CLUSTERS AS A MODERN PATTERN OF RUNNING BUSINESS SUPPORTING INNOVATION

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Abstract
Gaining competitive advantage in the contemporary business world requires entrepreneurs to quickly adapt to the changes occurring in the ever more dynamic environment. The tendency related with transition from competitiveness to cooperation was very distinctive in the World in the last twenty years. Nowadays initiatives in this direction are also undertaken in Poland. One of them is the Cluster of Innovative Manufacturing Technologies created in Lower Silesia. Its strategic goal is to support development of the region economy and reinforce competitiveness of manufacturing companies.

The essence of the cluster performance poses a very complex issue because for many years competition was the base of planning and introducing enterprises’ strategies. Contemporary business units need to move from this approach to the attitude founded on a smart collaboration. Due to the lack of a data base in the field of manufacturing innovative products in cooperation of independent organizations in Poland there was undertaken an effort to collect and analyze information enabling ‘cluster-like’ integration of the manufacturing environment.

Keywords
cluster, manufacturing network, innovation.

Introduction
Tight competition on global market and dynamic changes in field of technology made companies and governments search for new strategies of running business. Gaining competitive advantage nowadays requires high level of flexibility. Enterprises have to acquire diversified resources and competencies to identify and exploit opportunities emerging in the ever more dynamic environment. It is very time and money consuming once a single business unite adopts production system to requirements of a new order especially when the task falls within the domain of innovations and advanced technologies. Operating in this manner is practically impossible for small and medium companies due to their limited funds. To minimize a risk connected with functioning in very unstable conditions and collect greater potential entrepreneurs began to consolidate their efforts creating clusters.

In the most general formulation cluster can be defined as a geographic concentration of industries that gain performance advantages through co-location [1]. United Nations Industrial Development Organization defines clusters as sectoral and geographical concentrations of enterprises that produce and sell a range of related or complementary products and, thus, face common challenges and opportunities. UNIDO characterizes clusters as a strategy enabling rise of external economies such as emergence of specialized suppliers of raw materials and components or growth of a pool of sector-specific skills and fostering development of specialized services in technical, managerial and financial matters.

It is worth to mention in this place term network which is also connected with the phenomena of con-
solidation however has a slightly different meaning. It is explained as a group of firms that cooperate on a joint development project complementing each other and specializing in order to overcome common problems, achieve collective efficiency and penetrate markets beyond their individual reach. Networks can be developed within or independently of clusters [2].

When several companies belonging to a cluster start realizing particular project or order in cooperation they are often described as a virtual organization. This indicates that with respect to law they operate independently but for the need of a given market opportunity they temporarily become one business unit realizing common goal. VOs are strongly connected with information technology. They mainly come into existence when there are appropriate means of data and information exchange.

The phenomenon of business concentration was very distinctive in the last twenty years. The literature on that issue mostly contains case studies describing process of cluster operation and its results. The examples given in the publications enable to notice variety of these structures. It results not only from the specific character of the industry and environment in which they exist but first of all from different levels of cooperation achieved by their members. It is hard to find one pattern for successful cluster build and development. On the other hand there is a great demand for kind of a guide through process of creating favorable conditions for collaboration which results with synergy effect and brings profits to business partners. It is especially important for the emerging associations to take advantage of the more experienced ones and avoid their mistakes.

**Polish Cluster CINNOMATECH**

In Poland most initiatives connected with clusters appeared in the last few years. Majority of them is on the early stages of development. There is not enough information about integration of independent organizations and manufacturing innovative products in cooperation. The purpose of this article is to describe clusters in different levels of development operating in different conditions to formulate set of a good practices serving as a guideline for future development of clusters in Poland especially for successful leadership of CINNOMATECH.

The cluster brings together about 50 companies and institutions, most of which have headquarters in Lower Silesia. These manufacturers are mainly from the metal processing industry, production of machine parts and cutting tools sector. The cluster includes service institutions from education, research and development institutions as well as representative of finance sector, IT services and consulting in the field of cutting process planning, machining tools selection, and optimal use of electricity. Companies in the Cluster represent the following fields:

- metal processing (turning, milling, grinding),
- technology services,
- distribution of machine tools,
- research and development within the area of metal production,
- management of production systems,
- consultancy and vocational education

The mission of CINNOMATECH is “to support the development of the region’s economy and strengthening the competitiveness of companies in the manufacturing sector” and the strategic objectives are:

- Creation of networks of enterprises, government, universities and business institutions,
- Increasing the capacity of innovative companies,
- Ensuring flow of information between participants of the Cluster,
- Supporting the establishment and creation of conditions for effective commercialization of research results,
- Developing and launching new products/services that are innovative,
- Promoting regional and Polish manufacturing industry, creating a common brand,
- Creating favorable conditions for innovation of the manufacturing industry by operating costs reduction.

