. This awareness of the importance of regional factors is at the core of theories on regional innovation systems.

Of course, regional innovation systems are affected by nationally defined institutions referred to in the discussion on national innovation systems. They, however, also depend on specific regionally defined institutions and organisations. Hence, the regional innovation systems approach also puts strong emphasis on the role of geographical proximity and informal institutions not governed by nation states but sustained in networks. Put in other words, a regional innovation system is described as a system of collective order emanating

from mutual trust and understanding in an economic community, facilitated by a common set of regional institutions and organisations, underpinned by the unique territorial assets of the region. Examples of such regional assets are research and educational institutions, technology transfer centres, financial services (e.g. banks and venture capital), producer associations, local lead firms and suppliers of specialised goods and services.

Industrial clusters, finally, are defined by the concept's founder, Harvard professor Michael Porter, as "a geographically proximate group of interconnected companies and associated institutions in a particular field linked by commonalities and complementarities. Clusters encompass an array of linked industries and other entities important to competition including governmental and other institutions – such as universities, standard setting agencies, think tanks, vocational training providers and trade associations." Even though this is a broad definition, which at first glance appears to be quite similar to the definition of innovation systems there are some fundamental differences. The cluster concept is first and foremost substantially narrower than the concept of innovation systems. A cluster is a sectorally delimited phenomenon, while an innovation system spans across several sectors in the economy. While a cluster consists of co-located and interconnected actors *in a particular field,* an innovation system serves as a framework for the creation of capabilities for firms *in a variety of sectors.* Furthermore, a cluster is somewhat of an exclusive phenomenon (a high density of functionally related firms) while innovation systems appear almost everywhere (as long as there are institutions and organisations that interact). Put in other words, clusters and innovation systems may co-exist, and an innovation system may contain several clusters, but a cluster is not a necessary ingredient in an innovation system.

When it comes to clusters' role in supporting innovations, a cluster may be regarded as an urgent driver of innovations at the industrial level. Even if the conditions are optimal at the general national and regional level, the performance will probably be quite low if there are no meaningful expressions at the industrial level. At the same time, innovation can rarely be developed entirely within a cluster, without supportive institutions at the regional, national and sometimes even international level. So national innovation systems, regional innovation systems and clusters are nested phenomena and need to be treated as such for innovation policy to be successful.

6.3 Implications for policy

Drawing on the concluding remarks of this session it is obvious that a successful cluster policy has to work on multiple levels. If the national institutions are not efficient, the regional institutions will most likely suffer, and that will impact the result of the cluster initiative, no matter how appropriate that might be on the industrial level.

Furthermore, one has to bear in mind that, in the end, innovations are created through interactions among individuals, not by the clusters as such. Thereby innovation has to be regarded as a social process. The prime objective of innovation-based cluster policies is thereby to facilitate interactions among individuals. The policy must therefore be supportive rather than directive. It is impossible to force individuals to interact through top-down initiatives. The only way of achieving such a goal is by stimulating bottom-up initiatives. At

the same time many of the cluster initiatives emanating from bottom-up perspectives aim at promoting the same kinds of regional assets, but for different purposes. Surely those activities would be considerably more efficient if one initiative cut across those aims and needs. This might be an objective for a regional innovation systems' policy.

Finally, innovation is not only the result of an interactive process, but is also a cumulative process. Whereas policies supporting national and regional innovation systems have to be somewhat general in order to upgrade the entire system, cluster policies have to be focused. The road to success is not trying to do what everyone else is trying to do, but to identify the unique strengths of the particular region and accentuate them.

7 NETWORK OF EUROPEAN CLUSTERS - A PLATFORM FOR INNOVATION AND GROWTH

Introduction: Gerlinde Poechhacker, Head of Cluster Management, Upper Austrian Technology and Marketing Company, Austria
Facilitatator: Petra Falchetto, Managing Director, Inno GmbH Vienna, Austria.
Summary: Martin Svensson-Henning, Department of Social and Economic Geography, Lund University, Sweden.

7.1 Objectives

Although in past years much emphasis has been put on the importance of local networks to foster innovation and enhance the competitiveness of clusters, contemporary research has highlighted the fact that outward linkages (i.e. linkages between companies inside and outside the cluster) often are even more important in the creation of competitive advantage. Empirical evidence shows that collaboration between innovative firms often takes place on a variety of geographical scales. Global linkages in innovation are especially prominent in industries with a high demand for state of the art scientific knowledge. Thus, the importance of the local environment and of locally based factors of production may vary across firms and clusters. In order to stay competitive in the global learning economy, many firms probably have to take advantage of both localised and global sources of knowledge and competitive advantage. Therefore, a realistic view must be taken with respect to the importance of localised cluster networks.

In what could be partly regarded as a response to these insights, the workshop "Network of European clusters - a platform for innovation and growth" discussed the possibilities of building a common framework for cooperation between clusters in Europe.

7.2 Key discussion and conclusions

The Upper Austria Clusters as a reference example

Cluster initiatives have been implemented in the region of Upper Austria, with around 1.4 million inhabitants, since 1998 onward through a combination of top-down and bottom-up initiatives. They have been comprised of initiatives in the sectors of automotive, drive technology, plastics, wood, eco-energy, food, health technology and mechatronics. Funding has consisted in both company fees and government support.

Altogether, the initiatives have covered almost 1400 firms. They have been at the basis of a wide range of concrete actions involving the provision of services to the firms in the cluster, such as information and communication platforms (detailed databases, cluster homepages, customer interviews), training and qualification efforts (special events, and workshops), cooperation projects (establishments of contracts, round table meetings with cooperation partners and support during grant application processes) and marketing and PR (national

and international PR and advertising activities, measures to strengthen branch image, trade fairs, company visits and presentations to major customers).

Creating platforms for cooperation: a concept proposal

The cluster initiatives in Upper Austria are indeed ambitious and seem to have reached a high degree of success. They are not limited to just cooperation between firms within the cluster itself. Long-term partnerships are formed with actors in other countries, and cooperation efforts have been initiated with other regions and clusters in Europe. Lessons from the programmes indeed suggest that a network platform geared towards intensifying collaboration efforts between European clusters can help companies face competition in international and global markets. A higher degree of collaboration and co-ordination of activities between European clusters could, if managed professionally, reap further potential positive effects and result in a higher innovative performance and growth in the long run.

The workshop discussion centred around three themes:

- Trends and developments in international cluster activities - future challenges for cluster managers.
- Ideas for cooperation topics among European clusters and networks.
- Consequences for stakeholders of the discussions above: business leaders, academia, cluster facilitators, and policymakers (local and national).

Trends and developments in international cluster activities - future challenges for cluster managers

In order to pinpoint the rationale for forming an intra-cluster cooperation platform and to sort out topics of collaboration within the platform, several contemporary trends and developments in cluster activities were identified.

- The recent general investment slowdown, posing new challenges to cluster facilitators to further strengthen cluster environments despite a harsh competitive climate.
- Increased pressure on firms due to the internationalisation processes. One way of responding to this among SMEs is the development of inter-firm networks, building for example pools of competencies and collaboration structures for entering new markets.
- Increased importance of adopting a value-chain perspective. It is an important task to increase productivity and efficiency among suppliers and help SMEs (mainly suppliers) to raise the overall effectiveness along the value chain.
- Increased competition, implying that the most resource-effective ways of conducting cluster policy is by dropping areas that you are not good at, concentrating on the "winners".
- Increased importance of visibility. By necessity, cluster initiatives have to make branding efforts if they are not already well known.

Ideas for cooperation topics among European clusters and networks

With the broad trends above in mind, some important policy areas were discussed, primarily on the European level. Some of these were potential areas of concern to a future platform of European clusters.

Taking advantage of the "new Europe" - In a new Europe without borders one must explore ways to take advantage of the competitive advantages offered by clusters in different countries through inter-cluster cooperation efforts.

Stimulation of the development of economies of scale and scope - Networking arrangements between European clusters could entail cooperation in the establishment of larger cluster networks, in order to deal with competitive trends originating from economies outside Europe and posting rapid growth. The network would also provide a base for collaboration between small countries with relatively limited national production environments, thereby increasing the critical mass of firms.

Match-making among cluster actors - An important aspect of the network could be the creation of a portfolio of clusters, specialised in different sectors. This would facilitate match-making between actors in different clusters, and include cooperation between clusters in order to make strategic fits.

Joint development of new technologies - As technological development is at the core of competitive advantage in today's globalised economy, an important aspect of a network of European clusters would be to create an environment conducive to joint development of new technologies, thus creating stronger science bases.

Quality management and quality certification - The network of European clusters could provide a basis for collaboration in the field of quality management, establishing a quality certification for clusters and regional innovation systems. This would mean that members of clusters would be provided with a quality-secured cluster address. Here, it might be added that the quality management and quality certification issue is controversial, as it could be regarded as being part of a somewhat protectionist policy concept. Therefore, the issue needs to be further discussed, and to some extent handled with care.

Cooperation on market intelligence and information - Since the production of specialised economic information often entails high costs, one possible area of collaboration between clusters is the production of systematic economic intelligence and the co-ordination and diffusion of intelligence on a reoccurring basis, thereby facilitating the production of updated information.

A framework on business and policy learning - A network of European clusters would also provide ample opportunities for policy learning. This could for example entail learning processes

regarding what is taking place in other clusters and sharing experiences, thereby widening the possibilities of policy learning within the network.

Benefits to firms and academia of a platform of European Clusters

A number of potential gains to firms and academia arising from the establishment of a platform of European clusters were discussed at the workshop. To the private sector, a range of potential gains could be listed, such as increased knowledge of international markets, a perspective on and the redefinition of strategies, the development of efficient production systems, access to new technology and know-how, taking advantage of the different R&D structures in Europe and exploring the competitive advantages of clusters in different countries, yet operating inside a common cluster framework.

However, the benefits of such a platform would not just be relevant to the private sector. To academia, increased cluster-to-cluster cooperation could, for example, result in closer collaboration with SMEs in different clusters and facilitate the development of global excellence in R&D in Europe.

7.3 Implications for policy

A fundamental message from the examination of the Austrian experience is that companies must be the ones to decide on their strategies and the extent and scope of their collaboration efforts. Government and other public policy bodies must not interfere with this too extensively. Companies might otherwise leave the cluster initiative.

The main challenge to policymakers is to facilitate the establishment of the European cluster platform. In connection to this, it is vital to stimulate cooperation incentives on a firm-to-firm level, for example facilitating information provision on financial, competition and production matters. Strategies for the set-up of the platform must however be further developed and the concept proposal be evaluated before hands-on policy advice can be provided. Further examination of the opportunities and potential benefits of setting up a network of European clusters is of high priority to policymakers as well as to private sector actors. It is important for policymakers to be realistic about the possibilities and limitations of policy initiatives, leaving strategic business decisions to be settled by representatives of firms in the clusters.

8 SCIENCE PARKS AS BOUNDARY CROSSERS

Introduction: Helen Lawton Smith, Centre for Local Economic Development, UK
Facilitator: Kathryn Peters, SQW Ltd, UK
Summary: Henrik Mattsson – Dept. of Social and Economic geography & CIND, Uppsala University

8.1 Objectives

The objective of this miniforum was to explore whether science parks can serve as boundary crossers and facilitate university-industry synergies. This summary brings forward the main points from the presentation by Helen Lawton Smith focusing on science parks, and from the ensuing discussion.

8.2 Key discussions and conclusions

Science parks have their roots in the United States. The Stanford Research Park in California, established in 1951, is often regarded as the genesis of the science park movement. Up until the 1980s, the world saw a rather modest growth in science parks, but over the next decade there was an explosion in such establishments around the globe. By 1990, there were over 1,000 parks world-wide, of which nearly 45 percent were situated in North America, 20 percent in Europe and another 15 percent in East Asia.

Within academia, a science park is broadly defined as an organisational entity that sells or leases spatially contiguous land and/or buildings to tenants whose principal activities are basic or applied research or the development of new products, services or processes. However, there is room for several types of science parks under this definition. For instance a university science park, usually located in the vicinity of one or several universities, focuses on management and ancillary services. Incubator science parks or innovations centres, on the other hand, put special emphasis on the transfer of university knowledge into start-up firms. Thirdly, sector science parks work as research engines in specific sectors, e.g. in biotech. In other words, there are many different types of science parks and these should be treated accordingly in analyses and policy. However, all these different types have some characteristics in common:

- Most science parks have formal and operational links with some kind of major centre of research
- Most science parks are designed to encourage the formation and growth of knowledge-based businesses
- Most science parks have a management function which is actively engaged in the transfer of technology and management skills to the organisation on site

In summary, most science parks deal with some kind of boundary crossing. There are broadly three boundaries that science parks can help cross. First, there is the boundary

between idea and firm. Usually this boundary lies between university-based knowledge or technology and the firm, which bears the potential to commercialise it. Science parks are considered to be an efficient tool to create local conditions supportive of the transfer of technology from universities to industry. Secondly, there is the boundary between the firm and the cluster in which the firm is situated. Science parks can function as link-creators between various actors in the park. Such links can in turn be seen as bridges between the components of a cluster. Finally, there is the boundary between local clusters and regional or national innovation systems. This boundary can be crossed by science parks as they can put their member firms on a larger map through, amongst other things, media coverage and branding. It is not unusual that science parks function as nodes in regional or national networks, linking clusters together.

Critics say that the assumed links within and between science parks are generally weak. Empirical studies clearly show that a science park in itself does not guarantee interaction and linkages. There is also a clear national variation in commercialisation and spin-offs between science parks. There are both informal and formal science parks and there is usually a development from the former to the latter. This development is, however, not a natural progression. Local context and governance seem to play a decisive role on the development of science parks. In terms of context the most important factor seems to be the formal and informal institutional framework residing at the location of the science park, especially regarding incentive structures. In terms of governance, the role that universities take upon themselves is important. There are some paradoxes in science park projects that the actors in the project can react to in different ways. For instance there seems to be a trade-off between being an entrepreneurial university and having high intellectual eminence, although there are some counter-examples, e.g. St: Johns Science Park in Oxford. There is also a conflict in objectives between different sources of funding. Universities are, in general, funded by the state while science parks are generally funded by the region. Universities therefore do not have strong incentives to commercialise products/services since their funding is in any case secured. In contrast, the local firms in the science park directly benefit from commercialisation of their products and services, and so does the region when it finances the Science Park as the benefits go back to the region. Conflicts of this kind might lead to considerable formal or informal resistance from universities or other actors and prevent boundary crossing.

The way that the regions and the other actors' at play in specific science park projects face these challenges, along with the ways they institutionalise their solutions, is decisive for the outcome of the project in terms of boundary crossing, commercialisation and growth.

8.3 Implications for policy

Science parks carry the potential for university-industry synergies by enabling boundary crossing between the parts of the triple helix model by offering both the hard and the soft infrastructure of clusters. In addition science parks can enhance the profitability of land use, mainly through property specialisation, selling an image and raising the profile of a region.

However, the science park as a tool for economic development faces some important challenges. In the institutional context of developed economies, intellectual property rights can constitute a significant hindrance for successful science parks. Incentive structures might also vary sub-nationally. For instance, commercialisation of university-based knowledge works well in the Oxford science park but not in Cambridge. It might be important to create good institutions that allow professors and similar individuals to sit on double chairs. In the developing economies, science parks have proved to be a good way of securing post-studies employment for students. However, this in itself is also a problem because it creates a brain drain from the financially constrained universities.

Apart from practical issues, there are also some conceptual barriers to overcome. For instance, there is a need to develop a better language for describing the indirect functions of science parks, both within academia and the policy sphere.

In summary, where there is a need to cross boundaries between academia (idea) and firms, firms and clusters, clusters and regional- or national innovation systems, science parks can contribute to this in several ways: by providing firms with both the hard and soft infrastructure of clusters; by providing management services; and by supporting the emergence and growth of knowledge intensive industries. To obtain efficient boundary crossing, policymakers and other actors have to work on institutions and incentive structures. This work has to be sensitive to specific context. There are different types of science parks and these fulfil different functions. They should be recognised and dealt with accordingly.

9 FROM CLUSTER INITIATIVES TO MICROECONOMIC AGENDAS

Introduction: Örjan Sölvell, CIND - Centre for Research on Innovation and Industrial Dynamics, Uppsala University, Sweden
Anders Malmberg, CIND - Centre for Research on Innovation and Industrial Dynamics, Uppsala University, Sweden
Facilitator: Göran Hallin, ITPS - Institute for Growth Policy Studies, Sweden
Summary: Amy Cogan

9.1 Objectives

This miniforum dealt with how a new policy vision based on the cluster approach can be built on existing policies. Specifically, does there need to be a clearer definition of what a cluster is? What does cluster research reveal about the drivers of cluster dynamics? What do these research findings imply for the formulation and implementation of cluster policies?

The two speakers in the miniforum had complementary approaches to the topic. Malmberg presented the results of recent research in the field of economic geography that provides policymakers with data-driven analysis of cluster dynamics. Sölvell discussed the importance of the microeconomic environment and the role of cluster initiatives in the broad policy context.

9.2 Key discussions and conclusions

Is there a need for a clearer definition of what a cluster is?

The recent increase in attention given to clusters and to issues of economic geography have encouraged more empirical research, the results of which are of direct use to policymakers. For economic geographers, the key questions that the cluster approach sets out to answer are:

i) How is the performance of firms affected by their location?

ii) Why are certain places/regions economically successful?

iii) Why is there regional economic specialisation?

Basic assertions on the benefits of clustering which the research aims to test include:

- The ability to innovate is more important than cost efficiency in determining a firm's long-term success
- Innovation usually occurs as a result of interactive learning among actors with complementary skills
- Spatial proximity enhances the process of interactive learning and innovation

- Locally-based knowledge-enhancing structures are more important than general factor supply, production costs, etc. in determining economic growth and prosperity

Several meanings tend to be attributed to commonly-used cluster terminology. The common definition of a "cluster" is a functionally-defined system of inter-related economic activity and a spatially-defined system of similar and related economic activity. The term "cluster" is, however, also commonly used in the sense of an industrial or regional policy *project*, which, in fact, should be referred to as a cluster initiative.

The term "industry clusters" may be suggested to mean "functionally-linked industrial systems", which are rarely confined to narrowly-defined regions. In contrast, "localized clusters" are spatial agglomerations of similar and related firms and industries. Localized clusters rarely make up complete clusters and are normally strongly linked with firms and organisations that reach well beyond the boundaries of the region. The central issue is whether clusters are primarily a functional or spatial phenomenon. The distinction is important because industrial clusters are generally not spatially concentrated, while localized clusters are not always as interrelated as one would think.

What does cluster research reveal about the drivers of cluster dynamics?

A large body of empirical research addresses how and why clusters work. For the time-being, these ideas should be seen as hypotheses, while the following assertions are tested:

i) Sophisticated demand from local customers triggers learning and innovation

ii) Rivalry among local firms spurs learning and innovation

iii) Knowledge and innovation diffuse faster among firms locally than across longer distances

iv) The more local collaboration, the more innovative the system

v) Appropriate institutions and concerted policies at the regional level can stimulate local interaction and the development of dynamic localized clusters and innovation systems

These ideas arose from the research conducted for *The Competitive Advantage of Nations*, which profiled in-depth case studies of industries and competitiveness in 10 countries over four years. Since its publication in 1990, more attention has been given to the role of economic geography in policy making. Researchers are identifying localized clusters, doing surveys and interviews, and conducting analyses to understand the general applicability of the cluster concept, and measure the benefits of clustering.

Only few broad and general studies have been conducted, but the evidence from the empirical work done in selected industries in selected regions provides preliminary findings that can be drawn upon to help determine policy priorities.

Research has for example shown that the presence of locally-based related and supporting industries seems to be less important than was originally thought. Relatively little business is done with local firms and most local inter-firm transactions are mostly exchanges of basic inputs and services rather than exchanges of knowledge. Formal cooperation between firms at local level is found to be more limited than was originally thought, which raises the question of whether local links should indeed be part of the definition of a cluster at all.

