

# Clusters as platforms for business-research (B2R)/research-business (R2B) relations

Country Report – Slovakia

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## List of Abbreviations

ALE	The Association of Legal Entities
BA	Bratislava region
BB	Banská Bystrica region
CO	Cluster organization
ECEI	The European Cluster Excellence Initiative
ESCA	The European Secretariat for Cluster Analysis
HEI	House of Events Innovation
ICT	Information and Communication Technology
KE	Košice region
LE	large enterprises
NPO	Non-profit organization
NR	Nitra region
OP	Operational programme
PI	Public institutions
R&D	Research & development
R&D&I	Research & development & innovation
RI	Research institution
RO	Research organization
SARIO	The Slovak Investment and Trade Development Agency
SAS	Slovak Academy of Sciences
SBIC	SME Booster and Innovations Cluster

SIEA	The Slovak Innovation and Energy Agency
SMEs	Small and medium sized enterprises
SGR	Self-governing region
SPK	Slovak Plastic Cluster
UNI	University
UKS	Union of Slovak Clusters

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## Summary

The main aim of this report is to describe the matter of relationships between business and research facilitated by cluster organizations (COs) in the Slovak Republic, which is necessary to achieve the objective of the project “Clusters as platforms for business-research (B2R)/research-business (R2B). The objective of the project will be achieved by finding answers to the following questions:

1. What **policy instruments** on cluster organizations’ development and R2B/B2R cooperation have been set in the V4 countries? What policy instruments focusing on cluster development and R2B/B2R cooperation are considered helpful? How can they be further improved or reconsidered?
2. What **types of research organizations** such as universities (UNI) and research institutions (RI) are members of cluster organizations in the V4 countries?
3. What **motives** for cooperation between companies and RO on the basis of COs prevail in the individual V4 countries?
4. What **forms** (procedures, activities, and models) of cooperation between business and RO based on the cluster organizations (COs) (but not necessarily initiated by the cluster) are used in the individual V4 countries?
5. What **models** of cooperation between business and research institutions constitute the best practices in cluster organizations in the V4 countries?
6. What **factors** are influencing the cooperation between business and research institutions in cluster organizations in the individual V4 countries?
7. What are the **obstacles and challenges** of cooperation between business and research institutions in the V4 cluster organizations?

The Slovak COs’ environment is very specific in Slovakia. There is no holistic cluster **policy**, cluster strategy, cluster legislation in the Slovak Republic. The CO in the Slovak Republic were established on the bottom-up principle without any specific governmental or other institutional support. In this regard we can observe two groups of COs in the Slovak Republic. The first group consists of clusters, which are not prefer the straight support and they perceive the legislation as restrictive and limiting. They can carry out activities based on membership fees of their members. The second group of COs have had experience with various project financing with national and international projects and therefore they would welcome practices related to holistic cluster concept and policy. These statements are confirmed by our findings.

The largest **membership** base of both groups of COs is made up of SMEs (79%), educational institutions (9%), large enterprises (7%), RO/RI (5%). The research organization are divided into

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two groups of stakeholders: universities and research institutes. The 64% of the RO are universities and 36 research organizations. Among the universities connected to the COs' cooperation often belonged: University of Žilina, Slovak Technical University in Bratislava (The Faculty of Chemical and Food Technology, The Faculty of Materials Science and Technology in Trnava), Technical university of Košice (The Faculty of Mechanical Engineering), University of Žilina (The Faculty of Mechanical engineering at the University of Zilina).

Our research provides answers to all questions, and they are presented in individual parts of this report. It provides the answers on questions from two point of view: cluster managers and researchers.

The first part of the report is focused on findings related to **motives** for cooperation between companies and UNI/RI/RO on the basis of COs. According to cluster managers in Slovakia the main motives for this type of cooperation include: access to new knowledge, cutting-edge technology, state of the art expertise/research facilities and complementary know-how. 100% of cluster managers consider these motives as the most important for the above mentioned cooperation. The least important motive was the influence research direction and new programmes for industry which marked two of eight clusters. This motives were marked as neutral for five cluster managers. According to researchers' explanations, the main motive is the ability to extent their network.

There are findings related to **forms and models** of cooperation in the second part of the report. Regarding the form of cooperation between firms and RI/UNIs, the most common form of cooperation used by all clusters is occasional cooperation. The second choice is cluster membership and the formation of an alliance. The least common form of cooperation is endowed chairs and advisory board.

From the researchers' point of view the research conducting was the most important form of B2R/R2B cooperation in CO. The scientific research is very important part at their parent institution and the obtained results are published in different ways. Participation in research projects enhances the overall credibility of researchers. Due to the low level of research sample in case of researchers, we cannot interpret the models of cooperation very well. Individual respondents reported a specific model of cooperation in this part of the report.

Third part of the report presents information about **factors** conditioning B2R/R2B cooperation in COs. The various research studies observe several types of factors that conditioning B2R/R2B cooperation. Within this project we focused on the financial funding under which several factors were observed. Financial sources are important prerequisite for the realization of common projects. Cluster managers consider as the most important factors, which **facilitates** the cooperation between cluster members the facilities, communications as well as the trust. The

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biggest **barrier** of cooperation is the factor of capacity, constraints of R&D&I in SMEs, six COs consider this factor as hinder. The weakest factors are the facility, communication between cluster members and mutual trust. Private sources were identified as the crucial financial source of cooperation. The least one was membership's fees. Researchers have perceived as the most important factors University/research organization internal budget and External education grants (international).

Anyway, the main obstacles the COs' representatives consider the absence of the cluster legislation and policy for clusters.

## Introduction

This national report was written under the project “Clusters as platforms for business-research (B2R)/research-business (R2B) relations co-financed by the Governments of Czechia, Hungary, Poland and Slovakia” through Visegrad Grants from International Visegrad Fund (Visegrad Fund project No. 22030333).

The research goal of the project is to identify models of collaboration between business and research facilitated by cluster organizations, based on the mapping of best practice across V4 countries. According to theoretical cluster model, such collaboration should emerge in every cluster as one of the cornerstones of its existence. The project also seeks to demonstrate why both companies and research organizations benefit from working together.

The project focuses on cluster organizations and avenues for collaborative efforts between business and research within the territorial ecosystems in Czechia, Hungary, Poland and Slovakia, in accordance with the quadruple helix model. Additional goals of the project are:

- to examine the motives for B2R/R2B partnerships between business and research institutions in cluster organizations,
- to identify factors which shape B2R/R2B in cluster organizations,
- to identify forms of B2R/R2B in cluster organizations,
- to define the best practices of B2R/R2B in cluster organizations that can be transplanted and implemented in other V4 countries.

According to the project’s methodology, the research presented in this national report was conducted in three steps:

1. Carrying out in-depth interviews with cluster organizations’ managers to define the role of research organizations in clusters organizations.
2. Conducting a survey among research organizations to collect data on the different forms of collaboration and their main benefits.
3. Conducting interviews with the representatives of research organizations to expand on the data collected in the survey.

The purpose of the in-depth interviews was to collect qualitative data on the role of research organizations in cluster organizations, to assess the added value of collaboration, and to identify forms of collaboration that work well. The interviews provided information on (i) the lessons

learned so far and (ii) the expectations and needs for policy instruments that may improve B2R/R2B partnerships. This part of the study served to identify the main motives for entering into partnerships, the outcomes of collaboration, and the factors that may determine its forms and scope. The interviews helped diagnose the most important challenges and barriers to be taken into account when designing prospective support instruments. The subsequent steps of the study built upon the interviews with cluster organizations' managers. The purpose of the survey among research organizations was to collect up-to-date, comparable data on the forms of collaboration with enterprises, as well as the resultant benefits for research organisations and universities. To further explore collaboration from the perspective of the science sector, semi-structured interviews were carried out with employees of the research organisations that deal directly with companies belonging to cluster organizations.

The present national report elaborates upon the data collected during the study. The whole project encompasses four national reports: for Czechia, Hungary, Poland and Slovakia. The purpose of the reports was to analyze the role of cluster organizations in facilitating partnerships between enterprises and research organizations. The national reports present key findings about such partnerships and good practice that can be disseminated.

The national report is structured as follows. The first chapter provides an analysis of the current status of collaboration between business and research institutions. The second chapter gives an overview of the cluster landscape in the country, as well as the national cluster policy in recent years. It also includes a profile of cluster organizations that took part in the study. The third chapter provides information on the motives for pursuing B2R/R2B in cluster organizations and the related benefits for the stakeholders, including factors that have motivated researchers to pursue collaboration with a cluster organization and its members. The fourth chapter gives an overview of the forms of B2R/R2B functioning in practice among cluster organizations. The fifth chapter discusses the factors shaping (and, in particular, promoting) B2R/R2B collaboration in cluster organizations. The challenges, barriers and detrimental factors were analysed in the following chapter to answer the question of what can hinder B2R/R2B. In the respondents' opinion, the cost of collaboration brought on by administrative overheads is the most significant barrier. The seventh chapter presents good practices of collaboration in cluster organizations that can be transplanted and implemented in other V4 countries. Finally, the last chapter provides recommendations and conclusions, focusing on suggested measures to improve cluster policy and to support cluster organizations.

The Authors of the report would like to express their sincerest gratitude to all the respondents that kindly agreed to participate in the study and to share their knowledge, opinions and thoughts.

