

## **Increasing Competitiveness of the Construction Sector by Adopting Innovative Clustering**

**Vladimir Gumilar<sup>1</sup>, Roko Zarnić<sup>2</sup>, Jana Selih<sup>2</sup>**

<sup>1</sup> *Slovenian Construction Cluster*  
Dimiceva 12, SI-1000 Ljubljana, Slovenia  
e-mail: [Vladimir.gumilar@sgg.si](mailto:Vladimir.gumilar@sgg.si)

<sup>2</sup> *Faculty of Civil and Geodetic Engineering*  
University of Ljubljana  
Jamova 2, SI-1000 Ljubljana, Slovenia  
e-mail: [roko.zarnic@fgg.uni-lj.si](mailto:roko.zarnic@fgg.uni-lj.si), [jana.selih@fgg.uni-lj.si](mailto:jana.selih@fgg.uni-lj.si)

**crossref** <http://dx.doi.org/10.5755/j01.ee.22.1.217>

*Companies in today's world need to become and stay competitive. This means, among other things, that they have to create new ideas and turn them into innovative products and processes. Appropriate innovation management strategies, including creation of various kinds of alliances with other business entities, need to be adopted within the company. Clustering is one of such possibilities. The paper discusses the main features of clusters and the benefits for their members; in addition, it identifies specific features of the construction sector that require specific approaches to establish a cluster.*

*The methodology Innovative Cluster Model with 3x3x3 mail elements (ICM333) is proposed and used to initiate and develop a cluster in the construction sector. In the cluster development three stages are identified: emergence, development and maturity of the cluster. Actions associated with these three stages tackle four areas (in each stage): rationale, organization, resources, and implementation. All areas are thoroughly elaborated and discussed in the paper.*

*In the first step, the emerging cluster, the key element is identification, assessment and dissemination of development opportunities. It can run parallel with the cluster initiation, which is followed by the operation. Within the steps to be taken in the stage of the developing cluster, visions and the goals have to be defined first, followed by the definition of the cluster organisation. The mature cluster stage has to focus on performance measurement and management, and take appropriate measures to guarantee its sustainability and adequate innovative character.*

*Implementation of the proposed cluster development methodology has the potential of greatly facilitating the betterment of a construction sector in a particular country. It can be a valuable tool, when available to policymakers, chambers of commerce and trade, and other stakeholders that wish to foster the development of such clusters.*

*The paper reports on the results of the 7th Framework project FP7-REGIONS-2007-1 RegCon – Support Action for Innovation Driven Clusters in Construction.*

**Keywords:** *innovation, construction sector, project oriented work, SME, clustering.*

### **Introduction**

The current business markets, which are continuously changing, require that every enterprise seeks to stay competitive, create new ideas, embrace them and turn them into innovative products and processes (Antončić et al, 2007; Koellinger, 2008; Slaughter, 1998; Barrett & Sexton, 2003; Thronhill, 2006; Psunder, 2008). Companies need to adopt innovation management strategies, which yield creation, development, testing and implementation of an invention so that it turns into an innovation (Banyte and Salickaite, 2008). Several researchers, e.g., Birchall et al (1996), Gann and Salter, (2000), Ling (2003) and Thornhill (2006), have studied innovation management in an enterprise and actions to be taken to enable innovation emergence; in addition, they have proposed different measures for the determination of an innovation drive level. Conventional processes facilitating innovation and its successful exploitation have predominantly been focused on establishing research and higher education institutions and internal R&D units. It has been shown that by enabling contacts among various stakeholders, especially among companies and R&D institutions, the innovation uptake in the industry does increase (Keast and Hampson, 2007).

The innovation drive level varies among various countries, as well as from one industrial sector to another. For a particular society as a whole, this level can be directly linked to the society's GDP. On the sectorial or national level, the innovation performance index measuring the overall national innovation performance has been proposed and measured systematically in the countries of the European Union and other countries. Generally, these reports associate the innovation with high technology industry (European Innovation Scoreboard, 2008), and tend to look at the low to medium technology sectors predominantly as users of a high technology innovation.

The construction sector is often perceived as one of the low to medium technology sectors, with a low level of innovation drive. At the same time, it is one of the largest contributors to the national economies and is a key performance component (Keast and Hampson, 2007). This sector requires specifically adapted procedures and

methodologies for innovation management due to its specific nature, namely: project-driven work; large number of project participants that are separate business entities, of which many are small and medium enterprises (SMEs); fragmentation; strong interdependency upon general economic conditions; dominant role of the client; and common perception of low innovation drive level in this sector (Barret and Sexton, 2006).

### *Clustering*

Clustering has been attracting wide public attention, including scientific circles, since 1990, when Michael Porter published the book *The Competitive Advantage of Nations* (Porter, 1990). Porter argues that successful companies reach and maintain their market share and growth rate due to unique links with various business entities. The business networks (or clusters) enable knowledge, product and services exchange among their members, and facilitate an innovation transfer. Since then the topic has been researched extensively and a vast literature body, e.g., Bossink (2004), Tollman and Jenkins (2004), Damaskopoulos et al (2008), Tan (2006) and Saboniene (2009), to name only a few, is available today.

In general, cluster members include manufacturing companies, special service providers (e.g., marketing, consulting companies), knowledge providers (R&D institutes, universities) and support institutions (e.g., chambers of commerce, sector associations, development agencies)

Clusters can be identified as

- geographical, or region-specific
- sectorial (clusters of businesses operating together from within the same commercial sector),
- horizontal (interconnections between businesses at a sharing of resources level) and
- vertical (supply chain cluster).

