

# Analysis of Sectoral Features in Hungarian Accredited Innovation Clusters

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## SUMMARY

*This paper discusses how sectoral characteristics are reflected in the operation of Hungarian accredited innovation clusters. The purpose of this paper is to analyse how sectoral bonding affects the mission of the clusters as well as their innovation and market goals, the membership criteria of the management and the motivation of the members and their cooperation. The study uses a literature review and in-depth interviews to identify the interrelations and the differences between networks and clusters, and to observe several sectoral features in the Hungarian accredited innovation clusters.*

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## INTRODUCTION

Clusters are undergoing a kind of an economic organisational transformation as a response to the challenges of globalisation. While clustering evolved in an organic way in the developed Western countries, in Hungary it was started by the state, governed from above, typically in the more developed regions of the country. The long-term cluster development concept began in 2007 with the introduction of a multi-stage cluster development model (Mag 2012).

In both international and Hungarian practice different types of clusters became common. According to their orientation, one can differentiate between regional (Todtling & Trippel 2005) and industrial (Enright 1996) clusters. In our research we focused on the latter. We sought answers to how sectoral characteristics are reflected in the operation of accredited innovation clusters. We wanted to know how sectoral bonding affects the mission of the clusters as well as their innovation and market goals, the membership criteria of the management and the motivation of the members and their cooperation. The process of clustering is determined by the presence of cross-sectoral clusters, and thus in our study we touch upon these as well.

Beyond enhancing the innovative and market efficiency of its members, innovation clusters can also serve broader, community purposes. Well-functioning clusters may contribute to the development of an entire region or industry (Urbanciková 2011), or can play a major role – through cooperation with universities,

research institutes – in the formulation of knowledge centres, in implementing novel directions of development, in boosting innovative sectors, in increasing employment, in connecting SME sector to the economic circulation, or even in strengthening responsible corporate behaviour. As a combined effect of all they can promote the improvement of the macro-economy.

## INTERRELATIONS AND DIFFERENCES OBSERVED BETWEEN NETWORKS AND CLUSTERS

Business networking gave way to the transformation of the organisation of the economy as a response to the challenges of globalisation. In the changed environment companies need to pay attention not only to their internal environment; they can only exploit their local competitive advantage if they are embedded in business networks (Håkansson & Snehota 1995). It is no different in the case of certain sectors or regions, either.

Although one can find different approaches regarding the terminological distinction of networks and clusters (Ford et al. 1986; Cooke, 2001; Lengyel 2002), there is a consensus about the fact that the foundation stone of both concepts is the relationship system and the

cooperation between the parties. With the formulation of clusters the development of network cooperation has come to a further stage. Formations were created that are nowadays considered as basic units of global competition (Döry & Rechnitzer 2000; Guinet 2001; Europe INNOVA 2008; Örsjan 2009).

In Western Europe and in the developed market economies cluster-oriented innovation has been preferred since the early 1990s. The European Cluster Memorandum (Europe INNOVA 2008) especially highlights the role of clusters in global competition in terms of efficiency and effectiveness of innovation activities. Clusters create a favourable environment and organisational framework for

- the formulation of new ideas, projects via cooperation,
- shortening the way from idea generation to market introduction,
- achieving cooperation ("coopetition") between competing companies,
- making small and medium-sized enterprises able to enjoy the benefits of new business and collaboration opportunities (Europe INNOVA 2008).

In accordance with these, the Memorandum emphasises that in modern competition all clusters are compelled to become innovation clusters.

Innovation clusters are network formations that build on knowledge networks and collaborative innovation systems. Their expansion and consolidation has a favourable effect regarding open innovations that are founded on broad knowledge bases, as well as regarding the conversion of R&D achievements into market success, or the market orientation of innovations. The distinctive characteristics of clusters compared to networks are reviewed based on these criteria.