## 1. Current status of cooperation between business and research institutions

The necessity of a closer link between higher education and practice is very actual and often debated topic in the Slovak Republic. Universities in every country should contribute to the competitiveness of the country. In comparison with other European countries, Slovak Republic lags far behind here. Increasing the proportion of practical training directly by employers is an absolute necessity. There is also a need to increase the quality of teachers, with an emphasis on practical experience of working with or in organisations outside academic area. It is also important to strengthen the 'transferable competences', including skills for internationalisation.

The results of our research confirmed both the importance of linking education with practice, as well as gaining practical experience by teachers and researchers. The results of conducted questionnaire surveys among cluster managers in the Slovak Republic showed that cluster organizations (COs) cooperate with universities (UNIs), research or research institutes (RIs) in various forms. These activities are supported by cluster platforms in some regions of the Slovak Republic in several ways depending mainly on the personal commitment of the cluster management. COs that have acquired one of the three labels (GOLD, SILVER, BRONZE), but were formed 2-3 years ago have provided R2B and B2R cooperation to a lesser extent.

The cooperation between business and RO in the Slovak Republic depends on several factors:

- (i) **personal relations:** between CO's representatives and representatives from UNI/RI; most COs cooperate in various forms of cooperation and participated on various projects (national, international, scientific, educational, etc.). Collaboration on such projects is usually based on informal collaboration and good relations between the cluster management and the UNI/RI representatives.
- (ii) **economic branch:** The COs, which are operated in Slovak regions provide partnership with UNI/RI in a more concrete form in projects related to R&D&I. RO, in some cases, based on the requirements of cluster members prepare various analyses, reports, evaluation reports and conduct final theses. We can confirm that there is both trade association, interdisciplinary and sectoral cooperation between UNI /RI and CO members. In some cases, this cooperation is based also on historical preconditions. If economic branches in region is focused with the same orientation as UNI/RI, the precondition or cooperation based on the cluster platform are possible and more beneficial for all CO's members.
- (iii) **location and distance between CO and UNI/RI:** As far as distance is concerned in terms of the localisation of the CO, this has a significant impact on some members. On the other hand, in the case of a sector such as ICT, localisation and distance of the partners does not play a significant role in terms of cooperation.

- (iv) **financial sources:** If we consider the financial possibilities for the CO/RO cooperation, we can conclude, that the direct state support for COs is very poor. During the last ten years, COs could finance their activities mainly based on their membership fees. A lot of projects are usually without financial benefit. The CO and UNI therefore use various forms of grants, such as innovation vouchers, support form SMEs, and international funding support (Interreg, COSME), for their cooperation. Not all COs have had possibilities to use funds from HORIZON 2020, although they prepared projects, despite achieving a high score, they were not approved for funding.
- (v) **interest in linking education with practice:** Functioning but also established clusters contribute to the creation of new curricula in cooperation with UNI, based mainly on personal relationships the UNI prepare the final thesis for CO's members based on the demand these members.

Despite the difficulties in the area of cluster support from the state and regional support programmes, the absence of cluster legislation and the overall cluster policy, we can conclude that cooperation between business and RO develops successfully with a significant impact on society not only in the region, but also in a national and in some cases in an international context.

## 2. Overview of the cluster development in recent years

### 2.1 Overview of the cluster landscape in the country

The clusters, which carry out their activities, there in the Slovak Republic can be described as a relatively new form of doing business. Functioning clusters are institutionalized and managed and can therefore be referred to as cluster organisations (COs). In the Slovak Republic, the official typology of COs according to the Slovak Innovation and Energy Agency (SIEA) is used. This typology divides the COs into two groups: technological and tourism. Tourism clusters are a specific category due to their support system. While in the past they were supported both by membership contributions and direct contributions from the state, at present they are rather reoriented into tourism associations, whose establishment, functioning and support are governed by the legislation in force, namely Act No. 91/2010 Coll. on the Promotion of Tourism, and clusters act either as regional tourism organisations or destination management organisations (e.g. Cluster Liptov). There are the tourism COs in the Trnava, Nitra, Banská Bystrica, and Žilina. Except for the Trenčín region, technology cluster organisations are found in all regions. Figure 1 show an overview of COs in 2021 in the regions of the Slovak Republic, typologically disaggregated according to SIEA, while technology clusters are further disaggregated by sectoral focus in accordance with The European Secretariat for Cluster Analysis (ESCA) in Figure 2.

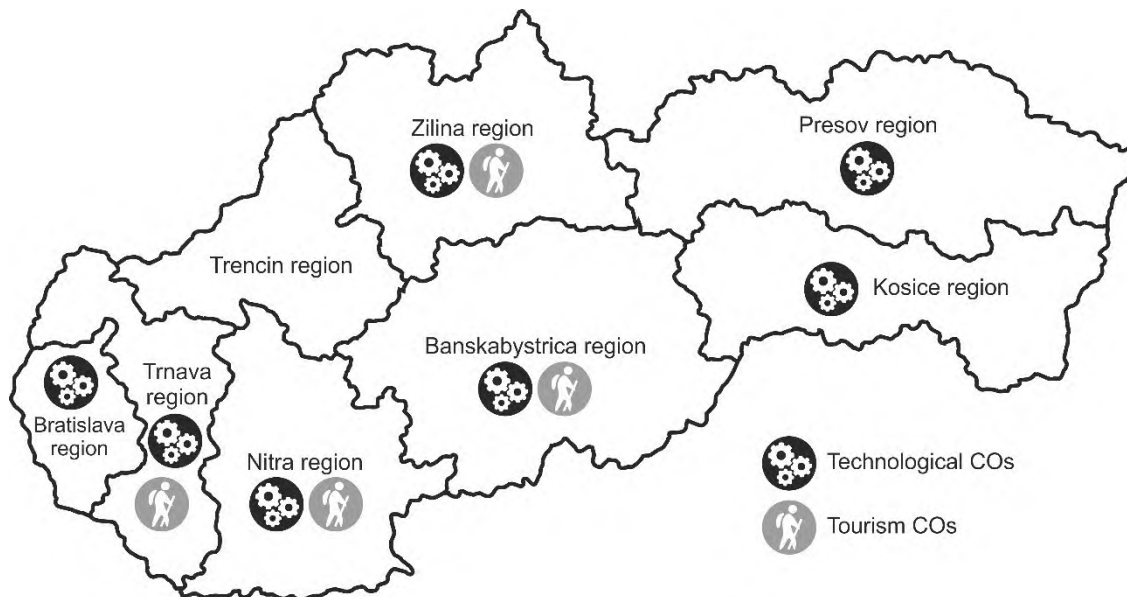
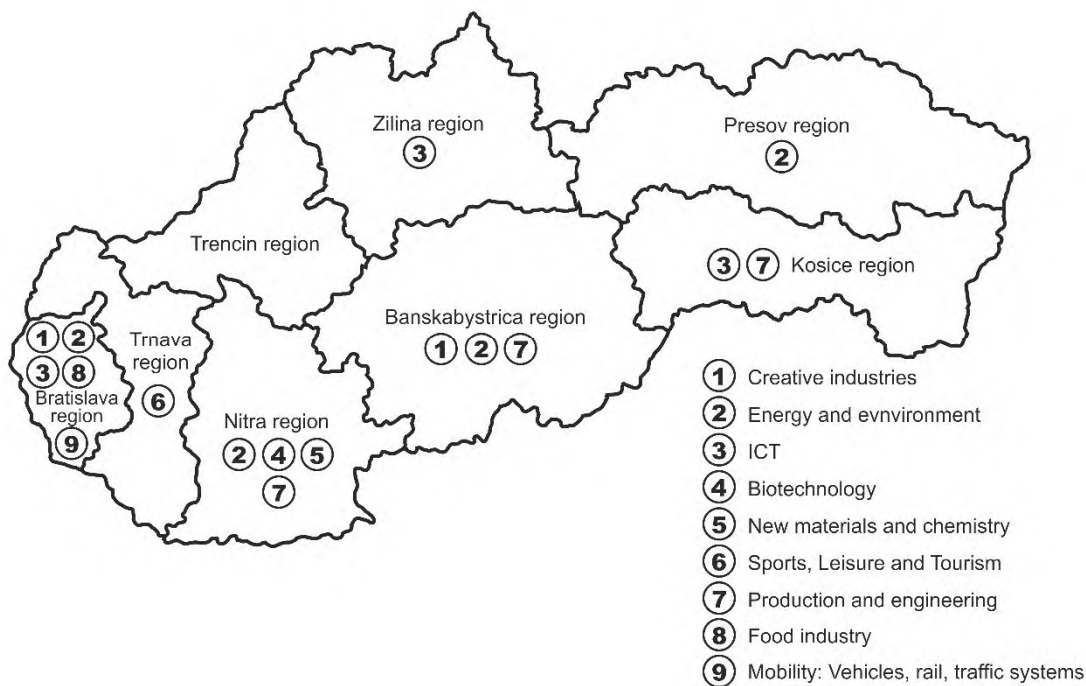


Figure 1 The typology of COs in the Slovak regions according to SIEA

Source: own elaboration



**Figure 2 The typology of COs in the Slovak regions according to ECEI**

Source: own elaboration

According to the ESCA’s typology, COs in the regions of the Slovak Republic are classified within the following sectors: (1) creative industries, (2) energy and environment, (3) information and communication technologies (ICT), (4) biotechnology, (5) new materials and chemistry, (6) production and engineering.

