The Economics of the Middle East

Series Editor: Dr. Nora Ann Colton

The Middle East has seen much more economic change than sociopolitical change over the past few decades in spite of the continuous political instability that is often highlighted by the press. Collectively the region is best known for producing and exporting oil. While the oil industry significantly impacts the region through generating wealth and movement of labor, it also has become the agent of change for endeavors such as development and diversification. With higher rates of growth occurring more in the East than in the West, the Middle East sits on the crossroads of this divide, acting as a bridge between these two market places.

This series is dedicated to highlighting the challenges and opportunities that lie within and around this central region of the global economy. It will be divided into four broad areas: resource management (covering topics such as oil prices and stock markets, history of oil in the region; water; labor migration; remittances in the region); international trade and finance (covering topics such as role of foreign direct investment in the region; Islamic banking; exchange rate and investments); growth and development (covering topics such as social inequities; knowledge creation; growth in emerging markets); and lastly, demographic change (covering topics such as population change, women in the labor market, poverty, and militancy).

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A LONG-TERM STRATEGY FOR DUBAI
BUILDING ON INNOVATION AND
CLUSTERS

Örjan Sölvell

INTRODUCTION

A long-term economic strategy for Dubai should build on policies aimed at enhancing the innovation environment. Dubai has created and attracted massive investments in both hard and soft infrastructure. The next step is to move from an investment-driven economy to an innovation-driven economy. Innovation is a broad concept involving the development of new products, processes, strategies, and organizational forms, and their coming into wide use. The degree of importance of an innovation is less related to the novelty of the technology as such but more related to how widespread its use is. The classical example is email, not technologically very sophisticated, but a new service that has changed the lives of most people in the developed world. Large innovations come with large economic consequences, and it is therefore important that Dubai starts to generate its own stream of innovations, to be commercialized in world markets both at home and abroad.

The innovation process takes many forms and is organized in many ways across the world. The classical Schumpeterian individual—the entrepreneur—is the person bringing new ideas, products, and processes that can alter whole markets. Such an act of entrepreneurship, by a single person (or in a partnership), can lead to the buildup of large firms, including examples such
as IKEA, Dell, or Virgin. Innovation also takes place inside firms (entrepreneurship), both large and small, and also in the “open space” in between firms. Recent scholarly work on innovation has emphasized innovation in between firms and between firms and end users, with concepts such as user-driven innovation (von Hippel, 2006) and open innovation (Chesbrough, 2003). Open innovation puts focus on the fact that knowledge is widely distributed, and thus innovative firms have become much more permeable, interacting with the surrounding business environment. The business environment can both be understood in the context of global markets and local clusters; both are important, but in different ways.

Innovation rarely takes place in a vacuum. Entrepreneurs and firms react to customer needs, new regulation, and so on. New ideas, products, and processes that actually become successful in the marketplace are often the result of a process of continuous interaction between firms and other agents in regional/local business environments. The most important regional/local environments for innovation seem to be city agglomerations, such as Dubai, offering diversity, and clusters of interconnected industries and organizations, offering specialization. In today’s world economy, leading innovation clusters such as Hollywood or Silicon Valley act as hotbeds for both open innovation and user-driven innovation. In dynamic clusters, firms interact in both prestigious rivalry and dense collaboration, and firms develop close linkages with academic and other organizations within the innovation cluster. High-tech innovations (what we will here refer to as “type 1” innovations) tend to emerge in close collaboration with universities and other scientific agents, whereas other innovations, not based on scientific knowledge or high technology (“type 2”), emerge out of entrepreneurial action. Leading clusters typically exhibit the most sophisticated users, referred to as lead users.

The Economics of Clusters

Many types of firms and organizations constitute the set of actors on the “cluster stage.” We have identified six main types (Sölvell, 2009): firms, both large and small and medium enterprises (SMEs), financial actors, public bodies, universities, organizations for collaboration, and media (see figure 7.1 and insert). Local clusters of firms and organizations in particular sectors, sharing skills and technologies, are commonplace both in the developed world and the developing world.

Economic activity tends to agglomerate or cluster in particular locations due to

- efficiency advantages offering lowered costs, including transaction costs,
- flexibility advantages offering high mobility of labor and other resources, and
- innovation advantages offering knowledge spillovers and cooperation across boundaries.