### *Flexibility, openness, and open flow of information*

While networks are rather closed, relatively stable organisations based on common business goals, clusters are open, more flexible forms of cooperation that are expansive in a variety of directions and have a collective vision (Lengyel 2002). Clusters host an institutionalised open flow of information and knowledge sharing (Grosz 2005; Sölvell 2009;).

Resulting from the above characteristics, clusters provide an ideal framework for network management of innovation processes, opening innovations. Open innovation is rooted in the revelation that all companies – regardless of its internal efficiency – need to be able to have deep and extensive relationships with external knowledge networks and communities (Chesbrough 2003). The benefits can be approached from two sides:

- accelerating internal innovation processes by purposefully utilising the inflow and outflow of knowledge,

- market expansion through extending the network of relationships, a better insight into the market and competition and finding mutual interests.

Clusters create platforms that encourage their members to share their information and ideas with each other and to combine their competences and resources. The "cluster product" of an innovation project is created as a result of common knowledge. Members can learn from one another, while they can also exert a pulling force on each other. They are propelled into continuous renewal through the development of relationships, and they can commit in long-term cooperation.

From the aspect of open innovation it is especially favourable that in clusters cooperation is not restricted to business organisations. Extensive interactions and close cooperation can be established among business organisations, universities and research centres, bridging organisations that provide technological or consulting services and other parties (foundations, chambers, governing institutions, business support agencies, etc.) A wide network platform (Guinet 2001) brings the various professional competencies together, provides a broad view of the whole innovation value chain, and connects the fields of science, technological development, manufacturing and marketing. Therefore, while networks are mainly characterised by codified (explicit) knowledge, clusters furnish a wide space to the utilisation of hidden (tacit) knowledge (Cooke 2001).

Through cluster connections and with the help of the supportive mediation of the management organisation it is easier to gain access to market information, to have a broader view of the market and a better understanding of the competition. The conversion of R&D results into market successes can be promoted by joint market actions, by market acquisition via the utilisation of the relationship networks of each other, or even by the creation of an 'internal' market consisting of purchasing transactions among cluster members. The market introduction of products and services created by the members can be accelerated due to the promotional or communication platform and relationship network of clusters. All of these processes promote the combining of consumer value and technological developments, the market orientation of innovations.

### *The chance of rivalry*

In business networks rivalry rarely occurs, whereas in the case of clusters competitors might be included among members. This makes establishing a climate of trust difficult, and thus requires more attention from the management. However, members can seek for joint solutions to common problems and exchange their experience. Small and large enterprises in the same field can realise mutual benefits through sharing innovative ideas and providing the relationship network that is necessary for market penetration (Szabo et al. 2013). An additional benefit can be cost reduction and improved

bargaining power available via joint procurement. If competitors cover a wide user area, then even despite rivalry market expansion opportunities may arise.

### *Cluster management organisation as a node*

Networks do not have a central node, which means that if one element is “removed” from the net, it will not make the entire system inoperable (Barabási 2003). The same cannot be stated about clusters, as a cluster management organisation itself is the node that connects the members and provides supportive background for cooperation.

The cluster management organisation provides a formal, comprehensive, coordinative framework for its members, and at the same time as the catalyst facilitates their collaboration, networking efforts, coordinates intentions and opportunities of cooperation, utilizes synergies. It plays an important role in the development of effective information chains, in the creation of a climate of trust, and at last but not at least in the exploration of (tender) opportunities. Simultaneously, it fulfils a bridging role between the entire cluster, its membership and the external parties as well. Since the composition and number of the members – being open organisations – can continuously change, the mediating role of the manager organisation is significant from the aspect of promoting the integration of new members and from the aspect of building relationships with the old players.

### *Freeriders*

In clusters “freeriders” can appear as well, who can profit from cluster membership as a result of synergistic effects, or even agglomeration benefits, without actively participating in the joint work or in projects (Roncz 2007). Inactive members usually expect the management to “force grant applications on them” or to contact them to offer them opportunities. In most cases they name their excessive workload as the cause of their passivity, but the cause might also be that there is no project opportunity to which their specific know-how could be linked (this is especially characteristic of the IT sector).