The identification of COs is quite complicated in the Slovak Republic. This is because there is no unified database in the Slovak Republic, which would provide unambiguous data on the number of COs operating in Slovak regions. There is the Union of Slovak Clusters (UKS) in Slovakia, which was established in 2010 as a non-profit organization. It is the only organization representing COs in Slovakia. Currently, UKS has 16 members.

When identifying the COs in the regions of the Slovak Republic, we can rely on the **databases** and **registers** where these COs are registered, given their legal form: *FinStat*, *Register of associations of legal entities*, *Register of Civil Associations*, and the *Register of Tourism Organisations*.

In 2021 there were 47 entities, which name contained the word cluster in the *Register of associations of legal entities*, which is provided by the Ministry of the Interior of the Slovak

Republic. The second register is the *Register of Civil Associations*, which is also provided by the Ministry of the Interior of the Slovak Republic, where we could find 11 entities with the word cluster in their name. The third register is the *Register of Tourism Organisations*, which is maintained by the Ministry of Transport and Construction of the Slovak Republic. In this register, the Orava Cluster is listed as well as the regional tourism organization, but at the same time the Orava Cluster, like the Balnea Cluster Dudince, the Horehronie Cluster, and the Smolenice Cluster, is a civic association, the TURIEC Cluster and the LIPTOV Cluster are tourism associations, and the LIPTOV Cluster is also a member of the regional tourism organization.

There were 27 COs in the **ESCA database** in January 2022, by which the validity of the relevant label expires in the years 2021-2024. However, not all COs met the requirements related to achieving the objectives of this project. Table 1 provides a list of technology COs in the regions of the Slovak Republic, in which the cooperation between business and RO is investigated under the focus of the project.

As part of the pre-research for the preparation of the project we set two criteria for the next research. In the first step, we have focused on the COs, which obtained one of the three ECEI quality labels: BRONZE, SILVER or GOLD for professional cluster management. In the second step we have investigated whether the COs declare the collaboration with a UNI/RI on their webpage. After a pilot verification of the survey possibilities, when formulating the objectives of the project, we determined that we would address 5 clusters out of the above-mentioned number by means of a questionnaire survey. During the duration of the project, despite the set number of COs in project, we have contacted all 17 clusters to complete the questionnaire, but not all of them were suitable for questionnaire survey due to the low level of their collaboration with UNI/RI. Finally, the questionnaire surveys were completed by 8 COs from 4 Slovak self-governing regions (Table 2).

**Table 1 The characteristics of clusters**

Cluster	Legal form	Predominant field(s) of cluster activity (NACE)	Year of cluster foundation	Number of cluster members
Bioeconomy Cluster	ALE	Biotechnology	2015	17
Cyber Security Cluster	ALE	ICT	2018	14
Energy Cluster of Presov Region	ALE	Energy and the environment	2012	5
HEMP Cluster	ALE	Production and engineering	2018	5
House of Events Innovation	ALE	Creative industries	2019	11



Industry Innovation Cluster	ALE	Production and engineering	2017	14
IPEEK - Energy Environmental Cluster from Ipel Region	ALE	Energy and environment	2020	16
Klaster Automatizačnej techniky a robotiky AT+R	ALE	Production and engineering	2010	17
KOŠICE IT Valley	ALE	ICT	2007	63
NEK - Národný energetický klaster	ALE	Energy and the environment	2012	52
SBaA - Slovenská Batériová Aliancia / Slovak Battery Alliance	ALE	Energy and the environment	2019	22
Slovak National Hydrogen Association Cluster	ALE	Energy and the environment	2019	51
Slovak Plastic Cluster	ALE	New materials and chemistry	2009	38
Slovak Smart City Cluster	ALE	Energy and the environment	2017	18
SME Booster and Innovations Cluster	ALE	Creative industries	2020	17
Združenie inteligentného priemyslu - Industry4UM	ALE	ICT	2019	15

Source: own elaboration based on databases of ESCA (2022)

## 2.2 Cluster policy in recent years

The identification and subsequent implementation of cluster policy in the Slovak Republic requires the fulfilment of four points: (1) policy, (2) legislative documents, (3) cluster support instruments and (4) the implementing agency.

- (1) policy:** the legal basis of cluster policy should constitute a coherent framework and legislative documents should form a key part of it and they should focus on the support of the COs. In case of the Slovak Republic, it is not possible to speak about a coherent and holistic cluster policy.
- (2) legislative documents:** the form of support and the way in which clusters operate in a particular territory (municipality, region, state, association or group of different states) should be regulated in legislative documents, support programs and tools, the role of public administration as a facilitator or mediator between potential members of a cluster. In the Slovak Republic, legislation directly regulating the functioning and support of clusters is currently not available. Some elements are found in various documents of strategic and program nature, while ensuring the functioning of the cluster organization is governed by the applicable legislation for the mentioned legal forms of COs and the forms of the entities themselves connected to the CO (e.g. 40/1964 Coll. Civil Code (§20), Act No. 83/1990 Coll., On Citizens' Associations, Act No. 523/2004 Coll., On Budgetary Rules of Public Administration, Act No. 71/2013 Coll., On the Provision of Subsidies within the Competence of the Ministry of Economy of the Slovak Republic 431 / On Accounting, as amended, Act No. 91/2010 Coll. On Tourism Promotion). These documents belong to the legislative documents at national level, which enable the association of entities and regulate the functioning and possibilities of obtaining support, either for individual entities, but also associations, whether they are ZZPO, OZ or OOCR.
- (3) cluster support instruments:** In addition to legislative documents, the support and functioning of cluster organisations in the Slovak Republic is ensured through various strategic and programme documents at national and regional level.

Documents at national level:

- Research and Innovation Strategy for Smart Specialization of the Slovak Republic (RIS3),
- OP Integrated Infrastructure,
- Rural Development Program of the Slovak Republic,
- OP research and innovation,
- Integrated Regional OP,
- Project - Increasing the innovation activity of the Slovak economy,
- De aid schemes of minimis to support the industrial COs,
- Scheme to support the increase of innovation performance of business entities and clusters.

Documents at regional level:

- Programs of economic and social development,
- Action plans in the fields of development: industry, tourism, creative industry,
- Regional innovation strategies

Within programming period 2014-2020 the COs were supported from:

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- the OP Research and Innovation, within the Call for submission of a national project entitled “Increasing the innovative performance of the Slovak economy” (applicant SIEA). The support concerns the raising of innovation awareness of target groups, including clusters.
- the OP Integrated Infrastructure, from which the calls for proposal were published divided by regions, which are designed to support networking of companies through the implementation of projects aimed at streamlining the activities and development of established cluster organizations, support for their innovation potential, cooperation, and internationalization.
- the scheme de minimis to support industrial COs, which is under the responsibility of the Ministry of Economy of the Slovak Republic.
- support for Tourist organizations’ activities in the field of tourism development is implemented in accordance with Act no. 91/2010 Coll. Focused on the support of tourism and it is under the responsibility of the Ministry of Transport and Construction of the Slovak Republic.

**(4) the implementing agency** should be established to ensure the practical implementation of cluster policy. Unlike other V4 countries (in the Czech Republic, for example, CzechInvest), there is no specific ministry or agency in the Slovak Republic that explicitly focuses on the implementation of cluster policy and cluster support. At the national level, there are mainly the ministries that contribute to the development of clusters and their competencies differ in different forms of support. These include e.g. Ministry of Economy of the Slovak Republic, Ministry of Education, Science, Research and Sports of the Slovak Republic, Ministry of Transport and Construction of the Slovak Republic, Ministry of Culture of the Slovak Republic, Ministry of Investment, Regional Development, and Informatization of the Slovak Republic and Ministry of Agriculture and Rural Development of the Slovak Republic. Among other institutions currently dealing with issues such as cluster operation and cluster support we can include the SIEA, which has produced several analyses and studies focused on issues of the cluster policy: "Clusters and support for innovation development (2009)", "Clustering - a prerequisite for success", "Cluster policy in Slovakia" (Balog, 2015). In the previous period, there were also agencies such as the Slovak Business Agency (SBA) and the Slovak Investment and Trade Development Agency (SARIO), which cooperated with clusters on various projects or educational activities. In 2010, the Union of Slovak Clusters (UKS) was established as an interest association of legal entities to support the development of clusters and cluster policy in Slovakia. It is the only organization representing clusters in Slovakia. It currently has 16 members, but is not the implementing agency for cluster policy, despite its prerequisites (elaborated according to Haviernikova, 2020).

In the Slovak Republic, the concept of cluster policy is only partially and marginally incorporated in the above elements. The subject of interest in the previous and current programming period are mainly some industrial sectors, creative industries, and tourism.

On one hand, there are well-developed documents that are designed to address the problems of clusters, such as the Smart Specialisation Strategy of the Slovak Republic (RIS3), the OP Research and Innovation and the OP Integrated Infrastructure, but on the other hand, their implementation in practice is still at an insufficient level.

The establishment of clusters on the basis of a bottom-up approach showed that despite the absence of a cluster policy, many COs are implementing their activities and looking for opportunities to obtain support for their projects from available programmes, not only at national but also at international level.

The current market and support activities of the EU allow also Slovak COs to participate in various development projects (of course, this area is also currently affected by the global pandemic). Insufficient support of COs by the state at the national and regional levels appears to be a problem. There is a lack of interest on the side of stakeholders, which is impacted by the weak awareness of the importance of cluster cooperation as well as low awareness of politicians at the national and regional levels about the problems of clustering. We can confirm that cluster cooperation is an open platform for cooperation between cluster organizations and universities and secondary schools. Regional, national, and international cooperation with other enterprises or clusters and cooperation with technology parks and incubators is developing (elaborated according to Haviernikova, 2020).

