

Industrial clusters development and organisation model

Model razvoja in organizacije industrijskih grozdov

Iztok Palčič

Univerza v Mariboru / Smetanova ulica 17

E-Mail: iztok.palcic@um.si

Abstract: Industrial clusters have been a prevalent element of several national competitiveness policies for the last 15 years. The author of this paper has followed the birth, organisation and performance of industrial clusters in Slovenia and Austria for the period of three years. Based on several in-depth case studies in Slovenia and Austria I have built a cluster development and organisation model applicable to smaller (transitional) countries. I have identified factors that have an impact on cluster development and organisation at the level of general business environment. At the same time I have identified a government role in fostering clusters. But external factors are not the only factors influencing clusters. There are also internal factors that are in the hands of the cluster actors. These are factors that directly influence cluster development and organisation process. I have classified them in four areas and they will be also presented in this paper. I have also identified four stages of cluster birth, organisation and growth. The model is highly applicable as it combines research results with best practices based on several case studies.

Keywords: cluster development, cluster model, cluster organisation, industrial clusters, Slovenia.

Povzetek: Industrijski grozdi so eden ključnih elementov nacionalnih strategij za spodbujanje konkurenčnosti že zadnjih 15 let. Avtor prispevka je tri leta sledil rojstvu, organizaciji in delovanju industrijskih grozdov v Sloveniji in Avstriji. Na osnovi več poglobljenih študij primera v Sloveniji in Avstriji je oblikoval model razvoja in organizacije industrijskih grozdov, primeren za manjše države. Avtor je identificiral dejavnike, ki vplivajo na razvoj in organizacijo industrijskih grozdov v določenem poslovnem okolju. Sočasno s tem je opredelil vlogo države pri spodbujanju industrijskih grozdov. Ugotovil je, da na razvoj grozdov ne vplivajo samo zunanji dejavniki, ampak tudi notranji, ki so v rokah članov grozda. Avtor je notranje dejavnike razvrstil v štiri področja. Prispevek prav tako prikazuje štiri faze razvoja, organizacije in rasti industrijskega grozda. Predstavljeni model je izrazito aplikativen, saj združuje raziskovalne izsledke s praktičnimi izkušnjami, ki jih je avtor pridobil z delovanjem v enem izmed obravnavanih industrijskih grozdov.

Ključne besede: razvoj grozda, model grozda, organizacija grozda, industrijski grozd, Slovenija.

1. Introduction

Various terms and definitions have been used to describe the phenomenon of agglomerations of interlinked firms. Pitelis provided a solid definition of the term "clusters" that embraces most important elements [1]:

"Clusters are agglomerations of firms in a particular activity, usually with geographical dimension, with horizontal and (preferably also) vertical intra- and (preferably) inter-sectoral linkages in the context of facilitatory socio-institutional setting, which cooperate and compete in (inter)national markets."

Clusters of high-technology firms have become an important source of economic development across the advanced industrial economies, and a central focus of technology policy. Many research studies have

provided descriptions of successful clusters and the existence of social networks, labour mobility and knowledge availability have been identified as crucial components that make clusters relevant for wider economic policy [2].

Although the cluster concept is quite widely recognised today, it is still just a concept rather than being supported by a well-defined body of knowledge. There is a need for research to put flesh onto the concept and establish operating principles and guidelines. There are many open questions concerning the creation and nature of clusters and concerning the operations management of clusters [3].

Hundreds of cluster initiatives have been launched involving virtually all regions in the world and the number is still growing. However, there is surprisingly little systematic knowledge of these initiatives, their

structures and their outcomes. This is a gap in the world literature that should be filled. The main contribution of this paper is a proposed model of cluster development, organisation and growth, especially applicable for smaller, even transition countries.

The paper is organised as follows. The introduction comprises a background of the paper. The next chapter presents the concept of industrial cluster in general. Third chapter briefly introduces industrial clusters in Slovenia, followed by a chapter that presents the research methodology and methods used to analyse the cluster development and organisation process. The results and findings are presented in the fifth chapter. Finally, we discuss our results and present some implications.