Although Porter's theory has been criticized for not having a foundation built on comprehensive empirical evidence, the policymakers have quickly grasped the idea and started to initiate various types of clusters by using a top-down approach. At the European level, over the past years, the European Commission (EC) has allocated special funding for cluster support in various industrial sectors, including construction.

This may be contradictory to the clusters as initially observed by Porter, where a bottom-up approach was registered (i.e., an industry has created networks on its own and not because of an external initiative). The end result (i.e., a functioning cluster), however, should be the same in both cases.

### *Clustering in construction*

Due to the complexity of the construction sector, general construction sectors can be classified simultaneously as sectorial, horizontal (as they include companies of one particular type, e.g., general contractors), and vertical (as they include various stakeholders of a construction supply chain, e.g., clients, designers, contractors, specialized subcontractors and material suppliers).

Typically, SMEs lack human resources and do not have R&D capabilities or the financial resources to engage exterior knowledge providers, i.e., R&D institutions. Large proportion of SMEs in a construction sector, as well as the project nature of work that does not enable permanent business relations and supply chains, thus stimulates the construction companies into seeking the new knowledge in clusters. The main objective of innovation clusters in construction is therefore to enhance the innovation processes by simultaneous cooperation and competition among their members, which brings the following advantages:

- facilitation of information exchange among stakeholders concerning buyers, suppliers, technologies, business plans, and human resources; better access to information and knowledge transfer is enabled on the basis of the positive cluster capital (predominantly exhibited as mutual trust), and a joint information exchange platform has to be built to facilitate the exchange process;
- use of synergy effects (joint R&D ventures, promotions, etc);
- enabling new business opportunities (e.g., cluster outreach to global markets).

Furthermore, by joining a cluster the organisation can decrease its transaction costs, create positive externalities (by which common needs can be met), decrease their production costs because of more efficient learning processes (since cluster members belong to the same geographical, economic and cultural environment), use the advantage of the first market supplier (which can keep the market share due to the economy of scale), use the advantage of better product quality and in general increase the added value in the company.

### *Problem statement and research objectives*

As already discussed, the perception of a construction sector is often as being a low to medium technology sector, where innovation is difficult to implement. To ensure the competitiveness of the European construction sector, construction innovation should be encouraged systematically. This can only be achieved by being aware of the specific features that distinguish a construction sector from the general mass production industry, and by adapting the general clustering and innovation enhancement principles to the field of construction.

Although all key construction stakeholders, entrepreneurs, R&D institutions and policy makers (Massa and Testa, 2008) are aware of the innovative clusters' importance and their influence upon business performance, it happens too often that a cluster is initiated (often by a governmental initiative, i.e., top-down approach) but as time progresses, it is not developing to achieve its full potential. This problem has been identified and tackled by the project **FP7-REGIONS-2007-1 RegCon – Support Action for Innovation Driven Clusters in Construction**.

The objective of the above/mentioned research is, therefore, to identify and develop a methodology to be used in the development of an innovative construction

cluster, that will lead to a well connected, fully operable and mature cluster in which a stakeholders will be able to exploit their full potential in terms of innovation drive enhancement and business performance.

### **Research methods**

The research methods employed in the present study include comparative analyses of the scientific literature, systematic development of the methodology to be used in the cluster formation and justification of its elements, and reflection on the methodology developed.

### **Development of the methodology**

The model for construction cluster development is a framework defining the most important elements for emerging, developing and mature clusters. The suggested **ICM333** (Innovative Cluster Model with 3x3x3 main elements) model can be used as a reference for different cluster development activities, e.g., new cluster initiation, re-engineering an existing cluster or cluster-like initiative or developing R&D driven cluster, focused on innovation and international R&D cooperation. It is focused on more practical than theoretical background information how to manage the innovative cluster development.

The basic presumption for the cluster development model is that no cluster evolves from scratch. Since one of the basic characteristics of the cluster is geographical proximity, some elements of cluster-like cooperation or particular sub-elements or process of the model are set in particular business environments. The basic idea of the model is to build the cluster on pre-existing elements or conditions.

Depending on the existing elements and conditions for cluster development, the strategy and action plan describing individual operative elements can follow different steps, and are customised to a particular situation in the geographic region under consideration.

In addition, existing opportunities of networking should be sought and employed. For example, within the European Union, there are numerous EU and national sponsored R&D projects going on; in each of these projects, the dissemination and exploitation of the results is a task to be completed. Consequently, the project consortia and the exploitation plan can be a good starting point for the development of an innovative cluster.

Three steps (in the context of the maturity level) have been identified in the cluster development: emerging, developing and mature clusters (Figure 1). Their specific features and associated opportunities, as elaborated further in Figure 1, will be discussed in the following chapters.

### **Emerging cluster**

Opportunities for cluster development

A cluster does not start, exist or grow in a vacuum. It starts in different ways, initiated and supported by the public sector (government, regional development agencies etc.) or can grow up on bottom-up principle, where an industry takes the initiative. In many cases, a person or a group of persons, so called *clusterpreneurs*, are involved.

The clusterpreneurs can even initiate cluster development if they are able to influence the existing network or strategic alliances of companies and other organisations.

Opportunities for cluster development can arise from globalisation challenges, environmental issues, business needs of individual firms or organizations, research and development activities and their results. They emerge from national, regional or European policies, and changes in legislation and regulation. Countries, regions and metropolitan areas continue to exhibit dramatic differences in terms of specialisation, competitiveness and industrial dynamics. Sustainable competitive advantage can be created by the combination of internal and external resources residing in local, national and sometimes also on a global environment.