### **2.3 Description of clusters that took part in the study**

The participation in the questionnaire surveys carried out in the framework of this project was accepted by eight COs listed in the table 2. These COs (see Table 2) were from four self-governing regions of the Slovak Republic (Banská Bystrica region, Bratislava region, Nitra region, and Košice region). Four researchers who had cooperated on common projects in cooperation with COs and their members represented the RO. Some researchers cooperate with more than one CO. Three researchers were from UNI (University of Žilina, Slovak University of Agriculture in Nitra, and Slovak Technical University in Bratislava), one researcher was from SAS.

As part of the pre-research for the preparation of the project we set two criteria for the next research. In first step we have focused on the COs, which obtained one of the three ECEI quality labels: BRONZE, SILVER or GOLD for professional cluster management. In the second step, we have chosen whether the COs declare the collaboration with a UNI/RI on their webpage. After a pilot verification of the survey possibilities, when formulating the objectives of the project,

we determined that we would address 5 clusters out of the above-mentioned number by means of a questionnaire survey. During the duration of the project, despite the set number of COs in project, we have contacted all 17 clusters to complete the questionnaire, but not all of them were suitable for questionnaire survey due to the low level of their collaboration with UNI/RI. Finally, the questionnaire surveys were completed by 8 COs from 4 Slovak self-governing regions (Table 2).

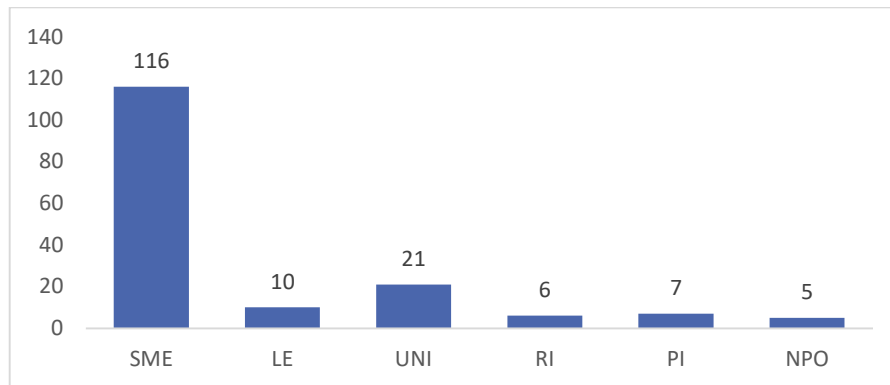
**Table 2 The characteristics of clusters participating in the questionnaire survey within project**

Cluster	SGR	Predominant field(s) of cluster activity (NACE)	Year of cluster foundation	Nr. of cluster memb.	ECEI label valid until	Web page
Bioeconomy Cluster	NR	Biotechnology	2015	17	BRONZE 2021/11/05	<a href="https://bioeconomy.sk/">https://bioeconomy.sk/</a>
HEMP	BB	Production and engineering	2018	4	BRONZE 2024/11/30	<a href="https://www.konopnydvor.sk/">https://www.konopnydvor.sk/</a>
House of Events Innovation	BA	Creative industries	2019	11	BRONZE 2024/10/31	<a href="https://www.heicluster.com/">https://www.heicluster.com/</a>
IPEEK - Energy Environmental Cluster from Ipel Region	BB	Energy and environment	2020	16	BRONZE 2022/09/30	<a href="https://www.ipeek.eco">https://www.ipeek.eco</a>
Košice IT Valley	KE	ICT	2007	63	GOLD 2023/07/31	<a href="https://www.kosiceitvalley.sk/en/">https://www.kosiceitvalley.sk/en/</a>
SBaA - Slovenská Batériová Aliancia / Slovak Battery Alliance	BA	Energy and the environment	2019	22	BRONZE 2024/10/31	<a href="http://sbaa.sk/">http://sbaa.sk/</a>
Slovak Plastic Cluster	NR	New materials and chemistry	2009	38	SILVER 2023/10/31	<a href="https://portal.spklaster.sk/index.php/en/">https://portal.spklaster.sk/index.php/en/</a>
SME Booster and Innovations Cluster (SBIC)	BB	Creative industries	2020	18	BRONZE 2023/12/31	<a href="https://www.sbic.sk/sk/kontakt-2/">https://www.sbic.sk/sk/kontakt-2/</a>

Source: own elaboration based on the ESCA

Within the questionnaire surveys COs declared cooperation within R2B/B2R with SMEs, large enterprises (LE) UNI, RI, public institutions (PI) and non-profit organization (NPO) as Figure 3

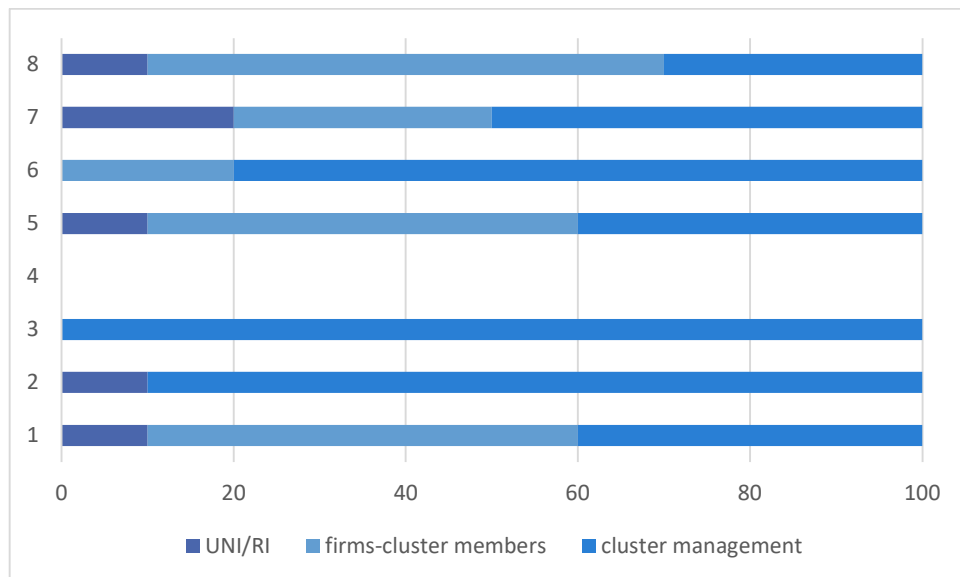
presents. This cooperation has formal form with real projects financing mainly from Horizon 2020, as well as in-formal form, based on personal cooperation between cluster member and a member from UNI/RI.



**Figure 3** Types of entities that are a member of the COs participating in research

*Source: own elaboration based on the interviews with cluster managers*

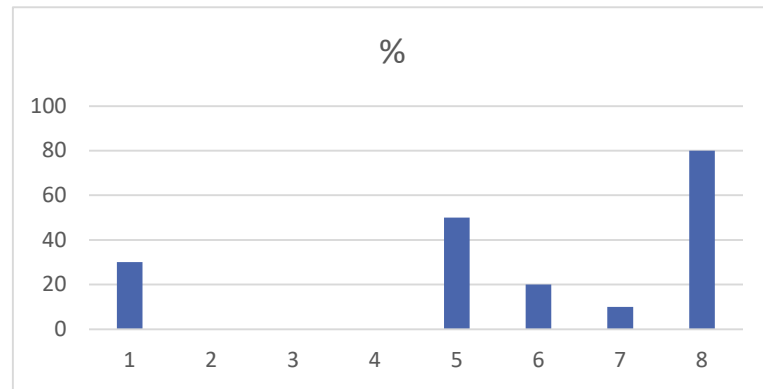
R&D&I cooperation was in most cases initiated by cluster managers (see Figure 4). The cooperation in most cases was based on in-formal ties between cluster managers, or cluster members – firms, which were followed up by cooperation in the form of various projects. One respondents didn't want to answer on this question.



**Figure 4** Who initiated R&D&I cooperation between firms and RO within your CO? (%)

*Source: own elaboration based on the interviews with cluster managers*

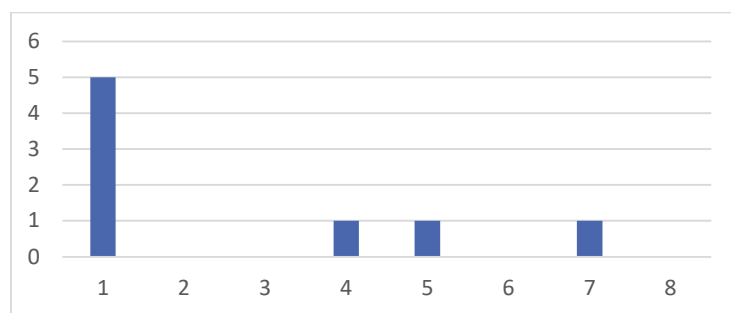
COs within questionnaire surveys also declared the approximate share of firms-cluster members that have been actively included in R&D&I cooperation between firms and RI/UNI with their clusters. Figure 5 presents the answers of COs' managers. Not all of them answered this question.



**Figure 5 Share of firms - cluster members actively included in R&D&I cooperation between firms and RO (%)**

*Source: own elaboration based on the interviews with cluster managers*

Within the questionnaire survey, we asked COs managers about the international R&D&I projects financing from grants e.g. Horizon 2020. From 8 COs, only 4 have participated in this type of project (Figure 6). Cluster managers are interested in cooperation in this type of projects, due to the benefits for the cluster members such as the transfer of knowledge, the support of cooperation between UNIs and economic practice, the involvement of members in various events, but it is not eased to be successful in this type of international projects mainly due to the administrative complexity and co-financing conditions.



