

# Regional Innovation and Cooperation among Industries, Universities, R&D Institutes, and Governments

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**Abstract** Globalization and regionalization seem like contradictory concepts. However, they present the framework for economic activity, innovation, and cooperation in our time. Under these circumstances, regions are, to an increasing extent, in an entrepreneurial position. They must compete among each other for: enterprises, investments, highly skilled personnel, and jobs. The extent to which a region is competitive depends on several factors, the most important of which are knowledge, social capital, networks, and supporting structures. These factors may be self-organized or government-based. In reality, there is no single recipe known that guarantees success in all cases. However, in view of the relevance of knowledge and learning, the cluster approach can offer an explanation as to why some regions manage to develop their knowledge-based industries more successfully than others. When we talk about globalization we have a new economic setting in mind, one in which profit-oriented multinational strategies of large business corporations lead to an international division of labor. The resulting post-Fordist concept of flexible production is comprised of a formation of independent units within large corporations. These units are integrated into regional networks, instead of being hierarchically sub-ordered into the centralized corporation. To local communities, this situation poses a challenge but also provides new opportunities concerning the task of directing their development to the advantage of the region. M. E. Porter (1990, 1998, 2000) is one of the prominent writers to draw attention to the relevance of regions in a globalized economy. The first part of this chapter gives

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greater insight into the concept of regional cluster development, its characteristics, and its meaning for regional policy. Very often, Science or Technology Parks are seen as a suitable means to form clusters of modern high technological industries. The second part deals with the example of the City of Dortmund, Germany, since the recent history of this city is a perfect example for successful regional development and the key ingredients involved. Special attention is given to the role of research and higher education within the structural policy that helped Dortmund to overcome a severe crisis. The technology park in Dortmund demonstrates how active cluster development can help improve the economic development of a region, thus improving its competitiveness and the life of its population.

## 1 The Concept of Regional Competitiveness

Globalization and regionalization do not contradict each other, but are mutually dependent. Global economic activity increases while national trading borders decrease. To the same extent, local and regional networks and conditions for production gain in importance. One reason scholars decided to look at the regional level was the fact that in the 1970s some cities and regions were able to deal with the economic crises in a much more successful way than others, even though the national surrounding conditions were the same. E.g., special attention was given to the development of the high-technology cluster “Silicon Valley” in California, USA.

The observation that in recent decades certain regional economies managed to develop into success stories while others decreased is a fact. It becomes clear that in times of globalizing markets and regional specialization of production systems, there is not only international competition between enterprises, but also between regions. The question is whether favorable conditions for successful regional development can be created and if so, which factors are of importance.

Cities and regions are increasingly aware of this growing competition. As a consequence, they try to increase their regional competitiveness. As a first thought in this context, the individual economic power of the enterprises located in a region comes to mind. It seems obvious that the economic performance of the regional enterprises is related to the prosperity of the region. However, the concept of regional competitiveness includes more than just the added competitiveness of the individual enterprises in one region. Moreover, it refers to synergetic effects that are created through interaction and cooperation among those enterprises, as well as certain framework conditions specific to the territory under consideration. Success in regional competitiveness can be measured by a few parameters:

- Economic growth
- Prosperity
- Quality of Life.

Regional competitiveness and the competitiveness of enterprises are therefore mutually dependent. Successful enterprises usually lead to the well-being of the region in which they are located. However, the success of an enterprise is closely related to the quality of regional conditions for production. A very individual, regionally special mix of location factors is the prerequisite for the success of enterprises. In the following section we will give more insight into the factors that promote regional competitiveness. However, it can already be stated that economically successful regions are usually more likely to create and offer those conditions.

## **2 Factors for Regional Competitiveness**

Competitiveness is the driving force for development. When regions find themselves in competition, the different factions within the region are more likely to cooperate in order to achieve mutual benefits. The common aim is to improve the regions comparative advantages with respect to other, competing regions. The diverse, loosely knit networks and interactions seem to play an important role for the development of dynamic economic regions. Interactions are usually based on knowledge exchange and spill-over between enterprises and their surroundings. The following section deals with factors that influence the level of regional competitiveness. They are: The availability of knowledge and the ability to learn, the presence of social capital and networks, and the form of organizational structures.