Dynamic, innovative clusters can exist in the environment where new development opportunities are constantly being identified, assessed and disseminated among cluster actors. These opportunities can be identified by:

- identification of challenges, business needs and requirements;
- research and development activities, and
- general and microeconomic setting analysis.

The analysis of cluster opportunities should be carried out by different actors involved in the initiation of a cluster, depending on the way the cluster is being initiated (top-down, bottom-up). Alternatively, it can also be carried out by a governmental agency or consultant, regional development agency, cluster experts and consultants, business consultant, or any actor among potential cluster members or clusterpreneur. In most cases, the definition of cluster opportunities runs more or less parallel with the cluster initiation.

#### **Cluster initiation**

Cluster initiation is a process that extends from the identification of cluster stakeholders to the first cluster project or activities. Cluster initiation includes sub-processes, namely:

- cluster identification,
- social capital development, and
- building networking competences.

The cluster, on its own, faces a major challenge, when attempting to conduct development and business in a new way, combining competitiveness and collaboration.

#### **Operation**

At the beginning of cluster development, a set of the first joint activities and projects should be planned and implemented at an operational level. Early benefits should motivate a leadership group to work hard to achieve even greater results. First projects have to be initiated, with deliberately short time to complete and with the results that will bring useful short term results; "Picking the lowest fruits" is a typical strategy in this phase.

The list of potential typical cluster activities at this stage can deal with:

- training,
- communication activity,
- joint marketing and public relations,
- international cooperation,
- network development & research,

- cluster expansion,
- policy action,
- innovation and technology and
- commercial cooperation.

At this stage of their development, clusters have to be supported from the governmental (regional or national) funds that should be used for the establishment of the organisation and infrastructure of a cluster, for cluster promotion and training of the staff. Besides, identifying cluster leaders activities, the cluster should examine who and how will manage (and finance!) these activities. Establishing a **cluster managing office** as one stop shop (Sheer at al., 2008) for different cluster activities and services should be discussed at this stage.

### *Developing cluster*

When a cluster is established and its membership is consolidated, more systematic planning, execution and revision of objectives, plans, activities and projects can be carried out. A formal or informal institution for collaboration (IFC) may be organised and registered. ICM333 methodology defines nine main elements for the development of the cluster which are grouped as goals, organisation and growth.

#### Defining the vision and goals

Cluster vision is a statement about what the cluster wants to become. The vision should bind already identified objectives (emerging cluster activities) and open a window of opportunity for the new ones. It should be built upon already developed or developing cluster strengths. Cluster strategy represents the path to the fulfilment of objectives and therewith the clusters vision. Different inherent issues and risks should be properly addressed in the cluster development strategy. Cluster strengths and weaknesses, external to cluster opportunities and threats should be a base for strategy formulation. The action plan is the last, most specific step in defining a cluster operation. It should represent specific, sequential and simultaneous targeted actions that are needed to create and build up a cluster. The drivers leading the implementation should be defined.

#### Organisation

Clusters are very heterogeneous systems, consisting of various members, businesses and partners, whose information, communication and cooperation has to be structured and organised. Therefore, a cluster organisational structure is of central importance. Formal organisation, developed strategy, recognised goals and rules for cooperation are giving the cluster its binding nature and ensure transparency and accountability for its members. This is the basis for mutual trust, which is also a crucial element for successful cooperation.

Organisational structures also define cluster's functions and benefits for its members. They help members to identify themselves with their cluster more strongly (emergence of "corporate identity"). An organisational structure has influence on cluster's competitiveness and vitality. Flat and efficient structures should be created as they are essential for successful operation in international contexts where fast responses and an organisational innovation are expected.

Even when the basic organisation has already been established in the first phase of cluster development, it has to be revisited to be able to efficiently support developing cluster activities and later on to become a good foundation for the cluster to mature. ICM333 deals in this point with the whole spectrum of activities: IFC formation and services have to be established, and cluster internal organisation and management and project management as the main tool of the cluster activities have to be further elaborated.

