Contributions to Economics

Regional Cohesion

Effectiveness of Network Structures

Bearbeitet von
Piotr Pachura

1. Auflage 2012. Taschenbuch. IX, 120 S. Paperback
ISBN 978 3 7908 2809 2
Format (B x L): 15,5 x 23,5 cm
Gewicht: 213 g

Chapter 2
Clustering and Networking in Regional Policy

2.1 Theoretical Aspects of Networking in the Knowledge Economy

The approach to the development and competitiveness of regions can be seen on the basis of examining economic concepts, starting from classic economics (Smith, Ricardo). In the classic economic theories, competitiveness was associated with the phenomenon of the *division of labour* which provides for economies of scale and differences in productivity across nations.[1] In the concept by Ricardo on the basis of the phenomenon of *comparative advantage,* the fundamental meaning connected with competitiveness referred to the benefits of international trade gained by particular countries.[2] Similarly, in neo-classical theory trade is deemed to be the engine of growth. Furthermore, it is deemed that free trade will equalise the prices of output, goods and, in turn, the prices of the factors of production (capital and labour) will also be equalised between countries.

Whereas classic economists treated capital and labour as two independent production factors, the Keynesian theory assumes capital and labour to be complementary. The Keynesian theory assumes that governments can successfully intervene in the cycles of the economy. This theory is of greater importance in the case of the policy of creating competitiveness of regions as state interventionism is evident and the convergence of regions can be achieved through economic policy.

In more contemporary theories of macro-economics, it is possible to find many more references to the question of shaping the competitiveness of regions. In the concept of *development economics* which is associated with *centre-periphery models,* the competitive advantage of "central" regions is most often rather long lasting and is catching up in terms of productivity which in the case of the 'central' and 'peripheral' regions is a slow process.[3] As *development economics theorems*

[1] Smith (2008).

[2] Ricardo (1957).

[3] Keeble (1976).

P. Pachura, *Regional Cohesion*, Contributions to Economics,
DOI 10.1007/978-3-7908-2364-6_2, © Springer-Verlag Berlin Heidelberg 2010

underline the lack of balance in the development of regions, foreign direct investment is of great significance in the process of convergence as regards regions. Economic policy plays an important role in determining regional success.

In the past decades the theory based on accumulation and the use of knowledge, frequently called the *endogenous growth theory* has been popular. Endogenous growth theory purports to provide a theory of economic history, in the sense that it tries to explain why some economies have succeeded and others have failed. The key assumption of the endogenous growth theory is that the accumulation of knowledge generates technological progress and economic growth. It is therefore acknowledged that investments in human capital and research and development are crucial for regional endogenous development.[4] The consequences for policy makers are for instance, the balance between spreading knowledge on the one hand, and protecting intellectual property rights on the other, in order to maintain the level of investments in R&D.

Aside from the theory on a macro-economic level, there are many theories associated with the explanation of the phenomenon of competitiveness operating at a micro-economic level which is of an interdisciplinary nature and is associated with such disciplines as sociology or economic geography. One of the most influential theories is Michael Porter's *cluster theory*. This theory is based on local competitiveness and the context of the global economy.[5] In accordance with this theory, in order to be competitive, an organization must continually improve the operational effectiveness of their activities and simultaneously strategic positions in the global economy. This assumption leads to the necessity of running a business activity at a local level while at the same time accepting a strategy of competitiveness at a global level – the effect of which is the creation of geographical clusters.

Another approach to the creation of competitiveness in a region is that which is based on the theories of economic geography, particularly the theory of locating business activities. The *Marshallian industrial districts* and the theorems of the economies of location are worth mentioning here. The formation of localized concentrations of industrial specialization is a part of the organic and organizational development of the industrial economy.[6] Marshall attributed the competitive success of key industries to their tendency towards geographical localization, and in turn industrial specialization as key to local economic success. Specialized industrial localization – consisting of various interactions fostered by inter-firm specialization and division of labour, the growth in the number of specialist suppliers, intermediaries – serves to reduce transaction costs, and promotes competitive advantage in the local production system. Furthermore, in this approach, knowledge and know-how are accumulated and become locally socialized into a local industrial "culture" and local "innovative environment." In contemporary times, the

[4]Aghion et al. (1998).

[5]Karlsson (2008).

[6]Cainelli and Zoboli (2004).

phenomenon of the *collective learning processes* is also underlined as the creation and application of innovative and entrepreneurial knowledge for the creation of a regional economic advantage.

Collective learning processes are simultaneously becoming a factor in the creation of the system of knowledge in a region, as well as an element in the process of creating a vision and aims for developing a region. Furthermore, with regard to the variety of approaches and interests of particular groups of regional players (institutional, business, social etc.), the common activity constitutes an element in the creation of trust as an element in the social capital of a region.[7]

Innovation is seen as an interactive learning process that requires interactions between a range of private and public regional players. The abilities of a firm to adapt innovation and knowledge are determined by its surroundings: its partners, competitors, customers, the human capital available, the regional knowledge infrastructure and institutions.

The increasing significance of the processes of knowledge and high level of IT in the modern market has become the stimulus for the shaping of such notions as: an economy powered by knowledge, information economy, information society, which is generally used with the aim of systemizing the phenomena that started in the 1950s. The arrival of a new era in the history of economic development – an economy based on knowledge, forced the players on the European and global markets to change their way of thinking to that of socio-economic activity, particularly in the area of gaining competitive advantage and striving towards socio-economic coherence by integrating the spatial structure. The necessity of adjusting to the conditions of a new economy was encountered by global corporations, individual enterprises functioning on a regional scale, as well as local authorities responsible for the shaping of regional policy in response to the new challenges of a global knowledge economy.

An economy based on knowledge is one directly based on production, distribution and the use of knowledge and information.[8] The notion of a *knowledge-based economy* should be understood first and foremost, as the definition of a modern stage of economic development, where knowledge is understood as the ability to act and play a decisive role in stimulating social and economic development.[9] Such an approach to the interpretation of this notion seems to be appropriate and allows us to notice that knowledge had been an important factor of economic growth prior to the emergence of economic models that are directly involved with knowledge as the fundamental factor of economic development.[10]

The knowledge economy is seen by the World Bank in a similar way, which defines this notion of a market availing of knowledge as the key engine of economic growth. It is an economy in which knowledge is acquired, created, spread and

[7]Cross and Israelit (2000).

[8]The knowledge-based economy (1996, p. 7).

[9]Innowacje i transfer technologii. Słownik pojęć (2005, p. 57).

[10]Jelonek (2004).

effectively used with the aim of supporting economic development.[11] The proposed theoretical concepts concerning the knowledge market are first and foremost aimed at explaining the roles of knowledge-derived resources and activities in stimulating productivity and economic development. Factors conditioning the economic success of enterprises and countries are much more dependent on the abilities of creating and using knowledge than ever before.