**Figure 6 Number of international R&D&I projects (such as Horizon 2020), in which CO was a partner**

*Source: own elaboration based on the interviews with cluster managers*

If we consider the initiations of cooperation from the point of view of researchers, they have 3 possibilities how to answer of this question: a) me, b) Supervisor/manager from my institution, c) CO's manager, we can conclude, that in all cases, it was the manager of CO, who initiated this cooperation. The results of surveys showed that his cooperation was based on previous cooperation or personal contacts between researcher and CO's manager.

### 2.3.1 Bioeconomy cluster

The aim of this COs is to promote cooperation, networking, innovation, and mutual exchange of information between cluster members and other stakeholders in agri-food and bio-based sectors. The members and partners of Bioeconomy Cluster are research centres, agricultural university and SMEs operating in the sector of agriculture, food, forestry, and other areas representing wide bioeconomy spectrum. Therefore, the Bioeconomy Cluster has national coverage. In November 2019, Bioeconomy Cluster was recertified by the ESCA and for the second time it was awarded with the European Cluster Management Excellence label in BRONZE. The certificate was valid until November 2021.

Cluster and its members have broad experience in the implementation of national and international projects (EU Framework Programmes, European Territorial Cooperation, International Visegrad Fund, structural funds, etc.), participate in monitoring committees and working groups at national and EU level, have experience in the area of technology transfer including the establishment of transfer centres. Members of the Cluster have built partnerships with major organisations and institutions at international level (OECD, JRC, etc.) (Bioeconomy Cluster, 2022).

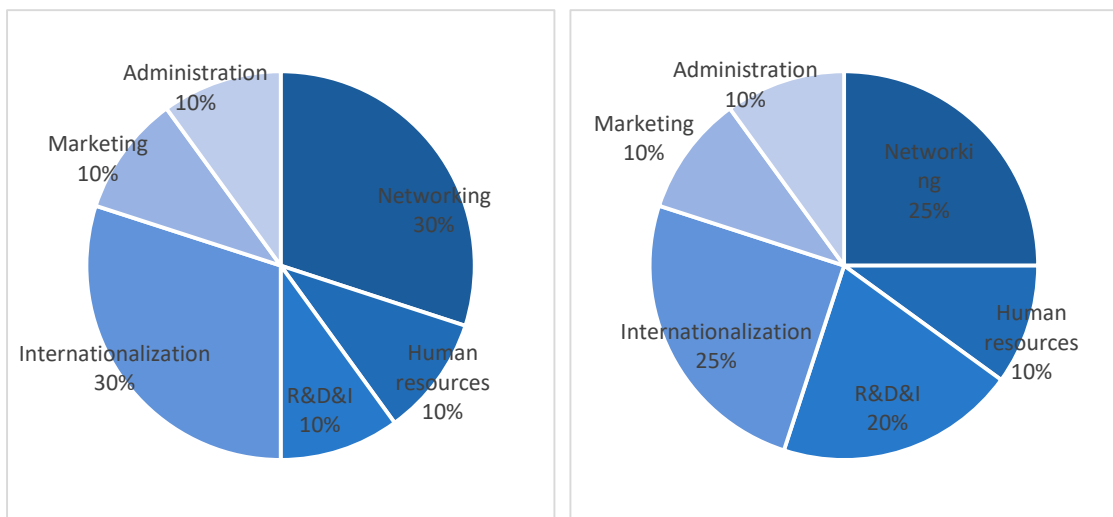
**Membership in the Bioeconomy cluster:** There are 17 members in this COs, of which 3 members belong to founding members. In the last 3 years the increase of cluster members has been 20%. The division of cluster's members in 2021 was as follows: 14 SMEs, 1 university (Slovak University of Agriculture in Nitra), 1 RI (Agroinstitut Nitra) other than university, 1 PI (The National Agricultural and Food Centre).

**Cluster management staff in the Bioeconomy cluster:** There are 9 employees in the cluster, from which 3 persons work full-time. Cluster manager position includes the position of cluster manager and project manager.

**Competences of cluster management in the Bioeconomy cluster:** project management, R&D&I, internationalization, and administration.



**The main activities of the Bioeconomy cluster:** Figure 7 presents the activities of the Bioeconomy cluster. In the last 3 years, this CO has been focused mainly on activities related to the internalization (35% of all activities) and the networking (30%). The CO foresees the focus of its activities over the next 3 years as shown in Figure 8, whereby this CO plans to increase the activities focused on R&D&I by 10%.



**Figure 7 Activities of the Bioeconomy cluster in the last 3 years**      **Figure 8 Activities of the Bioeconomy cluster in the next 3 years**

*Source: own elaboration based on the interviews with cluster managers*

*Source: own elaboration based on the interviews with cluster managers*

**Strategy of the Bioeconomy cluster:** Cluster management of this CO prepares a document of strategic development of a cluster up to 2025, in which the strategy of cooperation with RI/UNI's the part of this document. SPK was partner in 5 international R&D&I's projects (through e.g. Interreg, Horizon 2020). Within these common projects, the members of Bioeconomy cluster benefited from knowledge transfer, connection into events, cooperation and acquiring new contacts.

There are 17 companies included in the Bioeconomy cluster, of which 3 belong to strategic innovators with 75% of participation to cooperation in R&D&I and 14 to technology recipients with 25% participation. As a result of cooperation between firms and RI/UNI which was managed by cluster, belong business process innovation and the innovation in frost protection of apples, keeping a herd of cattle in a meadow, plant protection against heat stress, which were realized within 3 mini-projects.

**Cooperation of the Bioeconomy cluster with RO:** Bioeconomy cluster declare cooperation with 2 researchers (1 from university and one from Agroinstitut Nitra). Within this project, 1

respondent (from university) took part in the survey. The duration of the respondents' involvement in activities of CO was around 10 years, because this cooperation was established on personal cooperation in the field of agrobiotechnology with representatives of CO. The researcher declared that the cooperation during the pandemic situation related to COVID-19 was not affected.

### 2.3.2 HEMP CLUSTER

The HEMP cluster also participated in the questionnaire survey that is focused on research and development of new or innovated Hemp products. It has, together with Hemp cooperative, taken the role of partner institution for hemp industry advancement and technologically aligned companies. Goal is to ensure long-term sustainable advancement of Hemp manufacturing with high added and ecological value. By applying cooperative and circular economy it aims to create interaction of specializations in development and manufacturing of organic commodities from regional crude (HEMP CLUSTER, 2022).

**Membership in the HEMP CLUSTER:** There are 4 members in this cluster of which 1 belongs to RO.

**Cluster management staff in the HEMP CLUSTER:** The cluster employs 3 people, of which 2 work full time. Cluster manager has also full-time contract thanks to the realized project.

**The main activities of the HEMP CLUSTER:** The cluster management declare activities presented on the Figure 9. The CO is focused mainly on activities related to networking (40%). R&D&I activities present 30% of all realized activities and these are realized these are mainly implemented by enterprises without RI/UNI participation.

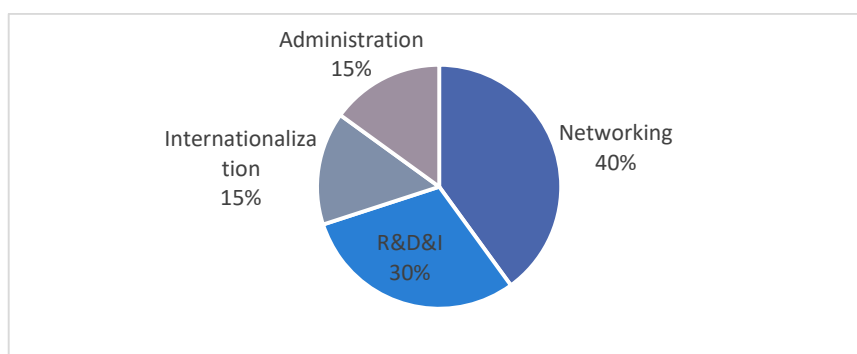


Figure 9 Activities of the HEMP CLUSTERS

Source: own elaboration based on the interviews with cluster managers

**Strategy of the HEMP CLUSTER:** The creation of strategy in this CO is affected by low awareness of the products provided by the cluster. Cluster members form strategy of CO and all 4 members are considered as strategic innovators. This CO cooperate also with SPK cluster, and within this cooperation they innovate their products.

**Cooperation of the HEMP CLUSTER with RO:** The cluster management state the cooperation with university, but this cooperation in this time is based mainly on non-formal cooperation and in form of final thesis consultation. The COVID-19 pandemic situation also has impact on the activities of this cluster.

### 2.3.3 House of Events Innovation (HEI)

HEI is an association of legal entities and independent experts dealing with issues related to event management and event services provider. HEI aims to contribute to research and education in the field of social sciences related to the organization and provision of events and to support the export of events related services to the EU and the world.

