# IMPACT OF CLUSTERS ON UNIVERSITY-INDUSTRY INTERACTION

**Pere Tumbas[1], Aleš Lipnik[2], Predrag Matkovic[1], Marton Sakal[1]**

*[1] University of Novi Sad, Faculty of Economics Subotica (SERBIA)*
*[2] University of Primorska, Science and Research Centre, Koper (SLOVENIA)*

## Abstract

The South East Europe Transnational Programme project "Smarter Cluster Policies for South East Europe", (ClusterPoliSEE) is being implemented in the period from 2012 till 2014. The project's main objective is to enhance the capacity of regional policy makers to develop smart specialization strategies for cluster improvement. 25 project partners cover 11 different SEE programme countries to develop smarter cluster policies supporting territorial cohesion, research and development and open innovation systems in the SEE region. The work plan spans six cross-cluster development areas: Innovation, R&D driven cluster development; Sustainability through cluster development; International cluster cooperation and networking; Financial framework improvement; Cluster and regional specialization and New skills and jobs creation.

The key milestones in this project are to: (a) set up a collaborative ICT platform as a learning mechanism systems for partnership and relevant stakeholders aimed at improving SEE cluster policies through cooperative learning, policy transfer and information exchange between them; (b) provide an in-depth assessment of the regional cluster policies in the partners countries; (c) identify factors, tools, experiences, and best practices related to the six thematic areas; and (d) strengthen support to transnational cooperation for designing new strategies for project results sustainability and as contribution to support the South East Europe region as the place of innovation.

This article presents a Triple Helix concept, with particular reference to the roles of the constituents of this concept – university, industry and government – in the implementation of the innovation system. It also presents the possible avenues of their interaction, pointing out individual categories of intermediaries, which play a particularly significant role. A quantitative and qualitative analysis of clusters and cluster policies in the region was conducted based on the data gathered by means of SWOT analysis and a questionnaire on the ClusterPoliSEE project, in order to establish the impact of clusters on university-industry interaction. These initial theoretical and empirical analysis activities served as a foundation for identifying activities that need improvement so as to raise the importance of clusters in the further development of university-industry cooperation.

Keywords: clusters, university, triple helix, interaction.

## 1 INTRODUCTION

The ClusterPoliSEE project's main objective is to enhance the capacity of regional policy makers to confront, prevent and anticipate change, developing smart specialization strategies for cluster improvement, and thereby accelerate differentiation and structural change towards a knowledge-based economy in which there is a place for all SEE regions to position themselves. Project partnership, including partners from 8 EU member countries and 3 non-member countries was established to develop smarter cluster policies supporting territorial cohesion, research and development (R&D) and open innovation systems in South East Europe, encouraging transnational cluster cooperation between strongly and weakly performing regions participating in the project. Partners from Austria, Bulgaria, Greece, Hungary, Italy, Romania, Slovakia, Slovenia, Albania, Croatia and Serbia, represent highly different organization profiles. Partnership involved: regional and national public Institutions responsible for cluster policy development and implementation, regional development agencies responsible for the management of cluster programmes and regional innovation strategies, national research institutes and universities, innovation promotion bodies and cluster networks.

The differences in the partners' profiles enables the successful achievement of the key milestones in the project: (a) setting up a collaborative ICT platform; (b) providing an in-depth assessment of the regional cluster policies in the partners countries; (c) identifying factors, tools, experiences, best practices related to the six thematic priority areas; and (d) strengthening support to transnational cooperation for the design of new strategies in the South East Europe region as the place of

innovation. The project work plan includes a matrix-based approach, where six cluster development areas cross-cut operational phases of the project (a) to find out information gap data and barriers and remove them from learning process and (b) to improve effective regional cluster policy making. The following development areas are included: Innovation, R&D driven cluster development; Sustainability through cluster development; International cluster cooperation and networking; Financial framework improvement; Cluster and regional specialization and New skills and jobs creation.

The project is being carried out by means of workpackages and activities, whose structure is presented in Figure 1. The content of the defined workpackages includes the following [1]:

**WP0 – Preparation activities:** This workpackage includes the activities of preparation of the proposal, i.e. generation of project concept, vision and operative plan, through the involvement of relevant transnational partnership relevant for the entire territory of SEE programme area.