Other controversial results were found in a number of areas. First, there is a difference between local and global rivalry. Often dynamic firms have no local rivals, but rather only a few global competitors. Second, knowledge sharing tends to be more informal, in the sense that it takes place between individuals as opposed to between firms. Preliminary empirical studies support this, but as knowledge sharing is difficult to measure, further study is required. Research also shows that the most dynamic clusters tend to have no concerted policy action.

Other results of this research indicate that other types of linkages arising within clusters are actually stronger than was expected. Links to customers and suppliers, for example, may be more important than local linkages. Also, labour markets are highly localized and the mobility and dynamics within them are what holds the cluster together. Spin-offs mainly occur locally.

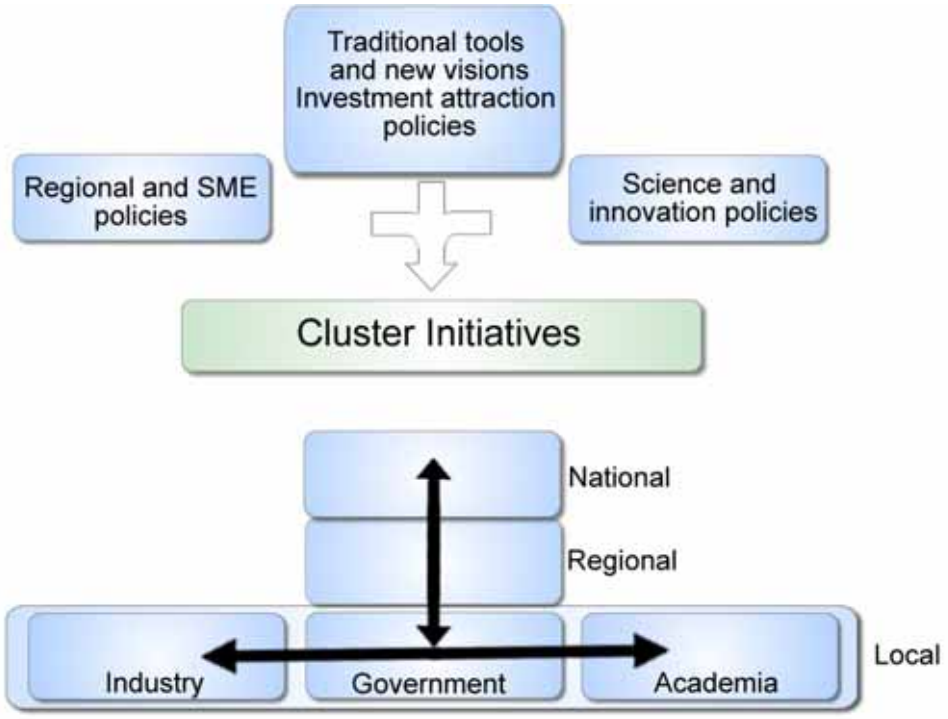
9.3 Implications for policy

Cluster policies have been shown to work, as evidenced in Sölvell et al. (2003). Furthermore, Michael Porter's recent research has found a correlation between clustering and wage levels and clusters and patenting. Cluster policies can be effective tools for regional development, but should be seen as part of a broader microeconomic policy agenda. Cluster initiatives are only one type of policy tool at the micro level. All policies, including social policies, affect the business environment.

There are three distinct policy fields into which public funds flow: regional and SME policies, investment attraction policies and science, research and innovation policies. These policies are used to "lubricate" the cluster. They are based on traditional policies (micro). Within these fields, there are several dimensions of policy. At the most active levels are spending programs to improve education, innovation systems, etc. Regulations (either simplifying or making them stricter) can be effective in aligning incentives to innovation. Encouraging a positive set of attitudes and norms is also very important, especially in transition countries. Trust is indeed particularly important, and cluster initiatives are unlikely to be successful without it.

The policies advocated are not new; rather it is the way they are used that is new. To foster innovation, it is important to coordinate policymaking across all levels – local, regional and national. The cluster approach breaks up the silos that have developed in the traditional fields of academia, government and industry.

Figure 22: Cluster initiatives breaking up the silos



Policy Examples

While macroeconomic policy has been given a considerable amount of attention by academics and researchers, microeconomic policy is not as well understood. Firms often do not realise how much they are products of their environments, and policymakers often underestimate their ability to affect the competitiveness of their regions. An analogy to a football game illustrates the distinction between macro and micro policy. Macroeconomic policy is like the field. A team cannot be expected to play well on a field that is overgrown with weeds or full of rocks. Just having a beautifully maintained field, however, provides no assurance that the home team will win. Similarly, businesses face extreme challenges in environments with unpredictable exchange rates, interest rates, inflation, etc. Stability in these areas, however, provides no particular advantage. Microeconomic policies focus on the business environment, the equivalent to developing the team so they can play their best.

Cluster initiatives are only one type of microeconomic policy. They will be much more successful when they are part of a broader agenda aimed at enhancing the competitiveness of a region. In *The Competitive Advantage of Nations*, Michael Porter introduced the diamond

model as a framework for analysing the microeconomic business environment. Most practitioners and policymakers involved in cluster initiatives are familiar with this model. Each aspect of the diamond model – firm strategy, structure and rivalry; factor conditions; demand conditions; and related and supporting industries – is important in its own right, while the dynamics and interactions among the aspects are important for upgrading and reinforcing all the aspects. Weakness in only one facet of the diamond lessens the potential for reinforcement. It is important to recognise how these aspects affect each other in a dynamic way and to put in place policies that can strengthen the area at regional or national level.

Factors of production such as skilled and specialised human resources, strong research institutions and universities, and high quality infrastructure directly improve the conditions enabling firms to be competitive. Additionally, these factors have secondary effects that can provide additional benefits to clusters: world-class universities and research institutions often spawn entrepreneurs whose companies upgrade rivalry and competition in the local market. When foreign students and firms are attracted to an area because of its world-class factors, this can lead to foreign demand for goods and services.

Examples of policies to upgrade factor conditions:

- Setting rigorous standards for education and teacher qualification
- Ensuring that there are respected and high quality educational alternatives to universities
- Avoiding taxation of employer training initiatives
- Easing restrictions for immigration of skilled personnel
- Supporting research programs that are important to the nation or region's clusters
- Directing investments in R&D more to universities and less to public laboratories
- Supporting specialised research institutions focused on industry clusters
- Developing explicit mechanisms for disseminating results from government-sponsored research
- Partially funding specialised institutes and subsidising research contracts rather than providing direct grants, subsidies or tax credits to firms
- Favouring innovation over protecting past ideas by having sufficient, but not too long, patent protection

Sophisticated home demand spurs companies to innovate faster and helps them anticipate emerging buyer trends. But sophisticated home demand can also encourage the development of specialised factors by channelling social and private investment into these areas. It can also help the expansion of the industry by the emergence of more specialised suppliers to address unmet needs and replace imports.

Examples of policies to upgrade demand conditions:

- Encouraging upgrading and innovation through the setting of stringent standards for product performance, product safety and environmental impact, especially when these regulations anticipate standards that will spread internationally

- Providing incentives to buyers to be early purchasers of sophisticated products
- Supporting early adoption of technical standards for high technology products

A strong network of suppliers and related industries can increase efficiency and quality through frequent and quick flows of communication and exchange of ideas and innovations. Furthermore, a large network stimulates government, educational institutions, firms and individuals to invest in factor creation for common inputs. Success in a related or supporting industry can also provide a reputation for an area that is transferable to related or supporting industries.

Examples of policies to upgrade related and supporting industries:

- Supporting the creation of specialised infrastructure, institutes, and educational institutions rather than general industrial zones with no constraints
- Supporting investments in universities and laboratories that will attract firms rather than provide subsidies for locating in a certain region
- Encouraging cluster development initiatives

A context where there is strong rivalry not only increases competitive pressures on firms, but also creates a number of secondary effects. A large number of firms competing in a region stimulates the rapid development of skilled human resources, related technology, market-specific knowledge and specialised infrastructure and reduces the risk of investing in specialised factors. Furthermore, a high degree of rivalry can lead to competitive efforts to develop relationships with educational and research institutions. A large number of directly competing firms can push supplier industries to develop and innovate through the development of specialised products and services tailored to the local industry. Furthermore, the large number of firms in a region can build a reputation for a specific geography and reduce the perceived risk of sourcing from that region due to the presence of alternative suppliers.

Examples of policies to upgrade rivalry:

- Setting and enforcing strong antitrust policies, especially in recently deregulated industries and where state monopolies have been privatised
- Discouraging cooperation among directly competing industry leaders unless it occurs through independent entities which the majority of firms have access to
- Encouraging private venture capital through tax incentives for long-term capital gains
- Streamlining regulations for starting new companies

10 CAN GOVERNMENTS CATALYZE CLUSTERS? EXAMPLES OF GOVERNMENT INTERVENTIONS

Introduction: Kevin Fitzgibbons Group Leader, Strategic Planning and Policy, Corporate Services Branch, National Research Council, Canada (presenting on behalf of Indira Singh, Ontario Ministry of Northern Development, Canada)
Facilitator: Peter Heydebreck, Inno Group, Germany
Summary: Fulvia Farinelli, United Nations Conference on Trade and Development (UNCTAD)

10.1 Objectives

The objective of this miniforum was to explore the government's role in cluster development and identify actions, both deliberate and unintentional that have had a catalyzing impact on cluster competitiveness and innovative capacity. For this purpose, the session examined in detail actions that government, private sector and educational institutions can undertake in order to support clusters. Examples from such a diverse set-up of countries, as South Africa, Scandinavia, Japan, India, China Taipei, Arizona and Canada are provided.

10.2 Key discussion and conclusions

There is a growing consensus that, if correctly interpreted, the cluster-based economic development model can provide a foundation for sustainable economic growth and the way forward to diffused prosperity. The success of the model is due to the fact that it is an example of endogenous development based on small and medium-sized enterprises, which is strongly rooted in the local communities and which often combines competitiveness and social stability. It is also due to the fact that with a strong presence of specialised and flexible small firms, areas are generally more likely to create the conditions that increase efficiency and productivity on a long-term basis and therefore become attractive for foreign investors.

This explains the interest of governments with widely-differing ideologies and philosophies, and the popularity of public interventions devoted to promote cluster initiatives.

In the United States and Canada, liberal and conservative governments have adopted cluster-based strategies. In Europe they have been adopted by governments across the spectrum – from right to left, namely, in all of the Nordic countries, most German and Italian regions, Scotland and Ireland, Spain and Holland. In the Asia Pacific region, national and local governments from Australia and Malaysia, to New Zealand and Singapore have adopted cluster strategies as well.

Ultimately, in both developed and developing countries, cluster initiatives have become a sort of "magic recipe" to meet the challenges of the new economy, to the point that they have now become dangerously fashionable. Many commentators are actually sceptical about

the possibilities of creating from scratch local production systems (clusters) of small firms which compete on the basis of collective efficiency. The evidence, however, indicates that various interventions by public or private institutions can play an important role in helping a cluster, once it has emerged, to attain, maintain and enhance competitiveness. Just to cite a few successful examples:

- In *South Africa,* the government provided funding to assess the competitive advantages of the capital equipment cluster (minerals and metals) and to develop a long-term strategy. The cluster evolved into a private sector-led initiative, and as a result of cluster strategy implementation, exports doubled and revenues tripled in the first year afterwards.

- In *Scandinavia*, government's early action to support tests with mobile telephony helped to create a strong, globally competitive cluster, having a transformative impact on the economy. The Nordic mobile telephone program was a cooperative effort of the Scandinavian countries to establish mobile telephony, well before anywhere else.

- In *Japan*, the government policy helped to speed up the growth of the facsimile industry, before it was even known to the rest of the world. For example, early demand for facsimile machines was boosted when the government approved the use of faxed documents for legal purposes.

- In *India*, the Bangalore Software Cluster is an example of a deliberate public policy to move along the value chain from application software to systems design cluster. In 1991, the government initiated 15 Software Technology Parks, which were instrumental in creating a critical mass of 180 companies with 20,000 skilled professional workers. It exported 85 percent of its software products in 96/97, growing at a 64 percent rate in 2002. While Information Technology Cluster growth worldwide has waned, the Bangalore Cluster continues to grow and still attracts talented expatriates, foreign investment and major corporations, such as Oracle, Microsoft and GE.

- In *China Taipei*, the Hsinchu Science-Based Industrial Park is an example of government intervention. The government has invested $1B (USD) since 1980 and provided tax exemptions, generous grants and government laboratories specialising in computer semi-conductors and telecommunications. The Park was established in 1980 and has now over 334 firms, with 98,616 employees generating over $7,054,000 M (USD) in annual sales. The government reached its break-even point on the project's annual $40 M (USD) running costs in 1996. The cluster attracts foreign investment and has enticed talented ex-patriot workers back to the region.

- In *Arizona*, the cluster-based Strategic Planning for Economic Development (ASPED) proved to be a powerful tool to revitalize the economy. In the late 1980's, like most of the United States, Arizona experienced an economic slowdown. Employment growth was mostly concentrated in low-wage and highly cyclical real estate, construction and service sectors. In response to ASPED, Tucson emerged as

an international optics 'silicon valley', which grew by 65 percent, between 1994 and 1999. Besides the optics cluster, the aero-space cluster added 60,000 jobs and the tele-services industry cluster grew from 2,000 to 16,000 jobs.

- In *Canada,* several successful cluster development cases can be found. Among these:

  - In 1991, the Québec government was the first Canadian provincial government to adopt cluster development as a government policy. The Québec government made a $30M (CAD) cluster development commitment, identified 14 clusters and established committees for each cluster and cluster service centres. Since then, the economy has reduced its reliance on exports of raw materials in favour of higher value products, and Québec has a stronger presence in information technology, biotechnology, multimedia and aero-space. In 2002, the Quebec government's holding company, Societé Générale de Financement du Québec (SGF) announced that it would promote regional economic development through the identification of regional industrial clusters to generate prosperity.

  - A dynamic wine cluster in Niagara, Ontario, recently emerged with unique high quality globally competitive ice wines, winning international awards and enjoying superior ratings. The federal and provincial governments invested $160M (CAD), pursued an aggressive marketing and advertising strategy in partnership with the private sector, and developed a strategic framework with goals to increase market share and create new jobs. Experimentation with new grape varieties and investment in advertising and marketing the Ontario wine brand were two key factors that contributed to its success. Neither could have been accomplished without government funding.

  - Early success at the Ottawa's Silicon Valley North's telecommunication cluster can be attributed to the government of Canada's unprecedented R&D spending levels, tax credits and start-up incentives. The government was a demanding procurement customer, using its mainframe computer purchasing requirements to encourage multinationals to establish research, development and manufacturing facilities in Canada. Access was also granted to government laboratories such as the National Research Council (NRC). In the 1990s, Silicon Valley North actually grew at a faster rate than Silicon Valley, California.

  - Saskatoon Biotechnology Cluster has become one of the world's leading agriculture biotechnology clusters. Thanks to government post-war investment in R&D, a new variety of rapeseed, canola, was created, but only in recent years have international companies started to commercialise it. Saskatoon's Biotechnology Cluster is located within an Innovation Research Park and works in close cooperation with the National Research Council's (NRC) Plant Biotechnology Institute. It now includes over 100 companies, sharing a $1B (CAD) market. The government was instrumental in providing research funding and attracting a talented workforce.

- New Brunswick's Information Communications and Technology Cluster reached a 177 percent growth rate between 1999 and 2001. It generated $500-$770M (CAD) in revenue in 2001 and 63 percent of its market revenues came from outside Canada. Its success was a direct result of the provincial government's attempts to diversify the economy, to identify ICT as a key development priority and to create a local ICT market by becoming a customer of ICT products and services. NBTel, the provincial phone utility, modernised the economy and the province's community college, private technical schools and local universities graduated the skilled personnel needed by the cluster.

These examples demonstrate that government policies for promoting infrastructure, human resource development, networking and technology diffusion, can play a critical role in creating the conditions that are required for clusters of SMEs to flourish. This applies to both high technology and traditional sectors. In particular, in some areas, public policies not only contribute to cluster strength but governments are in a unique position to enable favourable outcomes. This is particularly the case under circumstances marked by a strong presence of free-rider problems among market actors.

From the examples presented in the miniforum, a list of actions conducive to cluster development was elaborated.

i) Adopt a national policy of cluster-based economic development.
ii) Promote a shared long-term vision for the development of the cluster.
iii) Fund cluster assessment/analysis and strategy development.
iv) Increase R&D spending and tax incentives (invest in learning).
v) Diffuse technology through incubation/industrial/research parks.
vi) Ease the access to public laboratory facilities.
vii) Fund marketing, common brands and advertising.
viii) Use public procurement strategically.
ix) Restructure programs and services to support the cluster in its entirety.
x) Make public information and statistics relevant and available to clusters.

10.3 Implications for policy

From the above, the following policy implications can be drawn:

- Policy interventions may play a major role in the field of cluster promotion, but these should be confined to revitalizing only existing clusters with high growth potential.
- Strict top-down interventions aimed at reproducing specific models can easily fail. Problems tend to be specific to a region or sector and require tailor-made responses.
- Cluster development is a long term-process fraught with obstacles, where commitment, leadership and communication are keys to success. This emphasizes the need for long and often costly consensus-building and concertation processes.
- Besides governments, organisations such as firms, educational and research institutions (colleges and universities), non-profit organisations and trade

associations all play important roles in cluster development and have a catalytic effect on clusters.

- Each of the actors at the macro, meso and micro levels must commit to a common long-term vision for the development of the cluster and must play their appropriate role. In particular:

National governments should:

- Play a role as 'broker', 'facilitator', 'initiator', 'participant' and 'listener' to engage partners in a productive dialogue and create a sense of urgency to cause action.
- Conduct ongoing cluster assessments to determine their viability and relative strength to ensure global competitiveness.
- Institutionalise cluster upgrading (e.g. restructuring government programmes and services, diffusing new knowledge, and collecting and disseminating data/information by clusters)
- Directly invest in, and provide investment incentives for technical, physical and knowledge infrastructure.

Local political leaders should:

- Engage with federal, state, provincial and/or regional governments to build a competitive local environment.
- Build/encourage/facilitate local and global partnerships to attract knowledge-based firms.
- Support clusters by promoting their inherent strengths/assets.

Business leaders should:

- Lead and participate in the development of cluster strategies.
- Identify weaknesses and strengths of clusters.
- Set higher aspirations pursuing global strategies.

Academics should:

- Promote a culture of entrepreneurship among students and professors.
- Focus on applied research and support the needs of local clusters through cluster analysis, training programs, R&D.
- Meet the technological needs of cluster-based SMEs.

Cluster facilitators should:

- Encourage synergies and build consensus.
- Maintain the balance of achieving short and long-term benefits.
- Focus on concrete action plans for cluster specific initiatives.

11 COLLABORATIVE GOVERNANCE – TRIPLE HELIX

Introduction: Michael B. Darch, Ottawa Global Marketing, Canada
Brian C. Catts, Principal, Cattman Ventures, USA
Facilitator: Johan Hauknes, STEP Centre for Innovation Research, Norway
Summary: Martin W. Wallin, Department of Industrial Dynamics, School of Technology Management and Economics, Chalmers University of Technology, Gothenburg, Sweden

11.1 Objectives

Today it is recognised that innovation does not take place in isolation. In fact, this often mystified activity, so fundamental to economic growth, takes place in complex and reciprocal networks of different actors, be they commercial firms, government agencies or academia, and is shaped by the institutional framework in place. Moreover, it is realised that innovation is not an activity that can be entirely left for markets to coordinate. The traditional neo-classical framework that has guided policymakers does not provide innovation stakeholders with an appropriate understanding of innovation nor the proper set of policy tools. Instead, new ways to think of innovation are under way. These, at this point perhaps rather embryonic and incomplete models, challenge the old thinking that emphasised competition between firms and leaving government out of the equation. At the early and formative stages of innovation, when only emerging pieces exist, there is not much to compete about, creating an increased need for collaboration.