The necessity of referring to the essence of the knowledge economy is due to the attempt to set the appropriate context for the considerations at hand, as the natural attribute of the knowledge economy is understood in the wide ranging scope of a *network paradigm*. Therefore, it appears to be justifiable to define the modern economy as a network economy. On one hand, the modern economic area is being filled with network ties in global terms, but at the same time the role of local networks which constitute a defence mechanism against the negative effects of economic globalization.

The competitive potential of an enterprises is the function of the resources accumulated in the network in which the enterprises participates, the position it occupies in the network, as well as the abilities to mobilize these resources.[12] This is a notion that is representative of the economic concept of M. Bratnicki, that is seen as a specific form of interactions between various economic units in which the enterprises in question, as a part of the whole gain an advantage in the flexibility of activities and increase their competitiveness. The author defines the notion in economic terms as "the geographical concentration of mutually connected enterprises and institutions in a given area of business which represent a new type of spatial organization located between risk and hierarchy."[13]

The network organization is a modern form of organization that illustrates the way of organizing mutual ties between firms or units of an individual enterprise. Its existence was possible thanks to the reduction of transaction and transportation costs as a result of the resolution in telecommunication and forwarding technologies. However, the network organization also means a new style of management and a new form of organizing relations between companies. The fundamental basis for the ties between the network elements is at least the partial collectively of the aims, the realization for which particular elements voluntarily entered the network as network elements. Such a network can be formed by separating and significant independence of the elements of the organization or a combination of small organizations whose independent operations would be too problematic to maintain its position on the market. In this way they combine to increase their competitive strength by being able to counteract the activities of even large corporations.

From a theoretical point of view, the network constitutes an unquestioned hierarchy as a way of regulating events. Striving towards the reduction in the significance of the hierarchy as a mechanism for regulating activities and

[11]Chen and Dahlman (2006, p. 4).

[12]Sławecki (2005, p. 322).

[13]Bratnicki (1999, p. 22) and Sławecki (2005, p. 322).

integrating the organization causes the replacement of vertical communications and ties of giving orders and checking by horizontal ties. In such an organization the creation of an interpersonal network between employees is promoted, which supports the processes of the corporation. Thanks to the weakening hierarchical dependence and structures of the authorities, the level of flexibility and adjustability, as well as support for entrepreneurship are all increasing. The interactions between the elements of the network structures are therefore nothing more than channels of direct communications for people focused on a task and not authority. This facilitates the fast acquisition of knowledge and the multiplicity and mutuality of the transmission of information is the basis of cooperation and existence of the network. The interactions between partners and market mechanisms constitute an integrating element and external competitive pressure on the part of the organization that wants to connect with the network which causes the reduction of the prices offered for goods and services between partners. Such a solution favours the reduction of general costs and increases profitability by increasing competitiveness. The partnership of a network organization is based on mutual trust, common ideology and reputation. The discrediting of these elements can lead to the exclusion of a partner from the network or even the disintegration of the network itself.

In the afore-mentioned statement the interpretation of the knowledge economy by M. Castells is applied, in which in his opinion this market describes three mutually connected aspects: firstly, it is an economy concentrated on knowledge and information as the basis of production, productivity and competitiveness of both enterprises and whole regions, cities and countries. Secondly, an economy based on efficiency derived from knowledge and information which is global. The third factor which is essentially associated with the two previous ones is that of the *network economy organization*. These are decentralized networks from within enterprises, between enterprises and the networks of SMEs of dependent enterprises (subsidiaries of large corporations). In such an economy thanks to the networks, it is possible to facilitate extraordinary levels of flexibility and ease of adjustment. Therefore, it is an information based, global and organized economy within a network, in which one element can not function without the other.[14]

The *network* can be acknowledged to be a particular set (collection) of autonomous organizations that possess direct or indirect relations resulting from agreements (alliances) between the group participants. The purpose of the network is to gain a competitive advantage for particular participants of the network and frequently for the network as a whole. The feature of the network is the possibility of defining its borders (although frequently difficult), whereas the key phenomenon in defining the network is that the relations between enterprises within the network are greater than the relations between members of the network and external organizations (with relation to the network). Another characteristic feature of the network is the independence of the network organization members and their autonomous economic aims, which can be achieved thanks to participation in the network.

[14]Castells (2001) and Rózga Luter (2004, p. 31).

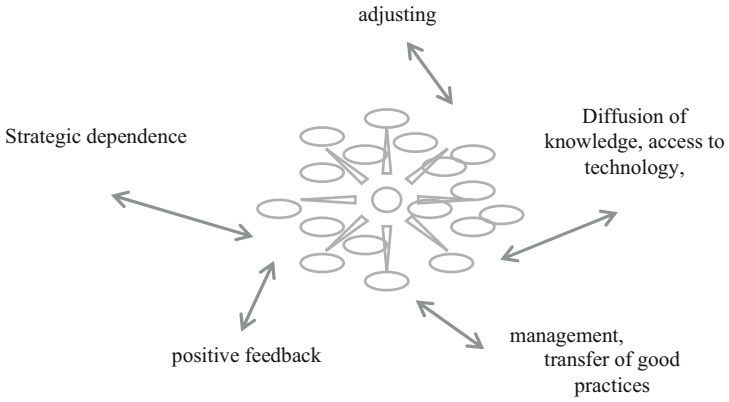

Fig. 2.1 Elements of the "*Network effect*"

The key phenomenon that occurs in the network is the *network effect,* or in other words, the impact (negative or positive) of the network on particular members (organizations, enterprises). The *network effect* can involve the following phenomena (Fig. 2.1): strategic dependence involving the restriction of strategic choices of the network participants; selection of partners resulting from the "adjustment" (*network fit*/*network fitness*),[15] diffusion of knowledge within the framework of the network (referring to good practices, particularly in the sphere of management); minimization of technological risk (participation in the network provides better opportunities of availing of the leading technologies); *positive feedback* which means for instance, availing of the economies of scale.

In accordance with the concept of *networking* an enterprise should possess an increasing level of abilities to cooperate with external partners such as universities, research units, or competitors that possess special skills. External cooperation facilitates the access to resources of particular knowledge which can be generated by internal structures of individual organizations. The network of cooperating units constitutes a central location of innovation as it provides knowledge and other inaccessible resources for individually operating organizations at the right time.

The dynamic ability to learn in an organization which generates a competitive advantage should therefore transgress organizational barriers. The functioning of the organization within the network of inter-organizational ties is seen as an important element in the organizational process of learning as the units learn through cooperation with others, as well as observation and adopting good practices from others. Enterprises do not gain their skills in isolation but discover, assess and learn from their implementation during the course of cooperating with partners of exchange. The ability of the organization to compete is the quality function of international ties and the learning abilities provided.

[15]Concept of *network fitness* presented by among others, Ard-Pieter de Man, Koen Franken and others.