#### Growth

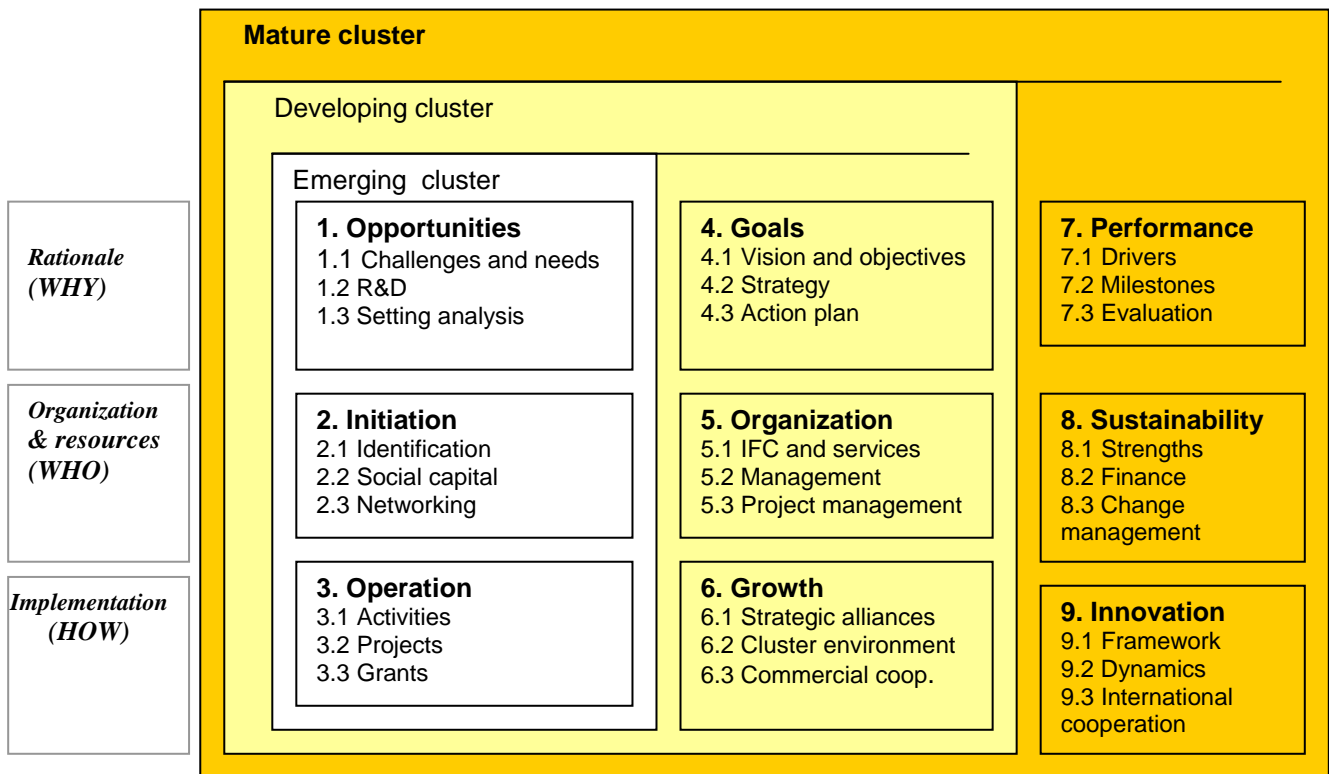
As a cluster is growing, strategic alliances usually arise on the basis of professional or personal contacts. Cluster's components, such as, organisation, collaboration, trust, project and, exploitation of the results, new business or R&D opportunities, lead and actually stimulate inter-actors alliances, often as a follow-up of a particular cluster project. Strategic alliances are a natural follow-up of the cluster. This is an important step within networks and a networking framework; however, caution should be exercised: this step, when not properly managed, can lead to the disintegration of the cluster.

A cluster should develop competences to be able to participate in the creation, implementation and changes of policies, which influence cluster development in different ways. If the strategy is about the innovative cluster development being driven by the international R&D, we must look beyond the national context. The cluster must be concerned about different context policies, should be aware about their development and changes and to some extent be able to participate in their creation and implication (if this is strategically important for the cluster development). Technological platforms and other initiatives to generate policies and priorities (on both national and international scale) need to be analysed from different perspectives on cluster development.

Commercial cooperation has been positioned as the last of the *ICM333 Growth module* intentionally. Focusing mainly on commercial cooperation could lead the cluster development into a value chain cooperation, moving it from a traditional, industrial cluster. Effort should be dedicated to support commercial cooperation if this will help the cluster in other developmental activities. Cluster services, infrastructure and organisation can be assessed on the basis of the extent they enhance the commercial cooperation among cluster members and even how they can be improved.

### *Mature cluster*

A mature cluster is the one that has reached a certain critical mass of actors and activities. It has also developed relations outside the cluster, to other clusters, activities, regions. There is an internal dynamic of new strategic alliances creation. New start ups, joint ventures, spin offs can be created. Along this technologies changes, new development opportunities emerge, and the cluster can or has to adapt to these changes. The ICM333 model focuses particularly on performance, sustainability and innovation as the most important elements of the mature innovative cluster.



**Figure 1.** Schematic representation of the ICM333 cluster development model

#### Performance

Cluster performance measurement and management control are critical components of the process yielding improvement cluster performance. Mature clusters should be able to design medium to long term drivers which will guide its strategies, organisation and actions; therefore, keeping the cluster together and attract new members.

Drivers have to be elaborated in cooperation with other relevant institutions, companies and many times also with the government and/or national innovation system institutions. The government should be involved when these drivers are related to national technological priorities and large private and also public investments into research, development and innovation.

Long term drivers have to be structured along leading technology, important challenges, market segment or a clear long term vision. On the other hand, drivers should be structured to stages with the defined milestones of development. The stages do not need to run sequentially; the development can run in parallel but with a common goal.

In an innovative cluster, long term drivers are an envelope for a number of needed innovations and R&D activities. Cluster management control has to define milestones, stages of cluster development activities, and when cluster innovation performance has to be systematically evaluated.

#### Sustainability

Any kind of mature cluster, being an innovative or industrial, small or big, can face the issue of its sustainability. ICM333 suggests that strengths, finance and changes have to be managed in an efficient way.

During the cluster development, different cluster competences and strengths are being developed. Some of them can be very cluster specific.

**Cluster strengths** can be perceived by cluster members differently. On the other hand, they may not be aware of some of these strengths since they are embodied in the cluster as a whole. Many of the strengths are more related to particular cluster members (i.e., other members cannot use them) than to the cluster as a network.

Managing cluster financing should be one of the main concerns of cluster management and cluster as a whole. Three main issues related to finances should be managed, and they are:

- cluster infrastructure financing,
- project financing,
- long term financing.

**Cluster infrastructure financing** is usually provided by cluster membership fees and governmental grants if available. When this infrastructure grows along with the cluster development (cluster services, joint activities, laboratories, testing equipment, cost related to outsourcing) – and not all members use this new infrastructure – then the infrastructure has to be financed by a service fee at an appropriate level. Project financing can be used if the activities can be organised as a project. Long term financing deals with the issues related to changes of financing sources, growth of private financing and other financing mechanisms, like, e.g., R&D foundations, Public Private Partnerships (PPPs), and long term innovation cooperation.

