

# CONTRIBUTIONS TOWARDS A CLUSTER STRATEGY FOR THE SEA IN THE ALGARVE

## CONTRIBUIÇÕES PARA UMA ESTRATÉGIA DE CLUSTERS PARA O MAR NO ALGARVE

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### ABSTRACT

This article advocates the relevance and crucial need for a strategic vision of the Algarve based on a cluster approach for its economy of the sea. The article reviews the literature on clusters and relevant topics related and relevant to that issue. It starts by summarizing the scope and structure of the article, followed by a theoretical framework, which highlight the key features and benefits associated with the cluster approach taken, the role of knowledge - intensive service activities as key drivers for innovation and entrepreneurship, taken as critical factors for successful cluster strategy advocated, along with the networking and cooperation, innovation systems and the importance of knowledge spillovers for knowledge management within the cluster.

Keywords: Cluster; Innovation; Network; Spillover.

### RESUMO

Neste artigo defende-se a emergência de uma visão estratégica para o desenvolvimento regional do Algarve, assente numa abordagem de *cluster* que integre as actividades ligadas à economia do mar no Algarve. O artigo faz uma revisão da bibliografia relacionada com esta temática, nomeadamente dos tópicos que se assumem de particular relevo para tal efeito. Assim, após uma introdução onde se identificam o âmbito e estrutura em que o mesmo se elabora, parte-se para a apresentação do quadro conceptual e teórico que deverá estar subjacente, o qual ressalta as características chave e principais vantagens que advém da abordagem *cluster* preconizada, o papel das actividades baseadas em serviços de conhecimento intensivo, enquanto vectores para a inovação e o empreendedorismo, passando pelo enfoque nos processos de *networking* e de cooperação, e terminando na relevância crítica crescente desempenhada pelos sistemas de inovação e dos *knowledge spillovers* para a gestão do conhecimento no seio dos *clusters*.

Palavras-chave: Cluster; Inovação; Rede; Spillover.

JEL Classification: O13, Q00, R11

## 1. INTRODUCTION

The importance of the ocean and seas to mankind has been widely recognized within the United Nations and other international fora. Around the world in recent decades, awareness has emerged that the management and governance of the ocean, coastal zones and human activities associated with it should be addressed at an ecosystem approach, of sustainable development, based on a comprehensive view, not sectoral and integrated, towards (EMAM, 2007, p.13): “The use of windows of opportunity for the development of new activities and uses of ocean and coastal areas, minimizing, in advance, potential conflicts of use between the various users and activities that make use of the sea to fulfil its objectives or as a resource, such as tourism, recreation and leisure, water sports, sea and inland cruises, shipping, dredging and coastal protection works, nature conservation and biodiversity, underwater archeology, recreational and commercial fishing, aquaculture, renewable energy, exploration and extraction of geological resources, the passage of cables, pipelines and broadcasters, commercial and fishing ports, marinas, scientific research and technology, engineering and shipbuilding, military exercises, the use of genetic resources, inter alia, by biotechnology. “

The maritime regions, which house 40% of the EU population, account for more than 40% of its gross domestic product (GDP), as expressed in CCE (2007). The maritime economy represents five million jobs and about 3-5% of EU GDP comes directly from the industries and services in the maritime sector (CE, 2007). This figure is much higher when taken into account the indirect contributions of other sectors such as tourism.

According to SaeR (2009), in the context of the first quarter of the century, there are five areas of vocation that Portugal can explore and learn to develop according to the resources at its disposal. On the whole, and if they are exploited in an integrated manner, have enough potential to constitute a platform of modernization that drag other more traditional sectors, through their interconnections and by the dissemination of good business practices and appropriate social behaviors. Also, they have a strong potential for job creation, viewed as a relevant condition to support the transition phase between the development model of the national economy (with its social safety nets) and the development model of competitiveness (where the devices of social protection will depend on value creation within that economy and society). These five areas of national vocation are tourism, the environment, the enhancement of cities' role as centers of development, the value-added services and the economy of the sea. These five domains are not strictly economic sectors, but from them emerge areas of economic activities that structure the economic sectors.