The functioning of the enterprises within the framework of inter-organizational networks of cooperation brings specific results in the area of their innovativeness. The ability to generate innovation through cooperating organizations is to a large extent dependent on the type of ties and position held in the network. The value of the enterprise comes from its participation in the network, but however, the amount of social capital accessible for companies is determined by its position within the structures of the network. Therefore, the organization can gain value through the ability to create and use the knowledge acquired thanks to participation in the network. The network structure is defined by appropriate mechanisms and types of interactions which have an impact on the quality of relations and simultaneously, on the value gained by the organization.

Analysis of the mechanisms and factors of creating network structures of interaction and their transformation have great significance for the effective management of development of enterprises (participants or future participants of the network of interaction), regions and countries. The main course of research for network structures is associated with analysis carried out from the point of view of an enterprise (or a network participant in general). Scientific work is less advanced in the case of the mechanisms of creating and transforming networks in a spatial sense, as well as comparative research on the aspect of creating and transforming the network structures in various regions/countries with the aim of identifying the factors of success of particular participants of the network and the network itself.

It is increasingly stated that the notion of innovation includes everything that is connected with the creation and application of new knowledge with the aim of achieving a comparative advantage. In this sense, innovations apart from technology of course refer to economics, society and culture. Traditional approaches of science towards organization and management are insufficient to explain and manage the development of enterprises, as well as regions and countries. The modern economy called post-capitalist by P. Drucker requires a new approach to the challenges of development as the "individual act of innovation" which is no longer sufficient as innovation must be of a continuous nature. Therefore the core of the modern economy is becoming the network structure. The feature creating the network ties is most often their spontaneous and chaotic nature. With relation to this, a large role is attributed to the administrative environment as a "catalyst" and participant of the network of interaction. Moving away from the way of thinking that defines innovation as a linear process: science (basic research) – innovation (initiation) – commercialization, the direction of the paradigm of *continuous innovations (innovativeness)* requires a different view, frequently radical changes in thinking. If innovativeness is the following: constant process of the flow of knowledge and its creation, then the factors defining the effective functioning of the network structures are becoming more significant. Another important phenomenon associated with the change of innovative strategies of enterprises is the approach to the inspired concept of "*open innovation*."[16] Innovative strategies of enterprises up

[16]Davenport et al. (2006).

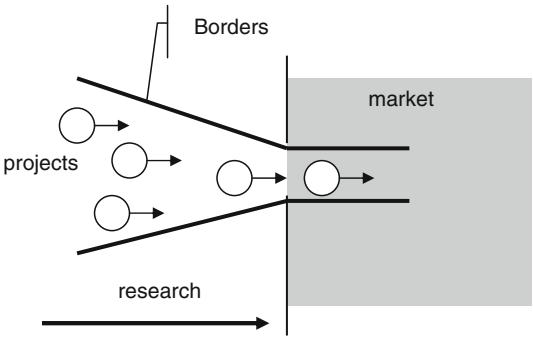

Fig. 2.2 The closed innovation model

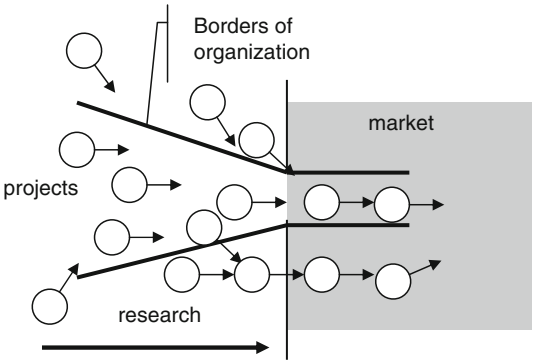

Fig. 2.3 The open innovation model

to now have been most frequently based on research on new products or services carried out by the enterprises themselves in their own R&D centres (Fig. 2.2). However, the concept presented in Fig. 2.3 defines a new model of creating and commercializing innovations based on a free flowing transfer of knowledge and innovation through the organizational borders of an enterprise. This model is most often based on network structures of interaction.

If we also assume that the *networking* itself is sufficient for the creation of the process of *continuous innovations*, but the quality of cooperation in the network (*quality of interactions*) then the category of social capital appears as a factor which stimulates the quality and effectiveness of the innovation.[17]

In the last few years, particular significance has been attached to the approach to pro-innovative network structures from the point of view of a region on the basis of the process of creating clusters.[18] Such an approach can be justified by the following: the possibility of locating certain elements of the network (geographical

[17]Nowicka Skowron et al. (2006).

[18]Particularly evident in the strategic development of voivodships and regional innovation strategies (RIS).

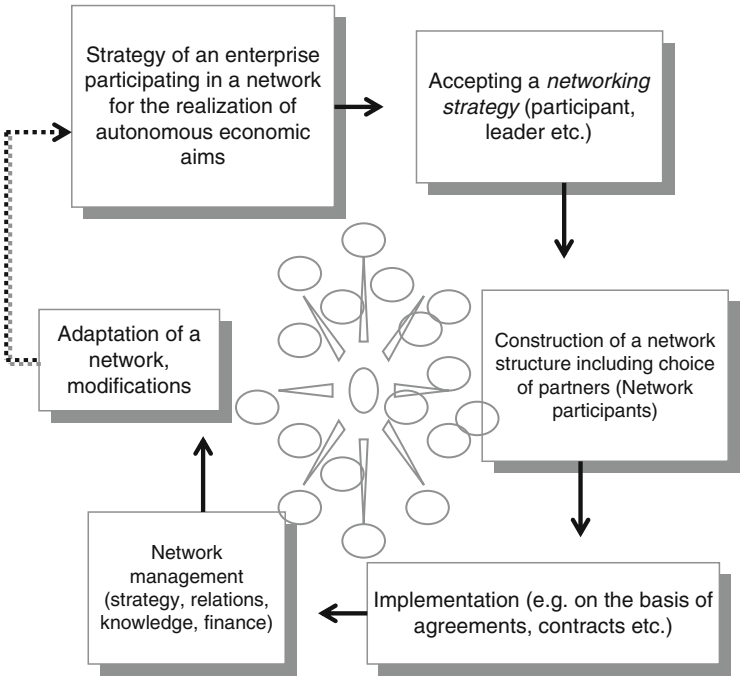

Fig. 2.4 Process of networking

proximity); direct contacts between the players is possible and can be created; synergy exists in the community of activity on behalf of the specified community and territory, as well as most frequently common psychological and cultural patterns.

However, from the point of view of innovative strategies of enterprises it is possible to speak of a *network strategy,* understood as a sequence of strategic choices (Fig. 2.4) associated with entering the network (or its creation) for the realization of autonomous economic aims. The stages of the process of *networking* includes the construction of network structures that involves a selection of the network participants, while subsequently the implementation or in other words, initiating the functioning of the network which most frequently takes place on the basis of agreements, contracts etc. (e.g., with relation to alliances or clusters, networks of course exist without the formation of formal agreements). Further stages are associated with the use of mechanisms, tools serving the management of the network and the adaptation of the functioning of the network to the conditions and changes in the network environment.