As a cluster develops with time, the need for changes may arise due to various reasons. An associated change management has to be systematic in order to ensure cluster

progress. Generally, two types of changes should be managed: operative and strategic ones. Operative changes are managed at the operational level that deals with organisational instrument, evaluation, planning, and preparation of different documents. It is important that occasionally a survey regarding eventual changes be conducted.

If a cluster has reached a development level where the main objectives of its development have been fulfilled and there is no more interest and the required 'glue' to keep it together, then the cluster can disintegrate. Strategic changes are needed. If these signs are identified and/or the majority of (existing) cluster members requires a strategic change, the cluster management should try to manage this strategic change in a controlled way. Controlled strategic changes can include:

- **Re-engineering:** a complete re-thinking regarding aims, organisation, goals, and expected results that can be carried out, if the cluster members agree that resources, infrastructure and cluster competences are the capital, which can be productive in some other cluster or in cluster-like constellations.
- **Innovation:** a clear focus on innovation has to be established. It should include also an innovation in an organisation and superior cluster management and control mechanisms (mature innovative cluster).
- **Transformation:** a cluster divides into one or several new clusters or other strategic alliances that focus around specific activities (e.g., joint marketing), projects, goals or long term drivers. Some of the cluster infrastructure and practices can be still used.

#### Innovation

At the end of the model description, the ICM333 model deals with the issues of innovation. It describes why a cluster innovation system, innovation dynamics and international R&D cooperation should be established and maintained.

A mature cluster should build a cluster *innovation system* or some of its functionality.

Innovation systems are defined as "a collection of institutions and organizations which interact to support the production, diffusion and use of new knowledge" (Lundvall, 2002). They provide a broader framework within which governments form and implement policies to influence the innovation process. Innovation can rarely be developed in its entirety within a cluster, without supportive institutions at a regional, national and sometimes even an international level. It should be mentioned these national innovation systems (NIS) institutions, most likely, are developed by using the top-down principle.

As far as innovation clusters are concerned, cluster management and core members should analyze the effectiveness of national innovation systems for cluster and its growth. A cluster should develop its own institutions (formal and informal ones) if the goals cannot be reached with the external institutions of NIS. It does not mean a cluster has established a whole series of institutions but to rationally decide which of them are needed and can add

value to a cluster vision, drivers and activities. Cluster IS institutions should be developed also from the point of view of exploiting the existing NIS institutions and instruments.

Innovation as a commercialisation of knowledge takes normally place in the companies. Since this is a competitive advantage, their management is not interested in sharing information regarding innovative products, processes or technologies with members of the cluster, who may be their competitors in same market or technology. When the cluster matures, these practices (and concerns!) by the companies tend to become more acute. The cluster becomes an important driver of the innovation, both at the cluster level and at the cluster members' level.

An innovative cluster continuously and systematically develops internal networks and strategic alliances. Project consortia are formed by joining temporary projects, internal resources (including know-how and knowledge) or inter-firm networks for pooling of resources. The organisation and cluster policies should enable and systematically support different routes to commercialize the knowledge, inventions, and innovations, to exploit R&D results and the results of other cluster projects and activities. New start-up, spin-off or joint venture companies should be initiated and established as a result of cluster dynamics.

**Cluster innovation dynamics** can be strengthened also in an institutional way, that is connected with the cluster innovation system's formal and informal institutions and instruments. Inter-cluster technology transfer office (or service) can help cluster members to find competitive technologies needed in the implementation of potential innovation. Properly delivered information about technology opportunities can initiate an innovation. Web based communication and group work technologies develop new external linkages which are also a potential driver for the innovation. The success of clusters with respect to innovation is critically influenced by the competencies embodied in a specialised workforce who is activated and/or developed within cluster activities and projects. With intensive **international activities and cooperation**, an intensive free movement of innovation capital can be even strengthened which brings new opportunities for innovation, growth and competitiveness. A mature cluster can make a free movement of knowledge and reality.

The basic principle of enabling firms to overcome internal limitations by joining efforts and resources with other firms, R&D institutions and universities is now expanding to international context. The international R&D should be one of the primary elements of the innovation cluster development since today's global environment means also a global innovation environment. Networking and outsourcing are becoming not only an opportunity but also a must.

For an emerging and developed cluster an innovation system, innovation dynamics and international cooperation are present as opportunities (R&D), part of an external environment (innovation system) or as a potential threat to cluster development (inter-actors networks). A mature innovation cluster on the other hand builds its strategy on

these elements and takes very active approach in their development and exploitation.

Before preparing a strategy and plan to go international we must do a survey among cluster members to get answer if this is what they expect and to what an extent they expect internationalisation of the cluster:

- Is a cluster's vision and objective regarding the competitiveness related to a regional setting or beyond it (European, global scale)?
- Do we see our cluster in European or global technological development and innovation activities?
- Do our members need / require state of the art knowledge, know-how and technologies? Can we offer our knowledge and technologies to foreign markets?
- Do our members do business abroad? Do they plan to extend it to foreign markets?

A customised strategy for participating in international RTD activities market should be developed and integrated to the overall strategy of cluster development. Different organizational approaches (virtual organisation, consortia based project cooperation, networked innovation, virtual professional communities) should be taken into consideration. A cluster office has to establish new services and supporting activities, like training in innovation management, project management (7 Framework project, EUREKA, and others), ICT tools, and communication skills.