The presence of such members exerts a “pull back” effect on the entire cluster, since the effectiveness of clusters are measured along with indicators such as the number of joint projects or the proportion of participants in completed funded projects. For this reason it is important that the cluster management organisation should demonstrate sufficient activity in exploring funded project opportunities as the basis for joint work, and should have a generative force, thereby it can motivate members. During the development of clusters the membership goes through a continuous cleansing. If

“freeriders” fail to be activated, they may be sieved out, while new players may enrol.

### *Achieving goals for the benefit of the community*

Clusters may serve broader goals beyond the promotion of innovation and market efficiency of the members. They can have a decisive role in the development of a region, in the creation of knowledge centres, in the implementation of novel development trends, in boosting innovative sectors, in increasing employment, or even in the strengthening of responsible corporate behaviour (clusters operating in the environmental industry). As a result of all these factors, their role in the development of macro-economy is significant. It should be highlighted that clusters represent a favourable ground for connecting the SME sector to economic circulation. As a consequence, it is not enough for cluster management to concentrate their efforts on internal issues, but they also need to keep in mind the effects on the development of the whole region and the industry.

## THE PURPOSE OF THE RESEARCH AND THE INTRODUCTION OF THE SAMPLE

In our qualitative research – in line with EU directives – the focus was on accredited innovation clusters.

The basic objective of innovation clusters is to promote the development and market introduction of knowledge-intensive products as a result of joint research and development. Cooperation from a market aspect enhances the improvement of the domestic and international competitiveness of cluster members and the extension of their market outcomes. From a research and development aspect cooperation can contribute to the improvement of the ratio of applied research and to an increase in the number of patents. Hungarian experts on the topic emphasise that the boosting of the employment of researchers with significant results (Dobronyi et al. 2012) is an important aspect. Innovation clusters are highly region-dependent. Plenty of research has proved that the regions where intensive cluster activity can be observed are considered as leading areas in innovation, too (Weisz, 2008; Mag Zrt, 2012; Horváth et al. 2013).

In our research we sought answers to questions like to what extent sectoral characteristics are reflected by the operation of clusters, what kind of innovation and market advantages can be gained by the membership and how it is enhanced by the management organisation – especially information flow and communication -, what the levels of cooperation are, and by what specific characteristics the clusterisation process in Hungary can be described.

The targets of our research were innovative clusters and their affiliates that were awarded or renewed the accreditation title of innovation clusters during the course of our research (the accreditation process is supervised by the MAG Zrt Cluster Development Office). The Cluster Development Office evaluates the received applications by the following main criterias: employment, SME status, export orientation, cooperation and innovation (due to lack of space we are not discussing these criterias in our article).

The period of data recording lasted from July 2011 to May 2014, during which time 21 innovation clusters had been accredited.

The sectoral distribution of domestic innovation clusters shows the dominance of the IT sector and the health industry. ICT-oriented innovation clusters are the most popular. This can be traced back to the "trendiness" of this industry, the rapid diffusion of innovations, and the volatility and diversity of the market. In addition,

Hungarian-owned companies also have a strong presence in these two areas; among start-ups and SMEs this sector is a particularly trendy area. The health care industry has a strong track record of innovation, and among the involved companies regaining lost market positions acts as a significant motivation, and also a cohesive force.

In the first phase of our research, we managed to contact 19 accredited innovation cluster management boards, which provided an access rate of 90.48 per cent. In the second phase we conducted in-depth interviews with cluster members. We were able to contact 40 accredited innovation cluster member companies in this way.

The industrial breakdown of our sample was the following (Figure 1): 33% of the clusters contacted operated in the IT sector, 28% in health industry and 11% in the plastics and packaging industries respectively.