Innovation (innovativeness) is not (or is not only) a technical process of transforming knowledge into a new product or a process that requires the involvement of a social sphere. The dynamic dimension of the process of innovation can involve viewing the innovative network as a system which has the ability of self creation/auto-creation/innovation on the basis of key elements/dimensions (Fig. 2.5).

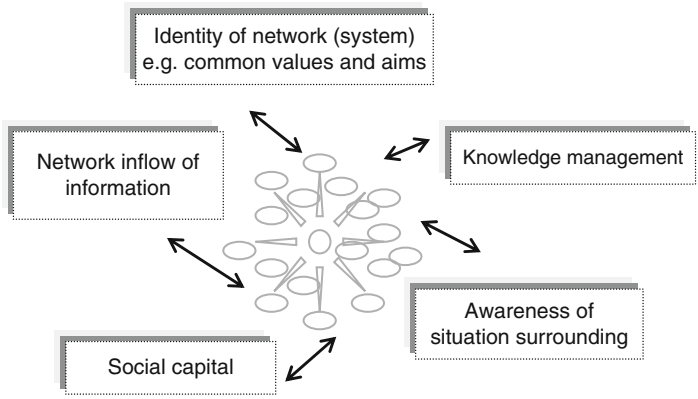

Fig. 2.5 Strategic network elements of an innovative nature

The system possesses features of distinction from the external environment and possesses the ability to provide an identity and justification of existence. It can also possess a common system of values. Furthermore, the identity of the players (elements) of the system is defined by the relations with reference to the external environment. The system of common values is created by external relations (between players) and relations with the external environment. The innovative system has the ability of "self maintenance" through the processing of information about its condition, changes emerging in the system, aims and principles of activity and cooperation. Constant communication and the flow of information must exist between the elements of the system (players), whose content is the identity of the system. Furthermore, the identity of the system is decided by the autonomy of particular participants (elements, players) of the network, as well as the conviction, consciousness of belonging to the network in question.[19]

The engine of the network is the mutual relations between the players, who avail of their participation in the network in an equal manner. The whole system must be seen by each player and simultaneously each one becomes partly responsible for the whole. The essence of networking can be understood as a varied system of relations (particularly from the view of personnel) within the framework of the network. Trust and tolerance also exist as the foundations of the flow of information and feedback.

Management of knowledge, the flow of information is the imminent feature of a system that is based on the appropriate tools for the transfer of knowledge and information flows. In this sense, the system is open to external information that flows in from the environment of the system. This system exists as "information flows" and is in a state of permanent uncertainty[20] which causes a change in the way of thinking and breaks up routines. The phenomenon of entropy is associated with

[19]Pachura and Kozak (2006).

[20]Prigogine and Stengers (1984).

the surplus of information and their disorder constitutes a factor that stimulates the formation of a new" synthesis of knowledge which leads to innovativeness. The innovative system on one hand, creates an entropy of information and knowledge on the other hand, restricts and strives towards ordering and directing their use in the realization of these goals. We are therefore faced with the phase (state) of the entropy of knowledge and its ordering (crystallization) in the second phase. In the network, there must be acceptance of the surplus of information and tolerance to the mistakes and uncertainty among the players.

It is worth mentioning that the process of knowledge management in innovative strategies can be based on the classic cognitive concept that is based on the analysis and processing of information relating to in an objective manner the existing external world concepts of organized knowledge, *autopoiesis*, or in other words, dynamic knowledge created within the framework of the organization itself.[21] The theory of *autopoiesis* in terms of an organization is to a certain extent associated with the theory of the emergence of systems and in this case in the system which possesses the properties of emergence the knowledge of *autopoiesis* can be known as the expression of the emergence of the system.[22] An innovative system constantly functions between chaos (*disorder*) and order (*crystallization*). The knowledge relating to taking decisions is important with relation to the external environment. Analysis of the environment and knowledge of the processes occurring outside the network is of significant meaning in taking decisions on the aims and strategies realized by the system. Recognising the opportunities and threats facilitates the efficient realization of aims.

Taking the conditioning of the global knowledge economy into consideration, it is possible to distinguish the strategic determinants of development as regards network structures of interaction. It should be treated as a platform or its own type of "fertile soil," on which the concept of networking grew that is understood as the formation of various forms of interaction from the centres of technology transfer, to clusters, and finally regional systems of innovation.

The fast changes emerging in the competitive environment of enterprises and at the same time the key role of innovation in gaining economic benefits is the characteristic feature of the period of the knowledge economy. That is why, it is suggested that instead of the term the knowledge economy, the term the *learning economy* should be used, as it fully reflects the changes occurring. The fast tempo of change means that specialized knowledge is becoming a resource that has a shorter life cycle and from this the ability of learning and adapting to new conditions to a large extent determine the results of individual units, enterprises, regions and countries.[23] *The organizational aspect of learning as a critical factor in generating innovations constitutes the basis for creating interaction ties and is currently first and foremost at the level of network interactions within the framework of the*

[21]Stachowicz (2006).

[22]Pachura (2006).

[23]Lundvall and Borrás (1997, p. 31).

concept of clusters. Therefore, the use of the term the learning economy is justified in the context of interpreting the phenomenon of networking in a spatial dimension. Enterprises strive to achieve interaction even with their competitors at the cost of losing part of their market share, but in order to achieve the strategic aim of gaining valuable knowledge from other units. The *geographical proximity* is seen to be significant here, as well as the external effects of networking in the form of *knowledge spillovers*, which stimulate the process of clustering.

The significant meaning of geographical proximity determining the realization of the processes of knowledge in the region is the common element of the models of regional development thought up with the aim of constructing regions based on knowledge. According to Cooke, the potential resulting from geographical proximity is materialized through the exploration and use of knowledge while taking account of the open channels of knowledge which are important for these processes. These channels offer a wide range of possibilities for expanding the potential of knowledge as it can lead to "information leaks" resulting from the geographical proximity.[24] Research observations referring to the role of knowledge in the development of the spatial arrangement mainly take account of the *knowledge spillovers* and the creation of regional innovative centres in which the spatial proximity to the creation and sharing of knowledge is crucial.

Both in the case of clusters and other types of regional innovative centres the ability of innovative location and the process of the network itself emerging are based on the phenomenon of the *localized knowledge spillovers* and availing of the benefits of the functioning source of valued knowledge in the defined spatial proximity by the units themselves. The knowledge spillover occurs in the situation where knowledge that is created by a given unit leads to the creation of knowledge or innovation by other units. In this concept, the assumption that the creation of new knowledge brings positive external effects is key. These effects take place as knowledge is not an exclusive product and is difficult to exercise total personal control on it.[25] A. Francik defines these effects as the "uncontrolled process of the penetration of knowledge and its products, as well as various types of skills."[26] The author further underlines the essential role of these types of effects with relation to the systems of innovation and underlines that the essential role should be attributed to the flow of knowledge on the basis of informal contacts between the participants of the regional systems, as the efficient transfer of knowledge is difficult to code and first and foremost takes place through inter-personal relations. The deepening specialization of a region is becoming the source of endogenic development based on the internal intellectual potential of growth.[27]

The information flows resulting from geographical proximity are acknowledged to be one of the most important factors in the creation and development of clusters,

[24]Cooke (2006, p. 24).