During this session two attempts to use and implement this line of reasoning were presented. First, Michael B. Darch, Ottawa Global Marketing, Canada talked about his experiences in creating high performance clusters and working with the Triple Helix approach. Second, Brian C. Catts, Cattman Ventures, USA, presented the work on cluster-based regional development in Tucson, Arizona, USA.

11.2 Key discussion and conclusions

Regional collaboration has been prompted by the realisation that local determination and control of regional strategies is a more effective approach to sustainable economic growth than top-down mandates and implementation by large scale agencies at the state or central government level. Going beyond the fairly recent tradition of tightly-defined cooperative arrangements between municipalities in matters such as sharing costs for services or coordinating infrastructure development, local authorities and/or other parties are beginning to form voluntary groups to plan and coordinate economic development strategy at the regional and micro-regional levels. These groups typically have no administrative authority and address a broader agenda than traditional local policymakers. This new pattern involves taking a place-based approach to sustainable economic development by creating strategies that combine social, economic and environmental objectives.

Catts' presentation focused on the evolution of Tucson, Arizona's decade-old, metropolitan-wide high tech collaborative network, the Greater Tucson Strategic Partnership for

Economic Development (GTSPED), and the way it adapted to a series of potentially fatal internal and external challenges and opportunities. Tucson's all-stakeholder approach represents one of the most successful regional alignments of the triple helix model. Harmonising the agendas of industry, university/research and government was initially more visceral than intentional, but the effectiveness of this interaction and the sophistication of the results grew over time.

According to Darch, collaborative governance is usually considered to be a Grimm's fairytale. With globalisation, free trade and technology that change at an ever-increasing pace, taming the triple helix is a key to constructing competitive advantage. The ability to move three headstrong and independent horses in vaguely the same direction allows innovation, research and commercialisation to prosper. Finding the common ground and mutual benefit allows fairy tales to come true.

Instead of going through the two presentations separately, what follows is a synthesis which focuses on the commonalities of the two presentations. The lessons for policy-makers can be grouped under five themes – the '5 A:s of Collaborative Governance. These are, in random order, Alignment, Arena building, Agency, Adaptability, Anarchy.

Alignment - Cluster initiatives should aim at aligning the different interests among different stakeholders. Different stakeholders will never move in exactly the same direction, but by focusing on common interests the alignment is much easier achieved. Alignment is important for staying focused because if different stakeholders continue to press for their special interests the cluster initiative as a whole will not move in the desired direction, and eventually it will fail. Alignment is also not something that can be achieved by putting a few bright men and women into a room to discuss what they think other stakeholders' interests are. All participants must be given a chance to communicate their interests. Such a collective process with a strong focus on common interests will make it clear to most if not all stakeholders which interests should be pursued. Working this way, alignment is more or less a by-product in the process of identifying common interests among stakeholders.

Arena building - Even though the collective processes to align stakeholders' interests can take place more or less naturally, sometimes more active measures are necessary. This is something that Catts and Darch defined as Arena building.

On the question of who should and who should not be part of the Cluster Initiative, the two speakers shared the view that Cluster Initiatives should stay open for new groups of people and other stakeholders to join and shape the direction. This feeds directly into the above point on alignment; new stakeholders can change the direction of the cluster initiative. It then becomes more evident that alignment is not a question of finding a static equilibrium but is rather a broader concept that will help to find the commonalities among stakeholders, commonalities that glue the initiative together. When defining and building the arena, it is important to include the public sector. However, the public, like parts of the business community as well as local government, can be quite inert and oppose change in the local business structure. These are important issues when designing the cluster arena.

The broad concept of an Arena provides a "bottom up" approach to programming economic development that is inherently more attuned to local characteristics and

specialisations than central government-based policy implementation. The boundaries are typically configured in terms of functional commonalities – e.g. a core municipality and its economic hinterland – rather than existing administrative units; in many cases, their establishment is concurrent with centrally-mandated consolidation of local authority.

The regional partnership should be outward looking, with an active public relations program to inform all sectors of the community and involve its leadership. Since all sectors of the community are to benefit either directly or indirectly from regional economic development, then everyone is a potential supporter.

Agency - Arena and agency is not the same thing. The arena is much broader in its nature whereas the agency is the responsible organisation with a prime objective which is to establish and maintain focus and support for the cluster initiative. Some stress the importance of a neutral agency or facilitator organisation, where the regional partnership exists to promote collaboration, rather than taking authority unto itself. In that case, authority stays with government, universities and business in their respective areas. There is no loss of autonomy by local government, or economic development agencies, or any other participant. If government is in charge of the agency many businesses will hesitate to join. The opposite might also be true. The agency serves common interests, particularly on agendas, which are either insolvable or not effectively addressed by individual jurisdictions. Their articles of association tend to be broad and flexible.

Adaptability - Cluster initiatives need to be adaptive, flexible and willing to change. On a broader level, governments should be interested in initiating new cluster initiatives. These initiatives do not necessarily come from within old cluster initiatives - especially if they are competing. Government should support such variety and be open to new initiatives and new stakeholders joining present initiatives. In fact, for the success and survival of all cluster initiatives, openness and willingness to change is crucial. Blocking new entrants to join the cluster may be the first signal that the cluster initiative is in decline.

Anarchy - A prerequisite for adaptability is to keep systems open. Open for influence for the off-system environment. Too much focus on top-down strategies and central planning does not ensure a prosperous future, on the contrary. In this sense a certain degree of anarchy is desirable. Goals, motives and strategies must always be under scrutiny. But the concept of anarchy is also chosen as a way to illustrate a paradox in these cluster initiatives: the need for coordination and alignment between stakeholders is often stressed. At the same time, there is a need for stakeholders not to give away power, and a need for neutral cluster facilitator agencies. Perhaps successful cluster initiatives are examples of coordination without hierarchy so to speak, which to many sounds like a paradox. This paradox can, however, be resolved if we admit that coordination and alignment is not an ultimate goal in itself, but rather an outcome of trying to find the common features, goals and interests in a heterogeneous population of firms, governments and academia and that some anarchy is necessary for the long-term survival of the cluster initiative.

11.3 Implications for policy

Local firms can, under certain conditions, gain more from cooperation than from competition. Government and universities have a role to play to help coordinate and facilitate this interaction in addition to providing their own specific and unique knowledge. Collaborative Governance and Triple Helix models of innovation try to capture these courses of events. More specifically, cluster initiatives should aim at aligning the different interests among different stakeholders. Sometimes more active measures are, however, necessary when the collective processes to align the diverse interests among stakeholders fails. The cluster agency then serves common interests, particularly on agendas, which are either insolvable or not effectively addressed by individual jurisdictions. Finally, cluster initiatives need to be adaptive, flexible and willing to change. In this sense a certain degree of anarchy is desirable. Goals, motives and strategies must always be under scrutiny.

12 DONOR FUNDING OF COMPETITIVENESS INITIATIVES: RESULTS TO DATE AND FUTURE PROSPECTS

Facilitator and Introduction: Kevin X Murphy, J E Austin Associates, USA
Summary: Dzamila Bienkowska, Centre for Research on Innovation and Industrial Dynamics, Uppsala University

12.1 Objectives

Provision of development assistance through supporting competitiveness initiatives represents a fairly new approach which is currently growing vigorously. The session focused on potential gains from combining the knowledge and experience of TCI members regarding competitiveness initiatives with donor agencies' interest in working with this approach. Results from previous and ongoing work with competitiveness initiatives in developing countries were presented and discussed, as well as methods currently used in such projects and possible obstacles to future efforts.

12.2 Key discussion and conclusions

Several donor agencies are currently working with Competitive Cluster Initiatives (CCIs) in developing countries. Among the agencies that have adopted a cluster approach in their work are USAID, World Bank, UNIDO and Inter-American Development Bank. During the miniforum, key questions regarding donor funded CCIs were addressed, including the motives for funding CCIs in developing countries, the methodology used in working with CCIs, results from previous work and implications for the members of TCI.

Which are the motives for funding competitiveness initiatives in developing countries as a new form of development assistance? According to Kevin Murphy, there are many reasons for the adoption of this approach. For example, developing countries themselves seek such assistance as they realise that macroeconomic reforms aren't enough for development to occur. CCIs also provide a unifying theme and a common cause for a country's industry, government, academia and citizens, giving the government a new role to play in the process, that of a partner rather than a director. There is also a growing concern in the developing countries regarding the advancements of WTO and other reforms – they want to secure a competitive position in today's globalising world. Furthermore, the results so far suggest that CCIs can leverage millions in counterpart funds from other donors.

There was already some interest in private enterprise development at USAID when the work with the cluster approach was initiated during 1998. After designing a prototype for the support of CCIs an experimental implementation started in Uganda and a long-term project was launched in Sri Lanka in 1999. Later the approach was introduced in more countries, and during 2003 the US government adopted CCIs as a part of its formal strategy for development.

The methodology used in the work with CCIs in developing countries differs from regional cluster initiatives that focus on developing particular regions. The CCI approach is applied

on the whole country and begins with a search for potential clusters where there already exists some form of local leadership and receptivity towards development efforts, as well as relevance for the particular country. When the counterparts are identified, the clusters are analysed by foreign and local experts with the aid of different tools, e.g. Porter's diamond. As a result of the analyses, cluster strategies are formulated. A dialogue between the public and the private sphere of society is established, and a competitiveness council is formed in order to coordinate the work of educational units, the business community, government and labour unions towards greater competitiveness.

There are, of course, potential controversies in working with competitive clusters towards development goals. One could, for example, say that supporting selected cluster initiatives equals subsidising the rich. The role of external actors in national cluster development could be questioned as well. Likewise, sustainability issues were brought into light during the session. The approach of the donors has recently shifted towards seeing the private sector as an intermediary for poverty eradication. That is the main rationale for engaging in cluster initiatives in developing countries. External actors have valuable skills that can contribute to business development that in turn can lead to job creation and greater wealth for the whole country. Competitive clusters are also important for promoting sustainable development as traditional price-based competition doesn't leave room for improvement in the areas of sustainability.

The newness of this approach lies foremost in its focus on clusters and its emphasis on process as compared with traditional development approaches. The amount of co-investment mobilised in the targeted country is also unique to the competitive cluster approach, according to Kevin Murphy. This gives greater results with less amount of money spent by the donors. The expected results of cluster initiatives in developing countries include productivity gains as well as increased levels of employment, GDP and exports. The results can be measured on different levels, however. The process leading up to the results on employment and other quantitative indicators should be monitored and evaluated. The process facilitators can, for example, look for evidence of cooperation and implementation of agreed actions.

12.3 Implications for policy

External actors have a great role to play in supporting cluster initiatives in developing countries. The outsider can take on the role of a neutral broker between actors. Actors with experience from the global market bring in a global point of view and knowledge of competitive strategies in other countries. However, supporting a competitive cluster requires a great deal of intercultural skills and talented facilitators. Development agencies throughout the world traditionally engage in development processes and could consider trying out the competitive cluster approach in their efforts. Real industry expertise is nonetheless always needed in order to succeed in fostering the development of clusters. This requires coordination between the agencies and industry in the donor country. Academia can contribute to the efforts by developing methods for working with and evaluating cluster initiatives, as well as documenting and reaching out with the lessons learned from previous efforts.

13 STRATEGIC UPGRADING THROUGH THE INFLOW OF FDI

Facilitator: Rolf Rising, Director, Head of IT and Electronics, ISA - Invest in Sweden Agency, Sweden
Summary: Magnus Eklund, CIND, Uppsala University

13.1 Objectives

The importance of global linkages in dynamic clusters has long been stressed by cluster concept proponents. For a knowledge-based cluster, the interaction between firms and academia is vital. Firms needs access to the research results, and academia needs access to a powerful industrial customer base. In Sweden, as an example, there is a tendency that the university capacity has outgrown the industrial demand. To sustain excellence in imbalanced clusters, the infusion of FDI in terms of new industrial customers with advance demand can be a solution. This miniforum explores whether strategic work to recruit foreign direct investment (FDI) can facilitate the upgrading of clusters to more advanced levels and provide such linkages.

13.2 Key discussion and conclusions

Much of the discussion during this miniforum centred on the case of Sweden and how the issue of foreign investments has been handled. The organisation *Invest in Sweden Agency* (ISA) has adopted the cluster idea in its work, focusing on major Swedish clusters that already have global linkages. The idea has been to move beyond the general marketing of Sweden as a country to invest in, to recruit specific companies with something special to offer on the Swedish scene. Since the late 1990s, several national programs have been initiated in order to recruit strategic FDI and upgrade the selected clusters. Two examples were presented in the discussion: the Swedish telecom cluster and the automotive cluster in the area around Gothenburg.

The focus on telecom may to some degree have been encouraged by concerns that important functions of Ericsson, such as R&D, would move to foreign countries. Another reason to attract FDI was linked to university research. Knowledge development in the telecom sector tends to be market driven, but lately university research capacity has outgrown demand from industry. Foreign investment was seen to be a way to increase the number of qualified customers and the demand for research, thus maintaining the cluster's knowledge-producing qualities. The focus is mainly on companies in the USA and Asia.

In the automotive cluster, major technology shifts have taken place in the last decades, from a mechanical to an electronic platform. Today more than half of companies' R&D spending is geared towards electronics and software. FDI by companies involved in computers and microelectronics was felt to be necessary to boost the quality of the supplier base in the cluster.

One important question in the discussion was at which geographical level strategic FDI policy was best formulated. Many national FDI organisations do not focus on clusters in

their activities, perhaps due to worries that such an approach would be seen as favouring specific regions. On the regional level, the cluster concept tended to play a more important role in FDI policy. In general, regions have become more autonomous when it comes to economic policy, and FDI is especially important to regions in the periphery. One problem, however, is that the regional level often lacks the necessary resources and expertise to obtain strategic FDI. It was argued in the discussion that the concern of a perceived regional bias of a cluster-based FDI policy at the national level was exaggerated and the important thing is to set up national programs targeting national clusters, even if those clusters only make up one or two regions, which is not the same thing as allocating resources geographically.

It is important to remember that a strategic FDI policy is not about merely seeking to attract the maximum possible foreign investment. An FDI policy is based on an in-depth analysis of the situation in the targeted cluster as well as a clear vision of the direction in which the cluster should be heading. Information about the business situation in possible investing countries is also important. In the case of Sweden, a substantial share of foreign investment has come from Asia. In Asia, industry has been growing rapidly in the last decades, while the university sector has not been able to keep up the pace. Universities have also been geared more towards education than research. Asian companies therefore have incentives to tap into the Swedish research sector, while also serving as demanding customers, thereby boosting the quality of R&D in Sweden.

Research and knowledge play an important part in today's economy, therefore the ability of universities to interact with industry is a vital factor explaining economic success. Traditionally, universities have not been involved in such interaction to any large extent, and it is not always compatible with the self-image of university researchers. An improved quality of such interaction can make countries more desirable for foreign investors. Research institutes are important links between universities and industries, and can be used as a broker facilitating interaction. By giving the institutes funds they can allocate to PhD research, incentives can be created for universities, making them more receptive to industry demand.

FDI organisations should not only aim at attracting investors to the country, but also act as an advocate for the interests of those foreign companies when it comes to establishing a favourable business climate for them. That might mean criticising the home government on some occasions.

13.3 Implications for policy

At least in smaller countries, strategic FDI policy is probably best pursued at the national level, focusing on national clusters. It is important to analyse and obtain knowledge about the targeted clusters, as well as the incentives of possible foreign investors. A clear vision should be set up about which direction of development is desirable for the clusters before the FDI attraction policy is launched. FDI organisations should aim at making the business climate friendlier to foreign investors, by advocating their interests and facilitating the interaction between industry and university.

14 GENDER IS INNOVATIVE CLUSTERING – HOW TO INCLUDE VAST POTENTIALS

Introduction: Marie Ahlgren, CEO, Arviva, Sweden
Facilitator: Mateja Dermastia, State Undersecretary, Ministry of the Economy, Slovenia
Summary: Frida Wennerström, Department of Industrial Marketing, Chalmers University of Technology

14.1 Objectives

A recent study by Ahlgren and Stephansson (2003) – financed by the Swedish government agency for innovation systems (VINNOVA), with the goal of investigating how many men and women respectively are engaged in the VINNOVA-financed incubators in Sweden – found that women entrepreneurs are under-represented in Swedish incubators. This miniforum focused on why women tend to be under-represented in incubators, the issues that arise because of this, and how the situation can possibly be addressed.

14.2 Key discussion and conclusions

Two issues formed points of departure for the discussion: First, there are few women in cluster activities (Ahlgren and Stephansson, 2003) and second, this is seen as a problem from an economic growth perspective. During the mini-forum it was concluded that it is possible to draw parallels with other countries based on the participants' experiences from the Swedish example.

"Pre study on Incubators and gender"

The result of the study undertaken for VINNOVA is unambiguous: women are under-represented in the 14 incubators studied, geographically positioned all over Sweden. An incubator is a centre where entrepreneurs benefit from support and can draw on appropriate competencies during the first stage of a firm's existence: the establishment of the firm. This support often includes a building where offices and facilities are set up, proximity to a learning environment, access to mentors and investors, and visibility on the market. It is possible to argue that being part of an incubator means taking part in a cluster.

Three incubators in the Stockholm region were the focus of the study: the Stockholm School of Economics Business Lab (SSE Business Lab), Karolinska Innovations AB (KIAB) and Kista Innnovation & Growth (KIG). All three have a clear target group – defined as the population from which new entrepreneurs were to be identified and attracted to the incubator. The target groups for the three incubators, however, differed in terms of the percentage of women. The study showed that the character, context and performance of the incubators differ in many other respects not discussed here, where the focus is on the representation of women in the incubators.

Table 6: Distribution of women and men in the target groups and incubators

Incubator/ Percent women	KIG	SSE Business Lab	KIAB
Women in target group (percent)	20 %	40[94] %	60 / 16 %
Women in incubator (percent)	0 %	15 %	20 %

Source: Ahlgren and Stephansson, 2003

KIG is located in Kista, an IT and telecom cluster outside Stockholm. The target group consists of researchers at the IT University, the Royal Institute of Technology, and anyone in Kista who has an idea of a new product in the area of information and communication. The target group, which includes employees of firms and universities in Kista, includes 20 percent women but the incubator has no female entrepreneur at present.

SSE Business Lab concentrates on the students and recent graduates of the Stockholm School of Economics. As seen in Table 6 above the share of women at the SSE is 40 percent while the share of women in the incubator is only 15 percent.

KIAB is directed towards researchers at the Karolinska Institute, which is a hospital and research unit. The target group is in reality smaller as it consists of the top researchers, of which 16 percent are women. However, women account for 60 percent of the whole population of researchers at the Karolinska Institute. Yet, only 20 percent of the researchers in the KIAB incubator are women, i.e. one fifth of the founders of projects in the incubator. The difference between the potential and actual target group could be one explanation for having only 20 percent female entrepreneurs in the incubator compared with 60 percent in the target group. Overall it can be concluded that, independently of the proportion of women in the target group, there are few women in the incubators.

In addition to those three incubators, another eleven incubators around Sweden have been studied briefly. They show a similar pattern: there are few women in these other incubators and there is a focus on technical products. One exception is Västerås Science Park where an effort directed towards women has been made, focusing on educational areas with a high degree of women participation, e.g. environmental and energy issues. Västerås Science Park today has 21 percent women.

Explanations as to why there are few women entrepreneurs (in the incubators)

In the report three general explanations are given to the situation: first, the focus of the incubators is technical in character and it is a fact that in the technical fields, the number of

[94] This year there was 38 percent women studying at SSE but over the years the average has been 40 percent and since the alumni are included in the target group, the 40 percent figure is chosen.

active women is limited. So, in order to attract more women entrepreneurs, investments are needed in fields where women are.