Portugal has the largest Exclusive Economic Zone (EEZ) of the European Union and the 11th worldwide, with more than 1,700,000 km<sup>2</sup>, which corresponds to about 18 times its land area. Besides that, it's even possible that Portugal come to rely on maritime zones under their jurisdiction (only concerning the rights to the seabed and subsoil and not to any rights to exploit fishing) that could more than double the current area of the EEZ, if the claim already presented by the Mission Structure for Extension of the Continental Shelf at the International Commission on the Limits of the Continental Shelf of the United Nations is approved. If so, Portugal will achieve a territorial acquisition of over 2.1 million km<sup>2</sup>.

The Algarve, with a coastline of 220km, approximately, has with the sea a particular affinity, as a result of its excellent natural conditions: the famous Nautical School of Sagres created by Prince Henry, where the navigation pilots, who initiated Portugal's Age of Discoveries, received instruction, became the core of the portuguese maritime expansion during the first half of the XV century, the most advanced center for studies

and research worldwide; historically, the fisheries sector in the Algarve has always been an important economic activity with a strong tradition; and more recently nautical activities, such as tourism and recreational boating, have been gaining increasing importance. In the domain of the R & D/TT, this region can be considered well-equipped in terms of number and quality of the reference institutions in science and marine technologies regionally located, which are important cornerstones of the regional and national innovation system in this field.

The strongly specialized development assumed in the Algarve in recent decades, has led major regional traditional sectors, such as coastal fishing, canning industry, shipbuilding and naval repair, among others, to a situation of general decline, that is worsening over time (partly as a result of these sectors own inability in adapting to new operating logics of the market), along with a deeply asymmetrical territorial occupation. It not seems to be merely circumstantial the fact that Algarve is currently the portuguese region more strongly penalized by the economic crisis that has developed in a more acute way since 2008: in this strongly depressed context, unemployment is undoubtedly the main social scourge affecting Algarve. It's urgent to fight against this situation, because it's undermining the cohesion and the fundamentals of the regional socio-economic model itself.

It is urgent to rethink the model for future development of the Algarve, which must pass necessarily by the election of new areas of activity that add value and / or introduce virtuous complementarities to the core business of the region. Only the strengthening of the regional competitiveness will ensure its economic success in a society increasingly globalized and competitive, while ensuring the creation of wealth and of more remunerated jobs, along with the preservation of social cohesion. Making the Algarve an innovative community, territorially ordered, respectful of the environmental and socially cohesive, should form the main components of a strategy for sustainable regional progress.

In this context, based on a redefinition of priorities aiming the promotion of a more diversified and sustained regional economy, with a strong technological base, it is imperative exploring a new strategic plan, which is the strengthening of the association between the Region and the Sea. A maritime cluster will help to achieve a better articulation, will maximize the use of synergies and economies of scale, while it will contribute to build a sustainable and integrated view of the Algarve sea, of its resources and of the various activities associated with this, emphasizing its importance as one of our main economic resources and projecting it as an important engine for the economic development of the Algarve.

With this article, we make a strong defence for the appearance of a real and substantive alternative towards the diversification of the economic base through a regional cluster of the sea in the Algarve, to create and take advantage of potential complementarities with the core business activities that exist at regional level (e.g. tourism, construction and real estate). The guidelines for a regional strategy for tapping the potential associated with the Sea, should, necessarily, involve the identification of areas of expertise to respond to the increased competitiveness that we face as a region within the overall framework in general. In this context, the cluster approach, while complex of activities and interrelationships, is likely to add value to them, not only for its unifying and mobilizing nature, involving the various actors, but also as a matrix methodology for the implementation of a regional strategy in this area.