[25]Greunz (2005, p. 451).

[26]Francik (2003, p. 93).

[27]Francik (2003, p. 93).

particularly those concentrating the innovative enterprises.[28] The main aspect in the statement underlining the large significance of information flows in the region with relation to the process of networking is the fact that the transfer of new information takes place in a way which is more effective between units that are located close together. The essence of spatial proximity in the successful realization of information flows results from the basic properties of knowledge associated with the activities of innovative firms, mainly their complex nature and detailed nature of *tacit knowledge*.

The currently binding model of innovation forces the observation of the process of creating knowledge in the dimension of a system or in other words, a network. The new theory of economic growth forces cooperation in the area of realising the processes of knowledge, which has led to the binding *network paradigm of innovativeness*. In traditional economic models which explain the theory of economic growth, knowledge and technology remained as external factors. A significant change in this interpretation occurred thanks to the acknowledgement of technology as a key and endogenic factor of growth, the effect of which the *Total Factor Productivity (TFP)* was introduced, thanks to which the impact of innovation on the growth of productivity was reflected. This theory which was worked out by Solowa – a laureate of the Nobel Prize underlined the meaning of technology in the function of production, which in turn commenced research on knowledge as a factor driving the growth of the economy. As opposed to the neoclassic theories of growth, knowledge is becoming recognised as an endogenic factor of growth within the framework of the new theory of economic growth (*new growth theory*).[29]

The process of creating knowledge understood as the process of innovation is an interactive process which incorporates the interactions between organizations specialized in the creation of knowledge, enterprises, financial institutions, consumers and suppliers. As a result of the binding model, innovativeness is becoming regional and domestic systems of innovation are concentrating cooperating units together – as participants of the process of innovation. That is also why the process of creating knowledge can be defined as the interactive process which is of an organic nature. The modern growth of resources in terms of knowledge is taking on the features of a non-linear process.

Issues relating to the recreation of knowledge and the process of transferring knowledge conditioning its use in the economy, while also recognising the essence and role of transferring and spreading knowledge on a regional dimension led to the increased interest in regional concepts of networks of knowledge and innovative systems responsible for the realization of the afore-mentioned processes. In associated literature and strategic principles formed at the level of EU institutions, the essence of transferring technological knowledge from the sector of science and research to the economy is discussed at length. With relation to this, the meaning of

[28]Hoen (2001, p. 3) and Breschi and Malerba (2007, p. 2).

[29]Lipsey (1999), Abramowitz (1989), Nelson and Winter (1982), Arrow (1962), and Romer (1990).

close interaction between colleges and the world of science with that of business is emphasized as this favours the process of transferring technology.[30] Therefore, the regional possibilities in the area of R&D activities are associated with production operations within the framework of one regional system of innovation. With the aim of stimulating the processes of transferring technology various mechanisms of interaction are initiated such as technological centres, technology transfer centres and technological incubators.

The necessity of making organizational interaction results from the essence of knowledge, or in more precise terms, one of its categories – *know-how*. This comes from the industrial sector where it defines the skills and abilities that are not described with the aid of patents and licences, but technology transfer which is crucial at a given moment. This type of knowledge is usually developed and maintained within organizational limits of an individual enterprise or research team. However, together with the growth in the complexity of knowledge the trend towards development of interaction between organizations occurs. One of the most important reasons for creating the network of enterprises is actually the need to gain the possibilities of combining and sharing the elements of the complex type of knowledge known as *know-how*. Similar networks that are created are between research teams and laboratories.[31]

The ability of creating innovation should be understood in accordance with the dynamic and interactive model of the process of innovation. *Innovation is understood here as a process of a network and systemic nature, in which innovations are the result of numerous and complex interactions between units, organizations and the environment*. Innovation is the process of learning, which means that it is the result of accumulating specific knowledge and information that is useful for the activities of enterprises. The process of innovation uses internal and external sources, which makes it an interactive process.[32] The systemic approach to innovation means the impact of the widely understood external institutional players on the innovative activities of enterprises. The systemic notion of the process of innovation underlines the essence of transfer and diffusion with regard to categories of knowledge and skills. Flows of knowledge take place within the framework of channels and networks situated in a socio-cultural environment that has an impact on the innovative abilities of the regional players. Innovation is seen as a dynamic process in which knowledge is accumulated through the processes of learning and interaction.[33]

The innovative ability of a region – understood in the categories of a systemic organ is determined as the ability of networking and collective learning. The systemic approach to innovation provided the beginning of the concept of creating new mechanisms of regional development. The central point of the innovative

[30]Goldberg (2004, p. 14).

[31]Knowledge management in the learning society, as above, p. 15.

[32]Stawasz (2005, pp. 39–40).

[33]Oslo manual. Guidelines for collecting and interpreting innovation data (2005, p. 33).

management of a region became the issue of cooperation and interactive processes of creating, diffusion and applying the knowledge by the regional players. The establishment of the systemic approach is mainly reflected in the domestic models and regional systems of innovation, concepts of learning regions, innovative clusters, or the local innovative environment. The basis of the shaped concepts of regional development is that of the *network paradigm of innovativeness*. The creation of regional networks of interaction facilitates the mutual learning of the participants of the process of innovation and strengthens the flexibility of mutual activity. A particular role is also played by the social aspects of the innovative processes, which often take their course in accordance with unwritten principles and cultural traditions and explain the processes of networking.

Most concepts that are written into the systemic approach to innovativeness in a spatial dimension are based on regional network interaction that incorporates units representing the sphere of business, institutional environment and units of the scientific and research sphere. The development of regions based on knowledge and innovativeness constitutes a layer of related models of learning regions, local innovative environment, clusters, or finally regional systems of innovation. The converging assumptions of these concepts are particularly related in the policies of regional development realized by EU member countries. The problematic of creating a competitive advantage on the basis of the pro-innovative networks of interaction became the subject of consideration for many modern theories of regional development. Innovativeness and knowledge of a region were acknowledged by many theories of regional development as the most important factors of a regional economy. They indicate how to build the competitiveness of a region on the basis of the endogenic potential of growth. The modern binding models of regional development emphasize the mobilization of internal potential of the growth of location, which is to be the source of a competitive advantage of spatial arrangements. The assumptions of related concepts are widely initiated in the case of learning regions, innovative clusters, innovative environments, entrepreneurial environments, or domestic and regional systems of innovation. The models of regional development based on endogenic and knowledge-derived growth potential illustrate the abilities of a region in the sphere of realizing the processes of innovation guaranteeing self-renewal in a globalized and fast changing economic environment.