**WP1 – Transnational project and financial management:** This workpackage ensures an effective implementation of the project activities and the development of an efficient monitoring and coordination system. The activities of this workpackage are: setting up of steering committee, technical and scientific committee and workgroups for project management. Clear financial and administrative guidelines for the entire project, deadlines for completing individual activities, particularly compiling project reports are established in this workpackage. Another workpackage activity is to organize a shared and systematic plan for monitoring and evaluation. This activity includes developing procedures for internal monitoring and evaluation, and developing a specific method for project internal assessment.

**WP2 – Communication and dissemination activities:** This workpackage will develop a communication strategy which will act on two levels: internal and external. Internal communication activities will enable constant information flow within the partnership and external communication actions that will disseminate project strategy, outputs and results towards the relevant target groups, and thus will promote and raise awareness on mutual policy learning in addition to improving cluster policy making.

**WP3 – SEE Cluster policy learning platform:** The goal of this workpackage is to set up the collaborative ICT platform foreseen as a policy learning system technically and operationally across all project countries, including the institutional, organizational, design and implementation aspects, and to develop a competence centre in SEE for cluster stakeholders to spearhead and test the advantages of the smart specialization model as a guideline for R&D and competitiveness policies. SEE cluster policy learning platform is aimed at improving SEE cluster policies through cooperative learning, policy transfer and information interchange between SEE policy makers exploring the added value of transnational cooperation based on an open and interactive web-based support for mutual learning.

**WP4 – Learning process for reflective policy making:** This workpackage is the basis for the process of reflective policy making as a precondition for developing smarter policies in support of existing/developing clusters in SEE, as well as enhancing the capacity of the policy to confront, prevent and anticipate change. The main aim of workpackage is to create a common framework of understanding among all project partners, leading to an in-depth understanding of current cluster policies. This learning process is the first step towards developing smarter policies in support of existing clusters in SEE and enhancing the capacity of policy makers to confront, prevent and anticipate change. The learning process itself consists of four major actions: a past actions analysis for learning input; innovative information gathering from foresight workshops; creation of a framework of existing cluster policies for policy learning; and learning from study visits and benchmarking. Sound and effective transmission of results to relevant stakeholders is to be achieved through the SEE Cluster Policy learning platform, establishing a constant feedback process.

**WP5 – SEE cluster policy learning mechanism:** This workpackage is aimed at facilitating transnational knowledge exchange and regional capacity building in support of cluster development in the SEE area, promoting the development of evidence based regional cluster policies and initiatives, tested by pilot initiatives and implementing appropriate learning mechanisms to support regional administrations in specific areas of cluster policy. The workpackage structure comprises the following interconnected activities: development of policy learning mechanisms, testing by pilot initiatives of policy learning mechanisms and evaluation of selected policy learning mechanisms.

**WP6 – Future development of clusters in SEE area:** This workpackage improves framework conditions to support existing and emerging new clusters, adapting them to the EU challenges through result-oriented transnational cooperation for the design of new strategies for cluster development; and

adapting and addressing existing and future policies to the level of international challenges with an open system approach, capitalizing on synergies and spillovers in and between partnership and relevant stakeholders. The main activities in the workpackage are: setting up of SEE cluster initiative, conducting SEE foresight exercise and development of joint strategy and sustainability plan.

The main project outputs are: Reflective policy making mechanism pattern; Intelligent benchmarking methodology for specific cluster policy; Training package as S3 common knowledge base; Foresight exercise reports; Collaborative ICT learning platform; Comparative benchmarking analysis and Institutional agreement for SEE Initiative.