The first two types of advantages are typically offered by city agglomerations, whereas clusters, or Marshallian districts, are particularly important as environments within which innovation takes place.
The role of clusters in explaining economic performance of regions has been confirmed in several studies (Porter, 2003). From our own European data we can conclude that economic prosperity among the many regions of the EU is related to degree of cluster strength. In figure 7.2, the X axis shows the share of employees in clusters with a location quotient larger than 2, and the Y axis shows the level of economic prosperity in each EU region. Regions with a high share of clusters are performing better in terms of economic prosperity.

Today, there is a growing body of evidence to suggest that innovation and economic growth are heavily geographically concentrated. Clusters provide an environment conducive to innovation and knowledge creation. Regions with strong cluster portfolios are innovative leaders, while regions with no clusters or isolated research facilities fall behind. Globalization has increased the benefits of strong clusters and raised the costs for regions that fail to develop a clear specialization profile. Strong clusters emerge in open markets where intense rivalry and cooperation within and between clusters coexist. Clusters emerge where competition across regions enables companies, entrepreneurs, and financial actors to choose the location of their activities based on the attractiveness of a particular nation or region. Globalization has increased the need to combine strong internal dynamics within the cluster with a multitude of linkages to other clusters and markets around the world.

Regional specialization also brings risks, making regions more vulnerable to cluster-specific demand shocks (e.g., the construction cluster in Dubai recently) or fundamental technological shifts. The emerging evidence suggests, however, that a cluster-based regional economy rather than a highly diversified one still generates better
outcomes owing to many reasons. First, the economic costs of lower productivity due to a lack of specialization have dramatically increased with globally integrated markets. Second, dynamic clusters that are open to outside trends are better at dealing with external shocks, for example, by transferring existing skills into new market areas. And third, our research indicates that the most successful regions tend to have a portfolio of clusters, that is, a sectoral composition in between extreme specialization and extreme diversification.

**Clusters and Innovation**

Innovation performance tends to be highly skewed across regions, both within nations and across nations. A large number of empirical studies on regions and innovative performance have been published in the past decade (see Crescenzi, Rodriguez-Pose, and Storper, 2007, for an excellent overview). Using data from the European cluster observatory (www.clusterobservatory.eu), we can conclude that there is an important relationship between regional specialization (degree of clustering) and innovative performance (when measured as patenting levels). Regions in Europe without clusters (i.e., with employment evenly spread out across sectors) are all performing badly (dots to the left in figure 7.3). On the other hand, all regions in Europe with many ranked clusters are all top performers (dots to the right in figure 7.3). In the group of regions with a few ranked clusters, some are performing well and others are not. Again, this underlines that economic performance of a region is not only explained by the degree of specialization but also involves other aspects of the broader microeconomic business environment, such as labor quality, research and education, and access to venture capital and advanced infrastructure.

So, what makes clusters particularly important for innovation? As we know from the writings of Rosenberg (1992), the economic effects of technological breakthroughs are not really about the sophistication of a technology itself, but instead it is connected to the degree to which it is commercialized and diffused into society. Even in cases where there is a real technological invention behind it (type 1), incremental innovation and the adjustment of the business model and financial construction often become more important than the invention itself. And this is precisely where clusters come into the picture. Clusters offer a range of advantages of frequent day-to-day and face-to-face interaction where ideas, concepts, and beta versions are tried over and over again within a particular institutional setting, and personal networks and trust built up over time (Malmberg, Sölvell, and Zander, 1996).

Innovation and knowledge creation in clusters is built on the interaction of several technologically related actors on the cluster scene (buyer-supplier, industry-university, etc.). We can identify four interrelated characteristics that are particularly important for understanding innovation processes within clusters.

- Innovation is based on a process of **incremental reduction of technical and economic uncertainty** (Freeman, 1982; 1991), where new technologies and innovative concepts typically undergo a number of modifications, and business models are adjusted accordingly. This often takes place in a process of **Rosenbergian learning** (Rosenberg, 1992) where unplanned problems are solved in unplanned meetings, using technology and novel ideas in unplanned ways. Proximity favors such a complex and
evolutionary process. Tacit knowledge cannot reside in blueprints and formulae, but is based on personal skills and operational procedures that do not lend themselves to be presented and defined in either language or writing and therefore becomes sticky.