2.2 EU Innovation Policy Based on Clustering

According to the afore-mentioned results of literary research it is possible to univocally state that the geographical proximity between enterprises of a similar profile of activity facilitates the achievement of a higher level of productivity and innovativeness. The clusters covering the spatial sphere of its location: producers, suppliers, service providers, research units, educational institutions and other units supporting a given sector became an important factor in the economic development

of regions. The trend towards interaction and basing on the resources of business partners operating in a given location results from the new trends of management, among others, the school of resources in strategic management at the top with key competences and the *open innovation paradigm*.

Directing the regional policies of the EU along the concept of clusters also results from the wide impact of the progressing globalization on the essence of inter-regional competitiveness. Increasingly lower costs of transport and communication and the simultaneous liberalization of international trade revealed the weaknesses of regional economies and exposed them to global competition. With regard to the increasing number of locations with attractive conditions for investment, European regions faced the necessity of offering foreign investors even more unique benefits. Clusters became in this situation a magnet attracting a bunch of highly specialized resources of knowledge in a given sector which are not present in other locations.

Therefore, due to its practical application, the concept of the theoretical clusters regardless of whether the work of M. Porter or as a stage in the evolution of industrial districts of Marshall in the direction of the systems of innovation became one of the most important elements of economic, innovative and regional policies of the EU. The reasons for such a turnaround in the activities of the European Commission have been previously indicated. It is possible to add that the traditional instruments of supporting economic growth and the competitiveness of regions, for instance by supporting whole branches of the industrial sector, have not succeeded and had to be replaced by a mechanism that is more adjusted to the challenges of the global economy.

The network approach to innovation and the according theory of clusters became the central point of interest for the EU. A key element in the policies of innovation of the EU became the *cluster-based policy*. This type of policy is defined as a grouping of activities and instruments used by the authorities at various levels for the improvement of the level of competitiveness of the economy by stimulating the development of the existing cluster systems or their creation at first and foremost the regional level.[34] Among the elements that decide on the effectiveness of policies of supporting clusters the following assumptions can be listed[35]:

- The driving strength of the cluster policy is the free market
- This combines various units of the regional economy
- This is based on cooperation and mutual activity
- This takes the form of a strategic nature and helps to shape a common vision
- This creates new value

Involvement in initiating policies based on clusters can be naturally explained by the determination of EU member countries in the realization of the aims of the Lisbon Strategy whose achievement at the first deadline turned out to be impossible.

[34]Brodnicki et al. (2004).

[35]Cluster based economic development: a key to regional competitiveness (1997).

Clusters seem to be the appropriate direction for the realization of the innovative policies of the EU. From the point of view of the European Commission, promoting policies based on clusters is to lead to the achievement of the aims of the Lisbon Strategy. The competing conglomeration of enterprises provides the possibility of access to the network filled with skills and abilities to generate innovation. They are becoming an effective environment in which it is easier to realize the initiation of new products immediately after their development in research laboratories.

A policy based on clusters is not a separate element of activities on the part of national and regional authorities, but should be rather treated as an integral element of various policies. This is most frequently reflected in the assumptions of scientific policy or scientific and technological, innovative, economic, and regional development. In this way the idea of clusters penetrates into the strategy of development for regions, but is also taken into account in state programmes that are financed by the EU structural funds. Most often however, the philosophy of policies based on clusters takes on a horizontal nature and finds itself in all the afore-mentioned policies. It fits in perfectly into the policies of regional development based on the model of the innovation system. Clusters as a way of arousing the innovativeness of regions usually find themselves among the priorities of regional strategies of innovation. The cluster policy is part of the model of strengthening interactions within the framework of the so-called *triple helix*, or in other words, the system of interactions between the key players of the system of innovation: enterprises, scientific and research units and local authorities.

The concept of clusters became a topic of interest for national and regional governments, organizations of entrepreneurs, international organizations particularly OECD countries and the EU in the second half of the 1990s. This interest can be observed through successive *cluster initiatives*, starting from the theoretical work explaining the essence of clusters to the attempts of working out the methodology of their identification and finally the guiding rules in the sphere of the policies of stimulating clusters in regions. These last initiatives are worth devoting more time to in order to illustrate the factors of success in undertaking activities within the framework of regional policies on behalf of the development of clusters, which has been done in the later stages of this paper. The guiding rules of the programme and the strategic documents of the EU took account of the concept of clusters relatively late as it occurred at the beginning of this century but it is necessary to explain this as a rather different approach to the issue of the innovativeness of regions. The efforts in this area were from the very beginning directed towards the issue of the systems of innovation, industrial districts and local innovative environments, which in their own essence are also based on the network paradigm of innovativeness.

Apart from the initiation of the afore-mentioned models of regional development, another trend of activity in the EU associated with clusters was the creation of networks of interaction between regions. The stimulation of networks of interaction appears in various aspects and policies of the EU. The scientific and research policies can be used here as an example together with its main instrument in the form of the Framework Programmes that support the networks of interaction of scientific centres and their relations with industry. In the middle of the 1990s, the

EU started to place particular emphasis on the issue of regional innovativeness. The breakthrough moment was the passing of the Lisbon Declaration by the European Council in 2000 and the acceptance of the aim of transforming the EU economy in the most competitive market based on knowledge in the world. In this context the policy of supporting clusters in EU member countries grew in importance and the regional authorities acknowledged that the foundation of competitiveness is that of small enterprises. The creation of an environment that is friendly towards the development of small firms became a priority, particularly through the stimulation of interaction between them and also creating interaction with the R&D sector. The strategy of development for EU member countries initiated with the aid of programmes financed by EU funds that were assigned priorities in the sphere of supporting networks of interaction at the level of enterprises and the area of R&D. The network model of innovativeness was accepted as binding, in which the theory of clusters fits perfectly.

The activity of the EU Commission in the area of creating a favourable regulatory framework and the popularization of knowledge on the topic of clusters is confirmed by many conceptual papers and documents among which the following can be mentioned:

- "Industrial Policy in an Enlarged Europe" from 2002, in which the creation of innovative clusters became acknowledged as the key priority of the new industrial policy
- Communiqué entitled "Some Key Issues in Europe's Competitiveness – Towards an Integrated Approach," according to which one of the proposed activities was to be the European project of identifying the best practices in the sphere of initiatives of developing clusters
- Programme document entitled "Industrial Policy in an Enlarged Europe" from 2004, in which the innovative policies and supporting initiatives based on clusters were listed as being of key importance
- Consultation document entitled "Innovate for a competitive Europe," which states that the structural funds can support the internationalization of regional clusters, which according to the European Commission became the effective mechanism of stimulating innovation

The policy of regional development based on clusters can be the effect of bottom-up initiatives, as well as resulting from top-down initiatives. The second type of operation is the effect of the activity of the local authorities, however the bottom-up activity is usually characterized by the activity of the branch environment. Regardless of the way of realization of the cluster initiatives, a significant role should be attributed to the public authorities. According to M. Porter, the role of the public factor in creating and stimulating the development of the cluster in the area of shaping the factors of production, related and supporting sectors, conditions of demand, as well as the strategy and rivalry between enterprises.[36]

[36]Porter (2001).