The strategic goals of HEI:

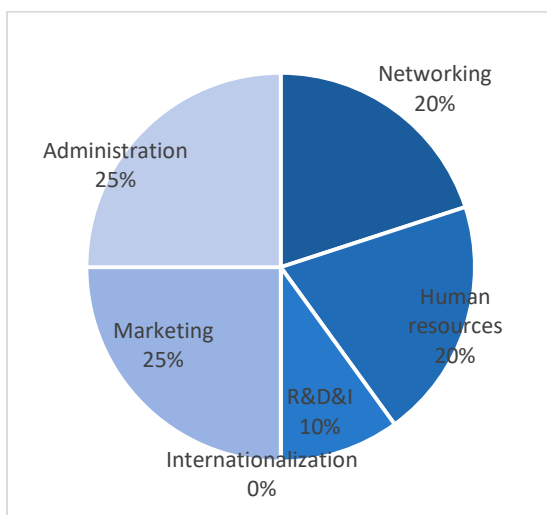
- To arrange educational activities, lectures, discussions, seminars, and conferences on the events management;
- Realization of optimization and automation of event processes;
- To develop optimized event organization schemes with an emphasis on security and cultural and social benefits for the local community;
- Educating of the organizers of the event in the field of security, eco-friendly and ZeroWaste orientations and sustainability towards the environment and nature;
- To promote Slovak organizers of events and subcontractors of events in the Slovak Republic and abroad;
- To research the basis of the data obtained from the participants in the events, to analyze the information obtained and to define the groups of participants in such events as well as their consumer preferences. Use of data while respecting GDPR requirements for follow-up activities and networking of collaborative events;
- Creating and supporting systematic contacts with professional institutions and academic institutions in the Slovak Republic and abroad;
- Cooperation with other legal and natural persons whose activities are in line with the HEI objective (HEI, 2022).

**Membership in HEI:** Nowadays, there are around 20 members in this CO, of which 3 members belong to funding member in the year of cluster foundation (2019). In the last 3 years the number of cluster members has had increased by 200%. There are 11 SMEs, 1 university (the Pan-European University with the Faculty of informatics) and 1 public institution (Bratislava self-governing region) in HEI.

**Cluster management staff in HEI:** There are 5 employees in cluster, of which 1 person - cluster manager works full-time.

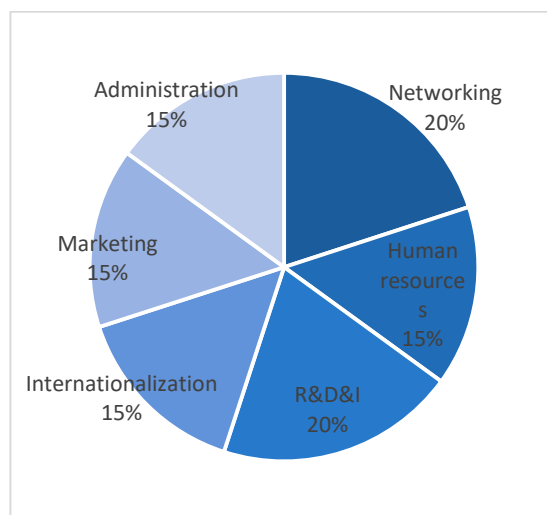
**Competences of cluster management in HEI:** project management, R&D&I, and administration. Their internationalization was in a form of research in V4 countries.

**The main activities of HEI:** Figure 10 presents the activities of HEI In the last 3 years. HEI has been focused mainly on activities related to the administration (25% of all activities) and the marketing (25%). The HEI foresees the focus of its activities over the next 3 years as shown in Figure 11. We can observe the progress in the case of internalization (increase by 15%) and R&D&I (increase by 10%).



**Figure 10 Activities of the HEI in the last 3 years**

Source: own elaboration based on the interviews with cluster managers



**Figure 11 Activities of the HEI in the next 3 years**

Source: own elaboration based on the interviews with cluster managers

**Strategy of HEI:** Cluster management of HEI prepares a document of strategic development of a cluster, but the strategy of cooperation with RI/UNI in this document is missing. HEI has not participated in international R&D&I project. Although the strategy with RI/UNI is not directly elaborated in strategic document, CO's management consider how to start cooperation in the

field of Cash less festivals, BigData analyses, elaboration of final theses based on common demand.

There are 13 members in the HEI, of which 1 member belongs to the category of strategic innovators and 12 to technology recipients. As a result of cooperation, the innovation is in form of new products or service innovation and in case of business process innovation, HEI declared as the results of innovation the production process for cluster members.

**Cooperation with RO:** The HEI has the cooperation with the Pan-European University (Faculty of Informatics), which was initiated by cluster, based on personal and non-formal relations. Within this cooperation partners help realized only several analyses. The cooperation during the last years was significantly affected by pandemic situation related to COVID-19 pandemic.

#### 2.3.4 IPEEK - Energy Environmental Cluster from Ipel Region

The founding members established this CO with the aim of sustainable development of a modern and systemic energy policy for the development of waste management and the development of the business environment with an emphasis on production, distribution, investment development, research, development, education, social development, ecology and the implantation of new technologies to relieve environmental burdens and promote the competitiveness of the Slovak economy. The key subjects of our activities are 3 x E:

1. Energetics
2. Ecology
3. Environment

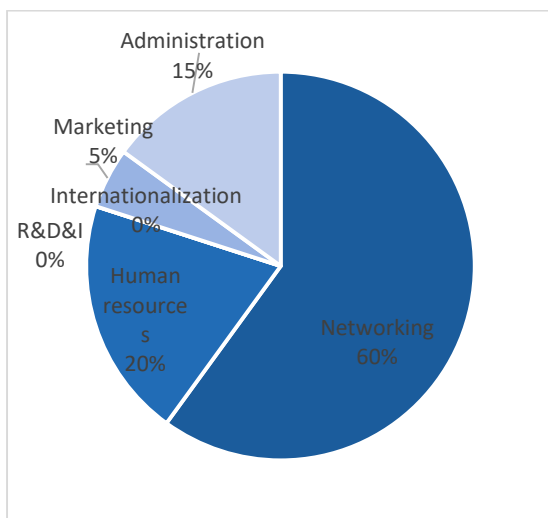
in related industry branches, projects a programme (IPEEK, 2020).

**Membership in IPEEK:** There are 16 funding members (SMEs) in the IPEEK, and this number in last 3 years has not changed. This CO has non-formal cooperation with Constantine the Philosopher University in Nitra based on personal relationships focused on various analyses related to regional development.

**Cluster management staff in IPEEK:** There is 1 employee, in this CO, who works part-time and was elected by the rest of CO's member.

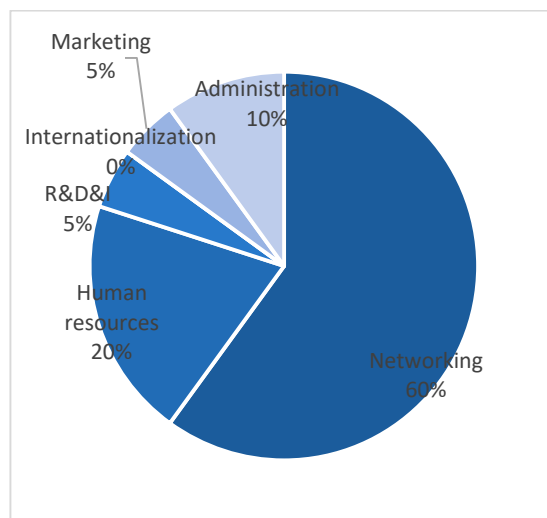
**Competences of cluster management:** project management, R&D&I, internationalization, administration, and networking.

**The main activities:** Figure 12 presents the activities of IPEEK In the last 3 years. IPEEK has been focused mainly on activities related to the networking (60% of all activities) and the development of the human resources (20%). This CO didn't focus on activities related to R&D&I and internationalization. The IPEEK foresees the focus of its activities over the next 3 years as shown in Figure 13, and it will also focus its interest on R&D&I projects to the extent of 5% of the total number of reported activities.



**Figure 12 Activities of IPEEK in the last 3 years**

Source: own elaboration based on the interviews with cluster managers



**Figure 13 Activities of IPEEK in the next 3 years**

Source: own elaboration based on the interviews with cluster managers

**Strategy of the IPEEK:** Cluster management of IPEEK prepares a document of strategic development of cluster up to 2023, in which the strategy of cooperation with RI/UNI is the part of this document. IPEEK was partner in 1 international R&D&I project (Horizon 2020). Within the common projects of SPK its members benefit in innovation in products and services, and processes.

There are 16 SMEs, of which 4 belong to strategic innovators and 12 to technology recipients. As a result of cooperation, they achieved 1 innovation in form of general process for cluster members.

**Cooperation with RO:** This type of cooperation is works only at in-formal level.

### 2.3.5 Košice IT Valley cluster

The Košice IT Valley cluster's vision is to create regional partnerships of IT companies, educational institutions, and regional governments. These will contribute to the expansion and improvement of educational programs, creating a broad portfolio of job opportunities for the skilled workforce. Furthermore, the cluster is interested in developing a unified strategy for achieving prosperity in the region of eastern Slovakia, thus ensuring a gradual improvement in its inhabitants' quality of life.