The research made by a team supporting development of CINNOMATECH indicates that in spite of a great variety in general clusters can be divided into two groups. One of them represents high performance clusters that have already developed good practices in the field of trust and communication. Their main goal is to create innovations and high added value on a base of knowledge and exploration. The second group comprises less mature structures. They are focused on achieving economy of scale through consolidation of efforts. This categorization is not only visible in practice but was also described in literature [3, 4]. However the cluster may change its status. The early stage when companies share their resources in order to deal with demand fluctuations can lead to the more advanced cooperation and move the cluster to the group based on innovations. This hypothesis induces to analyzing consolidated structures in order to indicate smooth path of a development useful for those beginning their performance.
Polish cluster initiatives

The first studies on clusters in Poland occurred after 1989. At that time there could be observed the formation of characteristic association of industries. According to a study by the Institute for Market Economics, there were found 18 organizations with cluster structures, located in 8 provinces. Very often, together with typical clusters there are observed cluster like initiatives. Within the clusters one can observe less or greater linkage of science with the economy. The company representing high-tech sector always operate in close cooperation with the scientific community. However, innovative ideas and new technologies are implemented at the enterprise level. Such activity may be very profitable, but it also involves a big risk. The main threat here is a failure of the product or technology on the market, which can be a result of considering its price as too high by consumers. It happens that university authorities, for a promotion of innovative projects, design offer with favorable conditions of cooperation. This enables to decrease resistance against the non-standard ventures.

In Poland, the clusters of high technology (high-tech clusters) were observed in the pharmaceutical and cosmetic industry in Warsaw and Lodz. Most of them, however, represent the traditional industries, where the use of links between science and industry is quite small or does not occur at all. Most characteristics of the clusters showed associations of food producers in the regions of Warmia, Mazury and Wielkopolska, as well as groups representing furniture industry in Wielkopolska and textile industry in Silesia. The most famous clusters in Poland are: Aviation Valley (aviation industry), Pleszew Boiler Cluster (boilers), Tarnów Industrial Cluster Plastics Valley (plastic), Tiles in Opoczno, Amber in Gdansk, Automotive Parts Manufacturers’ Association as well as Organic Valley Food.

Aviation Valley is located in south-eastern Poland, a region famous for its high concentration of companies from aviation industry. The cluster was founded by entrepreneurs from the region, who in 2003 established the Association of Aviation Industry Group’s Business Aviation Valley. The cluster develops very fast. The number of its members (companies and institutions connected with the aviation industry) tripled during the two years of operation. Currently it has 72 members from the region, and over the next few years this number is to be increased to 100 entities. Aviation Valley in Poland is based on extensive research facilities, as in the cluster there is located Rzeszów University of Technology with highly developed Department of Mechanical Engineering and Aeronautics. Main tasks of this group is to build supply chain for aviation industry, cooperate on research in new technology solutions, support local entrepreneurs and promote Polish aviation industry. The ultimate goal is to create the competitive Aviation Valley in south-eastern region of Poland which would supply international markets with a wide range of products and services related to aviation [5].

Another example of an active cluster is Pleszew Boiler Cluster. In the southern part of Wielkopolska there is a group of over 100 companies, which produce boilers, components and elements of the heating equipment and electronic controls that control combustion process. These manufacturers constitute one of the most dynamically developing clusters in Poland. Pleszew district and city Pleszew is being known as boilers’ region. The local product called “Pleszew boiler” is known and recognized throughout the country. Such large number of companies with the same profile of production, concentrated on a relatively small area, creates perfect conditions for both collaboration and cooperation between companies. It also stimulates continuous improvement of products through healthy and strong competition within the cluster. This status could be achieved thanks to development of Pleszew boilers manufacturers with support of schools and training centers, which prepared future professional specialists. Another crucial factor contributing to success here are reliable suppliers of materials, automation and electronic components for the industry. The huge impact on growth of the Boiler Cluster has also ongoing cooperation with research and development centers. The higher education in technical universities seems very important too. Furthermore “around-business” institutions and local governments should be mentioned as very helpful elements. The manufacturers of boilers from Pleszew in conjunction with Euro Centre for Innovation and Entrepreneurship and Self-government of the District Pleszew have consistently pursued a strategy of cluster development for several years. They have been working together on innovative products, participating in training and cooperation with experts from universities, and finally, jointly organizing exhibitions and implementing marketing activities reinforcing the brand. Currently, in the region of Pleszew there are over four thousand businesses of various industries. Leading manufacturing companies, however, are companies producing boilers and companies cooperating with them. They employ a total of more than 1,500 employees. Boilers industry has become, not only an economic showcase of the region, but also one of the largest employers in the south of Wielkopolska region [6].
Chinese Hosiery Cluster

