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## Theoretical Basis for Geodesic Clusters

### 1. Introduction

In April 2006 in Rzeszow, then the Head of Podkarpackie Province Leszek Deptula at a meeting with local government said: "If in our province every small business employed one person, the unemployment problem would disappear completely". Today, the statement is particularly meaningful since by increasing competition and rapid technological development, not only the problem of unemployment is increasing, but the very existence of many small businesses is at risk. Therefore, any initiative to increase the number of small and medium enterprises and strengthening their position is highly desirable. Similar difficulties, related to the survival of small and medium-sized companies, are also shared by highly developed countries. Many years ago the problem of development of small business in the face of increasing competition were faced in Silicon Valley. One possibility to prevent further weakening of economic operators is to strengthen them by organizational structures. A small company means a high flexibility and in many segments small costs. This results in a simplified structure and clear and transparent decision-making. However, practice has shown that small-business cooperation among them is very difficult. These companies usually compete heavily with each other. Competition takes the form known in the literature as a destructive competition [1, 4]. The prices of goods and services are often heavily lowered. This situation is not rare in geodesy. The solution may be to create such an organizational form that would allow on the one hand the cooperation of operators in the organization, on the other it would strengthen the competition between these operators contributing to their development.

These two seemingly diametrically opposed trends can be reconciled in the organizational structure known as a cluster [2].

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Clustering is a way to use the resources and opportunities inherent in local socio-economic structures [7]. This is connected with the so-called “paradox of location”. This paradox lies in the fact that in the era of globalization, the ease of switching the location to minimize costs and strong economic ties can provide a competitive advantage. To achieve this, you must identify those local resources that distinguish the region and can provide a competitive advantage (they are hard to copy, there are local resources or a large number of strong operators etc.).

## 2. Introduction to the Problems of Contemporary Geodetic Branch

Currently, Poland has many advantages that may allow the creation of conditions for rapid and sustainable development in the near future. The economic growth of regions is beneficial also for the development of education, especially higher education. Keeping up with growing demands and standards means taking new challenges. Postponing any actions arising from the need of the moment can lead to increased unemployment and further depopulation of the country, despite the relatively high birth rate compared to other European Union countries.

The plans involve the development of the regions into two directions: an increase in innovation and use of local characteristics and available, yet not fully used local resources.

Waldemar Pawlak, Minister of Economy stated that: “Clusters and parks may also provide for local essential element of the strategy to attract investors – Industry specialization may indeed stand the municipality, district, compared to other regions and their offers” and in a clear way encouraged the authorities to support and develop clusters.

In the view of the almost unprecedented technological development in surveying and increased inner competition, there is an urgent need for consolidation of economic agents operating in the field of geodesy. Progress takes place primarily in two areas: hardware and software. Currently, modern surveying instruments necessitates a complete change of surveying technology. Increasingly, it happens that the first new equipment is offered for sale, and then all the possible learning for its application is explored. Similar problems can be observed in many other areas of economic life. The introduction of GPS-s and scanners confirms that the development of technology often precedes theoretical considerations determining the applicability of the equipment. The popularity of GPS-s, further size reductions, increasing the positioning accuracy and cost reduction can actually cause unpredictable changes in the educational process and the technologies of surveying. The introduction of inertial sensors and the constant expansion of the (currently carried out with good results working on the use of GPS in underground)

may even exclude many traditional surveying instruments. Alongside technological development is the development of all types of software and information transmission. Cooperation between test station and the office in real time is now becoming standard. It is difficult to estimate the effects of geodetic scanners on the development of the industry. Manufacturers of the technologically developed equipment are not able to determine all its possible applications. In the history, the revolutionary development and advancement of technical ideas always caused a strong transformation in the economy. In surveying, on one hand we see a direct reduction of working time thanks to the surveyor's multitask instruments, on the other hand, the increasing need for collecting, processing and analysis of spatial data. In addition, the development of control systems in buildings could significantly reduce the traditional field of surveying the use of linear structures.