The main goal is to create conditions for the development of the IT industry and improve the quality of life in Eastern Slovakia. The activities of this CO are focused on the following areas:

- Education
- Innovation
- Cooperation

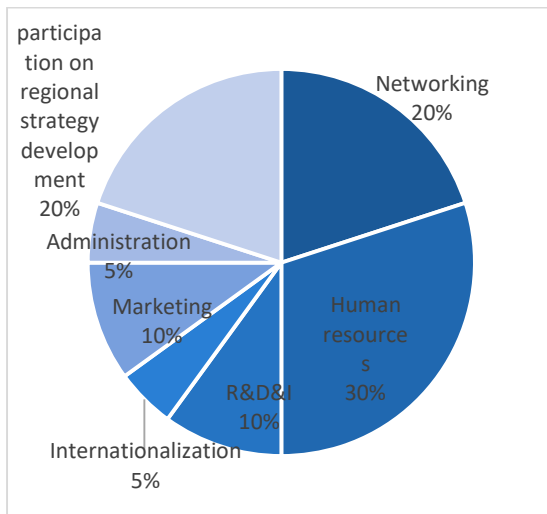
Innovation, science and research, cooperation within the cluster, or investment support have become an integral part of the cluster (Košice IT Valley, 2018).

**Membership in Košice IT Valley:** There is 7 funding members in the Košice IT Valley in the year of cluster establishment (2007), and the rate of change in the number of cluster members in last 3 year has increased around 23%. The division of cluster's members in 2021 was as follows: 15 SMEs, 10 large companies, 18-20 secondary schools, 3 universities (Pavol Jozef Šafárik University in Košice, Technical University of Košice, The University of Security Management in Košice), 1 research institution (Creative industry Košice), 3 public institutions (Košice city, Prešov city, Košice self-governing regions), and 4 non-profit organization.

**Cluster management staff in Košice IT Valley:** There are 4 employees in this CO, 3 of them works on full-time. The cluster manager has full time contract.

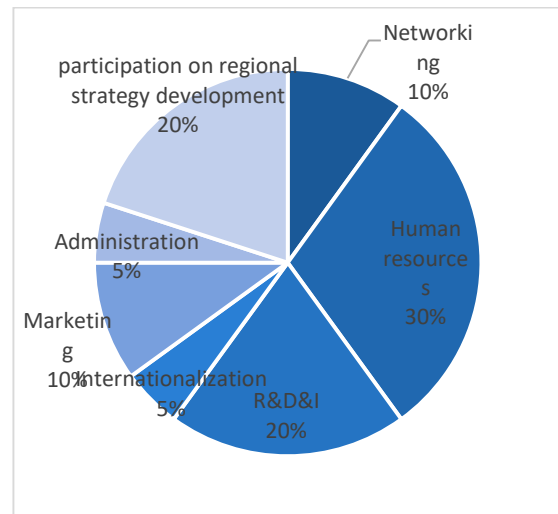
**Competences of cluster management in Košice IT Valley:** project management, R&D&I, internationalization, administration, networking, and the communication with foreign investors in cooperation with SARIO, work on strategic documents, mapping and analysing of the labour market in the field of IT sector.

**The main activities of Košice IT Valley:** Figure 14 presents the activities of Košice IT Valley In the last 3 years. CO has been focused mainly on activities related to the development human resources (30% of all activities) and the networking (20%) and participation on regional strategy development (20%). This last activity is very important for regional development. The Košice IT Valley foresees the focus of its activities over the next 3 years as shown in Figure 15.



**Figure 14 Activities of Košice IT Valley in the last 3 years**

*Source: own elaboration based on the interviews with cluster managers*



**Figure 15 Activities of Košice IT Valley in the next 3 years**

*Source: own elaboration based on the interviews with cluster managers*

**Strategy of Košice IT Valley:** Cluster management of Košice IT Valley have prepared a document of strategic development of cluster (2020), in which the strategy of cooperation with RI/UNIs is the part of this document. Košice IT Valley was a partner in 1 international R&D&I project (EDICH).

**Cooperation with RO: Košice IT Valley** cooperates in common projects with RI and universities as was mentioned above. They have also the cooperation with Government Office of the Slovak Republic, Ministry of Economy of the Slovak Republic, SIEA, and University science park TECHNICOM. The cooperation during the pandemic situation related to COVID-19 was not affected by common activities due to the economic branch in which this CO carries its activities.

### 2.3.6 SBaA - Slovenská Batériová Aliancia / Slovak Battery Alliance

The main goal of SBaA is to promote long-term competitiveness, merger and mobilization of its members' resources in order to establish an innovative and competitive battery eco-system in Slovakia. It wants to carry out activities aimed at increasing the awareness of this eco-system's importance for the industry.



In order to achieve its long-term goals and partial objectives the SBaA performs the following activities:

- Promotes the production of batteries in Slovakia, particularly for the automotive industry, but also for other sectors of transportation and industry.
- Operates as an industrial cluster aimed at promoting innovation in its field, including international cooperation.
- Promotes the creation of jobs in its field.
- Participates in the battery value chain in Europe, acting as a counter-balance to the trends on the Asian markets.
- Closely collaborates with industry actors and innovators united in the European Battery Alliance (EBA) and other international associations and organizations.
- Increases awareness of clean energy systems and the significance of the battery eco-system, promotes development and innovations in this area.
- Promotes and improves education in the area of electromobility and energy, training of experts and education of representatives of its own members.
- Promotes international exchange of information and technology transfer, roll-out of innovations and partnerships of experts which benefit the development of the battery eco-system in Slovakia.
- Develops and updates a database of entities active in battery manufacturing and development, and related fields with special emphasis on the automotive industry.
- Makes use of European funding available to the cluster to help it achieve its goals.
- Promotes R&D projects and rollout of innovations in electromobility, energy storage and hydrogen systems.
- Participates in and initiates research studies pertaining to the battery eco-system, while cooperating with universities, schools and experts, particularly in the areas of electromobility, energy storage and hydrogen systems.
- Organizes expert events, seminars and conferences related to the goals of the association.
- Participates in the legislative process and review procedures of legal regulations and other binding documents which relate to the activities of the association's members and the goals of the cluster.
- Its particular goal is to promote Slovak battery production and to assist in the development of a comprehensive battery chain in Slovakia from the mining of raw materials to battery regeneration and recycling (SBaA, 2022).

**Membership in SBaA:** There are 9 funding members in the SBaA in the year of cluster establishment (2019), and the rate of change in the number of cluster members in the last 3

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year has increased around 240%. The division of cluster's members in 2021 was as following 17 SMEs, 5 UNI (Technical University of Košice, Pavol Jozef Šafárik University in Košice, University of Žilina, Slovak University of Technology in Bratislava, Slovak University of Agriculture in Nitra), 1 RI (The Centre of Excellence for Advanced Materials Application of the Slovak Academy of Sciences (CEMEA SAV)).

**Cluster management staff in SBaA:** There are 11 employees in this CO, and 2 cluster managers. This CO didn't indicate the type of employment.

**Competences of cluster management:** project management, R&D&I, internationalization, and administration.

**The main activities of the SBaA:** The SBaA didn't indicate the percentage share of its individual activities. In the last 3 years, the activities have been carried out in the following order: project management, R&D&I, internationalization, and administration. The SBaA foresees the focus of its activities over the next 3 years in the following order: networking, human resources development, R&D&I, internationalization, marketing, and administration.

**Strategy of SBaA:** Cluster management of SBaA have prepared a document of strategic development of cluster, in which the strategy of cooperation with RI/UNIs is the part of this document. This CO was not a partner in international R&D&I projects.

**Cooperation with RO:** SBaA cluster declare cooperation with 1 researcher from CEMA.

### 2.3.7 Slovak Plastic Cluster (SPK)

In the Slovak Republic, the SPK is a subregional organization. It was established in 2009 as an initiative of non-governmental entities in plastics production sector. The associated companies are competitors on one hand, on the other hand they need to solve the same kind of problems and share the same resources.

Among the fields of interests of SPK it belongs:

- Support of networking/clustering.
- Increase in capacity and skills of suppliers.
- Strengthening of external relations (export) and development of new production projects.
- Support of skills for the labour market in the strategic areas of plastics processing sector.
- Increase of connections between research and company needs.

Specific activities of SPK cover:

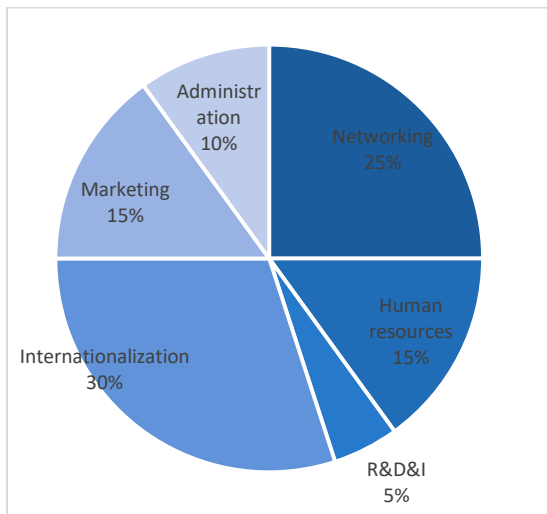
- HR and education.
- Support of networking and export.
- Support of projects in applied research.
- Support of cost decrease in the member companies.
- Presentation of statistical data (SPK, 2021).

**Membership in SPK:** There are 38 funding members in the SPK, and the rate of change in the number of cluster members in the last 3 years has increased around 35%. The division of cluster's members in 2021 was as following: 23 SMEs, 6 large companies, 1 chamber, 1 research and development centre, 1 non-profit organization, 3 universities and 9 secondary schools. The RO, which is the member of cluster is the Institute of Polymers, SAS, Bratislava. The SPK has nonformal cooperation also with Research Institute of Chemical Fibers. In this cluster, the following universities belong to cluster members: Slovak Technical University in Bratislava (The Faculty of Chemical and Food Technology, The Faculty of Materials Science and Technology in Trnava), Technical university of Košice (The Faculty of Mechanical Engineering), University of Žilina (The Faculty of Mechanical engineering at the university of Zilina).