2. The concept of industrial clusters

Porter defines industrial clusters as geographic concentrations of interconnected firms, specialized suppliers, service providers, firms in related industries, and associated institutions (e.g., universities, standards agencies, trade associations) in a particular field that compete but also cooperate [4]. In his work he argues that first response to globalisation has been to pursue benefits by moving assembly plants and other factor cost sensitive activities to low-cost location. Anything that can be efficiently sourced from a distance, however, has been essentially nullified as a competitive advantage in advanced economies. Information and relationship that can be accessed and maintained via ICT are available to anyone. While global sourcing and communication mitigates disadvantages, it does not create advantages. Moreover, distant sourcing is normally a second-best solution compared to accessing a competitive local cluster in terms of both total productivity and innovation. Paradoxically then, the enduring competitive advantages in a global economy are often heavily local, arising from concentrations of highly specialized skills and knowledge, institutions, rivals, related businesses and sophisticated customers in a particular nation or region. Proximity in geographic, cultural and institutional terms allows special access, special relationships, better information, powerful incentives and other advantages in productivity and productivity growth that are difficult to tap from a distance. Standard inputs, information and technologies are readily available via globalisation, then, while more advanced dimensions of competition remain geographically bounded.

Fulder et al. describe industrial clusters as the answer to the processes like globalisation, rapid technological development, where they can satisfy the need for faster development of global competitive capabilities of the business environment in the single country and regions [5]. OECD defines clusters as networks of production of strongly interdependent firms (including specialised suppliers) linked to each

other in a value-adding production chain. In some cases, clusters also encompass strategic alliances with universities, research institutes, knowledge-intensive business services, bridging institutions (brokers, consultants) and customers [6].

Maskell and Lorenzen also consider cluster as market organisation where commodities, services, and knowledge are traded in a notably efficient way among the insiders. In such a notion, an industrial cluster is then an alternative way of organising a firm or industry's value adding activities or value chain [7]. In addition to the characteristics of cost, process, and production associated with traditional industrial clusters, Porter also points out that clusters affect competition in three broad ways: first by increasing the productivity of constituent firms through specialization; second, by increasing the capacity of innovation; and third, by stimulating the formation of new businesses [8]. Geographical proximity has a positive influence on innovation activities [9]. The local concentration of quality human resources, needed inputs, and related services makes formation of new firms easier. Therefore, the presence of a well-developed cluster provides powerful benefits to productivity and the capacity to innovate that are hard to match by firms based elsewhere [4, 10].

Clusters can be also interpreted as reduced-scale national innovation systems. The dynamics, system characteristics and interdependencies of individual clusters are similar to those of national innovation systems. Clusters differ from other forms of cooperation and networks in that the actors involved in a cluster are linked in a value chain. The cluster concept goes beyond »simple« horizontal networks in which firms, operating on the same end-product market and belonging to the same industry group, cooperate on aspects such as R&D, demonstration programmes, collective marketing or purchasing policy. Clusters are often cross-sectoral (vertical and/or lateral) networks, made up of dissimilar and complementary firms specialising around a specific link or knowledge base in the value chain. Although innovation is stimulated by horizontal struggles between competitors operating on the same product markets, vertical relations between suppliers, main producers and users are equally important for creating innovations [11].

There are several reasons for the importance of geographical proximity in the overall transformation process of the firms as well as of the agglomerations themselves [9]. The challenge behind understanding how a cluster may benefit from, and sustain, international competitiveness lies in analyzing how the clusters can develop linkages to control the sources of specialized knowledge, wherever they exist around the world [12]. Agglomerated firms within related sectors may increase the capacity to create knowledge and an intensified division of labor. The interactions between economic activities and local institutions make the

agglomeration more attractive and the value created may justify the additional cost [13].