## 2. THE CLUSTER CONCEPT

The notion of “agglomeration economies” refers to the efficiency gains that might benefit production activities in a situation of proximity and that would not exist if the activities had isolated locations. Traditionally, spatial economics distinguishes between three types of agglomeration economies (Pontes, 2005):

- Economies arising from industrial concentration, in other words, the increasing returns to scale that determine the geographic concentration of production in the same establishment;
- “Location economies” resulting from the geographical proximity of independent establishments, but belonging to the same industry or sector of activity in particular;
- “Urbanization economies” that arise from the geographical proximity between production establishments belonging to different industries or sectors of activity.

In this context, Porter (1998, p.197) gives us an instrumental definition of the cluster concept which will serve as the guiding thread of the problem assumed in this article:

*“Clusters are geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (for example, universities, standard agencies, and trade associations) in particular fields that compete but also cooperate.”*

Porter states that a cluster is the full manifestation of the functioning of the “diamond” economy, in which proximity (understood as the placement of companies, customers, and suppliers) amplifies all the existing pressures to innovate and improve economic performance.

Porter (1990) also discusses the role of opportunity and of the state within the diamond’s vertices (competitiveness factors). Inside the cluster and its supporting forces, the resulting benefits (e.g. information and innovation) flow in several directions (Porter, 1990), allowing, thus, boosting growth, encouraging competition and innovation in related support companies.

According to Andersson *et al.* (2004) clusters are inherently idiosyncratic in nature, with different applications of the concept suiting various situations. However, collecting all the contribution of several authors regarding the cluster, seven elements can be adopted as key for the notions:

- 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.

Many structural properties of clusters are mentioned in the definitions and descriptions in the cluster literature. These are presented as either constitutive or complementary and can also be used to characterise clusters. The identification of clusters across geographies

however remains difficult. Structural properties of a cluster may include, according to Sydow *et al.* (2007):

- Sophisticated local customers and downstream-industries
- Competitive related industries
- Suppliers of complementary goods and services
- Capable locally-based specialized suppliers of goods and services
- Accessible financial services
- Innovative core companies and original equipment manufacturer (OEM)
- Locally-based competitors
- Sophisticated local labour market
- Involvement of the local education system
- Research and development and knowledge transfer infrastructure
- (Trade and labour) associations
- State actors and regional economic development
- Critical mass of organizations

Regarding its typology and classification, this paper will distinguish four types of clusters, namely (Chorincas *et al.* (2001):

- “Micro Cluster” or “Local Cluster” - is a set of geographically close companies and institutions, inter-related by common and complementary elements, acting in a particular field of activity (in the same sector or possibly in the same segment of an industry); these firms compete simultaneously in the market for products (or services) and are able to cooperate, and in doing so increase the competitiveness of the whole; the case of “industrial districts” fit into this notion, in which the focus of companies on a small range of activities or business segments is a key feature;
- “Industrial Cluster” (using the broader notion of industry, common in Anglo-Saxon literature), or simply “Cluster” - is a set of interconnected companies, specialized suppliers, service providers, of companies belonging to related industries, and associated institutions (from universities to quality certification centers and trade associations) that are active in different fields, using different but complementary technologies, and through the innovation that is generated by some, benefits are realized for the others, all benefiting from improved global competitiveness;
- “Regional Cluster” - is essentially an “industrial cluster”, with the main joints functioning within a given regional area (sub-national); these joints can be repeated elsewhere in whole or in part of the same country; at this level are more relevant the effects of geographical proximity on the dynamics of interaction between actors and at the level of competitiveness and innovation of the set;
- “Mega Cluster” - according to the OECD definition is a distinct set of activities, whose goods or services meet the demand of a single large “functional area of final demand”, using basic skills and exploring the complementary advantages of networking between themselves and with other entities, including those that allow the accumulation of intangible capital for all the companies involved, such as the state research institutions, NGOs, among others.