First foreign cluster analyzed within a research is placed in the province of Zhejiang, China and operates in the hosiery industry. It is located in a rural area what poses obstacle for industry development because government does not support it in such regions. The local entrepreneurs primarily operated on the small scale in a very old fashion way. It was changed after forming cluster. Thanks to that initiative the district became the biggest hosiery manufacturing base in China. The significant scale effect enabled the associated companies to become competitive on a global market. Although they do not have any famous brand name they sell their products under international brand names [7].

Intensive development and consolidation initiatives in the district began in 1992. It was connected with introduction of important local policies. They regulated issues of trade and the industry development.

Currently the local network consists of 1000 companies specializing in material processing, 8000 hosiery manufacturers, 400 material trade companies and 600 hosiery wholesalers and retailers, 100 companies assuring transport service [8]. The structure of the cluster is vertically disintegrated which means that it consists of members who are on different stages of the value chain and specialize in the complementary fields. However significant number of alternative production units within each production area indicates that we deal with cooperation of competitive companies as well. The group is enormous and thanks to that achieved high level of flexibility and benefits from economies of scale. Those two factors have special importance in this industry because it is strongly influenced by seasons and fashions. It characterizes with short periods for contract realization in order to follow ever changing market needs. Producers have to also take into consideration different tastes of the customers. It requires them to produce small batches and to supply great variety of goods.

The members of the network depend on each other. The activity of one enables investments and development of the others. Together they shape local production system. Participation in the cluster brings its members benefits and that is probably main reason of shifting priorities from competition to cooperation. Companies agree to obey rules existing in the cluster because it provides them advantage unachievable otherwise. The intensive collaboration contributed to increase of specialization. That in turn decreased tense within groups of alternative production units. Producers developed core competences in their shop floors. Linkages between competitors are very important when the cluster have to cope with a sudden rise of demand which overgrows production capability of a single manufacturer. Then peer companies temporarily work together sharing contracts [9]. The technology and knowledge exchange is still very difficult issue in the group of alternative production units because it is seen as a thread for their profits and future position on the market.

However the cluster as a whole developed means of effective knowledge and information exchange. Datang has a few knowledge brokers in form of large firms. As leaders of the network they are responsible for contact with the market. The ‘big players’ have databases with information about manufactures from entire value chain. They also bring significant assets to the group in form of a stable supplier system and a big market share. Flagship enterprises developed connections with partners outside the district. It was motivated by lack of highly skilled labor force such as professional designers and technicians. The cluster due to its localization has also very limited technological capacities. It employs workers from state-owned companies operating in urban areas. Datang has to also import machines from outside districts. To reduce costs resulting from the outsourcing a number of manufacturers from the network started cooperating with Universities in order to adopt advanced technologies and production models. The projects initiated so far comprise training of employees in the field of computer aided manufacturing and development of electronic knitting machines [10].

The district’s government plays important role in the cluster. At the very beginning of the network existence the industry got subsidy, technological assistance and market information. Local authorities helped to create website promoting products. They are still involved in marketing activities concerning local brands. In addition the government controls pollution level that is strongly connected with dyeing firms.

The Datang hosiery cluster is definitely example of the structure focused on gaining profits through economy of scale. The consolidation of efforts effectively reduces drawbacks resulting from demand fluctuations. Member of the network exchange information regarding order realized together rather than knowledge and technology. These early stages of the cooperation brought significant advantages to entire region. It encourages to undertaking the future activities in association. There is a big probability that this cluster will evolve towards high added value
networks. The cooperation established with professionals from industrial district and university proves movement in this direction.