During the past two decades, industrial clusters and their evolution have drawn lots of attention from both academic and policy arenas. One important reason for this is the fact that the emergence and roles of industrial clusters as an important industrial organisation in the economic system have significantly challenged and changed the traditional rules of industry competition [4, 14]. Under such circumstances, policy-makers do not focus solely on large enterprises in building national capabilities, and geographical clusters of firms are seen as drivers of national competitiveness and economic growth. Therefore, the question of how to promote the formation, development and upgrading of industrial clusters has been emphasized in policy-making for regional development around the world since the 1990s [15].

3. Industrial clusters in Slovenia

The Slovenian Ministry of Economics started the clustering concept in 2001, as the ministry recognized both the value of industry clusters and the need for greater innovation and networking among Slovenian manufacturers. Quickly industrial clusters became a part of the Programme of measures for fostering entrepreneurship and competitiveness. In 1999 three pilot projects were launched: Toolmakers Cluster of Slovenia (TCS), Slovenian Automotive Cluster (ACS) and Slovenian Transportation-logistic cluster. Since then the number of clusters has been continuously rising. It reached a number around thirty clusters that were successfully operating in Slovenia in the field of automotive industry, tool making industry, transportation, logistics, air conditioning, building construction, plastics, ecology, textile, wood, tourism, catering, hotels, geodesy etc. In the observed period of research (from 2001-2005) the cluster policy presented a pillar of Slovenian Government's industrial policy.

The Slovenian Ministry of Economics spent almost 9 million Euros for establishing and supporting 29 clusters in Slovenia in the period from 2001 until 2004. Majority of the funds was for cluster organisational aspects (establishing legal form, promotional activities, joint infrastructure etc.). The analysis of cluster policy measures from 2001-2004 proved positive effects on local economy. The Slovenian Ministry of Economy developed a systematic framework for developing industry clusters and soon it has been widely recognized that cluster policy in Slovenia was among the best in developing countries. It was constantly used as a case study in different publications and presentations (e. g. [16]). In 2006 TCS was named as one of the most innovative cluster in Europe (by EU IRE – Innovative regions). The manager of ACS was recognised as the best cluster-manager in Europe in 2006 by the Europe INNOVA initiative.

Despite all that, in 2005 a new government stopped direct funding of clusters. That was a huge barrier for younger clusters. Many of these clusters lost their starting enthusiasm and simply disappeared. Older and more established clusters continued to exist, but also faced many unexpected problems. Many joint projects were endangered, especially R&D projects. Clusters had to find additional funding elsewhere. Majority of smaller cluster disappeared. The original clusters, namely TCS and ACS still exist and operate. The government did not support cluster R&D projects in preference to other R&D projects. In the period from 2005 to 2013 cluster policy was not the important part of national policy to foster competitiveness and entrepreneurship of Slovenia. Nevertheless, the importance of clusters in neighbouring regions continues to grow.

4. Research methodology

The focus of our research was developing a cluster model in smaller transitional countries. The research has adopted a case study methodology [17] with a significant element of action research [18].

A case study research strategy enabled us to focus on understanding the dynamics of the phenomenon observed. The case study methodology is appropriate when the boundaries between phenomenon and context are not clearly evident. The case study's purpose may be strictly to describe a situation but, more often, it is to understand how or why events occur [19]. We attempted to study a particular process of cluster birth, development, organisation and growth and grasp the conditions surrounding the phenomenon to build a plausible explanation or discover a causal relationship that links the antecedents to the result. [5] also argues that case study is an objective, in-depth examination of contemporary phenomenon where the investigator has little control over events. This definition covers several significant points. First, the study typically involves one or more researchers gathering a considerable volume of data from within an organisation to develop the least possible picture of the phenomenon. The data may come from primary sources (such as direct observation or interviews of people involved). It may examine a single situation or, with multiple-case studies, several related situations. Second, distinct from historical studies, case study research generally focuses on current conditions, using historical data primarily to understand or substantiate the information gathered about the ongoing situation. Third, the researcher usually has little or no capability of manipulating events (in contrast to action research, where the researcher is involved as a participant and director of events in a natural setting).