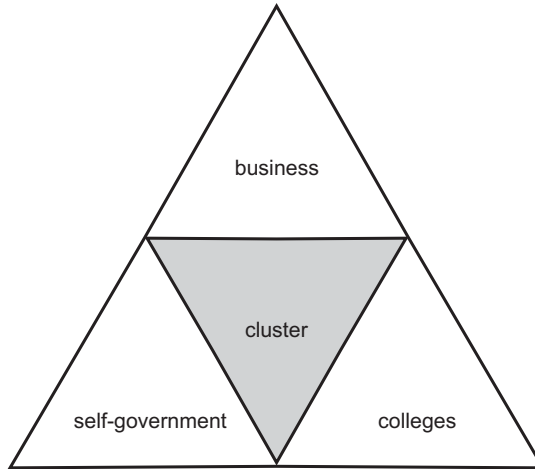
Technological changes in the coming years will lead to increased competition by continuous pressure to have more hardware and continuing skills development. Strong competition caused by large and financially strong companies can eliminate many small and medium surveying companies from the market. A very similar situation can be observed in the IT market. The occupation of a programmer is a freelance profession. Unfortunately, the tendency to take over small and medium companies in IT business is a fact. Small businesses often face the choice either to be employed in a big company or agree to be absorbed. One possible solution in such a difficult situation for companies is to organize activities in the form of clusters. U.S. experience has shown that it is possible for small businesses to compete with the giants, provided they cooperate closely. One of the possible solutions of cooperation among small businesses in surveying is a cluster.

### 3. Theoretical Basis of Clusters

A cluster is a field of action of many subjects [5]:

- business,
- education,
- state and local authorities,
- financial institutions (banks, venture capital, business angels etc.),
- private and public-private partnerships (NGOs, chambers of commerce, formal networks, cluster organizations etc.)
- media.

Base and foundation, however, there are three elements (Fig. 1): business, government and research units.



**Fig. 1.** Schematic diagram of the cluster

### **Geodesic Clustering – Vision and Performance**

Creating a geodesic cluster one must rely on theoretical foundations and experience of existing and already operating clusters in Poland. A good example of cooperation of many entities is ICT Pomeranian Cluster consisting of 86 entities under whose employment there are about 16 thousand employees within several provinces.

The vision of Surveying Cluster is recognizable brand in the region and country.

The mission is creating favorable conditions for business development industry and related geodesic industries through: cooperation, exchange of technical ideas, joint purchase of equipment, supply in innovative knowledge, encouragement in joint actions while working on bigger projects.

The Surveying Cluster mission should be performed by:

- providing access to new technologies for measuring and stimulating:
  - training and workshops for entrepreneurs,
  - close cooperation between business and science,
  - implementation of research and development projects within the cluster,
  - research in surveying equipment;
- providing access to skilled human resources:
  - the adaptation of curricula for Geodesy and Cartography to the expectations of the industry,
  - implementation of joint cross-industry training projects (such as control systems for road construction),

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- the possibility to obtain certificates by students with high-tech service hardware or software during the learning process,
  - to seek ever broader spectrum of geodetic application of knowledge in economic life,
  - to promote surveying as a universal field of study;
  - enabling cooperation among the members of the cluster and support the development of surveying companies:
    - common participation in auctions,
    - exchange of information,
    - training workshops,
    - creating a common data base,
    - mutual borrowing of specialized equipment,
    - launching of common services for members of the cluster such as accounting or legal,
    - integration and business meetings;
  - promotion of the cluster as a strong alternative for large companies:
    - ensuring effective information flow within the cluster,
    - the joint purchase of hardware and software for the cluster operators,
    - care for the representation of the cluster in the economic and institutional field,
    - participation in interregional and international work,
    - common database of geodetic,
    - making and sharing all types of the cluster analysis and market forecasts.
    - shared site of surveying services;
  - cluster are active in the field of surveying human resource development:
    - a survey within the cluster to meet the needs of hardware, technology, staffing and training,
    - preparation of proposals for amendments to the Human Capital Operational Programme, Action 8.1.1 (to be approved by MRD)
    - submission of proposals for changes Ministry of National Education on the principles of the reform of education 2012 (vocational and technical schools),
    - a platform for cooperation in education between enterprises,
    - organizing training courses and vocational training, apprenticeships,
    - run for students and increase the capacity of educational placements for graduates,
    - collaboration between universities and entrepreneurs in the implementation of common research objectives,
    - acquisition of additional funding sources to increase the availability of training courses.