The first paper that carried out a complex analysis on the effects of policies based on clusters realized in selected countries is the document entitled "*The Cluster Initiative Greenbook*."[37] In this document the results of research into cluster initiatives were presented within the dimension of their effectiveness and range. Interesting results were also presented within the framework of a range of OECD projects[38] directed at the analysis of practical aspects of the functioning of clusters. The afore-mentioned projects were aimed at diagnosing the existing state in the area of cluster initiatives, as well as working out the guiding principles in the area of formulating and initiating innovative policies based on networks. A compendium of knowledge and a type of guidebook on the topic of shaping policies based on clusters is constituted by the work prepared by the non-governmental organization IKED (*International Organization for Knowledge Economy and Enterprise Development*).[39] In the identification of the recommendations and factors of success in the realization of cluster initiatives the report prepared at the request of the Ministry of Trade and Industry of Great Britain was also used.[40]

On the basis of the afore-mentioned documents it is possible to indicate the experience of particular countries in the area of initiating policies based on clusters. The results of research facilitate the creation of the basic recommendations for the practical formulation and initiation of the policies of regional development based on the concept of clusters.

Cluster initiatives most frequently appear in highly developed countries, mainly in the sectors of large technological intensities with regard to the following: IT, telecommunications, medical equipment, production technology, pharmaceuticals, automotive. Most initiatives were directed at the development of a specific cluster and were started between the years 1999–2002. The aims of creating cluster initiatives are very varied and can be classified within the framework of the following six categories: research and the creation of network interactions, education and training, innovation and technology, expansion of cluster, political activity, commercial interaction. Within the framework of the distinguished categories of aims, most participants of clusters (over 75%) indicate the main aims of their participation in cluster initiatives as follows: the creation of interaction between enterprises and creating relations between people, development of their own company, easier access to new technologies and the ability to create innovation. Initiatives that have a priority goal in promoting innovation and new technology achieve significantly greater success in the area of improving the competitiveness of particular enterprises.

[37]The cluster initiative greenbook.

[38]Boosting innovation. The cluster approach (1999), Innovative clusters. Drivers of national innovation systems (2001), and Innovative networks. Co-operation in national innovation systems (2001).

[39]Andersson et al. (2004).

[40]A practical guide to cluster development, Department of Trade and Industry, DTI, London.

The process of creating and organizing cluster initiatives takes on different forms despite the fact that the nature of such initiatives enforces the principles of creating a partnership between the industrial sector, research and public authorities. The participation of particular parties is varied in individual cases. The idea of constructing a cluster is most frequently becoming an initiative of local authorities and the sector of enterprises at a more or less equal pace. A decidedly greater role in the aspect of financing cluster projects is played by public authorities. In over half of the clusters analysed, the main source of financing was the regional budget or national public units. In turn, the involvement of colleges in initiating clusters in their initial phase of development was very small, which clearly confirms the low financing coming from these units. A dominating role in managing clusters is played by the sector of enterprises, while the role of public authorities in some decisions is also envisaged. The involvement of local authorities, most often in the form of neutral organizational units, is to lead to the balancing of interests of the competing enterprises. The source of financing does not seem to have great significance in achieving results both in the aspect of competitiveness as well as the numbers of members of a cluster.

According to the theory of clustering, most initiatives are directed in their own sphere in a given industrial branch or geographical zone. Most existing clusters include units that are located within a radius of one hour's drive. The aspect of geographical distances was indicated as a significant factor in facilitating mutual personal contact. Clusters are not limited to the type of enterprises which can become its member. Both direct competitors and foreign business units can freely participate in the aforesaid initiatives. The only restriction in this regard refers to one level in the value chain, which means for instance a greater role in including specific producers but not their suppliers and clients.

The fundamentality of initiating policies based on clusters is becoming univocally confirmed by the benefits indicated which are provided to enterprises in these types of initiatives. Entrepreneurs identify the success resulting from the membership of a cluster through the prism of competitiveness and achievement of business goals. Most entrepreneurs confirm that the initiatives led to the improvement of their competitiveness and the most frequent effect is the tightening of interaction between the industrial sector and the R&D area. The factors that are decisive in the success of clusters include the following: the quality of the business environment, structure and way of running economic policies, as well as the internal strength of the cluster itself. Within the framework of the first category two key factors should be listed which attract other firms to participate in the cluster initiative to the highest degree: the presence of an advanced scientific society and a high level of trust between firms, while also the public and private sectors. Economic policy is also significant with such elements as: promotion of scientific research and innovation, the possibility of taking economic decisions at a regional level, protection of the high level of market competition. The trend of achieving better results in the area of competitiveness is visible through cluster initiatives directed at strong clusters. Clusters with a significant economic meaning on the scale of the whole region or country and a longer history of existence are more attractive for new members.

They usually attract the presence of enterprises that compete on an international scale.

Within the framework of research presented in the *Greenbook* a range of factors was diagnosed that are decisive to the failure of cluster initiatives. The greatest significance is attributed to the lack of consensus in the area of taking action, as well as a clearly formulated vision for the initiatives and undefined aims of a quantifiable nature. Significant meaning in the failure of initiatives is played by the issue of insufficient resources, both in infrastructure and financing. Other elements that lead to unsatisfactory results are as follows: restriction of the range of membership to only groups of large enterprises, one level in the value chain or enterprises belonging to the location dictated. Large significance in the failure of cluster initiatives is also played by a lack of trust in the initiatives undertaken by public authorities.

A survey of the reports prepared up to now on the topic of cluster initiatives in various countries enables us to note that the policy of supporting clusters takes on various forms. In reality it does not only vary from the level of analysis accepted and the methodology applied in supporting the process of networking, but also the degree in which the policy based on clusters was initiated, as well as the instruments used for this purpose. In terms of synthetic analysis, a set of strategies can be presented that was chosen by selected EU countries with relation to the ways of initiating policies based on clusters (Table 2.1).