Three case studies have been selected (industrial clusters) that served as a way for data gathering. The most important case study is TCS that has been the most detailed case study and at the same time a place to conduct action research. Two other case studies

were ACS and Automotive cluster of Austria (AC Styria) to deepen our understanding of researched phenomenon. The recommended number of selected case studies is usually between 4 and 10, but in this case that was not feasible because of the complexity of the studied problems.

The data was gathered in real business environment in specific firms and other organisations. Most of the data was qualitative, but in order to interpret the results additional quantitative data was also used. The author has used primary and secondary data sources. Direct observations of the events were possible because of the active participation in TCS. The author had a chance to participate in business meetings. He has also been involved in preparing and managing several TCS

projects (e. g. building database of existing and future knowledge and technologies, arranging and conducting business meetings with potential business partners). Active participation in TCS has enabled to gather data that otherwise would not be available. This especially refers to data, gathered through informal contacts with top managers in TCS. The next primary source was interviews with top managers of firms and other relevant informants. The interviews normally lasted 2 hours. They were tape recorded and transcribed in the hours immediately following the interviews. Interviews were conducted in TCS, ACS and AC Styria. Table 1 summarises all interviews.

Table 1. Conducted formal interviews for research purposes

Cluster	Organisation / member	Number of interviews
TCS	Firms	24
	Program manager	5
ACS	Firms	10
	Consultants	2
AC Styria	Firms	1
	The Styrian Business Promotion Agency (SFG)	1
	Chamber of Commerce and Industry Maribor	1
	Consulting firm	1
Other	Slovenian Ministry of Economics	2
	Σ	31

The secondary sources were documents, sometimes even classified documents (minutes and notes from meetings, business documentation, reports, newsletters, etc). The author also kept a diary of relevant events that happened in the period of four years. He also made notes, observations, impressions, ideas and analysed them accordingly. The use of different data sources improves the validity of the proposed models.

Action research element was extremely important to grasp the dynamics of cooperative activities between members of studied cluster. It is an approach to research that aims both at taking action and creating knowledge or theory about that action. The outcomes are both an action and research which, unlike traditional positivist science, aims at creating knowledge only [18]. It is important that the researcher is actively involved in the action of the examined system. As already mentioned the author of this paper was heavily involved in activities of TCS. For example he prepared a catalogue of technologies and knowledge within TCS. This catalogue was also a basis for understanding the relationships between firms with respect to technologies and knowledge. It was a starting point to build technology network. This enabled him to be part of initiated actions and also reflecting on consequences by developing knowledge informative to theory building. The research has focused on current situation in the cluster. Historical

events were helping to understand the current situation.

5. Cluster development and organisation model

5.1. Industrial cluster model

Based on intense studying of theoretical perspectives, domestic and foreign best practices and especially on the research conducted with the appropriate research methodology (case study and action research) the author prepared a model of cluster development and organisation process. This model also includes practical experiences with TCS, ACS and AC Styria. Building the cluster development and organisation model was the first part; the second part was the identification of factors influencing cluster development and organisation process.

The author has classified the cluster development and organisation process into four stages:

1. Cluster initiative – local economy analysis, governmental approach to cluster;
2. Cluster definition – the mapping of cluster, cluster definition, setting the leading team, setting a cluster vision, looking for partners, membership analysis, strategic cluster development plan, cluster development structure, cluster project organisation;

3. Cluster development – short-term plans, building trust and networking, building cluster ICT support, education and training, cluster promotion, technological development strategy;
4. Cluster growth and technological development – internationalisation strategy, cluster restructuring, cluster monitoring.

Cluster initiative stage encompasses the analysis of local and national business environment. Basic characteristics of business environment have to be identified in order to find out the potential for new clusters formation. In this initial phase a governmental role is very important. Government must promote the cluster concept in the region (bottom-up or top-down approach) and help cluster initiatives with advice.