**Intercluster relationships on example of Chinese and Taiwan clusters**

The next part of this study contains description of group of four clusters that belong to electronic industry. The associations are described here together to show very important phenomena of intercluster linkages. The mutual influence is also important from the perspective of the cluster development and evolution from lower value-added activity to higher added value based on innovative approach.

The structures analyzed are following:

- **Hsin-Chu Science Park** located in Taiwan controls 80% of the world market in the wafer foundry sector. It is focused on semiconductor industry and associates 382 companies.
- **Tainan Science Park** also located in Taiwan. One of the world's leaders in electro-optical production. It supplies over 60 percent of key electro-optical devices such as TFT-LCD display panels. It consists of 101 companies.
- **Shanghai Zangjiang Hi Tech Park** associates 3000 manufacturers and operates within semiconductor industry. To its main advantage there should be included big labor resources, natural resources and huge market potential. The same qualities characterize next cluster mentioned below.
- **Beijing Zhongguancun Science and technology Park (China)** its core competence is IC design. More than 6000 companies belong to this cluster.

Within each of the clusters mentioned above there exist both vertical relationships with partners upstream to downstream value chain as well as horizontal linkages. The latter pose a factor increasing potential for innovations. Connections in area of alternative organizations could be sustained only with high degree of trust which was achieved thanks to membership in the same network. At the same time partnering firms within one association are allowed to collaborate with another foreign corporations or clusters. In the case of Taiwan and Chinese clusters such premise brought significant benefits to the networks from both countries. From the short description of the clusters presented above it is easy to find out what are the assets to be exchanged in relationships between them. Taiwan’s clusters are much smaller and for this reason do not have such a potential of achieving economy of scale. On the other hand strong competitive position and significant market share indicates that there are founds and conducive conditions for disaggregation, specialization and R&D. Cooperation with Chinese clusters enables to gain huge base of resources and enforce effect of scale. In result clusters from Taiwan shifted from the lower value added activity which characterizes original equipment manufacturers to the activity on higher level with high-end design and key components manufacturing as core competencies. Chinese cluster are less mature but still have a chance to evolve towards higher segments. Linkage with the partners from abroad enables learning and gives an access to the world market. Authors of [12] assess current activity of the clusters from different countries on a curve presented in the Fig. 1.

![Fig. 1. Configuration of value adding activities [12].](image)

The analysis of the four cases enables to mention couple factors influencing cluster development. First of them is environment for cluster growth. This case study similarly to the one presented in the previous section proves that government has to be aware of cluster importance in process of creating economy based on innovations. It should create favorable conditions for enterprises consolidation in aspect of regulations as well as in matter of funding. The example of network from Taiwan and China also shows significant meaning of the linkages between companies. They help to increase creativity. An innovation initiated by one of partners triggers an additional ideas and improvements in cooperating business units. In the long term this process increases economic growth. Beside internal connections within one cluster it is very important to keep contacts with another networks not only these existing in the same country but also those from abroad. However cooperation across national boundaries may be challenging. The difficulties in coordination can be minimized when there are similarities in culture and historical background of collaborating parties. China and Taiwan have common language and close geographical location. These
are undoubtedly factors which reduced the complications and improved quality of the linkage [12].

Virtuelle Fabrik – the evolution process

Virtuelle Fabrik (VF) today is a cluster that should be placed on the top of the diagram presented in Fig. 1. It belongs to high added value group where new technologies and brands are created. This network has special importance in this study because it is focused on exactly the same field as Polish cluster CINNOMATECH, (mechanical engineering and manufacturing). Moreover VF is located in Switzerland, represents European clusters so we can speak here about cultural similarities. At last but not least the Swiss cluster exists since 1996, has relatively long history and process of its development has been diligently studied. For the reasons mentioned above it was chosen to be described here as a source of good practices for other less developed business associations.

Virtuelle Fabrik started working as a virtual organization in result of project initiated by the network members and university researchers. The goal of the undertaking was the network development. The cluster consists of two subgroups. One of them associates companies from the region of Midlands (18 partners). The rest of VF comprises business units from the region of Lake Constance (17 partners). Therefore the VF has 35 members in total ranging from small and medium enterprises to production divisions of large corporations.