- **Innovation is based on a process of continuous interaction across organizations**, building thick ties, specialized language, and social capital within the region. This process of exchange and creation of innovations is enhanced by face-to-face contacts. Frequent interaction between buyers and suppliers and the role of users have been emphasized by von Hippel (1998) and Lundvall (1988). This exchange frequently involves sensitive information, and therefore requires a high level of trust between the parties. Some studies indicate that informal and oral information sources provide the most critical communications about market opportunities and technological possibilities that ultimately lead to innovation. According to Utterback (1974), the unanticipated, or unplanned, personal encounters often turn out to be most valuable. It is in this context that the cluster has substantial advantage over dispersed configurations. The costs and time associated with repeated exchange of knowledge and information in the development work will be lowered if it is taking place in the local context.

- **Certain innovations (type 1) are partly the outcome of a process of transferring and creating new technology and tacit skills in close collaboration with universities**, often involving technology transfer offices and incubators. Important linkages between the scientific community and firms engaged in innovation have been illustrated in several studies (Freeman, 1982; Powell et al., 2005). Again, proximity favors such transfers and co-learning, as research, technology, and innovation are all involved simultaneously rather than sequentially.

- Innovation is enhanced in environments where different resources can constantly be rearranged at low cost, through mobility of skilled personnel, financial restructuring by VC firms, private equity and angels, and technology transfer through cross-licensing. Various forms of product and technology sharing, or sourcing, also facilitate reshuffling of critical resources. Many innovations do not find use where they first emerged, but only after migration will they find the right soil, a process highly influenced by information distance and density of networks. Clusters favor mobility of "small streams," with high transaction costs, while "large flows" of standardized information, materials, components, and products are typically traded globally (Scott, 1988).

All of this can potentially take place at a global scale, but for reasons both of efficiency, flexibility, and openness built on trust and social capital, these innovation processes seem overwhelmingly productive within proximate and networked environments, surrounded by a common set of institutions and particular historical and cultural norms. Linkages across organizational boundaries can, for example, include joint R&D projects, joint product development, or the sharing of technology through licensing (involving fees, patent transfers, and so on). These ties can develop between similar types of organizations (firm-firm), or between different types of cluster actors (research organization-firm, VC-firm, and so on). For example, the Boston-Cambridge biotech cluster is built on two quite separate networks of thick ties, one around Harvard-Brigham and Women's Hospital-Genzyme, and the other around MIT-Massachusetts General Hospital and Biogen (Powell et al., 2007).

In summary, the very nature of the innovation process tends to make technological activity and innovation (both type 1 and type 2) locally confined and suggests that recent globalization forces have not altered—and presumably it cannot alter in the near future—this process in any fundamental way. In particular, the costs and time associated with repeated exchange of knowledge and information in the development work will be lowered if it is taking place in the local context. These aspects are important determinants of success in Schumpeterian competition, as reduced costs and shortened development times increase the size and length of the temporary monopolies that firms can achieve.

**HOW CLUSTERS ARE BUILT—THE FUNNEL MODEL**

The emergence of clusters is built on a combination of evolutionary forces (history, geography, etc.) and constructive forces (policy and private initiatives). Clusters are a central part of the microeconomic
business environment of any region. The first set of building forces involve certain almost deterministic forces (blue arrow in figure 7.4) related to the overall history, legacy, and culture of a region, the geographical circumstances (access to waterways, how affluent neighbors are, etc.), general institutions and regulations, and the overall macroeconomic environment. All clusters within a nation are affected by the exchange rate, color and type of government, and historical and geographical circumstances of the nation or region (see figure 7.4).

If we take the analysis of the funnel one step further, one must distinguish between different clusters within a nation or region. Thus, within the same national or regional context we have a scale of clusters ranging from highly dynamic and competitive ones to more static and uncompetitive ones. In Dubai, for example, we find dynamic clusters in Transportation and Logistics, Construction, Tourism, and Financial services. In line with this, we expect to see more innovation and competitive firms on the right-hand side and less innovation and competitiveness on the left-hand side of the scale in figure 7.5.

Clusters are also shaped bottom-up, from entrepreneurial action and firms implementing new strategies and business models, that is, as a result of innovation (figure 7.6). Such activities are not coordinated but part of the normal market mechanism—the invisible hand is at work. However, as a result of these actions, the larger cluster environment will either develop or decline. Decisions

Figure 7.5 The Funnel Model: A range of more or less competitive clusters

Figure 7.6 The Funnel Model: Entrepreneurship and new strategies
to invest and innovate help to build the cluster, whereas decisions to leave the region will push the cluster toward decline, and resources will slowly merge with other areas of the economy or become idle.