Marshall (1920) was one of the first economists dealing with the concept of cluster, observing the creation of industrial districts. Marshall noted the apparent importance of industrial localisation while looking at English industrial regions of the 19th century, noticing the intangible dimensions of localisation, as evidenced in his famous comment about the secrets of industry being in the air. According with this author an “industrial district” is a concentration of large numbers of small businesses of a similar kind in the same locality. Agglomeration economies are associated with the cost savings to a business resulting from the proximity to markets and to inputs (supplies, labour force etc.). More specifically, as additional firms locate in the same geographic area, the lower the cost of production that can be achieved from suppliers competing for business, a

greater specialization of supporting firms, and a specialized labour force. Furthermore, the greater the number of firms located in an area, the greater the overall market to which a business can sell its goods or services.

Becattini (1992) has made several important contributions to our knowledge about industrial districts based on Marshall's reasoning. Becattini defines the "industrial district" as a "(...) socio-territorial entity which is characterised by the active presence of both a community of people and a population of firms in one naturally and historically bounded area. In the district, unlike in other environments, such as the manufacturing towns, community and firms tend to merge". Thus, Becattini extended Marshall's analysis of the purely economic effects of agglomeration to a broader perspective, to include the social, cultural and institutional foundations of local industrial growth. The economic miracle of Italy in the 1970's, during which small and medium sized enterprises (SMEs) started contributing substantially to the economic development and welfare in Italy, has initiated a large stream of theoretical work focusing on the competitive advantages of being located in industrial districts: Becattini based his considerations on Tuscany, particularly on a textile district located in Prato, near Florence. With its thousands of firms, mostly very small and specialised in a single production phase, Prato became the prototypical Italianate industrial district.

The analytical precision regarding varieties of clusters has evolved markedly since the pioneering intervention of Markusen (1996), who identified five types of industrial district:

- Marshallian – small firms, localized investment links, preferred suppliers, labour market loyalty, flexible work regime.
- Marshallian (Italianate variant) – with added cooperation, design intensive work and collective institutions plus local government support.
- Hub and spoke – structured around one or few dominant firms supporting the regional cluster, while suppliers and other activities spread around the hubs like the wheel spokes. In a hub-and-spoke cluster, inter-firm collaborations usually occur only between hub and non-hub firms, and the terms of cooperation are in many cases set by the hub firms. Collaborations between smaller firms are rarely seen as the smaller ones are usually very focused on benefiting from the large anchor.
- Satellite platform – largely consists of a congregation of branch facilities of externally based multiplant firms. In many cases, a satellite platform cluster emerged when certain local or national policies were developed to create a favourable investment environment for externally headquartered firms.
- State-anchored – the local business structure in this type of clusters is dominated by the presence of one or few large public or non-profit entities, such as universities, public research institutions, or military bases. The key public entities are typically surrounded by smaller firms/organizations, thus forming a structure similar to a hub-and-spoke cluster.

The overall market potential of a functional region, i.e. its size and density, is an infrastructure phenomenon in itself. It changes in a process of very slow adjustments and provides collective market opportunities that benefit both households and firms. In growing functional regions, the location of households and firms form a self reinforcing dynamic process, i.e. a process with positive feedbacks. Over time, the (slow) formation of regional infrastructure affects the process by gradually building up the basic conditions for the household milieu and the economic milieu of firms (Karlsson, 2008). Once again Karlsson (2008), states that this approach is a resource-based theory of location and clustering (and trade). The critical resources have the character of durable capacities which consists, on the one hand, of natural resources and, on the other hand, of the supply of infrastructure in the form of facilities and networks, R&D organizations,

existing production capacities with specific techniques, and the supply of different immobile labour categories.