### ***2.1 Knowledge and Learning***

Knowledge and learning have a fundamental meaning for regional prosperity and growth:

“Knowledge is the fundamental resource in our contemporary economy and learning is the most important process” (Johnson & Lundvall 1994, p. 24).

Knowledge, on the one hand, is nowadays globally available. Through modern communication technology it can spread globally within seconds: it is extremely mobile. One consequence is the global activity of not only networks of enterprises, but also of informal networks. On the other hand, knowledge tends to accumulate in certain areas and places. It clusters wherever conditions for generating and managing knowledge are best. Favorable framework conditions include the presence of R&D-adequate infrastructure and the availability of specialized personnel.

Moreover, social factors like networks play an important role in the development of knowledge. Proximity, social interaction, and face-to-face-contacts foster the evolution of what we call implicit or tacit knowledge. As opposed to explicit or codified knowledge, tacit knowledge is not available in books, rules, or formulas. However, it is crucial for innovations to evolve as a factor for competitiveness.

As a consequence, the availability and access to knowledge, i.e., the presence of institutions of education, research and development, are an important advantage for regions.

## ***2.2 Social Capital/Networks***

Social capital can be defined as a set of norms and values which govern interactions between people, the institutions where they are incorporated, relationship networks set up among various social actors and the overall cohesion of society (Camagni 2003). Social capital evolves through the interplay of individual and organizational learning. Thus, it is reproduced at the local and regional level because here, people live and interact. The global perspective rules the markets, but social capital as a comparative advantage is closely related to the regional level. Social capital is a resource that comes to life through the relations between different actors.

A network describes a type of cooperation that stands in between the (vertical) formal relations, i.e., supplier contracts, and the (horizontal) informal platform of the market. Networks are characterized by the cooperation of competitors. A network is strongly based on personal, informal relationships between actors from politics, business, institutes of education and research, and cultural and social institutions. In some ways, networks substitute institutionalized structures of decision-making through cooperation on the personal level.

Therefore, networks offer the conditions for social capital to evolve. Social capital can only be used in a reasonable way within a limited size of entity. Within that framework, social networks develop that endow a common identity. Certainty is increased, and therefore, cost for economic transactions between the members of a network decrease. The cooperation of a group according to informal principles causes higher prosperity and growth among the individual members of the group. However, the members produce positive external effects, thus increasing growth and prosperity for the entire region.

## ***2.3 Self-Organized Structures***

What we have in mind when we talk about self-organized structures in the context of regional development is a form of organizational system that is, to a certain extent, self-dependent and flexible. Self-organized structures have the ability to organize their activities and processes of development as well as the process of learning. Their goals are self-determined, and they pursue targeted activities to achieve them. The ability to act self-organized is one of the important factors that enable regions to be competitive.

Evolving self-organized structures is a reaction to the fact that traditional forms of regional governments failed, to an increasing extent, in the presence of today's

global challenges to regional development. Self-organizing structures have the ability to involve a more diverse range of regional actors in the process of regional development. Institutions of higher education and research institutes have great potentials to participate in these activities. On the one hand, they offer human resources that create social capital for the region. On the other hand, they are important hubs for regional networks, especially to connect regional enterprises with the scientific community. With the help of politics and administration, these positive impacts can be further strengthened.

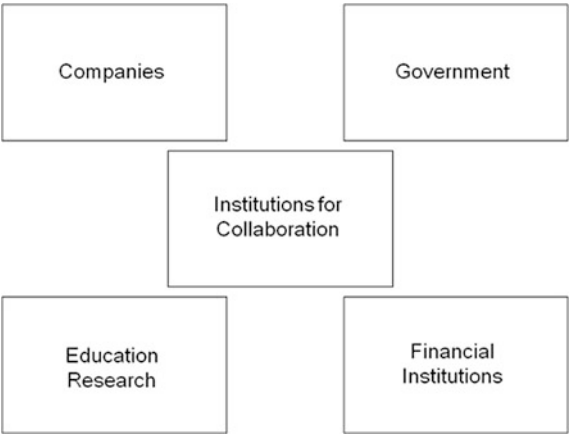
2.4 Cooperation of Actors

From the preceding sections it should be clear that networks of relevant actors account for the competitiveness of regions. Therefore, it is necessary to take a closer look at the actors who have to interact Fig. 1.