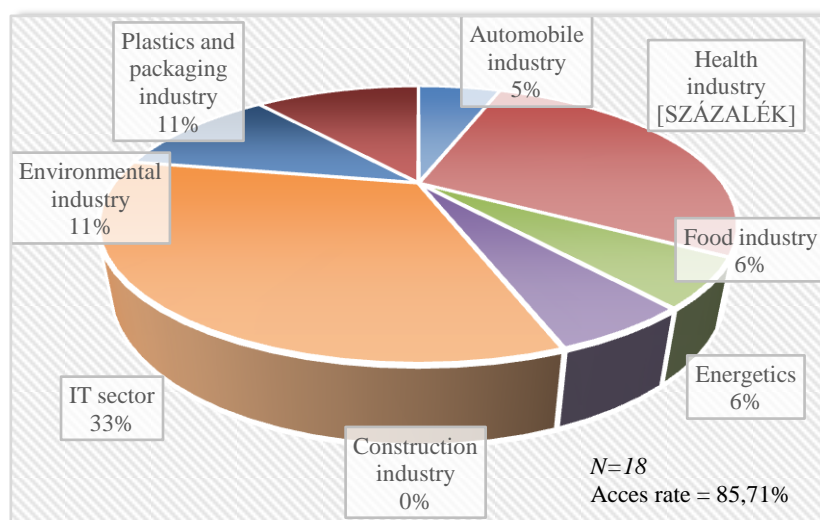


Figure 1 Industrial breakdown

## PRESENTATION OF RESULTS AND DISCUSSION

The sectoral features are expressed in the vision of the clusters, membership criteria, the applied collaborative solutions and forms. The innovative features and market aspirations of cluster members also show a strong correlation with the sectoral characteristics, and the aims that motivate the entry, the expectations of innovation and market advantages of the membership and the cluster management can be derived from it as well. Examples are presented below.

### Medical sector

In the medical field the principal objective of cluster formulation is to increase market opportunities

for the Hungarian companies involved in this industry, which has a long-standing tradition. With the dismemberment of the former large enterprises in this sector, development teams were forced to transform into small companies. Due to the emergence of multinational competitors, and nowadays mainly due to imports, micro, small and medium-sized businesses are almost completely excluded from the internal market. It is unfortunate, because an innovative product structure based on professional competence would allow the coverage of the entire demand structure. Cluster organisation offers an opportunity for the joint action of these domestic companies.

As a consequence, the most important advantage expected by the members is market acquisition by joint action. This partly means export market purposes and partly the exploration of gaps in the domestic market, finding supply opportunities in which the flexibility advantage rooted in smaller company size could be

exploited. Foreign-owned large enterprises competing in the Hungarian market are not interested in the production of tailor-made instruments. Consequently, it is an important sectoral feature that multinational companies are not allowed to join the clusters.

Member companies are characterised by technological and product innovations alike. Innovations are strongly market-oriented, their users respond to needs, in many cases individual needs. It is also an innovation feature to specialise in a given field (e.g. infant medicine). Small companies solely trading in the domestic market represent a significant proportion of the members. These companies are not able to enter the international markets on their own resources, whereas in the domestic market they are in close, professional contact with their users. Thus, access to market information is not a factor of inhibition in innovation, and the market introduction of new development outcomes does not require intensive marketing support, either. However, the presence of non-Hungarian manufacturers' products that provide solutions to the same problems represents a tough competitive challenge.

In this sector funded projects play a significant role, and companies with strong financial status test themselves on the international scene as well. In terms of innovation, the monitoring of international competitors bears decisive importance, but useful sources are foreign trade fairs and the brochures of foreign manufacturers, the monitoring of new solutions of medical technology found on the Internet, and also the exploration of domestic manufacturing facilities. This is related to the fact that in this field a relatively small number of patents are submitted, and it is not common to buy international patents either.

The development of governmental affairs and the improvement of the position of the entire sector plays a pivotal role in the positioning of the clusters on the international scene.

### *IT Sector*

In the IT sector fast development can be seen in terms of the market and technology, making it challenging to forecast changes. Strong business volatility makes it especially important to find good partners, to form synergies, to get acquainted with the ideas of each other and to implement collaboration in a broad platform.