## Conclusions

It is of a vital importance for a construction sector to move to a medium-to-high-technology level, and to an associated improved business performance. Various approaches should be used by different stakeholders (governmental agencies, associations, and others) to achieve these goals. One of the possibilities that exhibit a good potential is the formation of construction clusters.

## References

- Antoncic, B., Prodan, I., Hisrich, R. D., & Scarlat, C. (2007). Technological innovativeness and firm performance in Slovenia and Romania. *Post-communist economies*, 19(3), 281-298.
- Banyte, J., & Salickaitė, R. (2008). Successful diffusion and adoption of innovation as a means to increase competitiveness of enterprises. *Inzinerine Ekonomika-Engineering Economics*(1), 48-56.
- Barrett, P., & Sexton, M. (2006). Innovation in small, project-based construction firms. *British Journal of Management*, 7(4), 331-346.
- Barrett, P., & Sexton, M. (2003). A literature synthesis on innovation in small construction firms: insights, ambiguities and questions. *Construction Management and Economics*, 21, 613-622.
- Birchall, D. W., Chanaron, J. J., & Soderquist, K. (1996). Managing innovation in SMEs: a comparison of companies in the UK, France and Portugal. *Int. Journal of Technology Management*, 12(3), 291-305.
- Bossink, B. A. G. (2004). Managing drivers of innovation in construction networks, *Journal of Construction Engineering and Management-ASCE*. 130(3), 337-345.
- Commission recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized companies (2003/361/EC), Official Journal of the EU, 20.5.2003, accessible at [http://europa.eu/eur-lex/pri/en/oj/dat/2003/l\\_124/l\\_12420030520en00360041.pdf](http://europa.eu/eur-lex/pri/en/oj/dat/2003/l_124/l_12420030520en00360041.pdf)
- Damaskopoulos, T., Gatautis, R., & Vitkauskaitė, E. (2008). Extended and Dynamic Clustering of SMEs. *Inzinerine Ekonomika-Engineering Economics*(1), 11-21.

This type of business collaboration has been known for some time; however, the empirical evidence shows that often construction clusters are created but do not develop further.

A systematic methodology advanced in this work has the potential of greatly facilitating the development of the construction cluster in a particular country. The methodology is structured into three main levels, namely emerging, developing and mature cluster. Sub-elements of each level are elaborated in further detail in some of the cited research work.

The proposed methodology can be employed by stakeholders, who want to increase the competitiveness and business performance of the construction sector. Measures proposed by the methodology should be implemented in accordance to the ordering of the recommended steps. In this way, a cluster and its members can achieve their full potential and optimize their business performance.

The next step in the development of the **ICM333** model is its actual implementation for a set of case studies, i.e., implementation in a selected country with no existing construction cluster. The development process should be closely monitored, and its results should be carefully analyzed step-by-step. Ideally, several countries should take part in such project.

The results for construction cluster development in different countries should be compared and assessed taking into consideration economic and technological differences among collaborating countries/clusters. Then, based on the outcome of the analysis, model parameters can be adjusted.

## Acknowledgement

Financial support received through the 7th Framework project FP7-REGIONS-2007-1 RegCon – Support Action for Innovation Driven Clusters in Construction (2008-2010) grant is gratefully acknowledged.

- Gann, D. M., & Salter, A. J. (2000). Innovation in project based, service enhanced firms: the construction of complex products and systems. *Research Policy*, 29(7-8), 955-972.
- Keast, R., & Hampson, K. (2007). Building Constructive Innovation Networks: Role of Relationship Management. *Journal of Construction Engineering and Management-ASCE*, 133(5), 364-373.
- Koellinger, P. (2008). The relationship between technology, innovation, and firm performance - Empirical evidence from e-business in Europe. *Research Policy*, 37(8), 1317-1328.
- Ling, F. Y. Y. (2003). Managing the implementation of construction innovations. *Construction Management and Economics*, 21, 637-649.
- Lundvall, B. A., Johnson, B., Andersen, E. S., & Dalum, B. (2002). National systems on production, innovation and competence building. *Research Policy*, 31(2), 213-231.
- Massa, S., & Testa S. (2008). Innovation and SMEs: Misaligned perspectives and goals among entrepreneurs, academics, and policy makers. *Technovation*, 28 (7), 393-407.
- Porter, M. E. (2006). *Clusters and Economic Development: Towards a New Model for Regions and Inner Cities*. Harvard Business School. Brownfields, 2006.
- Psunder, M. (2008). *Ekonomika gradbenega podjetja*. Univerza v Mariboru, Maribor. (In Slovenian)
- Sheer, G., & Von Zallinger, L. (2008). *Cluster Management - A practical guide, Part A: Overview*; GTZ: Deutsche Gesellschaft für Technische Zusammenarbeit GmbH
- Saboniene, A. (2009). Lithuanian Export Competitiveness: Comparison with other Baltic States. *Inzinerine Ekonomika-Engineering Economics*(2), 49-57.
- Slaughter, E. S. (1998). Models of construction innovation. *ASCE Journal of Construction Engineering and Management*, 124(3), 226-232.
- Tan, J. (2006). Growth of industry clusters and innovation. *Journal of Business Venturing*, 21, 827-850.
- Thornhill, S. (2006). Knowledge, innovation and firm performance in high and low-technology regimes. *Journal of Business Venturing*, 21(5), 687-703.
- Tollman, A., & Jenkins, M. (2004). Knowledge, clusters and competitive advantage. *Academy of Management Review*, 29(2), 258-271.
- Zavadskas, E. K., & Kaklauskas, A. (2008). A Model for Lithuanian construction industry development. *Transformations in Business & Economics*, 7(1), 152-168.