Regarding economic success, companies are the main drivers. The ability to produce products people asks for and which are competitive in a national or international environment is vital to the well-being of a region. To this end they rely on a qualified work force that has to be trained in institutions of education, universities, and research institutes. A broad range of tasks has to be performed: these institutions altogether should be able to cope equally with a huge diversity of talents and at the same time produce highly qualified research-oriented experts. In particular, modern high technology companies require graduates from universities and benefit from close contact with research institutes.

Observations and studies show that regions with high-level universities and research institutes enjoy an advantage, at least as far as modern technological products are concerned. Both sides, institutions of education and research on the one hand and companies on the other hand, are asked for new forms of interaction traditionally not established in most cases.

Fig. 1 Actors for regional development



Institutions and procedures for cooperation between various partners have to be developed. This applies not only to companies and their partners from the educational and research sector, this task concerns much more “agents” of regional development: the financial institutions, the various chambers of commerce and the local as well as regional government. They all contribute their share to enable the region, the companies, and their employees to achieve a high level of competitiveness.

The degree to which governments at all levels are interfering in the economic processes may differ from country to country. But whatever impact is maintained, the role of governments is very important. They set the frame for and encourage promising activities, they have to be concerned with attractive living conditions and they are instrumental in guaranteeing the sound and stable prerequisites that economic activities need for success.

In conclusion, regional competitiveness does not only refer to the environment a territory offers to the individual enterprises located within this certain spatial entity. Rather, processes of collective learning and socialized growth of knowledge play a crucial role for regional competitiveness. Important factors are the conditions and processes of knowledge accumulation and the development of interpretative codes, as well as models of cooperation and decision-making on which the innovative progress of local companies is based. Competitiveness is created through:

- Specific advantages strategically created by single firms.
- Territorial synergies and cooperation capability enhanced by an imaginative and pro-active public administration.
- Externalities provided by local and national governments.
- The specificities historically built by a territorial culture (Camagni 2003).

At this point it is appropriate to conclude by quoting one of the most prominent researchers in this area, Michael E. Porter, who keeps on communicating that

“(...) the enduring competitive advantages in a global economy lie increasingly in local things—knowledge, relationships, motivation—that distant rivals cannot match” (Porter 1998, p. 78).

### 3 Theories of Regional Development: The Cluster Concept

Several approaches exist to explain the development of economic activity in regions (Fuerst 2001). Whereas the concept of “Innovative Milieus” (Frommhold-Eisebith 1999) lays its focus on the meaning of networks based on common cultures, the concept of “Learning Regions” (Johnson & Lundvall 1994) concentrates on the meaning of knowledge and learning, along side the ideas of networking and implementation. An even more holistic approach to regional development strategies offers the concept of cluster development. In the following, we will present main features of the cluster concept in order to describe in some

detail a certain type of regional economic development that is based on the factors of regional competitiveness discussed above with special emphasis on innovation and cooperation.

### ***3.1 Introduction to the Cluster Concept***

A cluster is composed of regional agglomerations of enterprises belonging to a certain sector of economic activity. They are closely linked through supplier connections. These connections offer a high potential for rationalization by the specialization of single enterprises in a certain element of production. However, those interactions are not limited to the functional organization of the production process, but explicitly include communication in the fields of research and development, marketing, and even common strategic development measures. Regional actors and institutions work through the informal exchange of knowledge and experiences on a common problem. Apart from businesses, institutions of education, research and development institutes, think tanks and technology centers play an important role, as well as NGOs and cultural institutions. Their spatial proximity and their regional context of social interaction is the basic prerequisite for successful clusters.

Michael Porter, through extensive research, came to the conclusion that economic success does not occur in single industrial branches, but in clusters (Porter 1990, 1998, 2000). These clusters are made up of actors from related branches and subsectors. They are linked through vertical and horizontal, formal and informal connections. Once a cluster has evolved, intensive exchange within the cluster starts. This interaction leads through the diffusion of new technologies, increased availability of trained specialists, rapid dissemination of innovations through the channels of subcontractors and clients, to the discovery of new possibilities for competitiveness and new market opportunities, and more. In an economically successful region, established enterprises compete with each other. Thus, a reciprocal strengthening system is created. The dynamics of the cluster on the one hand sustains itself, but also provides prosperity and growth for the region.

### ***3.2 Characteristics of Clusters***

A cluster is not simply an accumulation of different actors of a certain economic sector. Special conditions and frameworks help a successful cluster to evolve. They are all related to the regional dimension:

- An intensive local rivalry for gains and image; this leads to a constant improvement and diversification in products.
- The emergence of new enterprises on the market, for example spin-offs, enhances the dynamic competition.