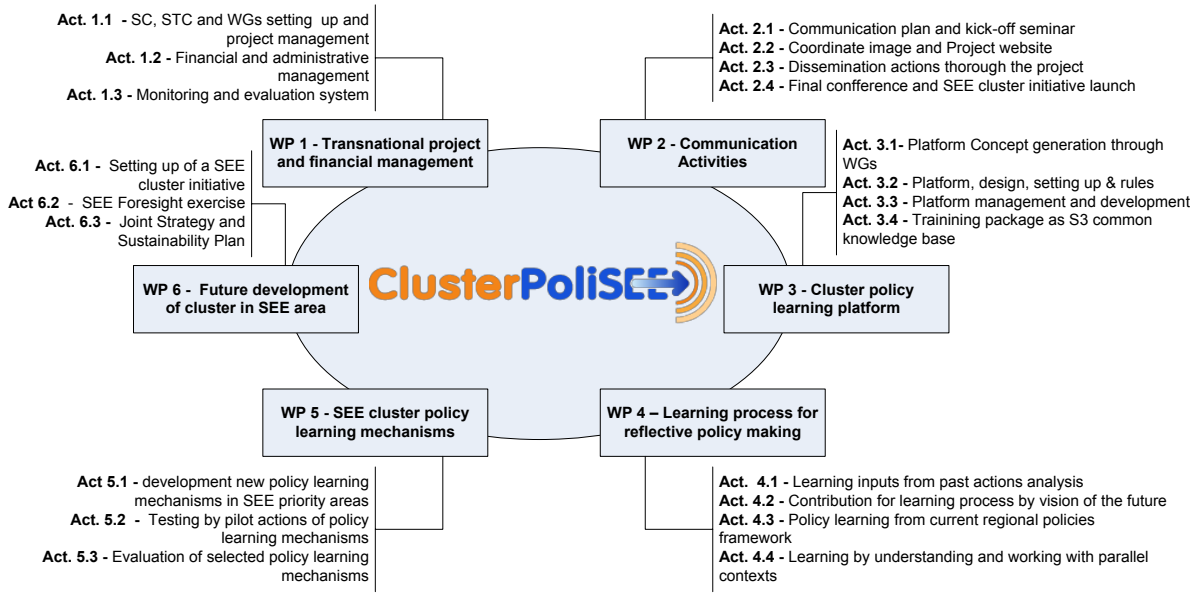


Figure 1. Workpackage and activity structure of the ClusterPoliSEE project.

## 2 TRIPLE HELIX CONCEPT OF INNOVATION

Triple Helix is a "metaphor for university, industry, and government interacting closely while each maintains its independent identity" [2]. The Triple Helix is an innovative concept implying that three spheres: university, industry and government take over each others' capabilities in interaction, but, at the same time, maintain their identities and primary roles. In this manner, each sphere acquires an enhanced ability to interact, collaborate and support innovation that arises in other spirals. Interaction of university, industry and government features as the key of innovation in the development of a knowledge-based society. As a result of interacting by using the Triple Helix concept of innovation, each of the categories of participants gains certain benefits of innovative development, and so does the whole Triple Helix model.

The intersection of relatively independent spheres of the Triple Helix concept, produces diversified i.e. hybrid organizations, such as technology transfer bureaus, business incubators, centres of excellence, technology platforms, technology parks, government research labs, business and finance supporting institutions and others. [3] These organizations are designated by the blanket term "intermediaries". Professional literature offers a multitude of definitions of intermediaries. Dalziel describes them as "organizations or groups within organizations that work to enable innovation, either directly by enabling the innovativeness of one or more firms or indirectly by enhancing the innovative capacity of regions, nations, or sectors" [4]. Howells defines intermediaries as "an organization or body that acts an agent or broker in any aspect of the innovation process between two or more parties" [5].

Intermediate organizations exist primarily to support collaborative R&D between triple helix members [6]. Intermediary roles can be classified into four large groups [7]:

- **Consultancy services**, referring to expert professional advisory work based on knowledge, skills and experience of the consultant in an innovation context. Advice might relate to due diligence, strategic management and marketing, business development, innovation process management, corporate finance management, and technology acquisition.

- **Brokerage services**, referring to agent representing one of the parties in inter-organization relationships, which can be:
  - knowledge broker – persons or organizations facilitating the creation, dissemination and utilisation of knowledge internally or between organizations,
  - technology broker – organizations that have been established to perform technology brokerage,
  - integrators – persons or organizations bringing together people and organizations with diverse skills and capabilities into some kind of business relation like strategic alliances, collaborations, and joint ventures in order to capture market opportunities and provide solutions to business problems.
- **Mediation services**, referring to organizations who act as a link between knowledge providers and receivers, assists in forming collaboration between two or more parties, and facilitates a knowledge network. Mediators are highly diverse and may be:
  - trusted intermediaries,
  - networking organizations (regional business councils, chambers of commerce, industry association, learned societies, science parks, incubators, early stage seed and venture capital funds, etc.),
  - industry and professional association outreach activities,
  - business incubators,
- **Resource provider roles** related to service-based provision of various types of resources.