The evolution of clusters thus emanates from both deterministic and voluntary forces. In addition to this we have the constructive, more conscious, forces that will impact the development and competitiveness of the cluster. One type of constructive forces emanates from policy-implementing efforts to improve the microeconomic business environment of a region. Such policies include science and education, innovation, entrepreneurship, and SMEs, and so on. Other constructive forces emanate from initiatives of actors within the cluster, including civic leaders from private firms, organizations, and academia (see figure 7.7). Local leaders behind cluster initiatives take on a constructive role to improve the workings of the cluster or the larger regional environment. Typical objectives of such initiatives include upgrading of human resources, expansion of the cluster stimulating new firm formation and attracting new firms to the cluster, business development, and commercial collaboration such as joint export initiatives.

![Figure 7.7 The Funnel Model: Constructive forces shaping the cluster](image)

or coordinated purchasing to increase purchasing power. Other objectives include upgrading of technology and improving the overall business environment, including initiating dialogue on new regulations and upgrading the infrastructure.

Combining the two sets of evolutionary and constructive forces, we can gain a better understanding of how clusters develop, whether they will increase in dynamism and size or if they will go into decline. Initial conditions behind a cluster formation are found in the two blue arrows in figures 7.4 and 7.6; in addition, the two red arrows will have a decisive impact on the continued growth or decline of the cluster (figure 7.8).

We know from our research that cluster dynamics is a highly complex process and is best understood as a combination of evolutionary and constructive forces. However, constructors must be aware that the evolutionary forces are strong, and political vision
can easily continue to stay as visions. A large portion of humbleness is in place as constructors roll up their sleeves.

AGGLOMERATIONS

Looking out over the economic landscape of the world, we find firms and organizations being located in regions characterized by everything from large agglomerations, such as Silicon Valley, to almost total isolation. Some clusters are part of larger urban agglomerations, such as Dubai, whereas others are more rural. A firm to the left on the scale in figure 7.9 is isolated in a cluster sense, lacking close rivals or firms in technologically related industries, including suppliers and buyers in the vicinity. However, the firm can still be located in an urban location, surrounded by other diverse actors. The left-hand side is in line with the Soviet-style planning model built on highly fragmented value chains, or the old model of one-company towns often found in traditional industries such as paper and steel. These firms were often large and efficient in terms of economies of scale at the plant level. On the other hand, they were not surrounded by a multitude of related firms and industries, and entrepreneurship and new firm formation were unknown phenomena in these towns. These firms represent the closed innovation model, where in-house R&D would be the main organizing principle for creating new products and processes.

Another dimension of clusters involves the level of dynamism and amount and quality of linkages between cluster actors and external linkages to international markets. Some agglomerations are more on the static side, that is, the “Silicon Glens” as opposed to the “Silicon Valleys.” Level of networking, factor mobility, and general dynamism differs enormously across clusters. Also, the level of sophistication differs, where some clusters are more production-oriented in low-cost goods (e.g., the automotive cluster in Dogu Marmara, Turkey) while others offer highly differentiated products (e.g., the automotive clusters in southern Germany or northern Italy), including R&D, design, branding, and other strategic functions. If the quality of resources differs within a region, so does the flexibility with which the pieces can be assembled and reassembled.

Dynamic clusters create the foundation for sophisticated strategies and act as a driving force behind upgradation and innovation among incumbent firms. In summary, these can be stated as follows:

- Firms in dynamic clusters develop new strategies and new capabilities in a process of prestigious backyard rivalry.
- Firms in clusters tend to share many activities through cooperation, or swap products. Clusters facilitate both horizontal and vertical (buyer-supplier) cooperation within a setting of a “common language,” trust, and high social capital.
- Firms in dynamic clusters can operate more efficiently, drawing on specialized assets, suppliers, and buyers with short lead times. Critical resources and capabilities to succeed in innovation are often not within the firm, but they are accessible through boundary-spanning networks inside the cluster.
- Firms in clusters can achieve higher levels of knowledge creation and innovation. Knowledge spillovers and close day-to-day interaction between buyers, suppliers, and organizations lead to incremental improvements, which is the foundation of innovation, both technical (type 1 product and process improvements) and nontechnical (type 2 business model improvements). Innovations diffuse fast within clusters.
- Clusters offer an environment where different resources (individuals, technologies, capital, etc.) quickly can be reshuffled and restructured (spin-offs, labor mobility leading to the transfer of skills across organizations, etc.), allowing for new and better economic combinations of skills, capital, and technology. The need for changing the strategy or “recipe” of the firm can quickly be accommodated within the cluster.
New business formation tends to be higher in dynamic clusters. Start-ups are reliant on close interaction with suppliers and buyers. The cost of failure is typically lower within a cluster where many alternative opportunities exist.