- An extensive culture of cooperation exists within the different actors of the cluster. It is fostered by the chambers of commerce, the departments for economic promotion, and institutions for collaboration.
- Clusters are based on networks of individuals, brought to life through informal interaction.
- Connections to related branches are available.
- Highly skilled personnel are available.
- New technologies are available.
- Markets and demand are close by (Ketels et al. 2003, p. 18).

Therefore, the entire value creation chain for a certain sector is present in a cluster. Networks are strongly related to the economic sector of the cluster. Knowledge as a factor is relevant in its regional production, availability, and exploitation. In a well-functioning cluster, the value creation chain is made up of regional demand for and regional supply of knowledge.

Thus, the research community includes the most important actors in a cluster, apart from the enterprises. Due to the crucial role of social capital for successful regional development, institutions of research and education which are part of the value creation chain of the respective cluster are the hubs for cluster networks. They hold a central position for knowledge spill over, for individual interaction and thus for cooperation and innovation. Interactions among cluster participants are fostered through institutions for collaboration. They create specialized platforms that allow knowledge to flow more easily and enable the cluster to organize collective activities. Thus, they operate as a mediator for cluster activities.

### ***3.3 Development of Clusters***

It has been argued repeatedly that lower costs and new technologies for communication will cause a “de-clustering” of the economy or even the creation of virtual clusters that supersede the need for physical proximity. However, empirical findings suggest that so far this development has not occurred. In fact, many of the cluster effects arise only because of proximity, for example the spill overs from unplanned meetings (Ketels 2003, p. 12). Physical proximity will most likely remain the crucial factor for cluster development.

Not only economic factors, but also the so-called “soft” location factors are relevant. Most soft location factors are regionally bounded and therefore belong to the innate assets of a region. Soft location factors include for example:

- Social climate
- Modes of conduct of public administration
- Image of the location
- Presence of R&D institutions
- Institutions for education and qualification



- Cultural institutions
- Infrastructure
- Natural environment
- Plus many more.

They are predominantly immobile locational factors. Consequently, public policy has the aim to improve the immobile factors in order to attract the mobile factors: Investments, jobs, and highly skilled workers. The role of public policy concentrates on promoting the kind of resources that are relevant for innovation: Human capital, innovative capital, the competence to interact, and coordinate and entrepreneurial performance. Successful clusters are located in places where people can acquire and share tacit knowledge.

Clusters can take a long time to develop. For many clusters, historical reasons can be found for their existence today. For example, natural factors like resources or the location at a major trading route or river can be the root for evolution of a cluster. Also, the existence of an initial institution, such as a company or a university can be the root for cluster development. They can over time act as an anchor for the cluster by spinning-off new businesses and attracting investment from companies outside the region. The evolution of a cluster can take years or decades. However, the literature indicates that some clusters have developed much faster “because of the determined action of regional leaders who had spotted the potential of their region for the cluster” (Ketels 2003, p. 6).

### ***3.4 Clusters and Economic Performance***

Clusters create economic benefits. These benefits have three dimensions:

- Companies can operate with a higher level of efficiency, drawing on more specialized assets and suppliers with shorter reaction times than they could in isolation.
- Companies and research institutions can achieve higher levels of innovation. Knowledge spill overs and close interaction with customers and other companies create more new ideas and provide intensive pressure to innovate while the cluster environment lowers the costs of experimenting.
- The level of business formation tends to be higher in clusters. Start-ups find external suppliers and partners on whom to rely. Clusters also reduce the cost of failure, as entrepreneurs can fall back on local employment opportunities at many other companies in the same field (Ketels 2003, p. 7).

Empirical findings suggest that clusters improve the economic performance of individual participants of the clusters and as a consequence the entire region benefits. There is a positive and significant relationship between the existence of strong clusters and higher overall wages. Strong employment in a cluster category in which a region is strongly specialized leads to higher overall wages in the

region. Moreover, if regions increase their concentration in employment across clusters over time, their wage growth is even higher. A strong economic activity in some fields seems to be more effective for regional prosperity than having a presence in all fields (Ketels 2003, p. 13). Apparently, the economic success of a cluster also has positive effects on the economic sections of the region that do not participate in the cluster. Overall prosperity increases.