The most frequent elements in the strategies of the development of clusters include:

- Strong competiveness of the economy and the reforms of economic policy in the area of market regulations
- Supplying strategic information by way of foresight type projects, cluster analysis and internet portals
- Agencies dealing in contacts with entrepreneurs and units supporting innovativeness e.g., innovation centres
- Development programmes for the development of clusters financed by public funds
- Establishment of centres of excellence connecting the industrial sector with the R&D area
- Adhering to public procurement (public tenders)
- Construction of platform for public and private dialogue

In many countries the process of clustering was initiated by the establishment of allowances, platform and regular meetings involving enterprises and organizations from the business environment associated with a given branch. The motive for starting dialogue was the results of research projects, particularly the technological foresight, which aroused discussion and prompted joint action. Generally speaking, the process of initiating clusters and other networks of interaction in a dimension of European regions takes on various forms depending on the political culture, way of institutionalizing the dialogue between the public sphere and the private sector, the size of the regional economy, but also depends on the scale of intervention of public

Table 2.1 Strategy of implementing policies based on clusters in chosen countries of the EU

Country	Approach	Cluster analysis	Policy initiatives/policy principles
Austria	Systems of interdependent economic entities	– Improving I/O tables – Traditional statistical cluster analysis screening for patterns of innovative activities – Case studies	– Cluster policy under construction – Framework conditions (regulatory reform, human capital development) – Providing platforms for cooperation and experimentation – Raising public awareness of technologies – Demand pull by public procurement
Belgium (Flanders)	Networks or chains of production, innovation and co-operation	– Graph analysis and case study work – Improving I/O statistics – Technology flows – Technology clubs (similar collaboration patterns)	– Cluster-based policy under construction – Market induced cluster initiatives – Government facilitating co-operation – Subsidies and co-financing for firms in cluster programmes (in metal processing industry, plastics, space industry, SMEs, furniture) – Stimulating cross-sectoral technology diffusion – Supporting supplier-producer networks – Centres of excellence around newly emerging technologies
Denmark	Resource areas	– Industrial districts/development blocks – Porter-like cluster studies – Improving statistics – Cluster analysis as an input to the process of dialogue	– Dialogue in reference groups – Centres of excellence in specific areas – New educational programmes in specific areas – Development centres in specific areas – Top down approach (selected priority fields) – Institutional reform in policy making (coordination between ministries)
Finland	Clusters as unique combination of firms tied together by knowledge and production flows	Porter-based cluster studies	– Clusters as an economic development tool – Identifying sources of competitive advantages in Finnish economy – Competition policy and structural reform – Creating advanced factors of production (basically creating favourable framework conditions)

			– Cluster programmes, strategic research, centres of excellence
Netherlands	Value chain approach	– Porter-like cluster studies – Cluster benchmark studies – Input-output analysis	– Dialogue in specific platforms – Brokerage and network policy – Public consultancy – Providing strategic information (a/o. technology foresight studies) – Renewal in procurement policy – Deregulation and competition policy
Spain	Inter-sectoral linkages and dependency	Technology and innovation flow analysis	– Framework policy – Stimulating R&D co-operation and R&D networks – Research centres (mixed private and public participation) and science parks
Sweden	Interdependencies between firms in different sectors	– Development blocks (1950s) – Technological systems (late 1980s) – Network approach (since the 1970s) – Porter studies (since the mid-1980s)	– Cluster-based policy under construction – General framework conditions – Technology procurement – Stimulating R&D cooperation – Research centres – Industrial systems project (is being set up) to stimulate strategic dialogue – Technology foresight studies – Identifying actual or potential innovative clusters
United Kingdom	Regional systems of innovation	Cluster case studies focus on identifying actors and development opportunities for the region	– Clusters as a regional development – Tool – Government as catalyst and broker – Regional cluster programmes

Source: Boosting innovation. The cluster approach (1999)

authorities in economic life, as well as the degree of industrial and technological specialization of the region.

In the afore-mentioned reports and expert analysis a set of key recommendations in the area of initiating policies based on clusters indicates the factors of success listed below[41]:

- The main role should be accepted by the sector of enterprises, however public authorities take on the role of a catalyst in the development of the cluster in question. In such an arrangement, the expansion of the public and private sector partnership is key
- The aims of the initiated policies should be transparent and measurable
- Clusters should be built on the basis of existing potential and avoid creating initiatives in branches which are not sufficiently developed or generally do not appear in a given location
- The presence of a large enterprise in a given branch which is seen positively as a source of new technologies, acquisition of expertise, client base and suppliers, as well as space for the development of human resources
- Adequate technical infrastructure is essential together with a developed network of transportation and telecommunication connections, as well as an accessible base of attractive real estate for investors. Institutional mechanisms are helpful here in the form of entrepreneurial incubators, scientific, technological and industrial centres, due to the conditions of mutual work in a specified physical space offered by them
- The presence of an entrepreneurial spirit, especially among employees of a scientific and research unit and large innovative enterprises which is to lead to the formation of spin-off and spin-out firms
- The possibilities of access to financial capital in the form of high risk capital (venture capital), networks of investors searching for innovative and prospering enterprises (the so-called business angels), loan funds and finally public programmes, finance programmes e.g., EU funds
- The development strategy of a cluster should be realized at an appropriate level of local government which facilitates the effective initiation
- In the initial phase of development of a cluster an analysis of the potential or existing concentration of enterprises of a given branch should be analysed making use of the existing clusters in other locations. The results of this analysis should be used for public debate with the aim of working out a wide social consensus
- The action taken should enable the increase in the specialization of cooperating enterprises and institutions with the aim of realizing economies of scale and range, division of labour, as well as development on a local scale of specialized factors of production which facilitates the strengthening of the competitive position of the cluster

[41]Worked out on the basis of the following: "Uwarunkowania rozwoju nowoczesnych technologii w Gdańsku" (Conditioning of development of modern technology in Gdansk), IBNGR, 2002.

- Using the benefits accruing from the geographical proximity should be promoted by the establishment of associations of sub-suppliers or other forms of mutual interaction (e.g., associations of mutual credit guarantees) stimulating diffusion of knowledge and technology, as well as the processes of mutual learning
- In the case of highly technological clusters, one of the fundamental activities should be acknowledged as stimulating and creating flexible interactions at the level of industry and the academic sector
- For the achievement of success, it is essential to build clusters on the basis of formal and informal networks of interaction within which the information flows can take place. This type of social network that emerged on the basis of a high level of trust and social capital can be stimulated by strong institutional structures divided by cultural values and common goals
- The market success of a cluster is conditioned by the access to the base of skills understood as the highly skilled workforce
- Mechanisms should be created that enable resignation from cluster initiatives in the case of their failure

In summing up, the results of the analysis of the conditioning of the initiated innovative policy directed at clusters, it should be first and foremost underlined that the key aim of this policy should be to strive towards the creation of a long lasting competitive advantage in the economy of the region. The way for achieving the afore-mentioned aim can become a strong innovative cluster or group of smaller innovative clusters functioning within the framework of a coherent system of innovation. The policy based on clusters should be supported by a set of other complementary actions within the framework of related policies, which leads to the gaining of synergy effects. This is therefore the policy which penetrates into other policies and in its own essence takes on a nature of horizontal activities. The concept of clusters is according to other models of development for innovative regions and should be treated in this way as a supplement for the models of the learning regions, regional systems of innovation and the innovative environment. All the afore-mentioned theories of regional development are based on the network paradigm of innovation and enable local spatial arrangements to meet the challenges of the global knowledge economy.

http://www.springer.com/978-3-7908-2363-9

Regional Cohesion
Effectiveness of Network Structures
Pachura, P.
2010, IX, 120 p. 31 illus., Hardcover
ISBN: 978-3-7908-2363-9
A product of Physica Verlag Heidelberg