The impact of economies of scale in the form of external economies of location had already been highlighted by Marshall (1920). A given company, operating under constant returns to scale, can benefit from external economies derived from the positive externalities produced by other businesses in the region, ie external economies of scale (Chipman, 1970). The economies of location often play a central role in many urban and regional economic models, as well as in models of spatial product cycles. According to the theoretical framework of Marshall, there are three sources of specific positive effects derived from the clusters, i.e., obtained through the agglomeration of businesses, that include: (1) local inputs non-tradables, (2) supply of local and specialized labour, and (3) information spillovers.

The processes of formation of clusters, although not linear, can be described as adaptive and of self-organizing nature. These processes involve entrepreneurs, as well as policy makers, and they contribute to the establishment of support functions and governance, as well as tangible and intangible infrastructures, often with the aid of public funds. This implies that either the cluster or a specialized region, created as a result of the activities of entrepreneurs, tend to be unique due to its particular history (Krugman, 1991) and as such difficult to imitate (Feldman and Martin apud Karlsson, 2008). Depending on the success achieved by entrepreneurs, their activities will be able to strengthen the regional economic environment, including its institutions and its capital, in parallel with the increase of possibilities to take advantage of economies of scale, both internal and external, as well as the establishment of new businesses (Karlsson, 2008). Successful clusters not only create their own resources, institutions and potential, but are also able to attract resources, such as financial capital, labour and entrepreneurs from other functional regions. However, there is no guarantee that the clusters that have developed well in the early stages, will continue to do so subsequently. From the moment entrepreneurs start their business and acquire resources and market potential, they become a crucial factor in the dynamic process of formation and development of the cluster. Very often, new companies are created in places where entrepreneurs live and where they established commercial and social networks, along with the access to a market of potential customers, as well as to a potential supply of inputs.

### **3. THE ROLE OF KNOWLEDGE AND INNOVATION SYSTEMS**

The cluster concept has been successfully applied in various regions, countries and sectors linked to the sea. Although many clusters are concentrated in coastal areas, the maritime economy, very often, has impacts beyond those coastal regions and because of so it is also necessary to establish relationships with stakeholders from such remote areas. The challenges faced, go widely beyond the simple sharing and collaboration *inter pares*. There are other key elements to be considered, such as the production and management of knowledge, the carry out of joint research and innovation (product development), the joint efforts in education and training, the sharing of innovative methods of organization within a group of companies (acquisition and distribution) or strategies for common promotion.

Cooke *et al.* (2007), quoting Choo and Bontis, define a regional knowledge and innovation system as a dynamic and evolving constellation of actors shaped by the knowledge embedded in organizational systems and embodied in associated technological systems. It has been argued that firms and research centres of expertise/excellence play

a dual role within a region, both creating (or co-creating) knowledge and absorbing knowledge from outside the region. Optimizing the potential contribution to regional development of a region's knowledge stock, however, will require complementarity between the regional knowledge base and the requirements of regional firms (Gunasekara apud Cooke et al., 2007).

For instance, the evidence suggests that, in general terms, spillovers and productivity benefits are probably greatest from publicly funded basic research which contributes to the related public knowledge stock. The heart of this issue lies in the fact that from the standpoint of its impact on regional development, the nature of knowledge, clearly, can not be considered isolated. Instead, a systemic view, more contextualised, is needed, since it reflects the provision of knowledge and their specific characteristics, as well as the different absorption capacities on the part of potential users of knowledge and effectiveness of knowledge transfer processes.

According to OECD (2007), the research concerning the sources of advantage in terms of improved productivity of the factors associated with clusters, has focused mainly on the movement of people and knowledge, in generating innovative ideas and into the development of new products and technologies. In the past, the academic work undertaken in this area, considered knowledge as a public good and technological progress as an exogenous factor to the economic system, equally affecting all businesses, regions and countries. However, the latest evolutionary theories have challenged this basic concept, recognizing that the generation, adoption and diffusion of new technologies is a complex process, and, therefore, endogenous to growth models (Romer, 1990).