Clusters in many cases offer lead markets where sophisticated buyer needs pull in technology development and innovation where buyers closely interact with suppliers.

These different drivers of competitiveness are combined in the so-called Diamond model developed by Professor Porter (Porter, 1990). Figure 7.10 below outlines the dynamic elements surrounding the Dubai tourism cluster.

### SCIENCE AND INNOVATION

In the policy debate, there is often a tendency to mix up science and innovation. Let us make a distinction between science, on one hand, and innovation, on the other (figure 7.11). Science is about creating new novel knowledge, whereas innovation is about novelty that is brought into use and commercialized in the market place. Some innovations clearly emanate from science whereas others do not. We have already referred to these as type 1 innovations based on new technology. The emergence of such innovations often happens in a mutual process involving academic actors and firms. Many important innovations within biotech, health, IT, and so on have emerged around the world's leading universities.

It is important to note that technological innovations do not emanate from a linear model, where more resources put into science and R&D automatically lead to more innovation. In Europe there is a discussion about the "European Paradox," where massive investments in science and R&D have not led to impressive new firm creation and successful innovations. For sure, investments in science lead to more scientific publications and hopefully more Nobel prizes, but this is no guarantee for successful innovation. Science must come with clusters to produce a stream of innovations.

The linkages between science and business involve a multitude of institutional factors, ranging from norms to regulation and legal foundations. Critical factors for innovation and firm formation include:

1. institutional setting of the science system (rules, norms),
2. incentives for researchers to commercialize findings (financial, prestige),
3. infrastructure to commercialize science (incubators, tech transfer offices, consultants, cofinancing, etc.),
4. mobility between science and business,

![Figure 7.11 Three subsystems: Science, the microeconomic innovation environment, and innovative firms](image)
5. personal networks across subsystems and meeting fora,
6. Curriculum development, PhD programs, and so on where business plays a role,
7. Organization of universities (establishment of new professorships, IPR rules, laboratories, applied research, etc.),
8. Available local financing with skills related to local science specialties (VC-funds, angel networks, etc.).

Innovations of type 2 can take place almost anywhere, but as discussed earlier, typical traits of the microeconomic innovation environment, including clusters, play a very prominent role in driving such innovations. Without the right incentives for entrepreneurial action, a dynamic "diamond," and cluster, we expect a cold innovative climate. Type 2 innovations include both new products and processes, but more often services (or services added to products) and novel strategic and organizational thinking. New business models—breaking old norms in the industry—have constituted the foundation for firms such as IKEA (furniture retailing), DELL (PC direct sales), and Virgin (airline services). By developing new strategies and ways of organizing business, whole industries can be transformed. New industries can emerge or old ones can be rejuvenated. The surrounding "funnel," as discussed above, plays a fundamental role in creating the right soil for nontechnical (type 2) innovations. Many emerge out of leading clusters, such as the innovative ideas laying the foundation for Apple, Google, and EBay.

A Future Agenda for Dubai

Dubai should move from an investment-driven economy to a truly innovation-driven economy. Whereas investments can be more directly controlled and steered through policy, innovation is a highly complex process, where initiatives must be taken by a multitude of highly motivated entrepreneurs. Innovation must emanate from both manufacturers and service providers, and also from users. Different groups of customers, tourists, patients, and so on can be more involved and initiate innovation. It is particularly important that Dubai can attract lead users who are setting world standards. This should to a large extent build on the already strong clusters in Dubai. Customers, tourists, patients, and so on with a diverse background have countless novel ideas that can be brought into the innovation process, from which both service providers and users will benefit. In line with von Hippel's thoughts about "Democratizing innovation," views of the users must be taken into account when formulating innovation policies.