Second, there are several myths of women entrepreneurs. A common stereotype is that women's firms are small. While that is true, it is equally true for men's firms. According to Bünger and Wennberg (2003)[95], 72 percent of women and 61 percent of men are solo-entrepreneurs, having no employees and 34 percent of men and 28 percent of women have between one and nine employees. Hence, the picture is similar for men and women. Another myth is that women do not want their companies to grow and that companies founded by women are very local. Again, this is not more true for women than for men (ibid.). An important conclusion is that differences in entrepreneurship are not due to gender but due to differences between sectors.

A third explanation for the low levels of women entrepreneurs listed in the report is founded on a more thorough analysis of women in society historically and culturally. The report also analyses women's role in the labour market at large as well as in public services and regarding wealth. The analysis shows that the issue of the number of women in incubators touches on larger questions that cannot all be addressed here. However, what came out of the miniforum were suggestions of actions to include women in clusters.

14.3 Implications for policy

There are special reasons for establishing incubators in fields in which women display a potential for launching businesses that in part is unfulfilled. There are several examples from service-oriented activities. In other words, cluster initiatives should not be limited to technology and technical products, since there is currently a limited growth in these areas, and there are few women in these fields.

A last point to acknowledge is that the issues addressed here require further research. Among other things, it is important to substantiate the nature and scope of benefits that may arise from having more women engaged in the clustering processes, and to clarify the nature of the linkages that appear to suppress their potential contributions in different countries and kinds of activities.

[95] Not quoted from original source, from Ahlgren and Stephansson (2003).

15 CLUSTERING COMPETENCIES

Introduction: Jan C Maier, President, Innoveras, Germany
Facilitators: Tomas Hultgren, West Sweden Chamber of Industry and Commerce, Sweden
Martin Börjesson, West Sweden Chamber of Industry and Commerce, Sweden
Summary: Linus Dahlander, Department of Industrial Dynamics, School of Technology Management and Economics, Chalmers University of Technology
Mattias Lindström, West Sweden Chamber of Industry and Commerce

15.1 Objectives

The objective of this session was to describe a recently founded project in Gothenburg, Sweden. The project aims at increasing the competitiveness of the region by improving the bidding process with Multi-national companies (MNC). This summary outlines some of the main benefits and drawbacks of the initiative and some conclusions relevant for policy-makers.

15.2 Key discussion and conclusions

Some notes on clusters and competencies

The question of clustering and co-location of activities and actors has attracted increased attention among policy-makers over the last decade. Building on the pioneering work of Marshall (1890 and 1920) who emphasised the role of local relations, a number of theoretical strands such as the new economic geography (Krugman 1991*a* and 1991*b*), regional innovation systems (Cooke et al. 1997), industrial districts (Brusco 1990) development blocs (Dahmén 1988) and clusters (Porter 1990) have contemplated the role of the local settings for competitiveness and growth. To varying degrees, these theories emphasise that development is carried out as a social process embedded in a social structure that encourages interaction among a lot of people. One should, however, be aware that surprisingly few empirical studies have actually provided convincing empirical evidence of the superiority of local over non-local interaction (Bathelt et al. 2002).

It is important to underline what makes up a competence and how it differs from other words commonly used in relation to the knowledge economy.[96] Routines are what an organisation de facto *does*, whereas capabilities refer to what it *can do* if the conditions change. Competencies, on the other hand, are the core *abilities* that an organisation *possesses*.

The Initiative

In the spring of 2003 the West Sweden Chamber of Commerce and Industry and Västra Götalandsregionen (VGR) initiated a project aimed at stimulating economic growth in the

[96] For a discussion of the concept of core competencies, see Prahalad and Hamel (1990).

West Swedish Region (WSR). The project aims at improving the bidding process for the regions' companies to get projects from MNCs.

To improve the bidding process a regional bidding organisation has been created that will facilitate the identification of complementary core competencies necessary for creating a powerful bid. This can, for example, come from a local company aimed at a MNC. The core of the bidding organisations' business is a competence system (CS), containing information on the competence of the network members. This system will be managed by the regional bidding organisation. The organisations relevant for complementing each other on the bid are selected on the basis of having unique core competencies that give them a high business potential. When bidding on a request from an MNC, selected companies and institutions from the CS collaborate for the specific task. By using the regional competencies, the bidding organisation hopes to create economic growth within the region.

The initiators claim that this regional organisation needs to be perceived as neutral and accepted by most companies and universities in order to create legitimacy. The bidding organisation should take responsibility for management of the CS and also for the selection of the organisations that should cooperate in the different alliances. For the participating regional actors the incentives for participation are imperative, and the bidding organisation needs to emphasise these incentives. The core of the organisation is the CS, containing mapped competencies of the actors within the region. Thereafter, one can search for a specific competence and thereby hopefully create new fruitful links between actors.

A German firm, Innoveas, which has created a regional CS for the biotech industry in Germany, illustrated how a new CS can be created. The system covers the competence of the industry on different aggregation levels. The aim is to enable creation of new links between competencies to solve problems in an innovative way. It has been used to analyse business potential between different fields that previously have not been working together. Obviously, there exist a number of challenges in the creation of the regional CS. The most valuable and unique tacit knowledge is by definition hard to articulate and will therefore be difficult to include in the CS. Moreover, the CS has to set a level at which they aim to describe the competencies e.g. persons, centres, firms etc. Given these major drawbacks, the CS can be created by using various indicators such as patents, publications, citations as well as industry indexes and experiences from people from the industry. According to Innoveas, it is vital to start with a specific industry and not have a holistic perspective on a complete region as it becomes too large and complex. Further, Innoveas had difficulties in the process of gaining consensus among the actors and how to get them to participate in the system. This process took about 6-7 months. There were also problems in reaching the right level in the organisations to anchor the idea. In order to avoid the risk of regional actors, trying to use the system for marketing themselves, the system needs to be managed by an objective organisation, which in itself is challenging and difficult task.

Given that a useful CS can be created in order to develop an 'objective' bidding system, one can search for a certain competence. The organisation and its CS aims at 1) creating face-to-face contacts with selected organisations, 2) matching the right competencies and 3) judging whether the participants are able to manage the project. At this stage, trust has to be created among the participants. They have to consider the system as reasonable and that moral hazards can be avoided.

Among the key success factors for a competence system are:

1. The needs for skilled and competent people with industry specific knowledge in order to map the regions' competence in a correct way and,
2. How and which competences should be logged.

On this basis, the bidding organisation can 1) gain regional acceptance; 2) be objective by setting up guidelines for how to work; and 3) create an incentive structure for the regional actors.

15.3 Implications for policy

The organisation and the CS is a tool for creating regional growth through a better knowledge of the core competencies which organisations within the region possess. Through the CS, it should be possible to get a better overview of the core competencies within WSR and also facilitate the competitiveness of WSR through an improved bidding process for mainly local companies.

Creating the CS and a bidding organisation is a question of a top-down initiative aiming at creating competitiveness and economic growth in the West Swedish Region (WSR). Many policy-makers have been eager to stimulate the creation of local relationships among firms, universities, research institutes, related industries with the intention of stimulating competitiveness and economic growth. Yet, the question remains to what degree this is created by policy-makers or by change, lock-ins and historical accidents. Even though the answer is a mix of both, policy-makers have to be aware that regions can evolve over time independent of policies. Too much intervention and picking the winners can be disastrous. Having argued for that general claim about the top-down vs. bottom-up policies, this initiative is relevant in many ways. The idea to create a bidding organisation by using a CS is associated with a number of benefits as well as challenges as outlined in Table 7 below.

Table 7 Benefits and challenges of the initiative

Benefits	Challenges
- Reveals the strengths and weaknesses of the region - Maps the actors with specific competencies and can create collaborative efforts across knowledge disciplines - Increase cooperation between organisations within WSR previously not aware of each others' activities.	- Hard to map competencies - Challenging to create objectivity in the bidding system due to path-dependencies and lock-ins - Too much emphasis on top-down intervention.

The CS and the bidding organisation will face a number of challenges. First, creating an objective bidding organisation is a difficult task. Making it legitimate as a bidder is hard as the individuals in the organisation might be biased towards people they already know. Measuring and mapping competencies in a CS is also a major issue. Despite these challenges, the initiative has the potential of creating new fruitful collaborations between its members that were previously unknown. The main benefit of a successful system would therefore be

an improvement in the regions' competitiveness and thereby the attractiveness to MNCs. This in turn, has the potential of creating revenues and profits at the firm level and economic growth and employment at the macro level. The CS that WSR aims to develop can be a tool for bringing together knowledge fields that traditionally have been working separately. Moreover, the main strengths and weaknesses of the region could be revealed by such as system.

LEARNING WORKSHOPS

1 REDEFINING CLUSTER POLICY IN EMILIA-ROMAGNA[97]

Introduction: Fulvia Farinelli, UNCTAD
Summary: Martin W. Wallin, Department of Industrial Dynamics, School of Technology Management and Economics, Chalmers University of Technology, Gothenburg, Sweden

Emilia-Romagna is one of the Italian regions that experienced a rapid development process based on SMEs and clusters, especially after the sixties, partly characterised by actions by local and regional government.

In previous decades, the regional government adopted a cluster-oriented policy through the establishment of technical service centres within the major local clusters of the region. However, today, the regional government assesses that in the light of global competition, this type of cluster level intervention is outdated. Successful multinational firms do not need this kind of services any longer, hence the service centres are being shut down.

Traditionally, the service centres have been instrumental in upgrading the technological capabilities in industrial regions by carrying out technological scanning on a global basis. This was important, as many firms were small and locally based. The centres then tried to transfer knowledge from outside the region to companies within the cluster, sometimes simply by conducting demonstrations. Moreover, to many people the fact that these institutions were neutral gave them credibility amongst businesses.

The closing down of these facilities might be explained by a poor understanding of their true function. Although they might have been successful in demonstrating the use of new technologies and guiding firms in their innovative search activities, they were perhaps less successful in demonstrating their role in the regional economic system to their financiers.

Service centres can work on the supply side to deliver services requested by local industry, but they can also work on the quasi-demand side, that is, helping entrepreneurs to articulate new demands, thereby facilitating market signals for services supplied by private firms, not by the service centers themselves. This distinction is quite important, at least to understand the different roles services centres can have, and relates to the rationale for government intervention. One of the most commonly cited rationales for policy intervention is the argument of market failure, which can be of many different types, most often related to some kind of information failure. That is, what kind of information does the market not supply through price signalling? Sometimes managers do not know what to do with the information they have acquired, or more generally how to transform information into knowledge. This kind of market failure often finds its solution in the realm of education

[97] Background information is provided as a presentation at the TCI conference website: http://www.tciconference.org/Emilia-Romagna.pdf.

policy. When it comes to government investments in general infrastructure, there is no simple way for the market to supply information on the size of demand. The business community often demands more and better roads, but can seldom communicate a common list of priorities. Another failure discussed during the session was coordination failure, be it due to cultural or legal issues etc. Successful policy interventions often address several if not all of these failures – unsuccessful ones only address a few of them. That is, there lies a great risk in cluster policies being too narrow in their scope of intervention, matters are simply too complex and interrelated to break out small parts to be addressed in isolation – a systemic approach is necessary.

Finally, service centres are perhaps more important in developing economies than in industrialised and highly advanced economies such as Emilia-Romagna. Very simple services can be crucial to facilitate economic and social development in such regions.

2 THE CONSUMER ELECTRONICS CLUSTER IN CATALONIA[98]

Introduction: Antoni Gurgui, D.G. Industry and Josep M. Montagut, Government of Catalonia
Facilitator: Lars Eklund, VINNOVA
Summary: Linus Dahlander, Department of Industrial Dynamics, School of Technology Management and Economics, Chalmers University of Technology

Catalonia has been a pioneering region in applying cluster-based policies as a tool for regional development. Over 20 cluster-based initiatives have been carried out in the past decade (1993-2003), following a similar methodology in different industries. The region has attempted to focus on a narrow concept of clusters (microclusters). The concept has been used as a tool for reaching economies of scale in analysis and action among policy-makers.

The history can be outlined as follows:

1950s: incipient consumer electronics production by local companies (valves, condensers, loudspeakers, etc.)
1960s: growing of the cluster mainly driven by TV production
1980s: large expansion of the cluster thanks to an FDI attraction policy mainly directed at Asian companies (Sony, Hewlett-Packard, Pioneer, Sharp, Sanyo, Samsung, etc.)
1990s: more than 50 companies present in the cluster with a total turnover of approx. 600 M. €. The cluster accounted for 80 percent of consumer electronics manufacturing in Spain, exporting 80 percent of its production. Various supporting and related institutions were present in the cluster (technological centre, test labs, universities, etc.)

The initiative has been focused on facilitation policies rather than on subsidising industries by 1) facilitating the strategic change, 2) creating tools of collaboration according to the cluster's needs (permanent work-groups, training centres, technological centers) and 3) viewing cluster policy as a learning-by-doing process. Table 8 summarises a number of conclusions:

Table 8 Pros and cons of the initiative

Pros	Cons
• Managed to keep up competitiveness of the cluster • Higher wages and tax incomes • Investment attraction policy • Links with other clusters • Smart profile • Cost effective	• Manufacturing labour has gone down • A small group of structurally unemployed • Still a great need to develop universities, etc

The cluster has managed to remain competitive by constantly upgrading itself to more advanced services and products. This has resulted in higher wages for the people in the region as well as higher tax incomes for the region. A drawback mentioned was that simple

[98] Background information is provided as a presentation at the TCI conference website: http://www.tciconference.org/catalonia.htm.

manufacturing jobs have decreased and that unemployment in these groups has increased. The cluster has successfully used a policy to attract foreign investments. For example, in order to attract large Japanese MNCs, a special child-care scheme was created for the employees' children. The cluster has used a smart and cost effective strategy, as the cluster was developed with small means instead of spending huge sums on policies that might not work. Taken together, the cluster initiative was perceived as successful by the workshop's participants, as it had accomplished its objectives at a reasonable cost. Turnover had increased, and the mix of employees is adding more value.

3 FROM INDUSTRIAL TO CREATIVE INDUSTRIES' CLUSTERS IN SCOTLAND[99]

Cluster representative: Mike Tibbetts, Scottish Enterprise, Scotland
Facilitator: Emiliano Duch, Competitiveness Group, Spain
Summary: Jerker Moodysson, Lund University, Sweden

Analysis of the cluster initiative

Setting

Business environment: Prior to the 1990s the Scottish economy could be characterised by an old-fashioned industrial environment founded on traditional industries, such as heavy manufacturing and fishing. This was not considered a problem, but rather something to accentuate as an image. The powerful engines of the national economy were large companies with long-term stability where people could get a good job for life. A 'real' job was one in which something was manufactured, and a 'real' business produced useful physical products. However, despite this relatively rigorous and old fashioned business environment, there has always been a high respect for education, innovation, cultural life and spirit of enterprise among the Scots. During the '80s and '90s, Scotland, in line with many other European countries, went through an industrial transformation with a great upswing of the service sector. This transformation was utilised as a great opportunity for the public sector to actively engage in the development of the Scottish economy. In 1991, two of the major public agencies dealing with pro-active industry policy – the Scottish Development Agency and the Training Agency – were combined into the unified Scottish Enterprise, which is the founder of Scotland's digital media and creative industries cluster initiative.

Policy: In 1993, the Scottish Enterprise undertook major research to identify key industries which subsequently should be supported and serve as the 'new' engines of the Scottish economy. Among the key industries identified were traditional ones such as oil & gas, food & drink and semi-conductors, but also industries such as tourism, film, multimedia, advertising, music, digital media and design. Due to the strong development of digitalisation, the boundaries between the media industry and the film industry became blurred, and Scottish Enterprise realised the great potential of treating all these various creative industries as one. Hence, the public support of the new engines of the Scottish economy was focused on all industries with human creativity as 'raw material'. In 1997, the cluster approach was adopted and the first cluster initiatives started.

Cluster potential: As all elements of a cluster already were in place, though not recognised as a cluster, the potential of the cluster initiative was promising. Many of the key industries identified were naturally related to each other, and there was a positive attitude to the initiative among most actors. When the cluster initiative started, the expectation was that the

[99] Background information is provided as a presentation at the TCI conference website: http://www.tciconference.org/scotland.htm.

cluster should add approximately £5.3 billion per annum to Scottish GDP and support around 70 000 full-time-equivalent jobs.

Objectives

Research and networking: Even though the creative industries were recognised as key industries of the Scottish economy, they had not previously been targeted for economic development policy. Therefore the first step of the research, or cluster preparation, was to establish contact and promote cooperation, between the industry actors and Scottish Enterprise as well as between the industry actors themselves. Another major aim of the cluster initiative was to promote complementary networking among the creative industries involving supportive actors in areas such as finance, legal services, property rights etc.

Policy action: As mentioned above, the first step was cluster recognition – to find out what was already in place in order to figure out what to do to accentuate the initial strengths. Thereafter, the major policy initiatives were focused on supporting bottom-up networking.

Commercial cooperation: Even though many of the Scottish creative industries were successful creators of new products and services, a great deal of the exploitation took place abroad. To induce the possibility for Scottish creative companies to exploit the great potential they themselves were a part of and be first adopters of new Scottish innovations, there was a great need for commercial cooperation.

Education and training: As focus is on creative industries like videogames and multimedia, one could expect the level of education among employees to be quite low (the general picture of a videogame designer is a teenager creating the game he wants to play himself). However that was just part of the picture. The employees in the creative sector were indeed driven by personal interest and engagement (e.g. designing the games they like to play for themselves), but the majority of the people working in the industry were highly educated. This mix of competences was one of the benefits to be accentuated further. Teachable as well as unteachable skills are important. One strategy of the cluster initiative was thereby to "open up channels from all walks of life".

Innovation and technology: The creative cluster as a whole must be regarded as a highly heterogeneous cluster, with a variety of technologies involved. However, the outstanding engine of immediate growth was digital media. Hence, the main efforts stimulating innovation, in the meaning of technological innovation has to be geared at this sector.

Cluster expansion: As noted above, the goal of the cluster initiative was an ambitious one in terms of expected growth rate. So far, the goal has been fulfilled. However there were still some objectives for cluster expansion to deal with. Mainly four objectives were prioritised: the cluster has to be more internationalised, the domestic industry has to make more out of available talent and skills, better access to innovation has to be supported, and a more responsive business infrastructure has to be created.

Process

Initiation and planning: Initially, a study was conducted where the above-mentioned heavy upswing in digitalisation and the blurred boundaries between the film and media industry were recognised. To take advantage of the great potential of the Scottish creative industry, the Scottish Enterprise cluster team, with representatives from the national office of Scottish Enterprise and industry representatives at local level, was formed. The team works closely with all trade associations available, as well as other public-sector agencies such as the Scottish arts council.

Governance and financing: The Scottish Enterprise cluster team can be described as a virtual team, governed from the national office of Scottish Enterprise, but coordinated mainly at the local level. Even though there is strong political support for the initiative, public financing and a joint collaboration with the industry department, support is derived through existing structures and bodies. No separate offices have been established for the cluster initiative.

Scope of membership: The initial description of the initiative as an initiative to support 'creative industries' faced major protest from other industries that considered themselves unfairly regarded as 'not creative'. This discussion led to a useful definition of 'creative industries' which since has been used as the official definition in Scotland. The 'creative industries' which are the focus of this initiative, are the ones 'in which the fruits of human creativity are actually a primary raw material to the business process rather than just a source of change or improvement'. Concrete examples of such industries are music, design, publishing, new media, computer games, film, broadcasting, advertising, architecture and other cultural industries.

Resources: Since no extra money was invested in the cluster initiative, the cluster team had to compete with other initiatives to show that their activities should receive financing. The total amount of investment was £25 million over 3-5 years.