### ***3.5 Cluster Initiatives***

Empirical findings already support a complex concept of cluster development. However, the research on clusters is not only interested in analyzing a phenomenon. In addition, a new approach for economic policy might be developed from the cluster concept. The underlying rationale is that there are certain externalities that sustain the development of clusters. These externalities do not necessarily occur automatically, but can be triggered or strengthened through purposeful action. Also, policy can influence the time it takes for a region to develop a cluster.

The conceptual knowledge about clusters and their strategic implications for regional development policies has already been applied in so-called cluster initiatives. Although empirical findings are still limited, they already provide some interesting insight (Ketels 2003, p. 17): The introductory step to forming a cluster initiative comes in almost equal shares from government and business, or a combination of both. Companies are usually engaged in the set-up and governance of the initiative, whereas governments tend to be important in terms of financing and securing some level of organizational support.

Cluster initiatives are involved in a broad range of activities. Activity areas are:

- Research and networking
- Policy lobbying
- Commercial cooperation
- Education and training
- Innovation and technology
- Investment attraction (Ketels 2003, p. 17).

Empirical data suggest that there are several drivers of success for cluster initiatives. They seem to be more successful if the cluster on which they focus is already strong and located within a good business environment. They are also more likely to have success if they are part of a broader strategy to improve the business environment in the region. Another important factor is the basis of a shared conceptual framework of competitiveness. The lack of a broad consensus turns out to be the factor most likely to cause failure of the cluster initiative. Last but not least, a small operational budget to finance an office with a dedicated cluster facilitator seems to be necessary to sustain the initiative over time. The second part of this paper will demonstrate a very successful example of cluster development, namely the case of Dortmund.

### ***3.6 Regional Structural Policy as Cluster Policy***

Insights in the concept of clusters as a principle of regional development are of great consequence for public policy. Today, public policy must bear the challenge to facilitate economic change and the adoption of innovations, while at the same time enhancing local assets which is also a key factor in growth (Konvitz 2000, p. 657).

Interregional competition is increasing, and a neglect of cooperation within regions causes soaring costs. Thus, different actors on the regional level have to come and work together, to pool their resources and cooperate. This necessity also calls for a new focus in public policy, the focus on governance. A regionally coherent system and non-governmental structures necessary to promote clusters are not a mere product of the market. Instead, they are based on political activity: Mutual learning, negotiations, and compromises between crucial actors of the region. Especially, important is that the regional economy and the scientific community create favorable conditions for successful clusters. This is where policy, administration, education, research, and business come together. The common aim is to pursue a policy that ensures the availability of resources and shapes external restrictions that comply with the common goals.

Regional government in Germany used to be centralized and hierarchical. Municipal authorities had the objective to work for predetermined targets, to make use of concessions for infrastructural development and to oversee distribution of social welfare. Structural policy at the municipal level was largely ignored. With the change from the Fordist-era to Post-Fordism, cities and regions have begun to assume their roles as entrepreneurs. Their task is to strengthen and develop their economic bases. For local governments, a new management system has developed. Instead of holding a central function, local governments today participate in networks that manage structural policy through a process of consensus.

Ketels sums up the objectives for regional development:

“Regions need to activate their clusters, address cross-cutting weaknesses in their general business beyond the life cycle of specific administrations, and define an overall understanding of the unique value they intend to provide relative to other locations” (Ketels 2003, p. 19).

Against the background of the concept of clusters as a strategy for regional development, regions have to evaluate in which sectors they have the potential to develop clusters. Regional as well as national strengths have to be taken into account. There has to be a regional consensus on which sectors should be promoted as clusters. With a common goal in mind, public and, if possible, private means will be directed on sector-related development, for example for physical infrastructure, the establishment of new institutions for education and research, the financing of new firms, marketing, and the setting up of networks.

“The integration of local educational institutions with regional development objectives is crucial; without it, the region will not be able to supply the specialized workforce on which any cluster is dependent” (Gerszewski/Krieger 2002, p. 107).

At the end of this section where we were conveying a positive view of cluster development it is only fair to state that critics of cluster policy may be found in the literature: E.g., the cluster concept might not be generally transferable to any industry and any region (Alsleben 2005; Alecke et al. 2006; Audretsch 2003). In (Huber 2012) certain seemingly well-grounded statements about synergies in clusters are questioned. Therefore, further research on the cluster concept is needed.