Since long ago, companies face and have to solve the need for remote resources, optimizing the spatial configuration of their supply and/or production network. These solutions are particularly suitable when the resource is a variable factor of production, manpower or explicit knowledge (e.g. a foreign technology 'closed' in a machine). But, in many cases, these factors have left or are leaving of being strategic, as all companies in a variety of sources, have or will have equal access to them (also as a result of globalization). On the other hand, the location and even the nature of the critical technology for an industry, usually stable, cease to be so. This can occur in a technological discontinuity, in a migration of skills from one region to another, in the evolution of a product, or even in the convergence of industries (e.g. computers, communications and contents). As pointed out by Furtado (2004), the concept of innovation to market represents a kind of innovation closer to the original idea of Schumpeterian innovation. Considering the impact on the pattern of competitiveness and on the accumulation of technological capability in the company responsible for its promotion, it can be classified as an innovation qualitatively superior to those that are only new to companies but not for the market. In contrast, pioneering innovations that are only so for companies, are closer to the Schumpeterian concept of technological diffusion (or absorption).

The interactive process perspective of organizational innovation has gained popularity in recent years for investigating the nature of the innovation process, examining how and why innovations emerge, develop, grow and end. This perspective describes innovation as a complex process (not static), produced by interactions between structural influences and the actions of individuals, which occur simultaneously. The term "interactive process" has been used to describe the activities within and between companies (Edwards, 2000). According to Giget (1997), the innovative process is not deterministic and does not follow a set formula, it is socially constructed by the actors involved or interested in the generation of innovation and, therefore, must be understood as a series of interactions and exchanges between researchers, users, technicians, scientists, governments, companies, which are the innovation network. Thus, the interactive view of innovation is the basis

for many conceptual constructions, related to the innovative process, which considers the increase in complexity, the importance of knowledge sources external to the organization and the intra and inter-relationships, fundamental for successful innovation.

Increased innovation is about improving one's competitive position through product, service, and process innovations (von Krogh *et al.* apud Back *et al.*, 2005). Innovations are mostly based on procedural knowledge and cultural conditions which are not easily imitable by competitors. Procedural knowledge is knowledge that has something to do with the generic innovation processes. Such a process consists of different phases, such as concept development, evaluation and selection of alternatives, and development of prototypes (Nonaka and Takeuchi apud Back *et al.*, 2005). Cultural conditions encompass shared values and modes of behaviour within the company (von Krogh *et al.* apud Back *et al.*, 2005). For larger companies with many business units, the challenge is to leverage their procedural knowledge to develop different innovations throughout the company and thus achieve a sustainable competitive advantage.

Henderson and Clark (1990) identify four types of innovations, which are linked to specific changes in knowledge:

- *Incremental Innovation*: Improves component knowledge and leaves architectural knowledge unchanged.
- *Modular Innovation*: Architectural knowledge unchanged, component knowledge of one or more components reduced in value.
- *Architectural Innovation*: Component knowledge unchanged, architectural knowledge reduced in value.
- *Radical Innovation*: Both component knowledge and architectural knowledge reduced in value.

For the purpose of this article, we highlight two of those types: incremental and radical innovation. Freeman (1988) argues that one can understand the radical innovation as the development and introduction of a new product, process or way of organizing production entirely new. Such innovations may represent a structural break with the previous standard of technology, creating new industries, sectors, markets, generating cost savings and quality improvements in existing products. The innovations of incremental nature refer to the introduction of any improvement in product, process or production organization, within a company, with no change in industrial structure.

#### **4. IMPORTANCE OF NETWORKING AND KNOWLEDGE INTENSIVE BUSINESS SERVICES**

One of the most important changes that emerged in the last decade, concerns the growing role of service sectors intensive in information, technology and science, in the so-called knowledge-based economies<sup>1</sup>. The idea of an innovation economy applied to the service sector opens a new approach with a wide analytical capability and recognizes the strategic role of this sector in generating wealth.