#### 4. Organisational Forms of Geodetic Clustering

Vital element of a cluster creation is its legal form. Currently existing law regulations in force admit the existence of many different organizational forms for cluster functioning [5]. The most common forms are: association, foundation, consortium and commercial law companies. The table 1 presents the percentage of different organisational forms currently functioning in Poland.

**Table 1.** The percentage of particular organisational forms in the general number of clusters

Organisational forms	Associations	Foundation	Consortium	Limited Liability company	Joint stock company	Other organisational forms
Percentage [%]	43	41	12	2	1	1

Because of the lack of data concerning the existence of all clusters, especially those newly set, the data given in the table undergo very dynamic changes. Practically we learn about the existence of many clusters the moment when they undertake particular actions. In connection to this presented data should be treated rather as data referring to clusters actually working than those existing. Nonetheless the data presented in the table no 1 are completely sufficient to estimate the trends. Generally there is a strong division in the structures into non-governmental organisations, namely associations and foundations, consortia and commercial law companies. Associations and foundations from the point of view of a cluster have a very similar activity profile [6]. The fundamental difference is the way of appointing the organisation and founding element (members, founders). In a foundation the founder has more control over the organisation, and in the case of association the initiative and the direction of activity depend on members. Over eighty percent participation of non-governmental organisations in all the remaining clusters clearly shows that vast majority of business entities watch for better opportunities to realise their goals in such organisational form. Another legal form is consortium understood as civil-law contract. This form joins the advantages of the non-governmental organisations with advantages offered by commercial law companies. Consortium also joins the disadvantages offered by the two organisations. Weak point of this solution is relatively short period of the consortium existence, which in Polish conditions most often means task-oriented character. Commercial law companies however offer bigger capital possibilities. In situations when business entities own a big capital and intend to perform valuable transactions of the commercial law company, they will probably function best. Additionally partnerships give benefits resulting from the shortening the path of

decision-taking and in all types of efforts to receive a grant. For instance, if a university is a member of a cluster then in the case of this cluster's activity in the form of non-governmental organisations all the important financial decisions should be first accepted by the university senate. This makes the decision process more difficult and complicated. If the same university decided to function in a cluster acting in the form of a commercial law company board of directors fully takes over full ability to make decisions. These are the reasons why the choice of the legal form is one of the most important decisions which have to be made by the founders of the cluster.

## 5. Organisational Structure within the Cluster

After making the decision concerning the legal form, another equally important one is the decision concerning accepting the organizational structure within the cluster. The exemplary structure in use in Pomorski Cluster ITC (Fig. 2).