Vladimir Gumilar, Roko Žarnić, Jana Šelih

#### Statybų sektoriaus konkurencingumo kėlimas sėkmingai diegiant inovacijas klasteriais

Santrauka

Šiuolaikinio pasaulio kompanijos turi būti konkurencingos. Norėdamos tai pasiekti, jos turi kurti idėjas ir paversti jas naujais produktais ir procesais. Dėl inovacijų valdymo strategijų, kompanijos tampa kūrybingos, plėtojasi, suteikiama galimybė įdiegti naujoves ir išradimus. Tačiau visos tos priemonės turi būti taikomos sistemingai. Verslo struktūros gali imtis ir kitų veiksmų. Pavyzdžiui, kuriamos įvairių rūšių sąjungos su kitomis verslo struktūromis. Vadinamųjų klasterių (susitelkimų) kūrimas yra viena iš galimybių, kuri jau yra plačiai taikoma ir tyrinėjama. Klasteriai yra įmonių grupės, kurias vienija bendri interesai, o tai sudaro galimybę atskiriems nariams lengvai keistis produktais ir paslaugomis. Svarbiausia, kad tai skatina inovacijų perdavimą atskiruose regionuose, sektoriuose tiek horizontaliai (dalinantis ištekliais), tiek vertikalčiai (sudarant klasterių grandines).

Statybų sektorius ypač turi plačiau taikyti inovacijas siekdamas likti konkurencingas. Turi būti kuriamos strategijos, kurios tenkintų statybų sektoriui būdingus poreikius, t. y. sudaryti statybų inovacinius junginius (klasterius). Tai ypač reikalinga smulkiojo ir vidutinio verslo statybinėms organizacijoms, kurios stokoja žmogiškųjų ir finansinių išteklių bei tyrimų ir plėtojimosi galimybių. Statybos sektoriuje vyrauja didelis susiskaldymas, stipri priklausomybė nuo bendros ekonominės padėties, klientų vaidmens bei nepakankamo inovacijų diegimo.

Įsitraukusi į klasterį organizacija gali sumažinti operacijų sąnaudas, sukurti teigiamą požiūrį į save, savo produkciją arba paslaugas, mažinti gamybos sąnaudas, diegti efektyvią mokymosi sistemą, labiau panaudoti rinkos tiekėjų paslaugas ir svarbiausia padidinti pridėdamąją vertę.

Nors pagrindiniai statybų akcininkai, verslininkai, tyrimų institucijos ir politikai gerai išmano klasterių naujovių diegimo galimybes ir jų įtaką verslui, tačiau pasitaiko atvejų, kad klasteris traktuojamas kaip laikina priemonė, todėl nesiikiama panaudoti visų jo galimybių. Ši problema atskleista projekte EP7-REGIONS-2007-1 RegCon., kuris buvo skirtas padėti statybų struktūroms, siekiančioms diegti inovacijas kuriant klasterius.

Todėl šio tyrimo tikslas – nustatyti ir sukurti metodologiją, kuri galėtų būti taikoma inovacijomis paremtiems statybų klasteriams sudaryti. Tai galėtų padėti sudaryti į gerai sujungtą, brandžią sąjungą, kurioje akcininkai panaudotų visą savo potencialą ir siektų konkurencingumo.

Sukurtas ICM333 modelis. Tai inovacinis klasterių modelis, kuris gali būti taikomas įvairiose klasterių plėtojimosi procesuose, pvz., skatinant junginių susidarymą, pertvarkant jau esamą darinį, plėtojant klasterio mokslinį tiriamąjį darbą, bendradarbiavimą, inovacijų diegimą, tarptautinius santykius. Be teorinio pagrindimo, modelis suteikia daug praktinės informacijos, kaip valdyti bendrą klasterio plėtojimąsi.

Pagrindinis siūlomo klasterių plėtojimosi modelio tikslas – parodyti, jog joks susijungimas neatsiranda iš niekur. Kadangi pagrindinis klasterio bruožas yra geografinis artumas, todėl klasterio bendradarbiavimas yra glaudžiai susijęs su verslo aplinka. Pagrindinė klasterio idėja jam tik kuriantis grindžiama tam tikrais tos aplinkos elementais. Nuo šių klasterio plėtojimosi elementų priklauso ir atskirų jo plėtojimosi pakopų tikslai ir uždaviniai. Sukurtame klasterio plėtojimosi modelyje pateikiamos pradinio kūrimosi plėtojimosi ir brandos pakopos.

Kuriantis klasteriui iš pradžių nustatomos klasterio kūrimosi galimybės. Jas galima skatinti pasiremiant įvairiais kitais sektoriais (vyriausybe, regioninėmis agentūromis ir t. t.) arba gali būti plėtojamos pagal bendrus tos srities plėtojimosi principus. Daugeliu atvejų asmuo arba asmenų grupė yra įtraukiamos į šį procesą. Galimybių gali atsirasti dėl globalizacijos iššūkių, kurie dažnai yra susiję su aplinka, verslo poreikiais, moksliniais tyrimais ir kitais aspektais. Klasterių skatinimas, rėmimas yra kita pakopa metodologijoje. Tai procesas, kuris apima klasterio akcininkų nustatymą iki pirmojo klasterio projekto arba veiklos pobūdžio. Klasterio plėtojimosi pradžioje turi būti planuojama jo veikla, projektai ir jų įdiegimo priemonės. Pirmieji projektai turi būti remiami, numatytas jų įvykdymo terminas ir rezultatai, kurie per trumpiausią laiką būtų naudingi. Šioje pakopoje klasteriai turi būti remiami iš vyriausybinių (regioninių arba nacionalinių) fondų, kurie naudojami organizacijai sukurti, infrastruktūrai plėtoti, personalui ugdyti.