Facilitators: The facilitators of the cluster initiative are national and local members of the Scottish Enterprise cluster team.

Framework and consensus: As the central idea of the cluster initiative is to stimulate interaction among firms as much information as possible is shared in a totally open framework. The vision of the cluster initiative is published in a document, and 'annual reports' are open to the public. This is regarded as a necessary strategy in order to create trust and thereby stimulate cooperation.

Momentum: The cluster initiative has managed to fulfil most of its initial goals in terms of growth and stimulation of interaction among the creative industries. The overall goal, however, namely the goal of self-sustainability, has not been evaluated yet. Scottish Enterprise has a clear exit strategy, and the ambition is that the cluster will be self-sustainable after 5 years of public support. To prepare for this exit and create a potential for self-sustainability of the cluster, a number of 'tangible' structures have been built. A physical infrastructure to stimulate interaction among creative actors has been initiated, among other

things two new media centres in Glasgow and Dundee. This basic physical infrastructure is seen as necessary for the broad bottom-up participation within the cluster to last.

Performance

Competitiveness: Apart from generating a large number of new jobs in Scotland, the key industries identified and supported through the cluster initiative, have had major global breakthroughs in recent years. As an example to be mentioned, there are three Scottish computer games among the world top ten today.

Growth: Since the start of the cluster initiative, the business stock (i.e. number of companies) within the creative industries has increased by 20 percent every year. This growth rate can be compared with the national goal which was 10 percent per year.

Goal fulfilment: The above results are ascribed to the building of cluster confidence and willingness to open communication. This is a clear illustration of how public involvement can cluster initiatives lead to cluster building, in turn resulting in increased competitiveness and growth for a local industry which was in dire need of re-adjustment. It shows how, through joining forces, targets can be reached which are unimaginable for individual firms.

Results from the open discussion on pros-cons of the cluster initiative

+ Professional awareness of the potential benefits of extensive interaction among related industries
+ Increased networking within industries as well as cross-over between different industries
+ Successful matching of complementary firms
+ Rise of social capital
+ Intangible (in economic terms) benefits

- Lack of public awareness of the importance of initiatives such as the cluster initiative
- Heterogeneity – a challenge.

Workshop conclusions

Cluster initiative efficacy: Has it accomplished its objectives?

Measured in the growth of number of firms, there is no doubt that the initiative seems to have had positive effects. There are also indications of growth in individual firms' performance. In total, the creative industry in Scotland seems to be extremely wealthy for the time being. However, it is hard to measure the success of the cluster initiative as such. It is impossible to know how the creative industry would have developed without the cluster initiative as a booster. Furthermore, the immediate intangible effects (e.g. social capital) of the cluster initiative are hard to measure, though with regard to the trends observed, the initiative seems to have accomplished the objectives.

Cluster initiative efficiency: Has it done it at reasonable cost?

Since no extra money was added to the system by the cluster initiative, this question is essentially hypothetical. Taking into consideration the success of creative industries in recent years, and furthermore acknowledging the temporal co-appearance of this boost and the cluster initiative, it is hard to imagine that the money invested in the cluster initiative would have been of better use in other 'competing' initiatives.

4 FROM PUBLIC TO PRIVATE INITIATIVE IN THE AUTOMOTIVE CLUSTER STYRIA[100]

Cluster representative: Gerd Holzschlag, SFG Automotive Cluster Styria, Austria
Facilitator: Göran Lindqvist, Uppsala University, Sweden
Summary: Lars Coenen, Department of Social and Economic Geography, Lund University, Sweden

Analysis of the cluster initiative

Setting

Business environment: During the 1980's the Styrian automotive industry had to respond to the globalisation of markets, increasing competitive pressures, and the calling into question of production locations. Therefore the value-chain needed to be restructured through increased partnership between firms. At the time when the regional development agency started its cluster initiative, the firms were only competing with each other. There was a lack of interaction and an underdeveloped culture of communication. Hence it was vital to create stable regional structures in which the firms were persuaded to cooperate more.

Policy: The regional development agency put cluster policy at the forefront of its strategy to upgrade the Styrian automotive industry. Through bottom-up communication with and among the companies – facilitated by ICT – and focus on 'soft', organisational topics (instead of pure technology), clustering results gradually became visible for the firms.

Cluster strengths: The potential for the cluster was promising. Leading automotive companies have been located in the region for more than 100 years. In total, about 30,000 people are employed in approximately 200 companies. There is thus a broad competence base available, covering nearly the entire value-chain.

Objectives

Research and networking: A major aim of the cluster initiative has been to strengthen the knowledge infrastructure for the automotive industry through networking with R&D institutes and universities in the region.

Policy action: As mentioned above, bottom-up networking efforts and improving the knowledge infrastructure have been spear-heading concrete policy measures. An important aspect of the policy initiatives has therefore been a broad involvement of relevant players (large firms, SMEs, universities, chambers of commerce and unions) in the cluster initiative's steering committee and respective projects.

Commercial cooperation: From the out-set, the development agency realised that many system-suppliers were not aware of the changes that were occurring in the automotive industry and

[100] Background information is provided as a presentation at the TCI conference website: http://www.tciconference.org/acstyria.htm.

the need for a focus on innovation in order to secure competitiveness. As a response, user-producer interaction with OEM (Original Equipment Manufacturers) was strongly stimulated to create intensified partnership product and process development in the value-chain. Furthermore, FDI (Foreign Direct Investment) was enhanced for the system-suppliers through on-going projects to increase commercial cooperation.

Education and training: An important feature of the cluster initiative has been the education of management in the automotive firms to raise the awareness and capability for necessary innovations through increased collaboration. Moreover, joint courses were created by inter-cluster learning that are not available via the market to step up innovation processes.

Innovation and technology: Obviously, innovativeness is at the core of the industry's competitiveness. However, in order to build a cluster in which the innovative behavior among and between the firms is boosted, the respective partners (including R&D institutes, public bodies, etc.) need to learn to communicate, interact and share resources. Therefore, the cluster initiative refrained from taking an overly technological perspective and instead focused on bringing partners together.

Cluster expansion: The cluster initiative is embedded in overarching national and even international networks to cater for an outward-looking cluster and linkages with other local cluster initiatives.

Process

*Initiation and planning: T*he initiative started with a feasibility study among companies and research institutes to establish a cooperative framework. This study clearly indicated the need for reciprocal exchange of information and experience and joint learning programs. The cluster formation process is thus characterised by an open-ended, iterative procedure of diagnosis, dialogue and strategy formulation.

*Governance and financing: O*n an operational level, the cluster initiative is run by a lean unit 'Automotive Cluster Styria' in the private organisation 'Styria Economic Development Company Limited' consisting of six people. This operational unit is placed under the steering committee which reflects the multi-player partnership. A main issue is that the initiative was initially financed through public funding, but over time it became financially self-sufficient through membership fees and strategic sponsorship, for example by banks and the energy sector.

*Scope of membership: T*he aim for a private-public partnership has been achieved. Currently, the cluster organisation AC Styria is self-supporting through company memberships – representing the complete automotive value chain.

Resources: The resources of the cluster organisation are dependent on respective automotive firms' perception of added value in their membership. This guarantees that the cluster initiative stays in touch with the cluster members.

*Facilitators: F*our tasks form the core of the cluster organisation: establishment of R&D competence centres, internationalisation, promotion of endogenous development of companies, and well-targeted establishment of companies. These tasks comprise the core objectives of the common projects undertaken through the initiative.

Framework and consensus: A project control circuit has been established to design targets, monitor the situation, develop strategies and realise measures. Through such institutionalised feedback-loops, adjustments can be made if needed. Here, the steering committee plays an essential role in suggesting strategies, focusing work, balancing interests as well as providing a multiplier role.

Momentum: Since its creation the cluster initiative managed to successfully bring partners on board as witnessed by the broad membership. The drive of the initiative is heavily underpinned by the broad, bottom-up participation.

Performance

Competitiveness: The successful settlement of internationally active suppliers not only created a large number of new jobs but also closed the automotive value-creation chain and gave Styria the position of an internationally acknowledged 'automotive complete supplier'. This is proof that the competitiveness of the industry increased substantially through the initiative. An additional indicator for this is the large number of quality certificates (e.g. ISO/TS 16949) which the partners obtained within a few years.

Growth: The growth of the industry is clearly illustrated by the strong increase in employment. While in 1996 approximately 20.000 persons worked in the industry, this number increased to 30.000 by 2002.

Goal fulfilment: The above results are ascribed to the building of cluster confidence and willingness to open communication. This is a clear illustration of how a public cluster initiative leads to public-private cluster building, catalyzing increased competitiveness and growth for a local industry which was in need of renewal. It shows how joint efforts can aid in reaching targets that are more difficult to manage as an individual firm.

Results from the open discussion on pros-cons of the cluster initiative

+ Deep knowledge of the firms before the initiative was started
+ The realisation that the sector needed to re-orient itself certainly facilitated engagement of firms in the initiative
+ Strong commitment of the partners achieved by networked, bottom-up strategy-making
+ A catalytic public-private collaboration underpinned the confidence among the partners in the project
+ The ability to constantly change direction depending on circumstances through institution-alised learning-by-monitoring
+ An inclusive and highly professional management of the project

- Disputable that the cluster initiative still needs public funding. More efforts need to be made to become fully private

Workshop conclusions

Cluster initiative efficacy:

It is very clear that the objectives were achieved. The local Styrian automotive industry has clustered together and became more innovative and competitive in the global automotive arena.

Cluster initiative efficiency:

Though it may be disputable that public funding is still in place, the financial target of the initiative to shift from pure public funding to becoming financially self-sufficient through a public-private partnership has been achieved. This reflects the general satisfaction of the firms with the initiative – given that their membership fees cater for the majority of the budget of the cluster organisation, AC Styria.

5 ACENET – A EUROPEAN UNION INTERCLUSTER INITIATIVE[101]

Introduction: Erik Bunis, Managing Director, Länsteknikcentrum
Yves Gyuon, Director of the Department of Industry and Services, Lyon Chamber of Commerce and Industry (Lyon CCI)
Nils Gabrielsson, Managing Director, Inno Scandinavia
Facilitator: Alberto Pezzi, Official, Catalan Government Innovation Agency CIDEM, Spain
Summary: Johan Brink, Industrial Dynamics, Chalmers University of Technology and Fredrik Waara, Service Management, Chalmers University of Technology

Objective

The objective of the workshop was to evaluate and analyse the ACENET thematic network by using the Cluster Initiative Performance Model (CIPM) presented in the Greenbook. It should be noted that ACENET (accelerating the establishment of clusters and company networks) is not a cluster initiative, rather a 'cluster linkage' initiative. Numerous regions in Europe have adopted cluster approaches, however knowledge regarding these initiatives is scattered and seldom diffused to other cluster initiatives. Since no systemic method for cluster initiatives has emerged, there is a rising need for diffusing knowledge about successful clusters. Furthermore, there is a will to increase the interconnectedness of Europe's regions to strengthen the European competitiveness. The ACENET initiative has therefore been designed to jointly develop processes and methodologies to manage clusters and networks. An important aspect of ACENET is the emphasis on the local engagement and the network of cluster facilitators and not policymakers *per se*. This has been manifested by providing actual business opportunities for SMEs across the different clusters. ACENET has been active for about two years and has, until now, been funded by the European Union. The workshop provided an overview over two cases of the involved clusters, the Rhône-Alps in France and the AluminiumRiket in Sweden. While having different industrial structures and different goals, both 'cluster initiatives' stressed the importance of having benchmarks of the initiatives, the reinforced local governmental support, and an increased understanding of the EU countries opening up for potential business opportunities and networks.

Key discussion and conclusions

One of the motives for the development of ACENET was to fill gaps in the local cluster value chain, which could be done by linking complementary cluster regions with each other. Thus, ACENET is not a network for policy-makers, but a network of cluster-facilitating organisations and cluster regions. The summary of the achievements of the ACENET Learning Workshop follows in three sections.

[101] Background information is provided as a presentation at the TCI conference website: http://www.tciconference.org/acenet.htm.

Analysis of the ACENET cluster initiative

In the case of ACENET, the *setting* could be described as:

- 11 members
- Diverse and widespread over different regions in Europe
- Mainly SMEs

The *objectives* of the ACENET thematic networks are to:

- Building trust (from telling success stories to sharing experiences of mistakes)
- Foster business relationships
- Influence policy-makers
- Benchmark policy
- Encourage commercial cooperation
- Transfer experience and knowledge
- Support learning in firms/clusters

The ACENET *process* includes the following factors:

- Visits
- Study visits/Events
- Bilateral action relationships
- Learning clusters/firms

The following issues were discussed regarding the *performance* of ACENET:

- Creation of a common platform
- Early stages of joint ventures
- Impact of conducting analysis is conducted at an early stage of the ACENET initiative (only two years of operation).

Results of the open discussion on pros-cons of the ACENET cluster initiative

The following pros were identified:

- Learning effects
- Trust (establishment of an infrastructure for cooperation and benchmarking)

The following cons were identified:

- Trade-off between diverse and specialised clusters
- A risk with initiatives similar to ACENET is that differences in terms of knowledge can be too big, and that industries are too diversified. This could be a weakness of the approach, but was not perceived to be a problem in the ACENET case.

Workshop conclusions and implications for policy

Cluster initiative efficacy: Has it accomplished its objectives?

Most of the objectives in terms of learning about best practices in policies, building trust, and early commercial networking have been reached.

Cluster initiative efficiency: Has it done it at reasonable cost?

The activities were done at a reasonable cost. It is a cost-effective way of establishing networks and relations. Future initiatives should, however, be more focused on specific activities rather than generic networking.

The ACENET experience seems to be a good and cost-efficient way of diffusing knowledge about hands-on experience of 'cluster initiatives'. Furthermore, the ACENET has opened new connections across local European clusters providing new opportunities in the future. However, a growth in the number of members in ACENET seems to be an inappropriate goal, as the original 'cluster initiatives' benchmarking is already done. Instead, the creation of completely new 'meta-level cluster initiatives' seems to be the right way ahead.

6 NEW ZEALAND CLUSTER POLICY[102]

Introduction: Alan Koziarski, New Zealand Trade and Enterprise
Facilitator: Ifor Ffwocs-Williams, Cluster Navigators
Summary: Frida Wennerström, Chalmers University of Technology

In this learning workshop, Alan Koziarski, New Zealand Trade and Enterprise, and Ifor Ffowcs-Williams, Cluster Navigators, shared their experiences from developing a national cluster programme in New Zealand. The first phase of the national cluster programme was introduced in 2002, and was followed by cluster initiatives in a number of regions, which are currently being implemented. The session focused on issues regarding development of a cluster on a national level, rather than on a specific cluster programme. The experiences might be of specific interest for representatives of small countries and from countries that are islands. In addition the New Zealand case study is of interest for any city, region, state or nation establishing a cluster programme. The main message from the New Zealand experience is that "*it is all about actions, to get things done!*" The New Zealand cluster organisers do not write reports or research papers, they want results.

Relevance of the business context

Any cluster programme needs to be adapted to the context in which it shall work. Based on the New Zealand case, five factors were emphasised as important for analysing the context. Each factor thus needs to be described and analysed for each cluster programme.

The first factor is *the scale of the business environment*, meaning the size of the economy and geography of the country. New Zealand's population is 4 million people. The size of the budget needs to correspond to the size of the market. Second, *proximity to markets* is deciding for a number of issues, for example logistics and transportation. As New Zealand is an island, access and distribution to markets needed to be addressed. Third, the *industrial structure* of the country needs to be examined in order to understand what type of firms there are. For example, in New Zealand, 97 percent of businesses have less than twenty employees. This is important to get an idea of the critical mass of the cluster programme. The fourth factor is *partners*, i.e. with whom can cluster initiatives cooperate. The ministries responsible for economic development are differently structured in all countries, e.g. they can be regional or inside local councils. This is a relevant detail, as partners' capabilities should complement each other. In the case of New Zealand, capabilities in cluster buildling didn't already exist; training was necessary. Fifth, *policy framework for cluster building* is vital. (Yet cluster practitioners should focus on action and not on the policy framework.)

[102] Background information is provided as a presentation at the TCI conference website: http://www.tciconference.org/newzealand.htm.

Strategic fit between the client's needs and the funder's objectives

The rationale of a successful programme is the strategic fit between the client's needs and the funding body's objectives. Clients are the people taking part in the cluster programme. Strategic fit can only be achieved after a number of decisions and compromises. Objectives, client needs and outcomes were highlighted in the session as key factors for reaching a strategic fit.

When formulating the objectives, the most important thing is to prioritise and to decide what the main goal is. Both the financing organisation and the initiator need to be clear about what they want to achieve. In New Zealand, the main goal was to build capabilities for Small- and Medium-sized Enterprises (SMEs) to participate in global value chains. The formulation of the goal is highly dependent on the business context; New Zealand's industrial structure consists mainly of SMEs.

Client needs are important to take into consideration in early phases in a cluster programme. By doing so, priorities should be clear.

Outcomes indicate the importance of evaluation – how to determine the success of a programme. Measuring success is coupled to the initial objectives. Another important issue is what happens if the cluster is not a success according to the evaluation criteria. In New Zealand, success is measured in the number of active clusters with private sector engagement. According to their measurements, just a collection of universities and government agencies is a failure. Based on the goal formulated in New Zealand cluster programme, it was concluded that company involvement was the best measurement criteria.

The programme design

After taking into account the context and the strategic fit, a programme can be designed. Programme design is articulated by four key factors.

First, *elements* are needed to put a programme together. Elements include funds, support, management and a "practical manual" database, which is accessible for all those involved in the cluster programmes. In New Zealand, there were funds available for starting 45 cluster initiatives in six months. The supported clusters were chosen based on a combination of top-down central selection procedures and bottom-up selection, where regions recommend what cluster to invest in. From the New Zealand experience, it was said that one would surely miss diversity if one only used the method of selecting centrally. The second factor is *people*. In New Zealand's cluster programme, 97 percent of the funding was spent on people. The money is spent on cluster facilitators, and thus not on research. Finding the right people for facilitating cluster initiatives is a difficult and demanding task. The speakers recommended people with social and networking skills, and as an indication the average salary is $20.000 per year. The salary depends on the facilitator's background, e.g. the level varies if it is a former CEO or a newly graduated masters' student. The cluster facilitators get support, e.g. in terms of training where several cluster facilitators meet and share experiences. The opinion articulated from the New Zealand case was that clusters are all about people. At the same time people are a common reason to cluster failure. The third key

factor, *budget-setting principles*, addresses the important issue of financing. Finally, the fourth factor is *resources* – how to get access to funding.

Implementation issues

Four aspects are also emphasised to be central for a good cluster implementation. The first aspect is *the people issue*. The New Zealand cluster programme work started off already in 1990, being one out of eleven cases in the Michael Porter book from the same year. For five years, not much development took place in New Zealand in the cluster area. There was much focus on the theory presented in Porter's book – rather than on people. Then another five years passed without much action, since there was a lack of policy framework. They New Zealand cluster programme made (what they refer to as) two "mistakes" but now they have stepped into the third phase: "Spray and pray, seed and grow", referring to the 45 investments made in six months. They have started to identify which cluster initiatives are successful and which are not, and they shall, based on this evaluation, continue to support 22 of the clusters.

Half of the clusters will thus not get continued support. Based on the experiences from New Zealand, a word has evolved, which is said to capture a rationale of cluster programming. The word is "*anticipointment*", consisting of anticipate and disappointment. Anticipate refers to the positivism the cluster initiative is coloured by during the participants' work in writing an application and when the application possibly is sponsored. Disappointment refers to the phase of getting no or no more money. A cluster initiative is, in other words, not only about supporting people but also about the opposite, about causing people displeasure. Consequently, there is a need for skills in handling both types of situations.