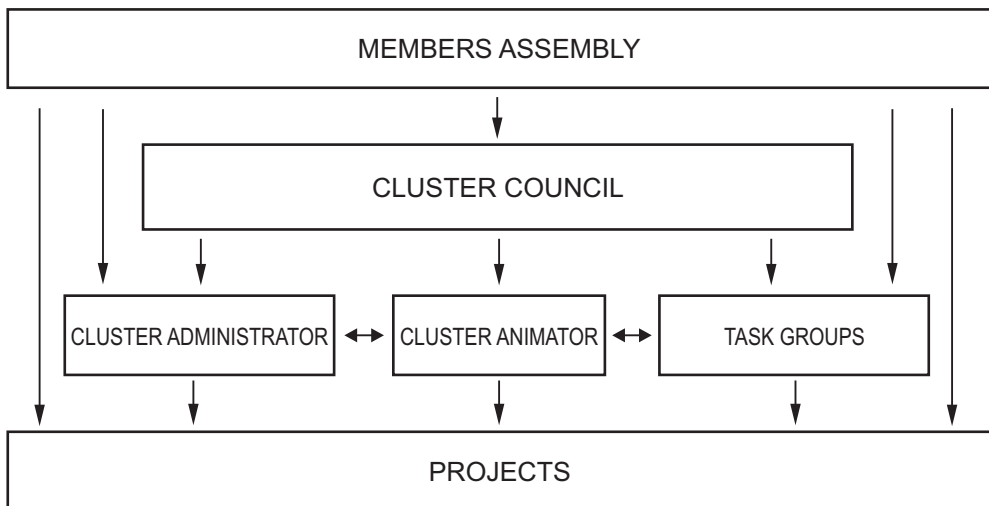


Fig. 2. Organisational scheme of the Pomorski Cluster ITC

Advantages of the structure of Pomorski Cluster IT:

- clear and ordered structure,
- uniform representation of all the cluster members,
- easy exchange of information within the cluster,
- positive initiating action “task-oriented groups”.

Disadvantages of the structure:

- exchange of the role of administrator and animator of the cluster,
- great dependence of cluster actions on the actions of the cluster animator.

### **Possibilities of Usage of the Structure of Pomorski Cluster ITC for a Geodetic Cluster**

The organisational structure of the Pomorski Cluster ITC is very suitable for big organisations. It assures the possibility of application in projects practically from every level in a direct or indirect way. Geodetic clusters are, however going to concentrate much smaller business entities and their functioning will effectively decrease the threshold of the economic initiative for many business entities. In a cluster it is easier to start the activity and enter the market with much smaller capital and technical-equipment infrastructure. Thanks to the cooperation entrepreneurs may receive the access to a unique technology, equipment and human resources. In the geodetic trade we mostly deal with small enterprises, very often one person or two people only. In some sense this activity will be more similar to the activity of liberal professions than classical enterprise. Geodesists very often work the local government units and additionally they run their own business activity. This situation creates strong competitiveness and very often working below cost. Creating a cluster would most probably initiate positive integration of business entities working in it.

## **6. Conclusions**

Creating a geodetic cluster is fully justified. Dynamics of changes in economy is going to force the consolidation of small and middle-sized enterprises [3]. Joining a cluster or a similar institution for many enterprises can be an efficient defense against consumptive competitiveness. Possibilities offered by grants for this kind of business entities are a good opportunity to receive additional means for entrepreneurs.

Relying on the experience of other clusters we can accept the following program assumptions for geodetic clusters:

- up to 1 year: co-financing of the EU project for the cluster development,
- up to 2 years: common realisation of the business or research project,
- up to 5 years: vital participation in the geodetic services market (up to 20%).

Bringing a common EU project would certainly strengthen the faith in the activity of enterprises working within the cluster.

EU project for developing a geodetic cluster should include among others:

- creating the Cluster office,
- development of the staff for the geodetic trade in the region,
- developing promotion and cooperation within the Cluster,
- cooperation with scientific-research units.



Predicted problems:

- distrust of entrepreneurs towards new economic forms,
- no proper involvement on behalf of the authorities,
- no professional coordinator (animator),
- no good value analyses within the range of future trends in the geodetic trends,
- no alternative sources of financing of the cluster activity,
- little developed infrastructure of the cluster,
- not using of possibilities offered by the common export activity and the Internet,
- difficulties in the organisation of changes of educational programmes,
- limited possibilities of participation in big projects requiring significant finances.

## 7. Summary

Functioning of the geodetic trade in the area of small and middle-sized companies in the structure of the cluster and the versatile usage of support programs aimed at supporting entrepreneurship in EU after 2013. It is predicted, and it results from many EU documents, that in the structures of EU it will be the basic form of support of small business in the next few years. However for many business entities functioning within the cluster can allow them to compete effectively with strong and big geodetic companies. In many cases the level of integration and cooperation of small and middle-sized companies will decide on the further functioning and the possibility of further existence. In the author's opinion Geodetic Clusters are an efficient forms of strengthening of the liberal profession of the geodesist and possibility of survival in conditions of ravaging competitiveness.

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