The concept of Knowledge Intensive Service Activities (KISA) is well summarised by Martinez-Fernandez (2006) as the activities originated by the production and integration of knowledge-intensive services crucial for the innovation process of the firm. Typical examples of KISA include R&D services, management consulting, IT services, human resource management services, legal services, accounting, financing, and marketing services. Activities oriented toward the use and integration of knowledge are instrumental for building and maintaining a firm's innovation capability. In practice, KISA in a firm are

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<sup>1</sup> Economies that are directly based on the production, distribution and use of knowledge and information (OECD, 1996).

achieved by the use of in-house, or the combination of in-house and external, expertise. The capacity of the firm to perform these KISA more effectively may indeed be what differentiates a firm from its competitors.

Networks and clusters are not necessarily linked to the extent that networks can take place between firms located at different points, while clusters are geographically located in a country or region. Although they represent different concepts, clusters and networks are inter-related and both refer to beneficial relationships between companies, being networks the essence for the functioning of clusters. Clusters can be defined as a network of networks because within a cluster can exist several networks (Chapman, McRae-Williams, Whalley and den Hertog apud Santos, 2007).

Asheim and Cooke (1999) contend that there exist two main types of innovation networks:

- Endogenous networks that appear on the basis of local industrial clusters of small- and medium-sized enterprises with traditions and expertise of mutually beneficial exchange of information as well as interactive learning in the process of joint innovation activity (e.g., Baden-Württemberg in Southern Germany, and Tuscany and Emilia-Romagna in Italy);
- Exogenous innovation networks existing mainly as technoparks in technopolises. They appear under the following circumstances: when large companies single out R&D into a separate functional unit and place it in a territory that is best for the emergence of non commercial interdependencies (e.g., Sofia-Antipolis in Greece and Ile-de-France in France); or when an innovation network is set up administratively as a planned action to establish and deepen cooperation between research institutes and enterprises (e.g. the technoparks in the United States and the United Kingdom).

The following characteristics are recognized as essential for the Regional Innovation Systems (Poruchnyk and Brykova., 2006):

- An organizational structure comprising companies and leading participants in the innovation process;
- Inter-corporate interrelationships, namely an intense interaction among the business sector and other organizations;
- A role for the state and state innovation policy;
- An institutionalised financial structure;
- Activity and funding of R&D (according to a ratio involving private and state sectors);
- An industrial structure (comprising average sized companies, an efficient competitive environment, primary industrial sectors, etc.);
- A territorial organizational structure (urbanization, availability of regional production net-works) and a scale of inter-regional agglomerations (innovation clusters, spinoff enterprises<sup>2</sup> and spillover effects);
- A level of openness and integration into the global production system, an ability to attract external resources of development;
- Historical specificities, cultural rules and traditions affecting economic activity.

On the perspective presented at DG Enterprise and Industry (2007), innovation is increasingly characterised as an open process, in which many different actors - companies, customers, investors, universities, and other organisations - cooperate in a complex ways. Ideas move across institutional boundaries more frequently. The traditional linear model of innovation with clearly assigned roles for basic research at the university, and applied research in a company R&D centre, is no longer relevant. Innovation can benefit from geographic proximity which facilitates 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 occurs locally whereas its benefits spread more widely through

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<sup>2</sup> Spinoff enterprises are defined as associated firms promoting the process of exchange of information and transfer of technologies through different channels of interactive learning.

productivity gains. Clusters may embody the characteristics of the modern innovation process: they can be considered as “reduced scale innovation systems”. Successful clusters encapsulate all the activities needed to deliver a particular value to customers; they cross the traditional definitions of industries and of manufacturing versus services. They can emerge even where companies’ locations are not determined by the location of markets or natural resources. Their specific nature, including their spatial coverage, differs according to technology, market conditions, and other factors that influence the geographic extent and relative strength of linkages.