In addition to the briefly presented major roles performed by individual intermediaries, another highly frequent occurrence is that of intermediaries with combined roles. The typology of innovation intermediaries usually comes down to: financial intermediaries, professional associations, business associations, networks, interest organizations and innovation services and technology transfer organizations [20].

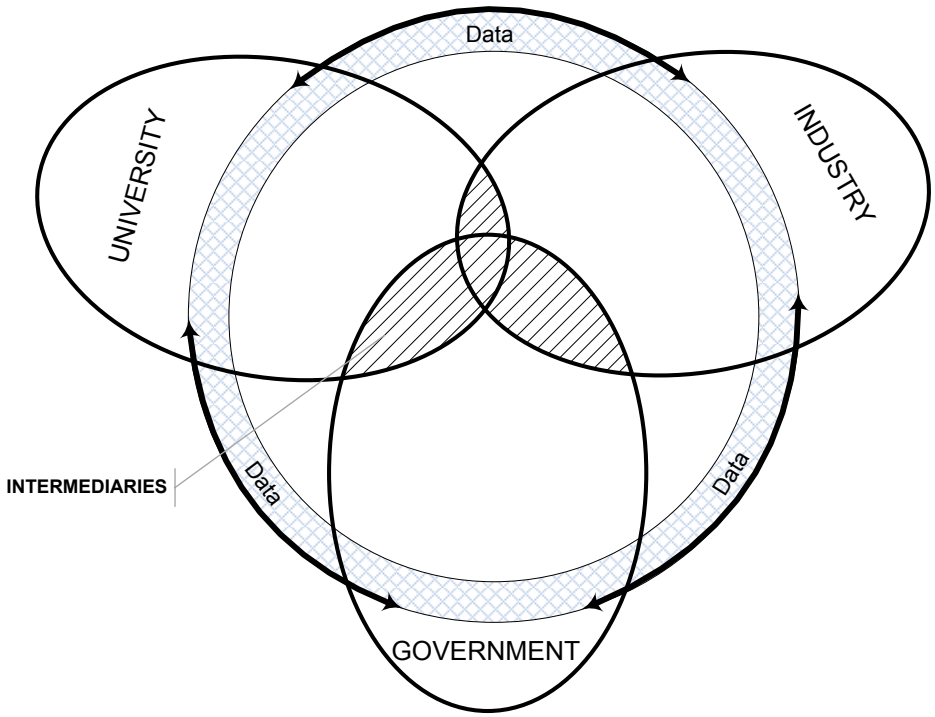


Figure 2.Triple Helix concept of innovation.

## 3 UNIVERSITY-INDUSTRY COLLABORATION

The collaboration between the university and the industry is a growing trend, strategically important to the partners.[8] Universities and industry have different motivations, but mutual interest to collaborate as well. Their natural strategic interest is crucial for building a close cooperation which would facilitate knowledge transfer from the university to the industry by means of mutual learning. In cooperation, both parties combine their resources to share costs and risks, produce a cooperative research and gain access to the competencies, resources, knowledge of the partner [9].

There are numerous forms of cooperation with indisputable benefits, but the reasons for cooperation are very diverse. Cooperation with the industry enables universities to supplement funds for their own research, to solve technical and design problems, develop new processes and products, improve product quality, conduct research, and other activities [10]. At the same time, this cooperation provides universities with opportunities to build their entrepreneurial role; get business opportunities; have access to equipment and data; and also get opportunities for student internship and job placement. Interactions with industry provide learning opportunities for universities through new knowledge and insights on industry; feedback from industry; information about problems faced by industry; application possibilities of research; and becoming part of the industry network [11]. Cooperation with universities, in turn, provides the industry with expertise, access to fundamental scientific research results obtained at universities, cooperation in research and development, and cooperation in the conduct of the education process.