However, the case of the City of Dortmund, presented in the sequel, provides a convincing example for regional cooperation which resulted in resolving a severe economic crisis of the 1980s. In Dortmund, all relevant actors including institutes of research and education, enterprises, local and regional government, and financial institutions worked together (and continue to do so) in a vibrant network in order to promote regional innovation and economic development. In this case the cluster concept proved to be a promising approach to promote economic development of knowledge-based industries, thus improving the regional competitiveness and overall economic situation of the region concerned.

## **4 The City of Dortmund**

### ***4.1 Location of Dortmund***

The City of Dortmund is located in the federal state of North Rhine-Westphalia (NRW) in the western part of Germany. This state is Germany's largest with respect to population (17 million inhabitants). The metropolitan area of the Ruhr, a region of around 4,500 km<sup>2</sup>, 53 communes, and a population of 5.2 million is situated in this state. Located at the eastern edge of this area, Dortmund is one of these communes—with about 600,000 inhabitants the seventh-largest city in Germany and a regional metropolis Fig. 2.

### ***4.2 Economic History***

For a period of more than 100 years the economy of Dortmund was based on coal mining and the production of steel. In addition, Dortmund was famous for its beer industry. One may say that Dortmund and its region essentially contributed to Germany's industrial productivity and wealth for decades. However, starting in the late 1970s of the last century these industrial sectors began to decline, as could be seen in many others places world-wide. This decline affected the fortunes of Dortmund severely. In 1997 the two biggest steel producing companies in Germany "Thyssen" and "Krupp Hoesch" decided to merge and closed steel production in the City of Dortmund. They then transferred production to the city of Duisburg, located at the other edge of the Ruhr area, about 100 km away.



**Fig. 2** Geographic location of Dortmund in Germany. *Source* Institute of Spatial Planning, University of Dortmund

Steel production in Dortmund came to a definite end due to the withdrawal of ThyssenKrupp.

To date, the successful period of the coal, steel, and beer industries is history. In a short time Dortmund had suffered the loss of 80,000 jobs. The community and the economic sector faced a nearly hopeless task of creating a huge number of jobs in a short period of time.

Two main areas of counter actions will be described in the following. They both serve as informative samples for the principle of regional development displayed in the earlier sections of this chapter:

- The development of the Technology Center Dortmund and the Technology Park Dortmund (started in 1985, “TechnologieZentrumDortmund” and “TechnologieParkDortmund” in German).
- The development and implementation of the city development model Dortmund-Project (started in 2000) with its cluster initiatives.

### ***4.3 The Technology Center Dortmund and Technology Park Dortmund***

In the early 1980s when the inescapable process of declining traditional industries was at its beginning the city urgently needed a new basis for economic development. It was then that various stakeholders in the city of Dortmund acted in an amazingly fast manner. They reached a consensus regarding analysis of the situation and concepts suitable for future recovery of the presently decaying traditional industry. This consensus has been referred to as the “Dortmund Consensus” ever since and formed the basis, shared by all, for a remarkable transition from old to new economic structures. This consensus can be considered as an informal but influential new form of government.

Cooperation between the local players is evident in the cases of the Technology Center Dortmund and the adjacent Technology Park. While searching for innovative ways to promote the restructuring of the region, a Dortmund initiative led to the establishment of a technology center. The founding fathers, so to say, were

- Dortmund’s institutions of higher education
- The City of Dortmund
- The local Chambers of Commerce
- Dortmund’s financial institutions.

The opportunity was grasped quickly. In 1985, 16 months after the preliminary negotiations, the first buildings were completed. Here Dortmund was among the pioneers in Germany, second only to Aix-la-Chapelle and Berlin.

The idea itself and the prompt implementation of the project were attributable to the advantages that the university and the city undoubtedly possessed. The University of Dortmund had deliberately developed strength in the fields of engineering, computer science, and the natural sciences, and therefore the potential for innovation was high. In addition, the University is situated on a large green field site that offered enough space for an industrial periphery.

The ‘Dortmund Consensus’ had become well known throughout the region; it signified a reliable partnership between the public sector (politics, administration, and education) and the private sector (industry and enterprise). Therefore, the project was the result of successful networking:

- The Rector of the University promoted the idea and served as a mediating influence among academia, politics, and industry; the infrastructure and fields of excellence of the university defined the focus of a local technology center.