It is possible to find a wide variety of innovative solutions in the clusters operating in this field: development of new products and services and research and development in technology are common. The range of consumer fields is also wide: telecommunications, advertising and service technology, customer service, education, controlling, finance, business, management information systems, etc. Due to extremely rapid technological changes, great emphasis is put on monitoring international trends. In certain segments (e.g.

the field of education, advertising technology) the implementation of new innovative solutions is severely hindered by the price sensitivity of the domestic market and the immaturity of innovation. This provides an important motivation in patenting, ensuring opportunities for market implementation. This research area is represented by relatively significant numbers in clusters, and it is not uncommon that the academic research relationships of the members are built by the time of joining a cluster.

In clusters emerging in the field of IT, market pull and technology push innovations are equally present. Innovations establish on-offer solutions for existing problems, supposing intensive customer relations, frequently for fulfilling individual requirements. On the other hand, companies that create new markets or give rise to new trends (e.g. in customer service) with their development are also represented. It was cluster membership that helped a number of companies to realise that they had not incorporated market aspects into their technology development until that time. Therefore, in this sector the role of cluster membership in shaping attitude is significant.

IT clusters are characterised by the presence of competitors, which places a major responsibility on management to develop a collaborative atmosphere. In such clusters it may happen that the communication of the members with each other develops more slowly than with cluster management, and it can be more problematic to mobilise inactive members. For this reason management organisations that are successful in this field pay great attention to informal communications solutions that help members in establishing relationships.

Clusters in the IT sector show a varied picture concerning the size of companies, and motivations for entry into the innovation cluster as well as the advantages expected by the members are fairly diverse.

Small firms are attracted to the clusters by market considerations, hoping to launch their innovative products on foreign markets, for which the market relationship networks of large corporate members provide a beneficial opportunity. Small businesses, which thanks to their innovative solutions have been able to achieve a market leader position in certain segments beside large enterprises, are also represented. For large enterprises the most important benefit is that they can access innovative solutions that can be incorporated into their portfolio. It is a general feature that member companies can purchase products and services from each other, which also has a market expansion effect. The presence of start-up companies in a relatively large number among members is a sectoral characteristic. For them, access to resources, a well-developed information system and the incubating role of cluster management are particularly important.

In the case of highly innovative companies with a firm market, membership is crucial to promote their innovation processes. The 'critical audience' of a cluster provides useful feedback, it can introduce its research and

development results and it can also test them through connections. The management can enhance this via different solutions: high-tech tests or laboratories, presentations, or ideas for mutual discussion in forums organised by the management.

For less innovative companies membership is advantageous in terms of increasing their innovation capability – primarily through joint projects. With the involvement of financial, relationship and intellectual capital they have the opportunity to generate technologies or products which could not be created independently in the absence of cluster connections.

It can be regarded as a general advantage in the sector that, since they cover similar fields of technology and markets, they have common problems and they can cooperate in seeking solutions to them. Partly this is the reason why certain companies are members of several sectoral clusters.

Among the accredited innovation clusters operating in the IT field differences in levels of development are still rather pronounced. Side by side one can find relatively young organisations as well as those that show outstanding performance and possess substantial experience. Differences can be well measured by both the attitude of the members and the expertise of the management. They are also expressed by how successful it was to create an atmosphere of trust among the members, to what extent cluster management fulfils the role of a catalyst, how the cluster management communicates common successes outside of the cluster, whether there is a well-constructed image of the cluster, and whether steps are taken towards building a common brand.

### *Plastic Processing Industry*

Clusters related to the plastic processing industry show a variety of forms. Both horizontal and vertical organisations can be found, on a regional basis, for the purpose of conjoining companies in a given area that are involved in similar industrial activities, or organised on a market basis, to strengthen collaboration between companies involved in complementary activities.