In the first phase of VF development the associated partners focused on competencies identification in order to improve machine utilization. Primarily they decided to describe their resources in accordance with classification and terminology suggested in DIN 8580 standard. The data presented in the unified system were supposed to be used in creation of electronic market for machining capacity. Although the idea seemed to be very clear in theory, in practice it turn out to be much more complicated. Two companies who were experts in grinding compared their performance and discovered that their prices are significantly different. Deeper analysis revealed that in fact their competences are not easily comparable. The higher prices offered by one of them resulted from specialization in smaller-sized parts and more precise tolerances. The other company offering lower price was not able to do orders with such requirements. This kind of events which occurred during data collection process contributed to the change on perceiving competencies. Instead of classifying them as undifferentiated goods they started to be described in a qualitative way as areas where one production unit is better than the other. However the method of classification chosen at the very beginning is suitable for the markets with high demand uncertainty (e.g. hosiery market in China). In case of VF high technical uncertainty and product innovation was the issue to deal with. In such environment simple machining operations are not sufficient to achieve a success. There is need for intangible competencies like project management, quality inspection and testing. The database with description of all machine tools owned by particular network’s member served only for establishing first contact between co-operators.

Collaborative projects done at the early stage of the cluster existence and focused more on resource share than new product development brought positive effect. Workers involved in their realization had to cope with requirements from different industries that extended their skills. Managers noticed Pareto dependence here. Small amount of time spend on manufacturing for the network resulted in significant increase of the firm flexibility. A few partners decided to resign from certain technologies, handed over them to the reliable partners and focused on the other considered as more crucial in aspect of competitiveness. The process of competence identification and development had evolutionary character. In case of Virtuelle Fabrik it took 5 years. For the first 2 years of this period the collaborative projects were realized only for internal customers from the Virtuelle Fabrik.

The next phase of the network development began in 2001 when members of the VF decided to answer a call for tender made by City Zurich. To exploit this short-term market opportunity they produced dust bin prototype. The quick reaction to the market demand and successful cooperative effort was possible thanks to the linkages developed earlier. VF won the contract, subsequently gained commercial success and got Swiss innovation award called ‘Idea Swiss’ in 2004. Another example of the project done by the network is engineering and building electric retraction device for a car steering wheel. In this case it was also an answer to the market need. One of the companies from the VF received a request to provide this kind of the part. Although it did not have capacity to answer this demand the manager of this firm passed the project to the entire network. A leader of the undertaking was appointed and the work begun. As a result ten different enterprises offered ten different technologies. After evaluation process for the feasibility and cost of the solution only three units were involved in design and manufacturing of prototypes.
Later on when the product was approved to the mass production another producers joined the project. The technology chosen was semi-fluid aluminum injection molding, developed by one of the partners. However the others participating in realization could learn about it.

The success of the Virtuell Fabrik in segment of high added value encouraged its members to advertising these unique skills during trade fairs and later on the website. These activities also brought an effect. One of the examples here is a challenge to engineer medical air-conditioning device given by one of the product developers. VF answered it in public during conference. The proposal was accepted. The equipment was subsequently designed and manufactured. It is easy to notice that identification and facing market opportunities poses event driven process but with a long-time horizon. Authors of [13] suggest that flexibility and agility of the cluster can be assessed on a base of such indicators as rate of new projects realized or more specifically experimental projects completed. They also indicate dependence between economy phases and proportion between standard projects and unconventional ones. During recession number of the non typical projects increases since manufacturers search for potential earnings in wider area. In periods of growth they remain constraint to the field of their core competences.

Coordination and management are very complex issues when the project realization involves significant number of cooperating units. On the other hand it is hard to introduce stiff procedures in such a flexible structure which operates in unpredictable environment. For this reason members of the VF specified only several roles that are necessary for the successful project performance. These are:

- ‘broker’ – the person who represents an idea and is responsible for contact with customer and identifying his requirements.
- ‘competence manager’ – this role player judges risks and feasibility of the project and decides how to divide work between partners to easily integrate its results afterwards.
- ‘in-/outsourcing manager’ – entitled to making decision for each potential partner.
- ‘virtual project manager’ – plans and coordinates cooperation.
- ‘coach’ – responsible for conflict management.

These roles are inter-organizational and interchangeable. It means that one partner can fill different role depending on the project realized.

Frequent informal contacts between people from the network are also very important element of coordination and management. So called ‘virtual dinners’, scheduled regularly in the sites of members, enable knowledge and information exchange.