- The City of Dortmund purchased the land and, financially supported by the state of North Rhine-Westphalia and the European Union, had the buildings constructed.
- The City, Chamber of Commerce, Chamber of Handicrafts, and the more influential financial institutions set up a managing company to run the center—or, more precisely, to lease the office space, to sublet it to start-up and existing companies, and to offer various services.

Still today, this successful networking is reflected in the legal structure of the technology center which is a private company with the following shareholders:

- The two universities in Dortmund
- The Chambers of Commerce and Handicrafts, respectively
- The City of Dortmund
- Various financial institutions.

The outline and structure of Dortmund's Technology Center became a model for the German innovation centers. It has concentrated both on technological development and spin-off companies; in other words, it has supported the development and application of technological products as well as helping and encouraging young entrepreneurs wishing to set up a business.

Since that time the Technology Center has developed into one of the most successful and largest centers in Germany. In 10 building complexes with floor space of 120,000 m<sup>2</sup> it accommodates about 190 companies with more than 1,500 employees. The Dortmund technology center has maintained its orientation toward the main fields of research pursued in Dortmund, more details will be presented below in [Sect. 4.5](#).

#### **4.3.1 Technology Park Dortmund**

The Technology Park was founded in the same year as the technology center, 1985. It is located on an area of 40 ha next to the joint campus of the University of Dortmund and the technology center Dortmund. The park offers space for construction of their own premises to those interested in pursuing early stage projects and enterprises which have hatched out of the incubator at Technology Center. It is likewise an excellent location for enterprises seeking contact with scientific institutions but have no need for the kind of support provided in the technology center.

The Technology Center has grown fast and today accommodates more than 250 companies with over 8,000 employees.

A more detailed analysis of the concept of Dortmund's Technology Center and Park as well as the mode of its operations will appear in (Becker and Herrmann 2013) Fig. 3.



**Fig. 3** Dortmund campus with Technology Center and Park. *Source* University of Dortmund

#### ***4.4 The Dortmund-Project***

To explain the establishment of the initiative Dortmund-Project (Dortmund-Project 2000) one has to go back to the year 1997 and the decision of the two biggest steel producing companies in Germany “Thyssen” and “Krupp Hoesch” to merge and to close steel production in the City of Dortmund. Within a Memorandum of understanding both companies agreed upon certain activities to substitute and replace the lost jobs, including the establishment of an automotive supply factory in Dortmund. After some counseling, the ThyssenKrupp AG engaged the consulting firm McKinsey & Company to develop a 10 year strategy for the City of Dortmund to halve the unemployment rate.

In June 2000, as a first step of implementation, the Dortmund City Council voted to establish the Dortmund-Project under the direct supervision of the Lord Mayor and reserved budgets of approx. €5 Mio. p.a. up to the year 2010. From the very beginning the Dortmund-Project was supported by ThyssenKrupp AG and the Economic and Employment Promotion Dortmund. The overall strategy was described in six goals:

- Set up new anchor industries in Dortmund.
- Strengthen companies resident in Dortmund.
- Expand training programs, skills upgrading plans, and R&D of an international standard.
- Turn the City of Dortmund into a modern business city with a high quality of life and unrivaled leisure amenities.



- Expedite planning and approvals procedures: one-stop shopping for start-up and/or relocating companies.
- Substantially boost the level of employment.

#### ***4.5 The Current Situation***

Without any doubt, the Technology Center, the Technology Park, and the Dortmund-Project constitute key elements of Dortmund's successful restructuring and recovery in economic terms after the collapse of traditional industries in the last 30 years. However, it has to be stressed again and again that it worked out so well due to various actors from different sectors of the society who worked together in a coherent manner:

- The City
- Financial institutions
- Chambers of Commerce
- Universities and Research Institutes.

No single actor can achieve what has been achieved so far. However, a few additional remarks are in order.

Technology center and park are focusing on areas and companies of modern high technology. This requires close contact to research entities which are available in Dortmund such as:

- TU Dortmund University, the University of Applied Science.
- Max-Planck Institute for Molecular Physiology.
- Two Fraunhofer Institutes for Logistics and Information Technologies, respectively.
- Two Leibniz Institutes for Analytical Science and, Working Environments, and Human Factors, respectively.