A small open economy can come a long way by importing innovations in the form of new products and services developed elsewhere. However, to become a truly innovation-driven economy, the locally based firms and users must take part in the innovation process. In line with any other nation or region, Dubai must also think about the fields within which there is critical mass to compete with clusters around the world. The economic origins of Dubai are closely related to trade (shipping, logistics, trade finance, etc.), from which a number of clusters have emerged in the past two decades. The microeconomic policy agenda for Dubai should include a strategy for innovation and clusters, and ought to include a distinct policy for clusters and cluster initiatives. Let us look at these in more detail.

Policy for Clusters and Cluster Policy

The role of government is to stimulate dynamism and upgradation among firms within its territory. Both an active fiscal policy and regulatory changes play important roles in this. Some measures are geared toward the more general macro and micro business environments, whereas others are more targeted toward individual clusters. The concept of a "cluster policy" is gaining ground across the world. Cluster policy can be interpreted in two ways: microeconomic policies, which impact clusters in more general terms, that is, policies for clusters; and more specific cluster policies targeting particular clusters. Both types of policies play a role in the construction of world-class clusters. General policy for clusters includes a number of traditional policy areas.

The increasing evidence on the important role clusters play in explaining prosperity differences across regions has raised the interest of policy makers across the world. Now, it is time for Dubai to develop micro policies to help construct new clusters or help existing clusters to grow and prosper. Choices of allocating resources have to be made, and such choices should be based on peer review and open competition between clusters.
### Table 7.1  Cluster policy

<table>
<thead>
<tr>
<th>Policy area</th>
<th>Implication for clusters</th>
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<tbody>
<tr>
<td>Science and innovation</td>
<td>Science-driven clusters (Type 1 innovations) are sensitive to investments in science and technology development and regulations surrounding the academic environment</td>
</tr>
<tr>
<td>Competition</td>
<td>Rivalry is one of the key ingredients of dynamic clusters</td>
</tr>
<tr>
<td>Trade</td>
<td>Linkages to world markets is of fundamental importance for cluster dynamism (both imports and exports)</td>
</tr>
<tr>
<td>Integration</td>
<td>Regional integration with neighboring nations tends to push specialization and cluster growth. For example, in Europe, the internal market works toward creating one level playing field, where resources flow more freely, leading to some clusters gaining resources and increasing competitiveness, whereas others fall into decline</td>
</tr>
<tr>
<td>Regional</td>
<td>Clusters can gain from subnational regional programs, e.g., promoting infrastructure or training</td>
</tr>
<tr>
<td>Social policy</td>
<td>Access to superior public services enhances attractiveness of clusters, attracting human resources including students, entrepreneurs, expats, and other skilled people</td>
</tr>
</tbody>
</table>

In order to build an innovation and cluster agenda, several steps are needed.

- **Innovation and cluster policy**: The strategic intentions should be outlined in a specific document, a white paper. This document does not have to define specific tools, allocate funding, or create responsibilities. However, it does set the political objectives and present the motivation why specific activities are deemed important.
- **Cluster program**: To move from intent to real action, Dubai should design a specific cluster program, create organizational responsibilities (ministries, agencies, etc), and define specific—competitive—conditions under which funding can be made available.
- **Implementing agency**: It will be the responsibility of a government agency or ministry to implement the program. The program might be their main activity, or it could be a small part of their overall responsibilities.

For hard-line economists looking for a rationale for such a cluster intervention, one can point to two common market failures. First, networking failures emanate from the fact that individual actors in clusters do not realize the spillovers they create for others, and thus there is too little of innovative activities or investments. Cluster policy can be used to overcome the gap between the private and the public return of such activities in a cluster. Second, information asymmetries are commonplace, as the necessary information about how to fulfill a novel idea and bring it to market is dispersed across many different actors. Cluster policy can be used to overcome these information asymmetries by supporting dialogue and communication within the cluster. Bridges between actors can be built through changing regulations and active support of networks and meeting fora.

The eight dimensions of university-business interaction should be closely investigated—critical questions include the following:

- How can Dubai improve the institutional setting of the science system?
- What about incentives for researchers to commercialize findings?
- How can Dubai improve the infrastructure to commercialize science?
- How can we increase the mobility between science and business?
- How can we build more personal networks across subsystems?
- How can we involve businesses in curriculum development, PhD programs, and so on?
• Is the organization of universities optimal for innovation?
• Is there available local financing with skills related to local science specialties?