In the innovative activity of the members of the clusters of this sector technology, machinery and tool improvements, the development of new products and upgrading existing products all play a role. Recycling is a significant driving force for innovation; from the point of view of cluster structure a new development trend can be attributed, namely the introduction of biodegradable plastics, the development of technologies and the promotion of their application. Within the related cluster a project team consisting of several collaborating companies were able to obtain an EU grant for the development of biodegradable materials, the successful implementation of which induced further corporate innovations in conjunction with the applicability of

biodegradable plastics in the printing industry and in the packaging sector.

An important aspect of commercially organised, packing profile cluster organisations is the improvement of the market position of its members. As a result, competitors and non-Hungarian companies are not welcome among the members, since competition in the domestic market is very strong, especially pricewise. The benefits expected by members are mostly marketing-related: greater insight into the market, a better understanding of the opportunities in terms of either potential customers or suppliers, sharing information and experience facilitating it, and building relationships. The lack of competition fosters an atmosphere of trust and strengthens the personal nature of relationships in the partnership. However, as a consequence of the concept of no competitors the hands of the members are bound to some extent, as they cannot start any competing in activities.

Since the members are not competitors, market benefits can be realised from a number of directions. On the one hand in the relation of external customers they are able to complement each other's bids, which can both exert market expansion effects, and can serve tactical and strategic market goals. In case customers order from more than one cluster member it has advantages from the logistics point of view. (Centralized sales have no real chance because of the different technical competencies). On the other hand, the membership also creates an internal market, since the members are users of each other's products. Internal trade allows them to replace their former suppliers with each other. As small enterprises operating in this field are the suppliers of multinational companies, it is also a marketing advantage of cluster membership that it implies a sign of quality to customers. A good atmosphere of trust and greater market insight encourage knowledge sharing, and thereby have a generating effect on innovation.

### *Cross-sectoral cluster organisation*

In addition to clusters featured by the specific sectoral characteristics there are some which are characterised by their cross-sectoral nature. One example is the linkage of the plastics, packaging and printing industries. In addition to cross-sectoral networking and individual development efforts, the aims of such organisations are the creation of common development concepts, the coordination of technological and manufacturing overlaps and, in certain cases, the better exploitation of automotive supply opportunities as a key target. A consequence of the regional character is building close cooperation with local knowledge centers as well (University of Szeged, College of Kecskemét, which became the centre of the education of mechanical engineers in the region of the Southern Great Plains).

Other examples of cross-sectoral cluster organisation can be found in the field of environmental

protection. In highly knowledge-oriented, deliberately heterogeneous clusters it is an important aspect that partners should be able to complement each other, and not regard each other as internal competitors. Their inhomogeneous nature and extensive partnership is explicitly favourable to the flow of information and knowledge and promotes building relationships, and very strong synergies can be utilised. With the participation of groups of companies, academic institutions and municipalities, a complex response can be offered to environmental problems. The membership structure is heterogeneous in terms of the size of enterprises, too. For example large enterprises are mostly involved in technology and product development, on the other side for small firms the communications/marketing support received from the cluster is also a major advantage. It is an important innovation aspect to create competences in the field of environmental protection, whose main direction is the so-called eco-cycle competence. One part of this is technological processes and the other is the management of the innovation chain. Small and large companies collaborate in development projects. Small companies can bring ideas, products and technology, while large companies promote market introduction through their relationship network.

A similar vertical-chain based cluster organisation has been formulated with a wider profile covering the quality of life, food, and pharmaceuticals, where again the complementation of the activities and portfolio of each other is emphasised. Such complete vertical-chain organisations have a strong innovation generating effect, since collaborations offer insight into other fields and disciplines (e.g. from the aspect of animal feed an insight into crop production, into the food-related human (medical) field, or into food processing). Profiles based on each other represent mutual benefits. Adaptation of a technological solution used in a related discipline (e.g. use of human test methods in animal husbandry) can generate new innovative projects. Food manufacturers have the opportunity to have products tested by a different member company, with an academic background, through university partners. In addition to the innovative aspects it is a marketing advantage that the relationship network of food companies at the end of the chain can contribute to market introduction innovation results. Once represented organisations cover the entire value chain (from animal feed through crop production, animal husbandry, food manufacturing, and pre-clinic testing to food firms) then the main aspect is interrelatedness, hence live relationships and substantial internal traffic are generated, and this counteracts the appearance of “free-riders”.