Cluster definition stage comprises several activities, such as cluster mapping, definition of cluster context, setting the leading team, setting the cluster vision, looking for partners, membership analysis, formation of strategic development plan, cluster development structure, cluster project organisation. In this stage is important to define cluster context, its core business and members, vision and top management.

After the cluster definition it is important that the cluster starts to develop immediately. The starting enthusiasm of the cluster members and particularly cluster top management must be transformed into action. Cluster development stage comprises several activities that differ from one cluster to another. Some of them should be present in each cluster: formation of short-term plans, building trust and networking, cluster ICT support, education and training, cluster promotion and technological development strategy.

The last stage is cluster growth and technological development. Cluster growth is associated with cluster physical growth and cluster competitiveness growth. Physical growth means acquiring new members, growth of existing members, linkages with other networks and clusters, new suppliers, new buyers etc. Clusters have great impact on productivity, innovation activities and formation of new businesses and all of these factors contribute to competitiveness growth of a cluster. At the same time competitiveness depends on new technologies and knowledge – cluster technological development. In this stage clusters go through internationalisation activities and organisational restructuring. It is also important that all activities are monitored.

5.2 Cluster development and organisation factors

The clusters are at least in their core a part of a national environment. This environment, in which clusters are born and developed, consists of four levels: general business environment, governmental cluster policy, microeconomic business environment (embedded in Porter's diamond model) and clusters. General business environment of the nation consists further of five pillars: national history and culture, geographical position, legal framework and

institutions, macroeconomic environment and infrastructure. We will take a look at each of them more in detail. These characteristics of business environment must be taken into account when we start with cluster initiatives.

The factors that have an impact on cluster development and organisation at the level of general business environment are:

1. National history and culture (level of development of market economy, level of experience in competition and cooperation between firms, level of cooperation between industry and R&D institutions, level of firms' acquaintance, level of trust between firms, level of trust in governmental organisations, level of impact of governmental policy in economy, existence of organisations to foster cooperation between private and public sector or to serve as a »glue« in society, social capital in overall society, entrepreneurship climate and culture).
2. Geographical position (physical position with infrastructure, natural resources, closeness of countries with developed clusters, geographical closeness of markets and customers).
3. The legal framework and institutions (governmental institutions, institutions for cooperation, educational system, intellectual property rights, environmental legal framework, jurisdiction, regional policy).
4. Macroeconomics with its goals (a favourable currency exchange, a low inflation rate, a positive balance, appropriate employment rate, a favourable fiscal policy (taxes), monetary policy, a foreign economic policy).
5. Infrastructure (local schools, universities, local trading associations, economic development agencies, regional agencies, technology centres, technology parks, business incubators with researchers, roads, railways, ports and airports, garbage disposal, communication linkages).

The second level is governmental cluster policy. The government has the following roles in dealing with industrial clusters:

- initiator (public calls, cluster policy),
- catalyst (new ideas),
- financier (at the beginning of the cluster formation, R&D projects),
- stimulator (of all actors in local economy to upgrade business environment, to set local vision),
- adviser (expert help with cluster development and organisation in initial stage),
- linkage (between private and public sector, governmental institutions firms – forums),
- caretaker (of favourable business environment, macroeconomic and political stability),
- doctor (removing gaps and errors in business environment),

- guardian (competitiveness policy, intellectual property rights, legal framework),
- tutor and mentor (training cluster managers),
- promoter (of the cluster concept home and abroad, new investors, new capital),
- agent (for knowledge exchange, R&D),
- buyer,
- informant (foresight studies, trends),
- constructor (infrastructure, physical supporting environment).

The third level is a step from macro level to micro level, described in Porter's diamond model. This model is used to illustrate the quality of regional business environment and regional productivity. Its four determinants (context for firm strategy and rivalry; factor (input) conditions; demand conditions; related and supporting industries) lead to the occurrence of interdependent competitive sectors in economy – industrial clusters. The cluster development and organisation process have already been presented. The micro level ends with a firm, as a central building-block of clusters and national economies.