**Stimulate Cluster Initiatives**

In addition to more general microeconomic policies enhancing innovation and clusters in Dubai, there is also need for a more active cluster policy where cluster initiatives are stimulated. According to the Cluster Initiative Greenbook, cluster initiatives have the following definition:

Cluster initiatives are organized efforts to increase the growth and competitiveness of clusters within a region, involving cluster firms, government and/or the research community.

The Greenbook dealt with the territory between “organic” and perfectly “planned” clusters (see figure 7.12), where collective action between industry, public authorities, and universities help to construct clusters. It is important to see the role of an “in-between,” not giving up to evolutionary market forces, on one hand, and not attempting to overplan top-down, on the other. To strike this balance will be a tough challenge for Dubai.

Cluster initiatives started to grow rapidly during the 1990s. Sometimes they were induced by national or regional governments, but quite often they were initiated by firms that came together to enhance the attractiveness of their region, or improve their own competitiveness through commercial collaboration. Cluster initiatives, that is, organized clusters, became a tool for practitioners and policy makers. Today, the European Cluster Observatory (www.clusterobservatory.eu) lists almost 1,200 of these organized clusters in Europe (Cluster Organisation Directory, 2009).

Cluster initiatives involve a number of objectives and areas of activity. Typically, a cluster initiative involves several objectives in parallel. There are six main objectives:

• **Human resources upgrading** enhances the available skills pool and involves, for example, vocational training and management education. Such efforts can focus on different target groups of people. One type is intended to attract and retain students for the region—and sometimes for selected sectors—to ensure the future supply of a skilled workforce. Another type targets management through management training programs, typically not sector-specific. A third type is sector-specific vocational training and technical training.

• **Cluster expansion** aims to increase the number of firms, through incubators or by promoting inward investment to the region. One way of doing this is to promote the formation of new firms and attract existing firms to the region. Incubators are popular throughout Europe and are therefore a vital element of cluster policies. They often combine provision of physical facilities with assistance in setting up business plans and financial plans, and they help entrepreneurs get in touch with financiers and potential customers.

• **Internationalization** promotes firm operations, for example, through export promotion.

• **Commercial cooperation** encourages firms to interact with each other, for example, through joint purchasing and providing general business services.

• **Innovation** objectives promote products, services, and process innovation, for example, through increased commercialization of academic research. There are two general approaches to innovation, and they are often combined. One is to promote innovation through enhanced cooperation and networking between firms. The other is to enhance cooperation between the business sector and the research/university sector in order to commercialize academic research.

• **Business environment** objectives, finally, aim at enhancing the conditions for business, through improving the legal and institutional setting or improving the physical infrastructure. Improving the business environment means that conditions outside the firms are improved. Business environment objectives therefore focus on issues that are in the hands of government rather than working with firms directly. There are two main aspects of the environment that can be addressed: the physical/technical infrastructure, and the legal/institutional setting. In addition, region branding is an objective that can be assigned to this category.
Dubai should develop a cluster program that promotes cluster initiatives (CI). Experiences from Europe and other parts of the world would suggest the following:

1. Three dimensions of the setting in which a CI operate have a particular influence on its likelihood to succeed: the quality of the business environment, the structure and content of economic policy, and the strength of the underlying cluster.

2. Two aspects of the business environment have a particularly strong influence on the performance of the CI, which is measured by the successful attraction of new firms. One is strictly economic: the presence of an advanced scientific community and many strong clusters is an asset. The other is more cultural: a high level of trust between companies and between the private and public sector is positive for the CI.

3. Both the content of economic policy and the structure of the economic policymaking process are important for the success of a CI. Economic policies that secure high levels of competition, and promote science and technology, have a positive impact on the success of CIs. A policy process that supports stable and predictable decisions and allocates important decisions to the regional and local level is also positive.

4. A strong tendency is that CIs serving strong clusters perform better, both in terms of increasing competitiveness and generating growth. CIs for clusters that are of national or regional importance are better at attracting new firms, and the same is true for clusters with long histories and many companies, including internationally competitive buyers and suppliers, and exhibiting tight networks of buyers and suppliers. CIs seem to work best as “turbos” on existing clusters.

5. The CIs that have promotion of innovation and new technologies as an important objective are clearly more successful in improving competitiveness. Other similar objectives with a positive relationship to competitiveness are facilitating higher innovativeness, providing technical training, and, to a lesser degree, analyzing technical trends and establishing technical industry standards. There are also other direct or indirect approaches to increasing competitiveness: brand building and export promotion are both strongly related to improved competitiveness.