The time frames for the New Zealand cluster programmes are short, and the focus is on getting things done. An "I will do it tomorrow" attitude implies that a cluster programme will take forever and most likely not achieve its objectives. In the New Zealand case, results are wanted after six months, but, according to the speakers, this is not realistic – as clustering is a process that requires a longer time span.

Top down strategy vs. bottom up ideas is the third aspect of implementation. The experience delivered in the session is that a top-down strategy works to a certain point. Bottom-up is needed to get the regions interested and then the initiative can come from the regions, which is appreciated from all involved parties.

The fourth aspect is what is in and what is not – where to draw *the cluster boundary*. In New Zealand, they first had a wide definition of a cluster to get applications. They moreover ran workshops and talked with the regional organisations in order to get people to engage in a cluster initiative. It worked: 300 applications were filed and out of these 45 were selected. Another aspect is the issue of geographical closeness in clusters. The basic argument in their theories on cluster activities is that the level of intensity should be high. However, if the industrial structure has such a character that it may be fruitful to build a national cluster, then it needs to be managed differently. The cluster facilitators have to work harder in those clusters in order to manage them.

Lessons learned from the New Zealand case

There are three important lessons to be learned from the New Zealand case. First, the context affects what objectives are possible to formulate, and consequently what criterion is appropriate for evaluation. Second, clusters are all about people. It is necessary to get the different stakeholders involved. Almost the entire budget of the New Zealand case was spent on people – cluster facilitators. Third, the speakers are proponents of a strategy that emphasises the importance of action, rather than extensive planning, also the actors working centrally at the cluster programme need a complimentary bottom-up approach, which in New Zealand means engaging the regional economic development organisations. Hence, a cluster programme according to the New Zealand experience is about finding the right people to facilitate the cluster initiatives and to do it today.

7 THE ARIZONA OPTICS CLUSTER[103]

Introduction: Robert L. Gonzales, New Global Strategies, LLC, and Robert P. Breault, Chairman, Breault Research Organisation
Facilitator: Eric Hansen, ETG, the Economic Transformations Group, USA
Summary: Martin Svensson-Henning, Department of Social and Economic Geography, Lund University, Sweden

Prominent characteristics of the Arizona Optics Cluster

The Arizona Optics Cluster initiative, initiated already in 1991, today includes about 200 firms and 150 associations, all in different ways connected to the optics sector. The boundaries of the cluster initiative are generously defined, geographically as well as functionally. This fact reflects the perhaps unusually broad definition of clusters taken by cluster initiative representatives. As the origin and development of the Arizona Optics Cluster initiative is extensively covered elsewhere, this report will concentrate on the main policy implications arising from the Arizona Optics Cluster initiative, as pointed out in the learning workshop.

A number of characteristics are especially apparent in the Arizona Optics Cluster initiative, distinguishing the initiative from many others initiatives taken on establishing and sustaining a lively cluster environment:

- The building of broad collaboration and partnerships around cluster issues
- Careful identification of common ground to move forward
- The private sector as a prime driver of the process
- Businessman to businessman contacts as the most important way of driving the development of the cluster
- The ambition to get the local SMEs to take the leadership in the cluster process, based on their more heavy involvement in the regional system production compared to larger firms. The Arizona Optics Cluster, like many similar clusters, is dominated by SMEs.

Policy lessons: process and objectives

In the discussion, the topics below were thoroughly discussed, and policy lessons could be drawn from each of the points below. Although the setting of the Arizona Optics Cluster initiative was briefly touched upon during the workshop, the focus in the discussion was primarily set on the cluster initiative process and objectives.

[103] Background information is provided as a presentation at the TCI conference website: http://www.tciconference.org/arizona.htm.

The process

The implementation of a cluster initiative is a long term, non-linear process. Therefore, temporary setbacks to the initiative should not be regarded as catastrophes, but perhaps as normal features of the evolution and consolidation of the cluster initiative. The Arizona Optics Cluster initiative clearly shows that cluster initiative implementation processes involve constant interaction between key actors on an iterative basis, and that there often is a cumulative dynamic in cluster development processes. Success often breeds success.

The Arizona Optics Cluster initiative is now firmly based on a local consensus on the importance of the cluster. This feature of the Arizona Optics Cluster initiative is one of the cornerstones of creating a successful cluster initiative. However, the issue of setting (or not setting) boundaries of the cluster initiative is a complicated one, and lessons probably have to be drawn from case to case. In general, the choice is between applying a narrow or broad definition of clusters.

Furthermore, the Arizona Optics Cluster example shows the importance of upholding a constant momentum in the cluster initiative process. For example, the importance of regular and effective meetings with the cluster initiative steering committees was emphasised in the discussion. In this context, it is important to bear in mind that the presence of a dynamic and engaging cluster champion is vital to the cluster initiative. The Arizona Optics Cluster has benefited extensively from having such a person devoted to the development and promotion of the cluster. The vital role of the cluster champion is prominent also after the first phase of the initiative, where individuals traditionally play an important role. Turning to the firms in the clusters, the workshop strongly emphasised the fact that in order to take part in cluster initiative activities, representatives of the firms have to perceive a strong value added created from participating in the process.

Objectives

The objectives of the Arizona Optics Cluster initiative were from the start to promote the development and growth of the firms in the cluster and the Arizona society as a whole. Some important features of the Arizona Optics Cluster were discussed in connection to the process of fulfilling these objectives.

The role of the education system in providing a skilled labour force is often under-emphasised in the discussion on the role of universities and other educational agents in the cluster. Therefore, the human capital issues in general are a prime objective to the Arizona Optics Cluster initiative. Human capital is of vital importance to the firms in the cluster, and this makes the demand for human capital as well as collaboration on scientific research primary driving forces in the process of forming firm-university relationships.

The discussion on the Arizona Optics Cluster underlined the importance of the actions taken by public institutions, even if the private sector is a prime driver in the cluster initiative. In discussing the role of public institutions, one must however bear in mind the fact that the actions taken by public organisations can entail positive as well as negative elements to the cluster initiative. One of the most important actions taken by the public

sector is in identifying cluster champions - leaving the rest of the process of cluster initiative development and consolidation to them. One interesting point made during the workshop was that there might exist substantial differences between American and European cluster actors concerning the trust and anticipation in government initiatives and involvement in cluster initiative development processes.

The workshop discussion also turned towards broader aspects of cluster initiatives, concerning not only the industries involved, but the society as a whole. Cluster initiatives, rightly managed, can, according to dominant views in the discussion, entail positive effects not only on the firms in the cluster initiative, but also on other parts of the regional and national economy. As such, the cluster initiative can play an important role in society as a whole, promoting development of the society, not just limited to the sector driving the cluster initiative.

Evaluating the performance of the Arizona Optics Cluster

As such, the Arizona Optics Cluster initiative provides an interesting example of a successful bottom-up cluster initiative, having succeeded in involving the private sector and creating a broad collaboration around cluster initiative issues. As can be concluded from the discussion, the social, political and economic setting, the objectives of the cluster initiatives and the cluster initiative process have all in different ways contributed to the strong performance of the Arizona Optics Cluster initiative. The process has been facilitated by devoted cluster champions, succeeding in the promotion of the cluster initiative through business-to business contacts. According to representatives of the cluster initiative, the objectives of the initiative have been reached at a very reasonable cost. The Arizona Optics Cluster therefore provides an interesting example of a cluster initiative, creating jobs, revenues and facilitating the creation of social capital, through a relatively long history of constant action, development, renewal and policy learning.

8 AUSTRALIAN MARITIME CLUSTERS – EXPERIENCES AND PERSPECTIVE [104]

Introduction: Steve Arnott, Department of Industry and Resources, Western Australia, Tracy Scott-Rimington, Cairns Region Economic Development Corporation, Queensland, and Richard Walker, Shire Consults, New South Wales
Facilitator: Peter Heydebreck, Inno Group
Summary: Petter Jönsson, Department of Economics and Management, Linköping University

In the Australian Maritime Cluster learning-workshop, two different clusters were presented: the Australian Marine Complex in Perth and the Super Yacht Group administrated by Cairns Region Economic Development Corporation in Queensland. The summary will compare the two clusters and describe the similarities and differences between the clusters.

Settings

Business environment - Queensland is a periphery region in the northwest part of Australia. The area is about the same size as Denmark with a very low-density population, only 250 000 inhabitants in the whole region. Queensland has historically been an isolated part of Australia, and for a long time, the seaway was the only communication channel. Fishing and agricultural industry has traditionally dominated the region

Perth is the main city in Western Australia, with over one million inhabitants. Strong industries in the region are marine, defence and offshore oil & gas industries. Perth is the home port of 50 percent of the Australian Navy and contains a number of large universities.

Policy and Cluster Strength - The Cluster Initiatives in Queensland were not supported by any government actions, nor were they strategically planned from the start. The external condition that triggered the cluster initiative was the decreased outcome from the fishing industry. This serious threat of the main industry forced the fishermen to seek alternative ways to increase their income. Most of the participants had no previous experience of clusters, before forming the Super Yacht Group.

The Marine Complex in Perth did not previously have any articulated cluster policy either. The cluster is based on the old industry in the region, as well as on entrepreneurial activities adopting ideas from the different industries – creating spin-offs that cross the traditional boarders between the industries.

[104] Background information is provided as a presentation at the TCI conference website: http://www.tciconference.org/queensland.htm.

Objectives

The main objective in the Queensland cluster is "Commercial Cooperation" whereas in Perth the "Innovation and Technology" objective is of significance. Both cases are examples of successful clusters that have led to "Cluster expansion" initiatives.

Commercial cooperation - The threat of the declining fishing industry led to a closer cooperation between the fishermen in the region. A success in transforming the fishing industry into yacht tourism demanded collaboration between many small enterprises. Collaboration was needed to create a strong, unified voice towards the government that could bring attention to the industry situation in the region, and also towards the market to communicate their new business ideas.

Innovation and technology - In the mid 80s Australia won the sailing competition Americas Cup. As a result of the victory, the next Americas Cup competition was held in Australia. Perth then got the opportunity to host twelve of the world's best shipbuilding teams – working 18 months on the preparation for the next competition. This event contributed to the knowledge creation in fields such as fluid dynamics and ship construction. After the event, some of the team-members decided to stay permanently in the region and work in the marine industry.

Cluster expansion - In both clusters, the successful transformation towards new industry has led to new constructive business initiatives. The Queensland yacht tourism cluster has brought a lot of attention to the region, and entrepreneurs have started to see new possibilities in the region. An example of the new businesses started is luxury furniture manufacturing for high-class hotels. This idea came from designers who discovered Queensland after having participated in a yacht tour.

Process

Initiation and planning - In the Queensland cluster, a small group of local fishermen played an important role when forming the initiative Super Yacht Group. These respected fishermen managed to convince the other fishermen to unify and concentrate on the tourism venture. It was thanks to their convincing work that the different small ventures succeeded in reaching a consensus and a shared vision about the yacht tourism industry. In the Marine Complex in Perth, it is difficult to pinpoint the specific initiation of the cluster initiative that led to the cluster. It has developed from a number of entrepreneurial activities, which now can be seen as cluster initiatives but were not planned or referred to as cluster initiatives when they were implemented.

Governance and financing - Both clusters have started off with private and community financing. The essential drivers of the clusters have been the local people involved, and it is their business visions that have led to the cluster expansion. Government support has first been given in later stages in the cluster development. In the Queensland super yacht cluster, the government has supported some marketing activities. The government has been more involved in the Marine Complex in Perth. It has supported infrastructure and facilitated

good business conditions. Today, the government owns the Marine Complex – providing the reliability of a long-term owner.

Resources and facilitators- Queensland's tourism cluster has developed step by step with limited resources. The cluster organisation has maintained a small size, and much of the initiatives and work is done by local, small enterprises. An important issue in the beginning of the cluster initiative was to create consensus about the serious threat in the present situation and the new possibilities the tourism industry could bring.

One important success-factor in the Marine Complex was the ability to combine the skills and resources from the different industries to be able to create new industry based on these combinations.

Performance

Growth - As a result of the tourist cluster initiative in Queensland, they have been able to change the industry structure in Queensland from an agricultural and fishing industry to a more tourism-orientated industry. Due to this transformation the economic growth of Queensland has increased, despite an overall decrease in the traditional industry. The large growing tourism industry has also had a positive effect on other businesses and created a stronger self-confidence and a more entrepreneurial spirit in the region. In Perth and the Marine Complex, it is difficult to relate the success of the cluster to a specific initiative. It is rather many small unarticulated activities and initiatives that have led to the dynamic cluster.

Competitiveness - The cluster initiatives in both clusters have created a wider spectrum of competitiveness in the regions and have transformed the industry into more profitable segments. Although the clusters in Queensland and in Perth are different in most aspects, and the business environment in radically different between the two, they have one thing in common: both clusters have been company-driven. The initiatives have come from the companies involved in the cluster business and have not been planned by government or local authorities.

9 CHIHUAHUA SIGLO XXI: LESSONS LEARNED IN A DECADE OF CLUSTER-FORMATION PROCESSES IN LATIN AMERICA[105]

Introduction: Salvador H. Avila, Principal on Competitiveness and Learning for the Economic Competitiveness Group.
Facilitator: Ted Lyman, Senior Principal, ECG - the Economic Competitiveness Group, USA
Summary: Jens Sörvik, IKED

Setting

Mexico's largest state, Chihuahua, has historically been a natural resource-based economy: producing crops, fruit, meat and diary, and metallic and non-metallic minerals. As a response to a fast-growing population in the 1950's and 1960's, leaders from the private sector and state government in Ciudad Juarez and Chihuahua City saw the need to reform the economy. They managed to convince the federal authorities of the benefits of the Maquiladora model and to allow foreign firms to locate along the Mexican-US border in order for them to benefit from a large pool of low-cost labour. Over time, the complexity of the products assembled in Chihuahua grew.

The main benefits of the Maquiladora model have been employment generation, monetary inflow, and the creation of managerial expertise in the region. Chihuahua is a great economic hub for Mexico with 400 large companies which have 80 percent of the employment, but the state also has many SMEs: out of the states 33 000 businesses, 90 percent are SMEs, most which are connected to the natural resource sector.

However, the model has not been unproblematic. Over time, the plants became concentrated on the bordering region and created heavy pressure on the infrastructure that the local authorities were not always able to meet. Secondly, it stimulated vast migration from the south, concentrated on the two major cities, Ciudad Juarez and Chihuahua City, which stood for 85 percent of the economic production and had 65 percent of the state population. Thirdly, the main source of revenue for the state and cities from the plants has been wages (which have seldom exceeded 2 percent of the total value of the products produced), rather than integration of local firms to the manufacturing process.

By the mid-1980s, Chihuahua started to feel self-sufficient and a decreasing need to promote itself, with the result of a notable fall in new establishments by the end of the 1980s. Concurrently, the state underwent severe drought problems that put heavy pressure on Chihuahua's other source for economic growth, the primary sector. By the late 1980s the state started to suffer from an economic depression, with 22 percent un- and underemployment, and only 154 new jobs were created, out of the 28,000 needed annually to meet the new labour force supply.

[105] Background information is provided as a presentation at the TCI conference website: http://www.tciconference.org/chihuahua.htm.

In this period, the civil and social activism against the ruling political party in Mexico, PRI, was high. There was, among citizens and business people, a lack of trust in government institutions, which were very weak. There was also a strong rivalry between actors and much misunderstanding due to different contextual culture and language, among other things. In addition, the culture in the state has traditionally been individualistic – not in support of cooperation.

Process

In 1990, actors from the private sector launched the Chihuahua Siglo XXI initiative with the purpose of redesigning the regional economy in order to increase competitiveness within the next 20 years. The group ordered a comprehensive diagnostic of 17 socio-economic sectors of the state that would serve as the basis for a strategy to create more economic diversification in the region and a more sophisticated industrial structure with stronger technology, higher incomes and better jobs. Initial findings in support of the cluster idea were that there were pre-clusters in natural resources and traditional industries, and that the Maquiladoras had begun to create a local supply base.

The project has had five phases:

i) 1990-1992: consisted of a comprehensive socioeconomic diagnostic of the state, done by the institute Monterrey Tec. A voluntary private sector organisation funded this study (US$ 150.000) with a small contribution from the State government. In 1992, a governor from the rightist PAN came to power as the first non-PRI government in four decades, and he strongly endorsed this project as the platform for economic development of the State and challenged the private sector to "work together for the benefit of the State".

ii) 1993-1994: effort to transform Chihuahua's economy by following a cluster-formation strategy done by SRI International. The study was to be funded equally by the private sector and the State government (MUS$ 1). The analysis found nine clusters, grouped in three areas that were considered relevant. These economic activities were mostly at the pre-clustering stage, with different degrees of integration corresponding to their historical evolution. In this phase, there was a momentum established that propelled the initiative for 5 years due to private sector enthusiasm and continued public support.

iii) 1994-1995: a follow-up to the second phase led by DRI-McGraw-Hill, half and half financed by private and public sector (US$ 300.000).

iv) 1995-1998: a local counterpart "Chihuahua Siglo XXI Organisation" took over the Project. This was formed by people recruited from all over Mexico, the financing was split between the private and public sector (US$ 400.000).

v) 1998: The initiative continued in a small scale and was led by the public sector, as a new administration took over in the state.

Objectives

Two main principles guided the project to achieve sectoral equilibrium and regional equity. The project focused on generating cluster initiatives on three different levels: i) cluster initiatives at the leading and supplier-firm level; ii) economic infrastructure initiatives; and iii) "flagship initiatives" which were the ones considered to be good showcases for the project. The objective of different cluster actions varied slightly between clusters in the different phases, but overall, there have been:

- *Networking* actions to establish industry and public sector networks.
- *Policy actions* to redesign the state's economy via cluster development and through strategic public policy support to industry (such as public investment in infrastructure).
- Actions to promote *commercial cooperation*, by creating conditions for more alliances and partnerships.
- Support to *education and training* in order to build methodological capacity in universities and to create capacity in the different sectors for clustering and networking.
- *Innovation and technology* actions to enhance technological capacity in all clusters, by, among other things, building stronger technology and applied research in institutions.
- Actions for *cluster expansion* towards more sophisticated primary firms with improved market penetration and suppliers which have a greater ability to support the primary firms.

Performance

Undoubtedly, there has been economic progress in Chihuahua during this period. Progress has also been notably more pronounced in some clusters than in others, as has the degree of clustering and cluster cooperation. Regarding *competitiveness*, business leaders have reported isolated improvements, as in the case of advanced materials. However, no formal evaluation has been undertaken, and it is consequently hard to tell whether this anecdotal evidence reflects a general trend. Chihuahua has been losing important anchor companies to other low cost regions, but some of those have later returned – some even with more advanced functions, as in the case of Ford which then established a design office.

There are further indications that Chihuahua has moved up the value chain, with more education facilities, and a more complex and productive economy. There is no doubt that the economy has *grown*, and substantial job creation has taken place. Between 1993-98, 182.000 new jobs were created. There have also been favourable social changes, and sentiments among the population at large have improved.

When it comes to *fulfilling its goals,* the initiative has managed to achieve more innovation in selected clusters, e.g., advanced materials and agriculture. It has established new industry networks, and enabled private sector leadership in economic development. The initiative has failed, however, to achieve higher levels of sophistication among local suppliers and to build

new capacity in local university, though it did foster the capacity needed within the private sector to move to the cluster model. According to Salvador Avila, the most favourable result of the project has been the strong impact on societal learning processes. In recent years, other initiatives have emerged, albeit on a more local scale, and all of them resemble the strategies from the Chihuahua Siglo XXI project. Additionally, different collaborative initiatives have continued to emerge, some of which evidently formed as a clustering process.

Open discussion on pros-cons of the cluster initiative

Pros: This was a private sector initiated project and not a donor agency or public sector push, which gave it an early anchoring among the private sector with high level of involvement of senior business and government leaders. It helped energize the private sector through focalized efforts, and inter-sectoral collaboration and it managed to sustain collaboration despite an individualist culture. The learning workshop participants found it to be an effective and powerful model with a bias to action and visualising the needs at local level.