External factors are coming from cluster business environment and the cluster does not have any impact on them in the beginning. The cluster can influence some of these factors later, when it is formed, developed and a powerful actor in regional and national economy (e.g. lobbying). The clusters can have an impact on legal framework and institutions, infrastructure as well as on future governmental cluster policy. With their business results the clusters can indirectly influence macroeconomics trends (the only condition is a sufficient critical mass of involved actors and many interdependent clusters).

But external factors are not the only factors influencing clusters. There are also internal factors that are in the hands of the cluster actors. These are factors that directly influence the cluster development and organisation process. The author has classified them in four areas: cluster size and structure; cluster members' enthusiasm; cluster members' leadership capabilities and organisational approaches.

The cluster size and structure that primarily influences cluster organisation:

- Critical mass – the cluster birth is reasonable only if there is enough firms and other organisations;
- The size – the higher number of members means more problems with organisational issues and with achieving consensus on what actions to perform. Large clusters are definitely preferable after overcoming these initial organisational problems. This is why it is recommended for a cluster to have just a core of actors at the beginning. This cluster core sets the rules of the game;

- SMEs and large firms ratio – there is a place for each and every type and size of firms in a cluster;
- Vertical and horizontal relationships ratio in the cluster – each dimension brings different relationships between cluster firms and different means of cooperation and cluster organisation;
- Presence of leading regional and national firms – these firms have a direct impact on attracting new members and different cluster organisation (establishment of internal networks and value chains around these firms);
- Geographical diffusion and focus – greater geographical proximity means easier organisation;
- Structural gaps – identification of gaps in value chains influences the cluster organisation (attracting new missing links, outsourcing specific activities).

Cluster members' enthusiasm primarily influences the:

- Visionaries – setting the common cluster vision, foreseeing cluster future, setting cluster core competence;
- Members' consensus – defined consensus on what actions to perform, common goals, common strategies, help with individual cluster members' goals, cooperation on common areas of interest;
- Willingness to cooperate and to network – the firms must start opening themselves, look for business partners and business opportunities;
- Firms' activity – only active and risk taking firms contribute to cluster development;
- Energy and enthusiasm of cluster members – a driver for cluster development;
- Understanding the essence of cluster and clustering process – this understanding has a direct impact on long-term cluster development process.

Leadership capabilities:

- Leadership team – skills to manage network organisations and all the qualities, mentioned at cluster members' enthusiasm;
- Cluster manager – with all characteristics a good leader must possess;
- Consultancy help – if there is not enough knowledge for cluster development and organisation or to ensure neutrality;
- Equality for all cluster members – the feeling of inequality never contributes to cluster development.

Organisational approaches in cluster:

- Formal organisation with its linking centre;
- The use of information and communication technology to connect all cluster members;

- Project management – cluster project organisation;
- Flexible organisational forms – simple organisational adjustments must be possible with cluster growth and new challenges;
- Monitoring – periodic cluster performance control (figure 1).