Plėtojant klasterių įtvirtinamas klasterio išsikūrimas ir jo narystė, sistemingai planuojama, planavimas koreguojamas, patikslinami tikslai, tikslinamos veiklos sritys. ICM333 metodologija pabrėžia devynis elementus, kurie skirstomi į tris grupes: vizija ir tikslai, organizacija, augimas.

Klasterio vizija – tai teiginys apie tai, kuo klasteris nori tapti. Vizija apima jau apibrėžtus tikslus ir atveria galimybes nustatyti naujus tikslus. Ji remiasi jau nustatytais stipriausiais klasterio plėtojimosi principais.

Klasterio organizacinė struktūra yra labai svarbi. Formali organizacija, sukurta strategija, numatyti tikslai ir taisyklės, bendradarbiavimo galimybės vienija klasterį, užtikrina skaidrumą, atsiskaitymą, narių atsakomybę. Visa tai sudaro pagrindą abipusiam pasitikėjimui, kuris yra pagrindinis elementas sėkmingo bendradarbiavimo ir kitose srityse, kuriose tikimasi greitai pasiekti rezultatų ir sparčiai įdiegti inovacijas.

Plėtojantis klasteriui, strateginės struktūros paprastai atsiranda, remiantis profesiniais ir asmeniniais kontaktais. Daugelis klasterio sudedamųjų dalių (organizacija, bendradarbiavimas, pasitikėjimas, projektai, rezultatų panaudojimas, naujos verslo ir tyrimų galimybės) faktiškai skatina plėtojimąsi. Strateginiai junginiai yra labai svarbus žingsnis bendrame klasterio plėtojimosi kelyje. Šioje plėtojimosi etape klasteris turi būti susijęs su įvairiais politikos kontekstais, juos suprasti ir prisitaikyti prie jų pakitimų bei aktyviai dalyvauti šiame procese, numatant kaip tai gali būti svarbu klasteriui plėtotis.

Brandus klasteris pasiekia tam tikrą plėtojimosi laipsnį, kuriame žmonės, veikla, bendradarbiavimas su kitais klasteriais ir regionais tampa rezultatyvūs. Pagal ICM333 modelį harmoningas klasterio plėtojimosi ir inovacijos yra laikomi svarbiausiais klasterio brandumo aspektais. Brandi klasterio veikla ir valdymo kontrolė yra svarbiausi plėtojimosi elementai. Brandūs klasteriai turi sugebėti sukurti aplinką, kuri būtų palanki ilgalaikiam augimui, o jo strategijos ir veiksmai siektų tikslo – išlaikyti klasterio vieningumą ir galimybę pritraukti naujus narius. Klasterio valdymo kontrolė turi apibrėžti pagrindines viso inovacijų diegimo proceso gaires, numatant sistemingą to proceso kontrolę ir vertinimą.

Brandus klasteris gali susidurti su harmoningo plėtojimosi trukdžiais, todėl sukurtas modelis pabrėžia efektyvaus finansų, pasikeitimų ir klasterio pajėgų valdymo svarbą. Klasterio pajėgumus jo nariai gali suprasti įvairiai. Daugelis pajėgumų yra susiję su tam tikrais klasterio nariais (t. y. kiti nariai tuo negali pasinaudoti), o ne su bendra klasterio tinklo struktūra. Be to, užtikrinant harmoningą klasterio augimą, reikalingas ilgalaikis pastovus finansavimas. Kai reikia pasikeitimų, būtina taikyti sistemingą pasikeitimų valdymą.

Kitas ICM333 modelio brandaus klasterio valdymo elementas yra susijęs su inovacijomis. Klasterio inovacijų sistemos pagrindas ir motyvai yra inovacijų dinamiškumas ir tarptautiniai ryšiai. Inovatyvus klasteris nuolat plėtoja savo vidinius tinklus ir strategines struktūras.

Projektų konsorciumas yra kuriamas imantis laikinų projektų, panaudojant vidinius išteklius arba kitų firmų tinklus. Organizacija ir klasterio politika turi nuolat remti įvairius būdus, kaip panaudoti žinias, išradimus, naujoves, tyrimų rezultatus ir kitų klasterių patirtį, projektus bei veiklą. Turėtų būti steigiamos naujos akcinės bendrovės, nes tai gerokai padidina klasterio dinamiką, glaudžiai susijusių su klasterio inovacijų sistema.

Pagrindinis principas, kuris padeda firmoms įveikti vidinius apribojimus, turi būti išplėstas iki tarptautinių kontekstų. Tarptautiniai pasiekimai mokslinių tyrimų srityje turėtų tapti pagrindiniais aspektais klasterių inovacijų politikoje, kadangi šiuolaikinė globali aplinka yra ir globali inovacijų aplinka.

Akcininkai turėtų taikyti ICM333 metodologiją, jeigu jie nori pakelti konkurencingumą ir statybų sektoriaus veiklą. Taigi klasteris ir jo nariai gali pasiekti, kad būtų pagerintas savas verslas ir visiškai panaudojamas potencialas.

Raktažodžiai: *inovacijos, statybų sektorius, projektinis darbas, smulkiojo ir vidutinio verslo įmonė, klasterių kūrimas.*

The article has been reviewed.

Received in January, 2010; accepted in February, 2011.

DOI: 10.5755/j01.ee.22.1.217