In addition to being supported by the private sector, the initiative also enjoyed a strong backing by the public, which managed to achieve a new vision and direction which eventually became institutionalised through public programs.

It was described as a regional learning trip, providing intensive training in all the state's regions with deep lasting experiences. One of the positive examples was the forming of a regional counterpart team (Organizacion Chihuahua Siglo XXI) at the beginning of the second phase that was meant to be a depository of the knowledge transferred from the consulting team. Over time, additional counterpart teams were formed, notably the team in charge of advancing the methodology of the project, which it did with assistance from the first counterpart team and the local university, the Universidad Autonoma de Chihuahua. It was particularly important as it helped Chihuahua adapt the technology applied to local conditions and customs, and also served as the learning body for the state.

Cons: The project has possibly been too much of a top-down initiative which could have benefited from involving actors at lower levels and in the regions at an earlier stage. Also, the scope may have been too wide, encompassing nine different clusters and five different elements of the economic infrastructure. The project has been less successful in generating real cross boarder linkages.

After a while, the initiative came to be viewed as a public initiative (imprecisely, as half the funding still came from the private sector) – connected to the politicians in charge at that time. In hindsight, it would have needed more distancing from the government, since the subsequent overturning of the government meant that the project not only lost its public sector support but also its credibility within the extended private sector.

Other recommendations: One of the early main lessons learned in the Chihuahua project was to form cluster initiatives on local/regional level, rather than on state or national level, due to problems with the local idiosyncrasy and also the lack of basic physical infrastructure that makes the ambitions to form national clusters unreal.

How one handles media and communicates with the surrounding world and partaking actors is central to the success of cluster initiatives. A cluster initiative should communicate openly what it is doing, visualise its needs, and promise concrete things. This is critical to succeeding in building trust within the business sector, and also to get support from public sector. The people from the Chihuahua project also emphasised the role of an enthusiastic clusterpreneur who could speak in the name of the cluster and manage to get support from other actors who they thought were best-situated to undertake cluster actions.

Workshop conclusions

The learning workshop on Chihuahua came to the conclusion that the cluster initiative had accomplished its objectives and efficiently so, at a reasonable cost.

GLOSSARY

Agglomeration – Agglomeration is sometimes used with reference to the phenomenon of people and firms gathering in urban areas, which is viewed as benefiting from advantages from geographical proximity referred to as urbanisation economies (Hoover, 1970). Another aspect, which is at focus in this report, is commonly labelled localisation economies and focuses on sector specialisation. In this case, firms within related areas of economic activity co-locate for the purpose of benefiting from, e.g., external economies of scale (Marshal, 1890) or learning processes (Estall and Buchanan, 1961).

Business Angels – Private, informal investors who provide "smart money", in terms of both risk capital and business expertise and skills, to unquoted small and medium sized ventures. Business angels support the venture capital market with micro investment in the very early stages of a business development.

Business Network – A business network consists of several firms that engage in ongoing communication and interaction. These firms may display a certain level of interdependence, but need not operate in related industries or be geographically concentrated in space (see Staber et al., 1996 for discussions of business networks).

Cluster Initiative – Cluster Initiatives are organised efforts to increase growth and competitiveness within a cluster. A Cluster Initiative can be formal or informal in nature and involve numerous different actors, not only private firms but also public sector actors, academia, financial actors, and so on.

Cluster Action – A cluster action is defined as an action jointly undertaken by groups of actors within the cluster, or by an IFC, for the purpose of directly or indirectly enhancing the competitiveness of the participating actors.

Cluster – A cluster consists of collocated and linked firms, public sector actors, academia and financial actors into a core activity. According to Porter, *clusters are a geographically proximate group of interconnected companies and associated institutions in a particular field linked by commonalities and complementarities.*

Clustering – Clustering is defined as the process through which firms and other actors that are operating within a concentrated geographical area, increase the level of cooperation by establishing closer linkages and working alliances to improve their collective competitiveness.

Embeddedness – Embeddedness refers to mutual linkages between firms and different actors in regions that provide a pathway both for the flow of information and know-how from the region to the firm, and from the firm to the host region. The term is often used in connection with large MNCs and their local environment.

Entrepreneurship – Entrepreneurship has a number of partly contradictory connotations. These include bringing together factors of production (Say, 1803), the bearing of uncertainty (Knight 1921), the carrying out of new combinations (Schumpeter, 1934), the exploration of opportunities (Kirzner, 1973), and the creation of organisations (Gartner, 1988). Although

entrepreneurship can take various forms it is here reserved for the efforts to establish a new company.

Externalities – Externalities are costs and benefits arising from activities that are not internalised by the actors undertaking the activity. Negative external effects, or diseconomies, are damaging to others, e.g., pollution. Positive external effects, or benefits, are beneficial for actors. In both cases, mechanisms for ensuring compensation for the effecs are lacking.

Globalisation – Globalisation indicates the process whereby both product and factor markets are increasingly cross-border, along with expanding cross-border technology and human capital flows. Strategies and decisions of private and public players are increasingly influenced by considerations to what is happening around the world, i.e. countries and markets are becoming increasingly "interdependent".

Human Capital – Human capital is the experience, knowledge, skills and abilities of an individual, household or a generation, which can be used in the production process. It can be estimated as the present discounted value of the additional productivity of skilled labour over that of unskilled labour.

Incubator – Is a tool designed to accelerate the growth and success of entrepreneurial companies through an array of business support resources and services. A business incubator's main goal is to produce successful firms that will leave the program financially viable and self-supporting.

Industrial Cluster – An industrial cluster (Porter 1990) is a set of industries related through buyer-supplier and supplier-buyer relationships, or by common technologies, common buyers or distribution channels, or common labour pools.

Industrial District – Industrial districts are concentrations of firms involved in interdependent production processes, often in the same industry or industry segment, that are embedded in the local community and delimited by daily travel to work distances (Sforzi 1992).

Innovation – With innovation is understood the effort through which new commercially relevant processes or products are developed.

Innovation System – A system of innovation is a set of distinct institutions which jointly and individually contributes to the development and diffusion of new technologies and which provides the framework within which governments form and implement policies to influence the innovation process. It is a system of interconnected institutions whose objective is to create, store and transfer the knowledge, skills and artefacts which define new technologies (Freeman, 1997, Lundvall, 1992, Metcalfe, 1995).

Innovative Cluster – An innovative cluster innovates in the broadest sense of the definition, i.e. innovation can emanate from improvements in the way that actors organise themselves, how products are developed, produced, commercialised, distributed, etc. The innovative cluster is, in principle, evolving constantly, and able to adjust to changing circumstances. It is

likely to be good at "looking outside" its present boundaries and, at the same time, combine flexibility with inner strength, stability and sense of direction (TCI Forum Key Note Address by Lynn Mytelka; Porter, 2001).

Institution for Collaboration (IFC) – Formal or informal actor - or group of actors - which act in the interest of the cluster initiative and its members. The IFC encourages interest in the cluster initiative among the actors in the cluster. It may also promote the cluster initiative externally and be involved in the identification, promotion, co-ordination and implementation of cluster actions (Porter and Emmons, 2003).

Internalisation – Internalisation is the process by which costs or benefits of an externality is integrated into the market decision making process through pricing, subsidies or regulatory interventions, e.g. by charging polluters with the damage costs generated by them.

Knowledge-Based Cluster – This kind of cluster specialises in fostering conditions that are conducive to the development and use of knowledge.

Localized Cluster – A regional cluster (Enright 1992, 1993) is an industrial cluster in which member firms are in close geographic proximity to each other. A more inclusive definition would be that regional clusters are geographic agglomerations of firms in the same or closely related industries.

Regional Innovation System (RIS) – A RIS is a geographically defined Innovation System that focuses on the innovative networks in a region. Institutional arrangements, as well as organisational forms and configurations of relationships among actors related to the creation and provision of knowledge, finance, and other inputs for innovation. It forms the framework within which governments form and implement policies to influence the innovation process (Cooke, 1992, Nauwelaers and Reid, 1995).

Science Parks – Science parks are physical locations aiming to provide localised firms with both hard and soft infrastructure that facilitates boundary crossing between academia, enterprises, venture capitalists, etc. Some specialise in assisting emerging firms and ideas by providing management services and contacts with venture capital,. Many science parks have a focus theme that leads them to be supportive of clustering processes.

Small and Medium-sized Enterprises (SMEs) – The definition of SMEs varies between countries, both regarding number of employees and if turnover limits are used, e.g. according to EU-definitions 250 employees represent the typical dividing line for what constitutes an SME, whereas in the United States, a cut-off of 500 is used. Some definitions also distinguish between micro, small and medium-sized firms. SMEs have in recent years received much attention from policymakers and academia, as key actors for economic development and innovation.

Social Capital – Community relations that affect personal interactions and thereby generate positive outcomes; refers to social organisation that facilitates collaboration among economic actors (Coleman, 1988 and 1990). It can be rooted in civicness or emanate from organisational and institutional developments. The forms of social capital include obligations

and expectations, trust, information potential, norms and effective sanctions, authority relations, and social networks.

Triple Helix – The "Triple Helix" is a concept that describes a situation in which industry, universities and public actors serve as interrelated nodes in processes sustaining new firm creation and the establishment of critical mass. The Triple Helix focuses on the interplay between, within and overlapping the actors to explain innovation (Etzkowitz and Leydesdorff, 1997).

Trust – Positive expectations or beliefs regarding the intentions or actions of other agents.. Trust can allow actors to initiate and maintain cooperation – without making costly safeguards and if it is common amongst a group of agents, widespread, flexible cooperation is a viable option. This applies both on principal-agent relationships within firms[5]; relationships between firms, customers and other actors; and between representatives of different firms.

Venture Capital – Professional equity often co-invested with the entrepreneur to fund an early stage (seed and start-up) or expansion venture. Offsetting the high risk the investor takes is the expectation of higher than average return on the investment.

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APPENDIX A: PROGRAMME

The Competitiveness Institute 6th Global Conference: Innovative Clusters – A new Challenge, September 17-19 2003, Gothenburg, Sweden.

Wednesday, Sept 17

09.00-09.10 Ifor Ffowcs-Williams, The President of The Competitiveness Institute

09.10-09.30 Kai Hammerich, Director General, ISA - Invest in Sweden Agency

09.30-09.50 Keynote: **Properties of innovative clusters**; Stuart Rosenfeld, President, Regional Technology Strategies

09.50-10.10 Keynote: **Innovative clusters - the role of local frameworks and supporting infrastructures**; Lynn Mytelka, Director, United Nations University

10.10-10.30 Keynote dialogue: **Reflections from science based innovation points of view**; Hans Wigzell, President, Karolinska Institutet, Sweden; Per Olof Berg, President, Stockholm School of Entrepreneurship

10.30-11.00 Keynote: **Competitiveness, innovative clusters and positive externalities**; Michael Enright, Professor, University of Hong Kong

11.30-13.0 **Miniforums I**; Lectures and discussions held with qualified experts focusing on areas of special importance

Building social capital and trust and civic entrepreneurship; *Speakers*: David Wolfe, University of Toronto, Canada; Mikel Landabaso, European Regional Development Fund, European Commission; *Facilitator*: Björn Terje Asheim, University of Lund, Sweden, University of Oslo, Norway

Benefits of innovative clusters; *Speakers* Mike Best, University of Massachusetts University Lowell, USA; Bagie Sherchand & Likando Mukumbuta, ZATAC - Zambia Agribusiness Technical Assistance Center Project, Zambia; *Facilitator*: Ifor Ffowcs-Williams, Cluster Navigators Ltd, New Zealand

Drivers of biotech clustering; *Speakers* Anders Östhol, ITPS - Institute for Growth Policy Studies, Sweden & Elisabet Juan, Competitiveness, Spain; *Facilitator*: Philip Cooke, Cardiff University, UK

Evaluation of cluster performance; *Speakers* Claire Nauwelaers, MERIT, Netherlands & Claas van der Linde, Institute for Strategy and Competitiveness, Harvard University, USA; *Facilitator*: Anne-Christine Strandell, ITPS - Institute for Growth Policy Studies, Sweden

How is e-business changing clusters and clustering; *Speakers*: Holger Schiele, h&z Unternehmensberatung, Germany; *Facilitator*: Trish Brimblecombe, Computing Whitireia Community Polytechnic, New Zealand

Clusters and regional innovation systems; *Speakers*: Meric Gertler, University of Toronto, Canada; *Facilitator*: Frédéric Richard, Strategic Research and Economics Branch, UNIDO

Investing in cluster specific talent; *Speakers*: Stuart Rosenfeld, Regional Technology Strategies Inc, USA; *Facilitator*: Alan Koziarski, Australian Project Developments, Australia

Network of European clusters - a platform for innovation and growth; *Speakers*: Gerlinde Poechhacker, Head of Cluster Management, Upper Austrian Technology and Marketing Company, Austria; *Facilitator*: Petra Falchetto, Managing Director, Inno GmbH Vienna, Austria

14.30-16.00 Miniforums II; Expert lectures and discussions continue

Donor funding of competitiveness initiatives: results to date and future; *Speaker & Facilitator*: Kevin X Murphy, J E Austin Associates, USA

The role of science parks as boundary crossers; *Speaker*: Helen Lawton Smith, Centre for Local Economic Development, UK; *Facilitator*: Kathryn Peters, SQW Ltd, UK

Collaborative governance - the Triple Helix; *Speakers*: Michael B. Darch, Ottawa Global Marketing, Canada & Brian C. Catts, Prinicipal, Cattman Ventures, USA; *Facilitator*: Johan Hauknes, STEP Centre for Innovation Research, Norway

From cluster initiatives to microeconomic agendas; *Speakers*: Örjan Sölvell, CIND - Centre for Research on Innovation and Industrial Dynamics, Uppsala University, Sweden & Anders Malmberg, CIND - Centre for Research on Innovation and Industrial Dynamics, Uppsala University, Sweden; *Facilitator*: Göran Hallin, ITPS - Institute for Growth Policy Studies, Sweden

Can governments catalyze clusters? Examples of government intervention; *Speaker*: Kevin Fitzgibbons Group Leader, Strategic Planning and Policy, Corporate Services Branch, National Research Council, Canada; *Facilitator*: Peter Heydebreck, Inno Group, Germany

Strategic upgrading of clusters through the inflow of FDI; *Speaker & Facilitator*: Rolf Rising, Director, Head of IT and Electronics, ISA - Invest in Sweden Agency, Sweden

Gender is innovative clustering - how to include vast potentials; *Speaker*: Marie Ahlgren, CEO, Àrviva, Sweden; *Facilitator*: Mateja Dermastia, State Undersecretary, Ministry of the Economy, Slovenia

Clustering competencies; *Speaker*: Jan C Maier, President, Innoveras, Germany; *Facilitators*: Tomas Hultgren, West Sweden Chamber of Industry and Commerce, Sweden & Martin Börjesson, West Sweden Chamber of Industry and Commerce, Sweden

16.00-17.00 Poster presentations of conclusions from the miniforums

17.00-18.00 Roundtable: Regional innovation systems and clusters in Canada and Sweden - similar objectives, different approaches; *Chair*: Michael Enright, Professor, University of Hong Kong; *Rapporteur*: Thomas Liljemark, Programme Director, VINNOVA; Participants: Kevin Fitzgibbons, Group Leader, National Research Council, Canada; Lois Stevenson, Deputy Executive Director, Industry Canada; Alf Chaiton, Senior fellow, University of Ottawa, Advisor to the Mayor of Ottawa; Magnus Lagnevik, Professor, University of Lund, Sweden; Per Eriksson, Director General, VINNOVA Kaj Klarin, Vice Director of Division, VINNOVA

Thursday, Sept 18 | MEETING THE CHALLENGES

09.00-09.30 Keynote address by Professor Antoni Subirá , IESE Business School in Barcelona; *Chair*: Emiliano Duch, President, Competitiveness

09.30-10.30 Presentation of the Greenbook based on a global survey of cluster initiatives; Örjan Sölvell, Professor, CIND - Centre for Research on Innovation and Industrial Dynamics, Uppsala University; Göran Lindqvist, CIND - Centre for Research on Innovation and Industrial, Uppsala University; *Chair*: Lars Eklund, Director of Division, VINNOVA

10.30-10.45 Introduction to the learning workshops; Emiliano Duch, President, Competitiveness

11.00-12.55 Learning workshops: lessons from mature clusters and programmes with more than five years' experience

Redefining cluster policy in Emilia-Romagna; *Facilitator*: Fulvia Farinelli, UNCTAD

Evolving policies in consumer electronics cluster in Catalonia; *Cluster representative*: Antoni Gurgui, D.G. Industry & Josep M. Montagut, Government of Catalonia; *Facilitator*: Lars Eklund, VINNOVA

From industrial to creative industries cluster in Scotland; *Cluster representative*: Mike Tibbetts, Scottish Enterprise & David Reilly, Scottish Enterprise; *Facilitator*: Emiliano Duch, Competitiveness

From public to private initiative in the automotive cluster in Styria (Austria) ; *Cluster representative*: Gerd Holzschlag, SFG Automotive Cluster Styria; *Facilitator*: Elisabeth Waelbroeck-Rocha, BIPE

ACENET-An European Union intercluster initiative; *Cluster representative*: Erik Bunis, Managing Director Länsteknikcentrum, Yves Gyuon, Director of the Department of Industry and Services, Lyon Chamber of Commerce and Industry (Lyon CCI) & Nils Gabrielsson, Managing Director Inno Scandinavia; *Facilitator*: Alberto Pezzi, Official, Catalan Government Innovation Agency CIDEM, Spain

New Zealand cluster policy; *Cluster representative*: Alan Koziarski, New Zealand Trade and Enterprise; *Facilitator*: Ifor Ffwocs-Williams, Cluster Navigators

Sustaining and evolving a clustering program for over a decade, lessons from the Arizona optics industry experience; *Cluster representative*: Robert L. Gonzales, New Global Strategies, LLC & Robert P. Breault, Chairman Breault Research Organization, USA; *Facilitator*: Eric Hansen, ETG, the Economic Transformations Group, USA

Australian maritime clusters - experiences and perspectives; *Cluster representative*: Steve Arnott, Department of Industry and Resources, Western Australia, Tracy Scott-Rimington, Cairns Region Economic Development Corporation, Queensland & Richard Walker, Shire Consults, New South Wales; *Facilitator*: Peter Heydebreck, Inno Group

Chihuahua cluster policy; *Cluster representative*: Salvador Avila, ECG - the Economic Competitiveness Group; *Facilitator*: Ted Lyman, Senior Principal, ECG - the Economic Competitiveness Group, USA

14.15-14.55 Keynote Address by Tea Petrin, Slovenian Minister of the Economy; *Chair*: Michael Best, Professor, University Massachusetts Lowell

14.55-15.15 Introduction to the Action Workshops; Per Eriksson, Director General, VINNOVA; Thomas Andersson, President, IKED - International Organization for Knowledge Economy and Enterprise Development; *Chair*: Frédéric Richard, Strategic Research and Economics Branch, UNIDO

15.15-18.00 Action workshops: Meeting the challenges of emerging clusters and programmes with less than five years' experience

Information Systems Cluster Latvia; *Cluster Representative*: Valdis Lokenbahs, President of DATI Group SC; *Facilitator*: Alberto Pezzi, Official, CIDEM - Department of Industry of Government of Catalonia, Spain

Moravian Slesian Cluster, Czech Republic; *Cluster Representative*: Hana Chlebna, Deputy Head, Czechinvest, Czech Republic; *Facilitator*: Arthur Bayhan, Special Advisor, Swedish Agency for Innovation Systems

The Pannon Automotive Cluster and the Pannon Wood and Furniture Cluster, Hungary; *Cluster Representative*: Tamas Szilasi, Cluster Manager, Pannon Automotive Cluster, Hungary; *Facilitator*: Håkan Gergils, Consultant, Ecofin Invest, Sweden