Various financing schemes have been established and are still being used. Venture capital and seed funds were made available by local institutions. In addition, a combination of investments from the city of Dortmund, the regional state of North Rhine-Westphalia and European Structure Funds is being applied to secure the financial basis.

Technology Center and the Dortmund-Project, in cooperation with the above scientific partners have successfully initiated several so-called "Competence Centres" which are medium-sized high-tech clusters.

The BioMedizinZentrumDortmund, in English—the Bio Medical Center Dortmund, is a recent Biotech-Cluster that is located on the campus of TU Dortmund University which also offers a well-known academic program in the field of biotechnology. About 30 biotech companies enjoy proximity to research institutes of world-wide reputation, to name the Max-Planck Institute for

Molecular Physiology as a typical example. This center was built in three steps between 2002 and 2009 with an investment of nearly €60 Mio and provides space of 15 000 m<sup>2</sup> in total with 8,000 m<sup>2</sup> designed as laboratories.

In 2005 and 2007 the MST.factory dortmund was opened, offering 10,000 m<sup>2</sup> total and absorbed investments of approximately €50 Mio. This center is supplemented by a Center for production technologies, constructed in 2008 with half of the previous investment. It is interesting to note that both centers are located on so-called “brown fields,” previously the site of the last Dortmund steel mill. Building the new economy on the sites of an old industry is a contribution to urban development. Moreover, it vividly displays the rise of a new economy in the city and region.

It is important to note the Technology Center, is successful despite the fact that it is run as a private company. Tenants in the Technology Center and other Centers enjoy the provisions of high-tech infrastructures and the general assistance from the centers, even though they have to pay high rents. The fact that this concept is working successfully is a proof of the quality of the services offered, and of the perceived advantages it brings to those companies that make use of them.

## 4.6 Economics Effects

“Governmental investments into the future of a region—pushing economy in the right direction or wasting tax money into a black hole”

Questions of this type are raised frequently, and they have to be raised in view of the huge spending pouring out of state sources (Becker and Herrmann 2013). In the case of the Dortmund situation a recent study (Gundeland and Luttmann 2008) has identified and measured the economic effects that can be related to the Technology Center and Park Dortmund (TPDO for short). At this moment, a balance of governmental investments versus fiscal effects is unknown to the authors. Nevertheless, taking into account also the non-fiscal effects we cannot but state that an overall positive outcome is beyond serious doubt, at least in the case of Dortmund.

In detail, the study shows:

- The gross national annual income linked to TPDO is €900 Mio where
- About €600 Mio stays inside the region
- About 16,000 jobs nation-wide are related to TPDO where
- About 11,500 of them are located regionally
- Tax income on the side of region amount to 20 Mio. p.a.
- Innovation in the region has greatly improved, 35 % of the companies in TPDO are filing patents, more than 20 % go international
- Academically trained personnel in TPDO amount to 70 %
- TPDO has positive impact on the entire region in regard to innovation, networks, ability to attract highly qualified personnel.

These figures and facts may justify high investments and show that the transition of old industrial structures, gone forever in Dortmund, into modern industrial and business structures can be described as successful to some extent.

However, there are old and new challenges to address as well, by measures still to be worked out. A few final words are due.

The rate of unemployment is still high. So far, the loss of so many jobs in the past has not been fully compensated. While the traditional industries were able to offer decent employment opportunities to a large number of low- to semi-qualified employees, technology-based enterprises predominantly employ a highly skilled work force. In a way, the shift of economic sectors leads to a substitution of work force, but not a substitution of employment opportunities. Also, high-tech companies are usually more specialized and smaller. They do not necessarily lead to mass employment. Other forms of business or industrial production also have to be developed in order to sustain a demographically diverse region such as Dortmund.

In addition, the huge threat of demographic decline in Germany, as well as in many western countries, poses questions not yet understood, let alone answered. Companies will be facing a fast growing difficulty to find the skilled work force they need to be competitive. At first glance, this seems to be a problem that enterprises have to resolve on their own. However, resuming the holistic view adopted in this paper, this problem will be of the greatest concern to all players who are involved in the economic process.

In the past 30 years in the City of Dortmund the enterprises, financial as well as educational and scientific institutions managed to develop strategies to cope successfully with the big economic crisis caused by the collapse of traditional industries. The authors of this paper are convinced that the previous arsenal of creative tools and actions will be suitably augmented to address the new challenges.

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