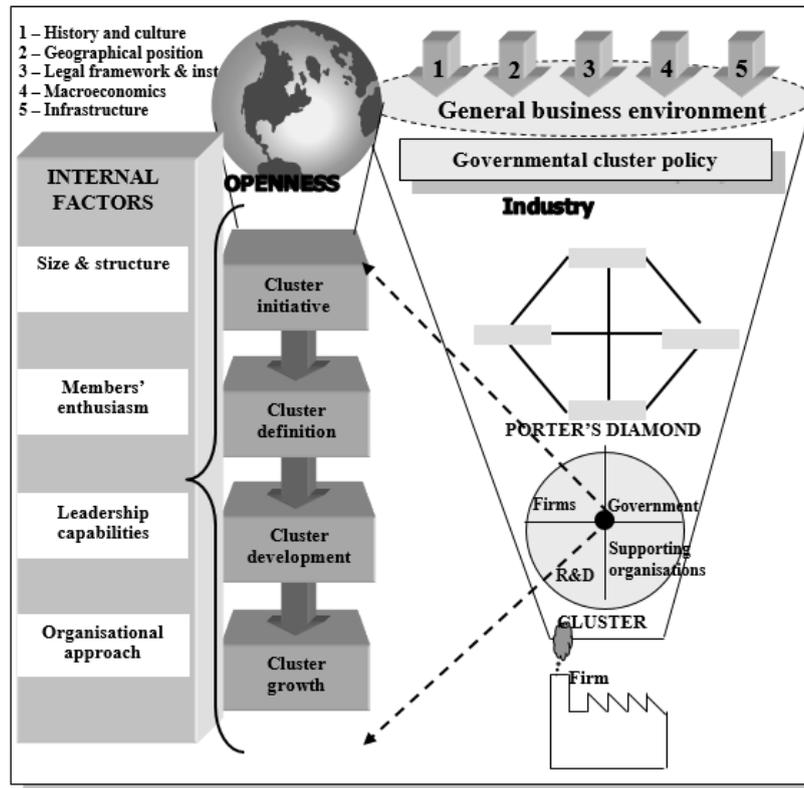


Figure 1. A cluster development and organisation model

6. Conclusions

Recent development of industrial clusters shows that it is not enough for clusters to be locally strong. On the contrary, they must tend to be globally strong and dynamic (local dynamism, global attractiveness, global market reach). A strong cluster core with local actors must become a part of international – global business environment and accept foreign influence. With one word, cluster must be open, which means:

- clusters must allow the entrance of new domestic firms and other organisations,
- clusters must welcome also the firms that do not seem to fit in the cluster,
- competition must be welcomed and not persecuted,
- cluster must welcome foreign firms and other organisations,
- cluster must attract foreign direct investments,
- cluster must attract as many as possible different financial resources from public and in particularly private sector,
- no monopoly, cartels and trusts,
- no trading limitations,

- no competitiveness protection by the government,
- cooperation with other domestic clusters,
- cooperation with foreign clusters from the same (similar) or different industries,
- cooperation with foreign multi-national firms and other firms and R&D institutions,
- more communication between firms and between firms and other organisations,
- comparison with other domestic and foreign clusters – benchmarking,
- continuous promotion and building of globally recognised cluster trade mark.

Although industrial clusters are not as popular as five years ago they were one of the main reasons that Slovenian firms started to cooperate more openly. A good combination of “top-down” and “bottom-up” approach of the clustering policy made this possible. A new network forms have developed since then, such as technological platforms, living labs etc. A recent study (in 2006, 2009 and 2012) performed by the author of this paper among manufacturing firms in Slovenia provided extremely interesting results. In comparison with several European countries Slovenian

manufacturing firms were the ones that had the higher percentage of cooperation with other firms and R&D institutions. Surprisingly, or not, a part of this fact can be explained by the clustering policy in the first half of past decade.

What will happen to clusters in the future? It is hard to predict, but is already clearly evident that the clusters are here to stay. It is quite possible that the organisational form of an industrial cluster will change. Clusters will perhaps even change their name. That is not the most important thing. What is important is the idea of clustering:

»The organisational form – industrial cluster – is not that much important. Much more important is the idea to link with other economic entities, to cooperate and at the same time compete with other firms and organisations from the same or different industries. The firms, academia, other R&D organisations, governmental bodies and the whole supporting infrastructure – we are all in mutually dependent and we have to learn how to use our potentials and potentials of others in order to reach synergetic effects. Cooperation and linkages of different spheres in a particular country have definitely increased competitiveness of regions and nations around the world and therefore brought to a greater prosperity. Whoever works just for himself will not be as successful as those who will work for the local environment and themselves at the same time. Only well-developed business environment can positively affect the development of existing and new firms. We will have to use all local potentials to conquer global markets. So – local knowledge for global success.«

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