Slovenian cluster and innovation system development initiative, Slovenia; *Cluster Representative*: Mateja Mesl, State Secretary, Ministry of the Economy, Slovenia, John Hagard, Swedish Ambassador in Slovenia Milanka Jakopic, Economic Counsellor, Slovenian Embassy, Stockholm Göran Lindqvist, CIND - Centre for Research on Innovation and Industrial, University of Uppsala, Suzanne Håkansson, Deputy Director, Ministry of Industry, Employment and Communication, Sweden; *Facilitator*: Michael Best, Professor, University of Massachusetts Lowell, USA & Lars Eklund, Director of Division, Swedish Agency for Innovation Systems, Sweden

Sunrise Valley Project, Lithuania; *Cluster Representative*: Andrius Bagdonas, Director, Sunrise Valley, Lithuania; *Facilitator*: Kevin X. Murphy, President, J E Austin Associates, USA

TCS-Toolmakers Cluster of Slovenia, Slovenia; *Cluster Representative*: Brane Semolic, TCS Manager, Slovenia; *Facilitator*: Staffan Håkansson, Director International Affairs, Swedish Agency for Innovation Systems, Sweden

Istanbul Sultanahmet Tourism Cluster, Turkey; *Cluster Representative*: Melih Bulu, Director, Competitive Advantage of Turkey; *Facilitator*: David Nordfors, Special Advisor to the Director General, VINNOVA, Sweden

The challenge of Tabasco, Mexico; *Cluster Representative*: Armando Arguelles, Director, Tabasco in Action; *Facilitator*: Eric Hansen, President, ETG, the Economic Transformations Group

El Salvador micro clusters, El Salvador; *Cluster Representative*: Salvador Avila, ECG - the Economic Competitiveness Group; *Facilitator*: Lars Christensen, consultant and interactive researcher, FBA, Sweden

Georgian cluster initiatives, Georgia; *Cluster Representative*: Dr. Nana Adeishvili, Executive Director, CERMA - Centre for Enterprise Restructuring and Enterprise Management; *Facilitator*: Alec Hansen, President, ECG - the Economic Competitiveness Group

Connecting innovative clusters in Western Gotaland and Catalonia Spain, Sweden; *Cluster Representative*: Johan Carlsten, Vice President, Chalmers University of Technology, Roland Andersson, Chairman of the Board, Region Västra Götaland, Lars Nordström, President, Cultural Affairs Committee, Region Västra Götaland, Rolf Wolff, Dean, School of Economics and Commercial Law, Gothenburg University, Emiliano Duch, President, Competitiveness, Barcelona, Antoni Subirà, Professor, IESE Business School in Barcelona, Anders Källström, CEO, Western Sweden Chamber of Industry and Commerce, Josep M. Montagut, Coordinator Cluster Policy, Government of Catalonia, Joakim Anjeby, General Manager, Electronics Production Division, Saab Ericsson Space, Lena Holmberg, Senior Researcher, Victoria Institute; *Facilitator*: Peter Lindholm, CEO of Inno TSD, Sophia Antipolis

Innovative clusters in Sub-Saharan Africa; *Cluster Representative*: Pr. Burton Mwamila, University of Dar es Salaam, Tanzania, Mr. Januarius Mrema, Ministry of Industry and Trade, Tanzania, Mr. Thomas Kimbunga, Confederation of Tanzanian Industries, Tanzania, Ms Bitrina Diyamett, COSTECH (Commission for S&T), Tanzania, Dr. John Bosco Turyagyenda, Makerere University, Uganda, Mr. Richard B. Lutalo, Uganda National Council for Science and Technology, Uganda, Vincent Ssennyondo, Uganda Samll Scale Industrial Association, Uganda, Carlos Lucas, University Eduardo Mondlane, Faculty of Engineering, Mozambique, Fatima Amade Ministry, of Higher education science and technology, Mozambique, Manuel Quissico, General Manager for Tubex but representing AIMO (industry assocation), Mozambique; *Facilitator*: Lennart Bångens, Department of Marketing, Chalmers University of Technology, Sweden

Robotdalen, Sweden; *Cluster Representative*: Harry Frank, Senior Vice President for Business Technology Evaluation at ABB; *Facilitator*: Elisabet Juan, Executive, The Competitiveness, Spain

Industrial development through the regional innovation system ReFine, Sweden; *Cluster Representative*: Erik Bunis, CEO, LTC AB, Sweden & Leif Melin, Professor, Jönköping International Business School, Sweden; *Facilitator*: François Manneville Counsellor for Science and Culture, French Embassy, Sweden

Triple Steelix, Sweden; *Cluster Representative*: Lars Hansson, University of Dalarna, Sweden; *Facilitator*: Gerd Holzschlag, Cooperation, Company-Networks and Cluster, Knowledge- and Technologie-transfer Steirische Wirtschaftsförderung, Austria

Further enhancement of the Swedish national innovation system, Sweden; *Cluster Representative* Per Eriksson, Director General, VINNOVA - the Swedish Agency for Innovation Systems, Anders Flodström, President of the Royal Institute of Technology, Heikki Kotilainen, Deputy Director General, Tekes - National Technology Agency of Finland, Lars-Göran Rosengren, CEO Volvo Technology, Jan Edling, Senior Expert, The Swedish Trade Union Confederation, Thomas Andersson, President, IKED - International Organisation for Knowledge Economy and Enterprise Development, Lena Torell, President of the Royal Swedish Academy of Engeneering Sciences, Ulla-Britt Fräjdin-Hellqvist, Senior Expert, Confederation of Swedish Enterprise, Per Bill, Moderate Party, Member of Parliament, Committee on Education, Anne Ludvigsson, Social Democrat Party, Member of Parliament, Committee of Industry; *Facilitator*: Ifor Ffowcs-Williams, CEO Cluster Navigators, New Zealand

Internationally competitive bio manufacturing clusters in Södermanland; *Cluster Representative*: Peter Eklund, Head, Economic Development and Business Intelligence, Province of Södermanland & Börje Haag, Cluster Coordinator, Biotechvalley.nu & Daniel Hallencreutz, Intersecta AB; *Facilitator*: Lynn Mytelka, Director, United Nations University Institute for New Technologies (UNU/INTECH), USA

18.30 Presentation of the North German church organ cluster followed by an organ concert

Friday, Sept 19 | TOWARDS ACTION

09.00-10.00 Roundtable: Experiences of multilateral agencies from supporting innovative clusters; *Chair*: Ifor Ffowcs-Williams, President, TCI *Participants*: Arthur Bayhan, Special Advisor, VINNOVA; Frederic Richard, Director, Strategic Research and Economics Branch of UNIDO; Grant Morrill, Private Enterprise Officer, Office of Emerging Markets, USAID Tomas Kjellqvist, Head of Division, Department for Research Cooperation, Swedish International Development Agency; Alfred Watkins, The World Bank

10.00-10.15 The TCI 7th Global Conference 2004; Mike Darch, Co-chair, Host Committee, Ottawa Centre for Research and Innovation

10.30-11.30 Synthesis and Whitebook; Elisabeth Waelbroeck-Rocha, President, BIPE & Thomas Andersson, President, IKED – International Organisation for Knowledge Economy and Enterprise Development

11.30-13.00 Keynote address by Professor Michael E. Porter; Harvard Business School *Chair*: Antoni Subirà, Professor, IESE Business School in Barcelona

PRE-ACTIVITIES, GOTHENBURG, SEPTEMBER 15-16 2003, THE COMPETITIVENESS INSTITUTE 6TH GLOBAL CONFERENCE

ACADEMIC SUMMIT

Monday, Sept 15; Location: Chalmers University of Technology

09.30-11.00 Plenary session: **Regional growth in a global environment**
Moderator: Phil Cooke; *Speakers*: Zoltan Acs & Mike Best

11.30-13.00 Plenary session: **Clusters, entrepreneurs and SMEs**
Moderator: Åsa Lindholm Dahlstrand; *Speakers*: Maryann Feldman & Magnus Klofsten

14.30-16.00 Parallel sessions:

A1) **Clusters and universities**; *Moderator*: Merle Jacob; *Speakers*: Pontus Braunerhjelm & Helen Lawton Smith

B1) **Networks and interaction**; *Moderator*: Alexandra Waluszewski ; *Speakers*: Håkan Håkansson & Rejean Landry

16.30-18.00 Parallel sessions:

A2) **Clusters and knowledge infrastructure**; *Moderator*: Magnus Klofsten; *Speakers*: Phil Cooke & Peter Maskell

B2) **Business networks**; *Moderator*: Lennart Bångens; *Speakers*: Bitrina Diyamett & Suma Athreye

Tuesday, Sept 16; Location: Chalmers University of Technology

09.00-10.30 Parallel sessions:

A3) **Clusters and institutional frameworks**; *Moderator*: Björn Asheim; *Speakers*: Meric Gertler & Mark Lorenzen

B3) **Systems of innovation**; *Moderator*: Mauren McKelvey; *Speakers*: Keith Smith & Stefano Brusoni

11.00-12.30 Parallel sessions:

A4) Path dependence and discontinuities; *Moderator*: Björn Asheim
Speakers: David Wolfe & Bent Dalum

B4) Sectoral/technological systems; *Moderator*: Staffan Jacobsson
Speakers: Bo Carlsson & Frank Geels

14.00-15.30 Plenary session: Clusters and governance; *Moderator*: Johan Hauknes
Speakers: Jon Pierre & Henry Etzkowitz

16.00-18.00 Plenary session: "The Dahmén Centre"

Summing up; *Moderator*: Bengt-Åke Lundvall; *Speakers*: Mike Enright, Per Eriksson & Merle Jacob

PREPARATORY COURSE ON FACILITATING INNOVATIVE CLUSTERS

Tuesday, Sept 16

13.30 Outline of the course; Ifor Ffowcs-Williams, Cluster Navigators Ltd (Wellington, New Zealand)

13.40 Cluster theory, the conceptual framework; Mike Enright (University of Hong Kong, PRC)

14.10 Application to regional economic development; developing a cluster based economic development program for a region: Alec Hansen (CEO, ECG - the Economic Competitiveness Group, San Francisco, USA)

15.00 Cluster analysis; developing the strategic direction and motivational push: Emiliano Duch, TCI VP Europe/Middle East/Africa, and CEO Competitiveness (Barcelona, Spain)

15.30 The role of cluster facilitators; developing a sustainable initiative: Ifor Ffowcs-Williams

16.00 Swedish case study; regional growth through development of dynamic innovation systems - a few tentative insights: Lars Christensen consultant/interactive researcher, FBA, Stockholm.

16.30 Open discussion

CLUSTER STUDY VISITS

Tuesday & Wednesday, Sept 16-17

NETGROUP www.netgroup.se
Mon 15th of September 10.45-13.00
Host: Tommy Bergh
Theme: Working in networks

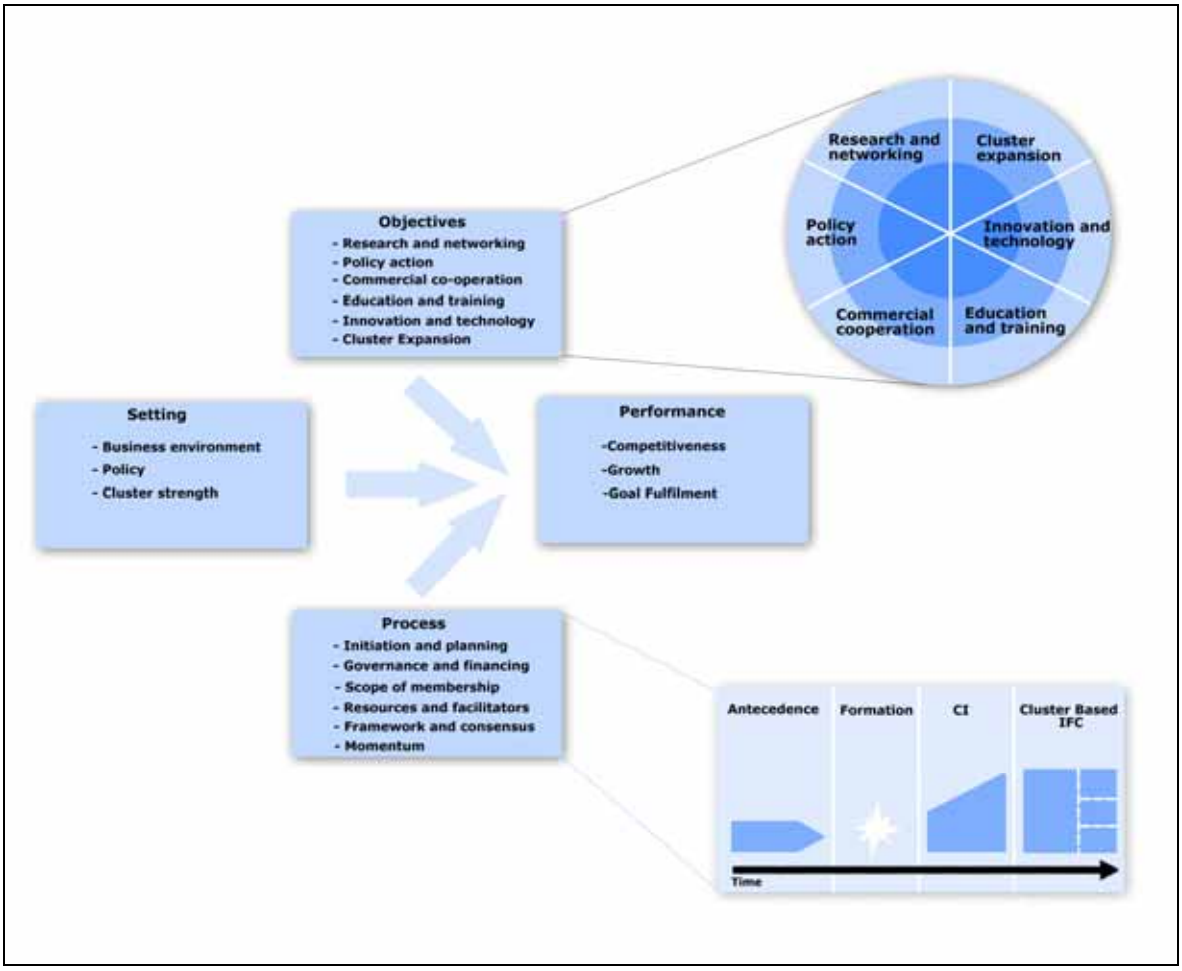
TELEMATICS VALLEY www.telematicsvalley.org
15th of September 14.45-17.30
Host: Tomas Gabinus, Executive Director of Telematics Valley
Theme: Creating a valley

VEHICULUM www.vehiculum.se
Tue 16th of September 10.45-13.00
Host: Ulf Johansson
Theme: Post car production

SKF www.skf.se
The 16th of September, 14.30-17.00
Host: Ulf Sjöblom, Director, SKF Manufacturing Development Center
Theme: Manufacturing networks within a company

FILM I VÄST www.filmivast.se
Tuesday, September 16, 09.00 - 15.00
Host: Tomas Eskilsson, CEO Film in West
Theme: Cluster emergence

APPENDIX B: LEARNING WORKSHOP EVALUATION SHEETS



ABOUT THE AUTHORS

Prof. **Thomas Andersson** is President of the board for IKED and also President of Jönköping University. Among other assignments, he is Vice President of the International Network of Small and Medium-Sized Enterprises (INSME) and serves on the International Advisory Committee of the Competitiveness Institute and on the International Advisory Board of *World Knowledge Forum*, Korea.

In recent years, Thomas Andersson was Senior Advisor to the Swedish Agency for Innovation Systems (VINNOVA), main secretary of the Ministers' of Finance project on the Nordic countries and the New Economy, under the aegis of the Nordic Council of Ministers, and member of the Board of Fora, a think-tank at the Danish Ministry of Industry, and of the International Advisory Board of Umeå School of Business and Economics.

Thomas Andersson was previously Deputy Director for Science, Technology and Industry at the OECD. Three divisions of that Directorate fell under his responsibility - the Industry Division, the Division for Economic and Statistical Analysis and the Division for Transport. He also coordinated the technology part of the *OECD Jobs Study*, the *OECD Growth Study* and work with the World Bank on building knowledge-based economies.

Prior to the OECD, Thomas Andersson was Assistant Under-secretary and head of the Structural Policy Secretariat in the Swedish Ministry of Industry and Commerce. During these years, he represented Sweden in the European Commission's Meetings for Director Generals for Industry. He has also headed the international research programme of the Industrial Institute for Economic and Social Research in Stockholm (IUI). Thomas Andersson holds a Ph.D. from the Stockholm School of Economics, has published widely on international economics and industrial organisation and has been a visiting fellow at Harvard University, Bank of Japan, Hitotsubashi University, and University of Sao Paulo.

Dr. **Sylvia Schwaag Serger** is Director at IKED. She has worked extensively with innovation policy both in the Swedish and international context, notably in the European Union. Among her responsibilities in recent years, she managed a number of country reviews.

Among previous assignments, Sylvia worked as senior administrative officer at the Ministry of Industry and Trade in Stockholm. At the Ministry she analysed and devised strategies for improving technology policy. During this time she represented Sweden in the EU Committee for Scientific and Technical Research (CREST), which advises the European Commission and the Council of Ministers on strategic aspects of research and technological development, and in the OECD Industry Committee. She also acted as expert on a governmental committee on Swedish policy on the European Monetary Union (EMU). She has also worked as senior researcher at the Swedish Institute for Food and Agricultural Economics (SLI), focusing on issues of strategic decision-making in the Common Agricultural Policy (CAP) of the European Union.

Sylvia Schwaag Serger holds a Ph.D. in economic history from the London School of Economics and Political Science (LSE). In addition, she has a Masters Degree in International Relations from the Paul H. Nitze School of Advanced International Studies of Johns Hopkins University. (SAIS).

Mr. **Jens Sörvik**, Project Officer at IKED, has worked extensively on issues connected to the use of ICT, networking and clustering. Mr Sörvik further serve as main Secretary in the Global Trust Agenda, a project that examines ways to establish an international clearing house structure for trust in virtual relations.

Mr. Sörvik has a solid background from both the public and private sectors. At the Swedish Embassy in Venezuela, he covered trade relations and also produced economic background reports and managed development programs. He further undertook research in Peru and published on the country's pension system. Mr. Sörvik has also worked in two different leading high-tech companies, C-Technologies and Hårdvarubolaget AB at the Swedish ICT-cluster, Ideon, and founded a third one, Bokks AB. From work on the three companies, he has extensive experience of business development, financial relations, market strategies and international sales.

Jens Sörvik has a Master's degree in Economics from the University of Lund. He has also studied at the University of Stockholm, University of Malmö and Université Paul Valery in Montpellier.

Ms. **Emily Wise Hansson**, Project Officer at IKED, has undertaken policy reviews notably of transition economies (including the Baltic countries, Poland and Turkey), focusing on the areas of SMEs and enterprise development, innovation and entrepreneurship, and cluster development. She also has special responsibilities for contacts with IKED's international networks.

Ms. Wise Hansson has international experience in both the public and private sectors. In the early 1990s, she worked as a project assistant in the World Bank's Europe and Central Asia (ECA) region, teaming with Country Officers for several Central European countries to monitor loan portfolios and country team projects, assist in portfolio management activities and communicate with client country ministers. She further interned at the IFC's Operations Evaluation Group, conducting a study on the impact of IFC projects relative to GDP growth. Later, she served as a strategy consultant for Accenture in their Copenhagen and Malmö offices, managing projects addressing global customer service and Internet strategy, organizational strategy, company and branch analysis, and global IT cost reduction. Ms. Wise Hansson worked primarily in the communication and high-tech sector.

Emily Wise Hansson has a Bachelor of Science in Foreign Service from Georgetown University and a Masters in Business Administration (MBA) from the University of Virginia's Darden School of Business.

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