However, having these different basic purposes the university and the industry support each other, e.g. the industry is “outsourcing verification activities to their partner university but allows the university to benefit since the enabling capability generates new knowledge that allows them verify their previous discovery work” [12]. University-Industry cooperation represents a basis for reaching innovations, developing new products, improving research and development (R&D), producing new knowledge, faster transmission of discoveries of research from lab settings onto the market, as a source of competitive advantage. Therefore, cooperation has a significantly positive impact on economic development and performance of associated organizations, as well as on their innovations’ productivity and knowledge creation.

University-industry interactions take many forms, which can be roughly classified into two groups [13]:

a) Teaching and training
   - active participation of industry in planning and designing university study programmes,
   - in-kind support from industry (equipment donations, student scholarships, teaching grants etc.),
   - participation of experts from industry at universities as part-time or visiting professors, or lecturers only on selected subjects from daily practice,
   - industry provision of on-the-job training opportunities and part-time work opportunities,
   - offer of lifelong learning courses by universities, and specialised customised programmes,
   - education of top talents and employees sent by companies, etc.

b) Research
   - tangible industrial support to the university (research contracts, research grants, direct funding of research institutes or university departments, equipment donations, opportunity to use industry research facilities, etc.),
   - exchange of knowledge (industry projects with the participation of students by writing theses or seminar papers; hiring of research-oriented students; knowledge sharing through scientific publications; participation in conferences, seminars, or round tables; student volunteers’ internship, industrial consulting by university staff; bilateral staff exchange, joint research etc.
   - technology transfer (patent sale or licensing, joint ventures for the commercialisation of joint research, creation of spin-of firms, and
   - starting up executed through founding by companies and others in the University campuses: business incubators, centres of excellence, technology networks and platforms, convergence laboratories and technology centres and parks).

According to research described in the reference literature, the above listed numerous forms of university-industry collaboration are conditioned by various factors influencing their quality. The

general conclusion is that there is a high number of factors that affect collaboration between universities and the industrial sector in knowledge transfer. Analysing the frequency of their occurrence in particular pieces of scientific research, one can infer that the highest frequent factors are motivation, social networks, organizational culture, communication, project management and knowledge management. In addition, factors with lower frequency include trust, funding, size, geographical location, evaluating potential partners' technological capabilities, absorptive capacity, information and communication technologies (ICTs), etc. [14].

# 4 CLUSTERS AND CLUSTER-LIKE ORGANIZATIONS AS INTERMEDIARIES

„Clustering is generally defined as a process of firms and other actors co-locating within a concentrated geographical area, cooperating around a certain functional niche, and establishing close linkages and working alliances to improve their collective competitiveness." [15]. Clusters are seen as drivers for entrepreneurship and innovation through assisting firms with complementary competencies and creating arenas for collaborations [16]. Clusters combine different types of actors by providing linkages between them, the way the Triple Helix model relates different spheres for collaboration. In both cases, what is especially significant are the various types of actors and various forms of interaction between the players and spheres.

Despite the fact that clustering has been present as a frequent economic phenomenon only recently, this type of linkage has long existed as a supplementary form to organizations' economic activities. The reasons for this status should be sought in several key reasons.

The first reason is related to managing relationships within clusters, as well as the overall operation of these clusters. Complex monitoring of all business relations within clusters used up considerable resources and the sheer volume of technical operations often compromised their main activity. Progress in information and communication has simplified the execution of these tasks, and created a prerequisite for more efficient management, rendering clusters economically justifiable.

Furthermore, due to the nature of resources it is based on – labour, capital, material and energy, the traditional production function did not find a favourable medium for its own achievement in the networked economy. The limited possibility for sharing these resources, resulting from their material nature, represents the key reason for all forms of networking, including clusters, to be regarded as a supplementary form of economic activities. Inclusion of knowledge as an equally important resource of the production function has given networking an entirely new dimension. The exploitation and dissemination of knowledge and information in the knowledge-based economy has become as relevant as their creation. Rather than a matter of prestige, innovation becomes a necessity, and networking becomes the optimum avenue for achieving their innovation.

It is the above listed reasons that lead to a conclusion that clustering, i.e. networking, enables one's own survival and progress only through an intense knowledge utilisation and dissemination. This can only be achieved by means of active inclusion of knowledge institutions, such as universities and institutes, in clustering activities.