6. There is no evidence to suggest that a narrow or focused CI approach is better than a broad one. On the contrary, virtually every performance parameter (except the ability to meet deadlines) is positively related to having a broader range of objectives. Increased competitiveness, contribution to cluster growth, and goal fulfilment all follow this pattern. Older CIs do not tend to have more objectives than younger ones, rather the contrary is more applicable.

7. There are no significant differences in performance between CIs initiated by government, industry, or jointly. Both in terms of growth and in terms of competitiveness, these three groups have fared equally well. There are also no significant differences if they are grouped according to main financing source. Government-financed CIs do not perform significantly better or worse than those financed primarily by industry or equally by industry and government. The only pattern emerging from the data is that the few CIs initiated primarily by the university sector have performed somewhat better in terms of improving ties between industry and academia, which is not surprising.

8. The findings are mixed regarding government actions required at an initial stage to ensure the success of a CI. On one hand, those CIs that went through a process of competing with other CIs to get government financing tend to perform better in terms of competitiveness, but not in terms of attracting new firms. On the other hand, if government bases its choice of which cluster to support with a CI on research identifying “attractive” industry sectors, this would be related to better performance in attracting new firms, but not to increasing competitiveness. There are other types of government interventions that have no significant effect at all.

9. The scope of the CI may be limited by aiming for a certain subgroup within the cluster if members do not help performance. CIs with most members within one hour’s travel distance of each other, CIs with members on a particular level in the value chain and not including their suppliers or customers, CIs avoiding having direct competitors as members, and CIs aiming at large companies rather than small ones have not performed better in attracting new firms or in any other aspect of performance. Aiming for domestic companies rather than foreign-owned companies actually has a considerable negative impact.
effect on attracting new firms and on improving international competitiveness. Limiting the membership scope to only large companies, at one level in the value chain, or to only domestic companies is a recipe for failure.

10. Having the right set of resources to work with is important for success. A budget that allows a CI to carry out significant projects without seeking separate funding is strongly related to attracting new firms, as is having an office for the CI. Many CIs have exchange experiences with other CIs. If this involves CIs in the same industry, but in other regions, this is connected to attracting new firms.

11. The facilitator is another factor that has importance for the success of a CI in terms of competitiveness. Facilitators that have deep knowledge of the cluster and a strong network of contacts contribute more to increased competitiveness. Disappointing CIs often have no office or an insufficient budget for significant projects.

12. The framework for a CI can be built based on the specific strengths and capabilities of the cluster in question or by using a more generic framework. The former is strongly related to better performance in increasing competitiveness. It also matters how this framework is shared with the parties involved in the CI. Those CIs that spend time and effort on sharing the framework are more successful. Successfully achieving a consensus about what actions to perform is also related to improved competitiveness. Failure is strongly related to a lack of consensus, as well as to the absence of an explicitly formulated vision for the CI and quantified targets. In failing CIs, the framework is not adapted to the cluster’s own strengths. Framework issues are more important to competitiveness performance than to growth performance. All the above effects have a less pronounced relationship for attracting new firms than for increasing international competitiveness.

To sum up, a future microeconomic agenda for Dubai should be grounded in the realities of modern innovation processes and modern understanding of cluster dynamics. Innovation is increasingly characterized as an open process in which many different actors—companies, customers, investors, universities, and other organizations—cooperate in a nonlinear way. Ideas now move across institutional boundaries more frequently, and the traditional linear model with clearly assigned roles for basic research at the university, and applied research in company R&D centers, no longer holds. Innovation benefits from geographic proximity; it enables the flows of tacit knowledge and the unplanned interactions that are critical parts of the innovation process. This is one of the reasons why innovation is much more geographically concentrated than productivity or prosperity. And, it must be kept in mind that more investments into science and R&D do not automatically lead to a stream of innovation and new firm formation.

Clusters reflect the very characteristics of the modern innovation process: they are defined as the colocation of producers, services providers, financial institutions, educational and research institutions, and other private and government institutions related through linkages of different types. Clusters represent the activities needed to deliver value to users; they cross the traditional definitions of industries and the differentiation of manufacturing activities and services. Clusters and innovation are two critical components of building a sustainable future for Dubai.

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