VF worked on improvement of the coordination process because evaluation of the initial projects showed that it generates 30% increase of cost in comparison to the projects made within a single business unit.

The additional costs were created by duplicate activities like quality inspection done on the same lot on the entrance to each partner factory or filling out papers and entering data to the partners’ electronic systems. The needles operations were reduced but it increased probability of mistakes. For this reason proper preventive means were undertaken. Companies agreed to follow certain procedures concerning selection of partners, price calculation and specifying standard products and contracts. It was decided that quality and timeliness will be the routine on the level of entire network. Additionally there were introduced new standards of communication in form of liaison positions. It enabled direct contact of engineers and machine operators from different companies participating in realization of the same project. It obviously induced employees to enrich their skills in external communication and conflict resolution. There were also agreements made about criteria of acceptance of new partners joining VF and reward system.

In relation to the coordination and managerial issues maturity of a cluster may be assessed by number of companies involved in collaborative projects because it is more difficult to manage bigger projects. The variance of the partners involved in different projects is also important indicator. When there are not well established routines in a cluster then usually relationships are limited to a few partners cooperating in the same configuration.

Authors of [13] after ten years of research on VF proposed model of rallying competencies in dispersed manufacturing environment. It is shown in Fig. 2.
Conclusions

The information presented in the article indicates that clusters are a good form of running business which allows getting its members benefits from cooperation, even though sometimes they are direct competitors. Paths of the clusters development are quite similar regardless of the industry in which they operate. Table 1 contains comparison of the clusters analyzed in this article. Describing them according to the four chosen factors enable to assess which stage of development they achieved and characterize variables that influenced this process.

Table 1

<table>
<thead>
<tr>
<th>Name of the cluster</th>
<th>Description</th>
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<tbody>
<tr>
<td>Datang hosier cluster, China</td>
<td>Vertical &amp; horizontal complementary &amp; alternative production units, low scale effect, medium and high technology, high added value, seasonal and fashions, small batches, short contract periods</td>
</tr>
<tr>
<td>Hsin-Chu Science Park &amp; Tainan Science Park, Taiwan</td>
<td>Vertical &amp; horizontal complementary &amp; alternative production units, medium and high technology, high added value, manufacturing, scale effect</td>
</tr>
<tr>
<td>Shanghai Zangjiang Hi Tech Park &amp; Beijing Zhongguancun Science and technology Park, China</td>
<td>Vertical &amp; horizontal complementary &amp; alternative production units, medium and high technology, high added value, manufacturing, scale effect</td>
</tr>
<tr>
<td>Virtuelle Fabrik, Switzerland</td>
<td>Vertical &amp; horizontal complementary &amp; alternative production units, manufacturing, scale effect</td>
</tr>
<tr>
<td>Aviation Valley, Poland</td>
<td>Vertical &amp; horizontal complementary &amp; alternative production units, manufacturing, scale effect</td>
</tr>
<tr>
<td>Plexsaw Boiler Cluster, Poland</td>
<td>Vertical &amp; horizontal complementary &amp; alternative production units, manufacturing, scale effect</td>
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- Increase of specialization
- Increase of disaggregation, specialization and R&D
- Cooperation with Chinese clusters
- Achieving scale effect, gaining access to new markets
- Searching for R&D support at the Universities
- Technology improvement due to cooperation with Taiwan clusters
- Emerging of industrial supply chain
- Increase of specialization
- Better resource utilization, scale effect
- Successful realization of innovative projects in cooperation
- Initiating mutual learning process
- Reducing cost of coordination process
- Creating reliable supply chain
- Increasing competitiveness of Polish aviation industry
- Investments on R&D
- Investments on the industry promotion and development
- Increase of trust among entrepreneurs
- Searching for R&D support at the Universities
- Economy growth in the region
- Enlarging group of specialists on a labor market
- Brand reinforcing
- Building reliable supply chain
The most serious problem in creating a well-functioning cluster is to convince its future members that establishment of the closer cooperation in the cluster is viable in the long term. Trust building process in this case is quite complex. In the first stages it consists of easy initiatives like joint material shopping which bring measurable benefit in a short time perspective. Later the cooperation moves to the higher levels and cluster members start sharing their resources and competencies. At the beginning orders realized in cooperation are usually standard but after cluster members get experience and confidence the projects undertaken become more advanced and can be classified as innovative. Members of the cluster based on high added value increase their knowledge and research capacity.

References