The analysis of clusters in the countries of the SEE region in the ClusterPoliSee project has identified inadequate share of knowledge-intensive institutions in the cluster structure. Table 1 shows the results obtained by this analysis. The table demonstrates the achieved progress, which cannot be precisely measured in time, due to the different times of establishing of the analysed clusters. However, information pointing to the significance of knowledge institutions is that the greatest increase in the share of knowledge institutions in clusters is noticed in the clusters which included the highest number of such institutions at establishment. It can therefore be concluded that practical recognition of knowledge as an inevitable element of the production function, and its exploitation and dissemination, creates dependence on knowledge, placing it in the function of the essential element of its own progress.

The diversity of types of actors in cluster structure leads to the need for organizations specializing in intermediating between them. This is what we call a cluster-like organization – an organization that operate within a cluster and intermediate between different actors with a certain aim. They could be very small but in the same time take advantage of the size and resources of a cluster [18][19]. Cluster-like organizations aim to perform different activities between other organizations in order to coordinate and balance relations between them.

The above chapter has stated the roles of intermediaries, which usually imply the groups of activities they realize. These are, but not limited to: Facilitator, Broker, and Provider of meeting places, Problems solver, Needs identifier, Educator/trainer, Promoter, Monitor, and Network builder. All these activities carry intermediary character. Cluster-like organizations mostly perform the activities of network building, providing meeting places, promotion and facilitation, monitoring, problem solving and brokering, needs identification, education and training. Thus, these organizations create the prerequisites for an even more successful cluster development and creation of various forms of intermediary organizations.

Table 1. Cluster structure for SEE region (average of all cluster from analyzed countries; according to benchmarking tool of ESCA- European Secretariat for Cluster Analysis) – Today and at establishment. [17]

| Types of Actors | At establishment * | In % | Minimum | Maximum | Today** | In % | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| Large companies | 2 | 7% | 0 | 15 | 4 | 5,6% | 0 | 74 |
| Medium companies | 4 | 13,3% | 0 | 49 | 7 | 9,7% | 0 | 81 |
| Small companies | 9 | 30% | 0 | 118 | 22 | 30,6% | 0 | 362 |
| Micro companies | 10 | 33,3% | 0 | 66 | 30 | 41,7% | 0 | 608 |
| Universities, technical colleges | 1 | 3,3% | 0 | 8 | 2 | 2,8% | 0 | 28 |
| R&D institutes | 1 | 3,3% | 0 | 9 | 1 | 1,4% | 0 | 13 |
| Training and education providers | 0 | 0% | 0 | 8 | 1 | 1,4% | 0 | 10 |
| Financial institutions | 0 | 0% | 0 | 4 | 0 | 0% | 0 | 12 |
| Public bodies and intermediaries | 3 | 10% | 0 | 26 | 5 | 6,9% | 0 | 62 |

* Average cluster structure for SEE overall at the establishment of cluster

** Average cluster structure for SEE overall today

## 5 CONCLUSION

In the development of Triple Helix innovation concept, clusters play a significant role in linking various organization types from different spheres into a unified entity. A special contribution to cluster development is provided by universities. There are different areas in which universities contribute to cluster growth. Universities with strong technical competencies have often been the starting point for cluster initiatives. Bidirectional university-industry interactions such as consulting, joint research and contract research enable the conduct of tacit and explicit knowledge transfer, benefiting universities, the industry and the cluster.

The proximity of universities and other types of organizations from the industry sphere within the same cluster allows face-to-face meetings and networking, enhances coordination and aids the development of trust and joint research culture. At the same time, within the performance of their research role, universities can also accumulate knowledge outside clusters and be the gatekeepers who filter and diffuse relevant knowledge into the cluster [21]. In particular, universities have a unique opportunity to acquire knowledge from foreign universities, institutes and knowledge centres, synthesize the knowledge, and diffuse it into the clusters.

Based on their orientation on profits, representatives of industries will typically be looking at knowledge from a short-term perspective, so it is on the universities to contribute to the heterogeneity of research and, at the same time, economic growth. Besides that, universities must have a crucial role in looking ahead for technological, economic, and social changes that impact clusters, depending on the needs of the cluster.

Cluster-like organizations that are able to perform their intermediary activities between at least two other organizations from governmental, industry or university sphere are of significant importance for the development of clusters. These organizations represent bodies which fulfil the mission in the society that is exploited by all of the Triple Helix actors.

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