As has already been mentioned in connection with the comparison with networks, innovation clusters can serve broader goals besides improving the effectiveness and market position of the members. In the fields presented above examples of such goals are the regaining of lost position in the medical sector; the promotion of the

economic development of a region; the improvement of the competitiveness of enterprises (e.g. the Southern Great Plains cluster organisation), with regional development purposes, the commercialisation of synergies found in the university and the business sectors (e.g. the establishment of a regional IT centre); the embracing of new directions of development (biodegradable plastics); the implementation of new competences (eco-competence); and the improvement of the quality of life by the collaboration of environmental-minded economic and regional development goals and related areas (health industry, pharmaceuticals).

### *Open innovation is not yet understood*

The positive impact of collaborations generated by cluster relations cannot be questioned in terms of open innovation, and Hungarian practice is no exception to this, either. During the interviews, however, it became clear that the conscious use of open innovation solutions is in its infancy, even in accredited domestic innovation clusters.

The conscious use of open innovation is indeed far from a quick process. It requires new ways of thinking and possibly different business management policies from companies, from the cluster management, and the application of solutions that ensure the organic integration of external intellectual capital and user needs and feedback into the innovation processes. This is not only a matter of deciding to do it, it also requires the development and availability of proper environmental conditions and of infrastructure and equipment. There is reason to be optimistic since one can find some good practices, including the T-City living lab in the field of ITC in the city of Szolnok, in which cluster members have the opportunity to test their new products and solutions prior to market launch.

If the open innovation efforts intensify through the cooperation networks of clusters for the better exploitation of economic value stored in shared intellectual property, it may be a propelling force for the increase of competitiveness of not only the members, but the whole economy as well.

## CONCLUSION

In our study, we touched upon the main differences between networks and clusters. We found that innovation clusters create favourable conditions for the conversion of R&D results into market successes and for the development of market orientation of innovations. In addition, it can be mentioned as a significant difference compared to networks that clusters provide more flexible forms of cooperation with an open, collective vision expanding in several directions, in which an open flow of information and knowledge sharing takes place. A further

significant difference is that clusters have a central node which is formed by the cluster management organisation.

Our research focuses on three main industries, the medical, IT and plastics processing industry. It can be said that the basic aim of the cluster organisation in the medical field is to increase the market potential of the domestic corporations operating in this sector with a long-standing tradition. As a consequence, the most important advantage that members expect is market acquisition via joint action, which is partly an export market goal and partly the reacquisition of niches in the domestic market. One of the most important sectoral features is that multinational companies are excluded from cluster membership.

One of the features of clusters operating in the IT field is that competitors may appear among their members, resulting in a higher workload for the cluster management organisation. Clusters involved in this industry show a varied picture regarding the size of companies as well, and it is typical of their sector that start-up companies make up a relatively large proportion of the membership.

In clusters involved in plastics processing industry it can be observed that both horizontal and vertical

organisations are present, the most important aim of which is to embrace companies with similar industrial activities in the region. Competitors and foreign-owned companies are usually excluded from membership as competition is very strong in the domestic market. It can be considered to be a sectoral feature that members do not only appear in a given region, but they also create an internal market that allows them to replace former suppliers with one another.

In our research, we also examined cross-sectoral cluster organisations, whose aims – in addition to independent innovation efforts – are to create joint innovation concepts and to coordinate technology and manufacturing overlaps; during the interviews we also examined how consciously they apply open innovation solutions. We found that even in the accredited domestic innovation clusters open innovation is in its infancy.

Of course, additional quantitative research is needed to support the survey and interview results presented in this study with numerical data. Our future plans include the investigation of correlations that we explored during our qualitative research focusing on a specific industry.

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