The Triple Helix thesis states that in addition to the knowledge infrastructure of university-industry-government relations, an overlay of communications and negotiations among these institutional partners has become increasingly important for the dynamics of the overall system. The emergent networks of internationalization, ICT, and globalization feed back on the carrying institutions so that the overlay provides competitive advantages in the reconstruction of the underlying systems. Knowledge organization and knowledge-based reconstructions can be transformed into a third coordination mechanism of social change in addition to the economics of the market and government interventions. The political economy is thus reshaped into a knowledge-based economy containing this more complex dynamics because of the evolutionary advantages of the combinations (Leydesdorff and Etzkowitz, 2003).

According to Goktepe (2003), the synergy of the three helices that compound the model of network innovation is the most efficient way to disseminate and use knowledge and enhance learning. The Triple Helix of university, industry and government, does not constitute an end in itself, but it configures new designs of innovation, scientific and economic. A balanced positioning of these three actors is an essential component for the innovation network strategy of any knowledge-based economy.

## **5. RELEVANCE OF KNOWLEDGE SPILLOVERS**

There are different views in the understanding of a knowledge economy, as has been pointed out by Smith apud Cooke *et al.* (2007). The first is that *knowledge as an input* is becoming quantitatively and qualitatively more important than before. This is reflected in an increase of knowledge related investment, such as R&D, education, software and information technologies, as observed for example, by the OECD apud Cooke *et al.* (2007). Another perspective reflects the idea that *knowledge as a product* is getting more important than in the past. Theories on firm performance emphasise the innovative process, notably the quality of factor inputs such as education, the positive rivalry between firms that drives innovation, and the structures/institutions that support innovation (Porter, 1990).

The role of geographical proximity has been discussed in the literature concerning regional innovation systems, as well as the related with knowledge spillovers. The proponents of the view that proximity offers innovation advantages in itself, begins in relatively recent times with Jaffe *et al.* (1993). The argument here was that R&D in particular constitutes a public good in locations where it concentrates and that this is sufficient to cause firms to concentrate in proximity to such knowledge spillover opportunities to access them as free goods in advance of competitors.

Innovation and entrepreneurial behavior is, as a consequence, heavily impacted or influenced by proximity conditions. While proximity is important for knowledge transmission and entrepreneurial effort, scale or agglomeration forces further amplify its effects. Therefore, large, well-integrated and relatively wealthy urban agglomerations are seen as locations where knowledge transmission is likely to be highest, *ceteris paribus*,

and consequently, locations of greatest entrepreneurial action (Karlsson *et al.*, 2006). Knowledge spillovers occur when a firm creates knowledge and that knowledge produces external benefits (“spills over”) onto other firms. Knowledge spillovers represent a positive externality in that the socially optimal level of knowledge is not created because innovative firms do not take into account the effect of their knowledge production on other firms. The result of knowledge spillovers is that spending on R&D will be below what is socially optimal, providing possible justification for government policies to increase innovative activity. By looking at the evolution of art capitals one needs to gain insight into the origin of creativity clusters and why some clusters overtake other clusters. This question is of utmost importance for policymakers seeking to overtake other regional clusters as firms have a strong incentive to locate in pre-existing clusters to take advantage of the high level of knowledge spillovers (Karlsson *et al.*, 2004). Also Audrescht *et al.* (2006) argue that entrepreneurship resulting from knowledge spillovers tend to be located geographically close to the sources that currently produce the relevant knowledge.

The work of Alfred Marshall pointed out reasons for increased business productivity, when several companies in the same industry are located close to each other, sharing the labour market, knowledge spillovers and specialized suppliers. Subsequent theories have argued that specialization in a particular industry, carries a cumulative process of assets and advantages, which is a direct consequence of strengthening the nature of this process (OECD, 2007).

Subsequent theories have argued that specialisation in a particular industry brings with it a process of accumulation of assets and advantages (cumulative causation), implying a self-reinforcing nature in this process. Additionally, market forces tend to concentrate investments in prosperous areas which offer better access to infrastructure and human capital, lower risks and better access to markets (Krugman and Venables, 1990).

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