**Cluster management staff in SPK:** There are 3 part-time employees in cluster, cluster manager position including.

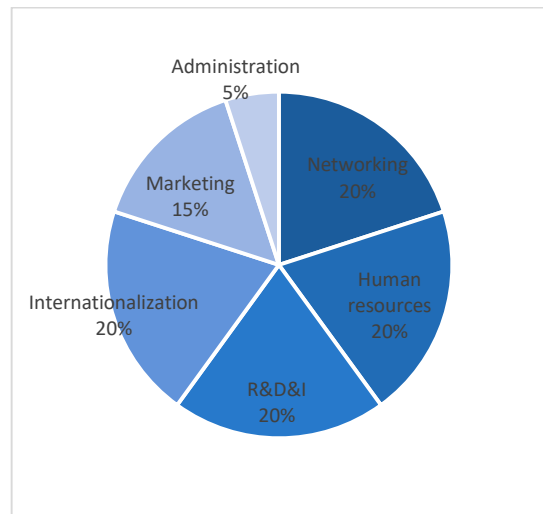
**Competences of cluster management in SPK:** project management, R&D&I, internationalization, and administration.

**The main activities of SPK:** Figure 16 presents the activities of SPK In the last 3 years. SPK has been focused mainly on activities related to the internalization (30% of all activities) and the networking (25%). The SPK foresees the focus of its activities over the next 3 years as shown in Figure 17.



**Figure 16 Activities of SPK in the last 3 years**

*Source: own elaboration based on the interviews with cluster managers*



**Figure 17 Activities of SPK in the next 3 years**

*Source: own elaboration based on the interviews with cluster managers*

**Strategy of SPK:** Cluster management of SPK prepares a document of strategic development of the cluster, in which the strategy of cooperation with RI/UNI is part of this document. SPK was a partner in 1 international R&D&I project. Within the common projects of SPK its members benefit from knowledge transfer, new technologies, and lower costs.

There are 29 companies included in the SPK, of which 9 belong to strategic innovators and 20 to technology recipients. As a result of cooperation, the product/service innovation in form of new processes of plastic production have been made. If we consider the cooperation between firms and RI/UNI managed by clusters, SPK is considered to be the innovator which has made the innovation related to common research on demand.

**Cooperation with RO:** SPK cooperates in common projects with RI and universities as was mentioned above. Within this research, there were 3 researchers (1 from SAS, and 2 respondents from universities) who took part in the survey. The duration of the respondents' involvement with CO and its members was around 3 to 5 years. The initiator of cooperation in all 3 cases was the manager of the CO. The cooperation during the pandemic situation related to COVID-19 was significantly affected, with a reduction in common activities.

### 2.3.8 SME Booster and Innovations Cluster (SBIC)

SBIC presents a network of companies and organizations supporting its members and partners in becoming more competitive by the transfer of knowledge and innovation, stimulating innovation activities and internationalization. SBIC provides its activities within 3 areas:

- Overall support - Exchange of knowledge and professional experience, creation of network and information sharing.
- Collaboration with science and educational institutions - Assistance with technology and innovations transfer.
- Experience and services - Competitiveness through innovation and internalization of business (SBIC, 2020).

Aims and objectives of the SBIC:

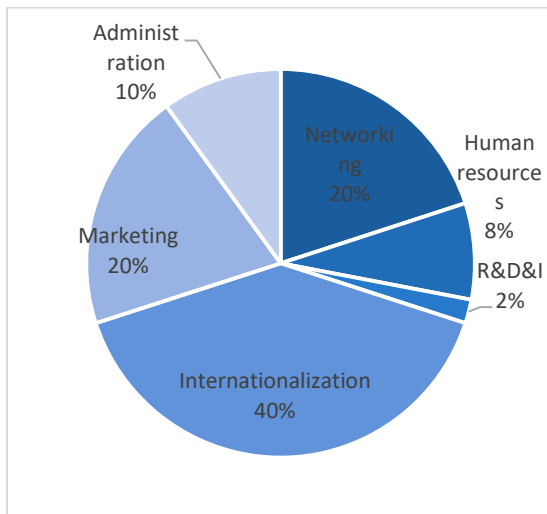
- Support of implementation of innovations, support of an innovation-friendly business environment, support of internationalization and growth of cluster members.
- Cross-border cooperation and economic development.
- Public relations and further education on current business topics.
- Support for job creation in less developed Slovak regions, support for innovation and SME growth.
- Achieving excellence of the cluster (SBIC, 2020).

**Membership in SBIC:** There are 18 members in this CO, of which 15 belong to SMEs, 1 RI (SAS), and 1 UNI (Slovak University of Technology in Bratislava - Faculty of Informatics and Information Technologies (FIIT)) and 1 public institution (Federation of employers' associations of the Slovak Republic).

**Cluster management staff in SBIC:** There are employed 4 persons in the SBIC with part-time contract, cluster manager including.

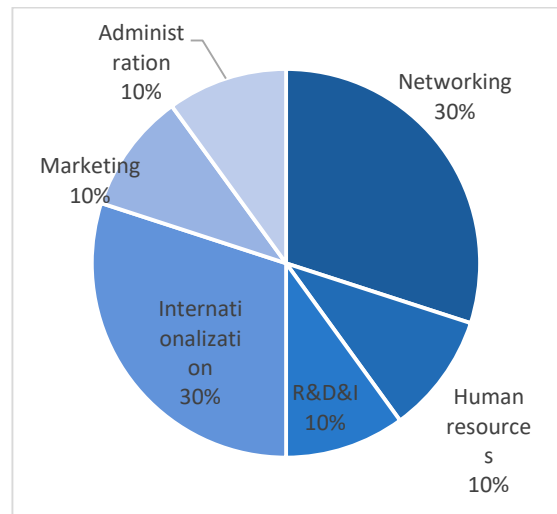
**Competences of cluster management:** project management, R&D&I, internationalization, and administration.

**The main activities:** Figure 18 presents the activities of SBIC in the last 3 years. SBIC has been focused mainly on activities related to the internalization (40% of all activities), the networking (20%), and marketing (20%). The SBIC foresees the focus of its activities over the next 3 years as shown in Figure 19. SBIC foresees an increase in activities in the areas of networking (an increase of 10%) and human resources (an increase of 12%).



**Figure 18 Activities of SBIC in the last 3 years**

*Source: own elaboration based on the interviews with cluster managers*



**Figure 19 Activities of SBIC in the next 3 years**

*Source: own elaboration based on the interviews with cluster managers*

**Strategy of SBIC:** Cluster management of SBIC prepares a document of strategic development of cluster, in which the strategy of cooperation with RI/UNI is the part of this document. So far the SBIC has not been partner in any international R&D&I project.

There are 15 companies included in the SBIC, of which 2 to 3 belong to strategic innovators and the rest to the technology recipients. As a result of cooperation in form of innovation the SBIC state following: the creation of platform for innovation creation, optimization of processes related to introduction of innovation and education.

**Cooperation with RO:** SBIC initiated cooperation with RI/UNI. The cooperation is at this time affected mainly due to the pandemic situation related to COVID-19. In the last two years, the management of the SBIC in this area mainly initiated negotiations, signed memorandums of cooperation based on the pilot projects for the development of cooperation.

### 3. Motives for B2R/R2B cooperation in cluster organizations and benefits for the stakeholders

#### 3.1 Managers of COs motives for B2R/R2B cooperation in CO

The motives that led to cooperation within the cluster are listed in the table below. Based on the individual responses, we can conclude that the most important motive for cooperation is access to new knowledge, cutting-edge technology, state-of-the art expertise/research facilities, and complementary know-how. Strongly agree was indicated by 7 out of 8 clusters, with one indicating agree. The second important motive based on the marked answers were 4 options: Business opportunity, e.g., exploitation of research capabilities and results or deployment of IPR, multidisciplinary character of products and technologies, opportunity to access a wider international network of expertise, access to research networks or pre-cursor to other collaborations. Access to funding for research was rated as the 6th most important motive (6 out of 8 clusters). This is followed by the cost saving motive, limitation of inter-firm conflicts of interest, risk reduction/sharing. The least important motive among these was rated - influence research directions and new programs for industry. Most cluster managers ranked this motive as neutral (5 out of 8 clusters), while 2 clusters disagreed with this motive (Table 3).

**Table 3 Motives for cooperation between firms and RI/UNI- responses in %**

Motives	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
A. Access to research funding	25	50	12.5	12.5	0
B. Access to new knowledge, cutting-edge technology, state-of-the art expertise/research facilities and complementary know-how	87.5	12.5	0	0	0
C. Business opportunity, e.g. exploitation of research capabilities and results or deployment of IPR	62.5	25	12.5	0	0
D. Multidisciplinary character of products and technologies	62.5	25	12.5	0	0
E. Opportunity to access a wider international network of expertise	62.5	25	12.5	0	0
F. Access to research networks or pre-cursor to other collaborations	62.5	25	12.5	0	0
G. Influence research directions and new programs for industry	0	12.5	62.5	25	0
H. Limitation of inter-firm conflicts of interest	12.5	37.5	37.5	12.5	0

I. Risk reduction/sharing	12.5	37.5	37.5	12.5	0
J. Cost savings	25	37.5	25	12.5	0
K. Human capital development	25	25	50	0	0

Source: own elaboration based on the interviews with cluster managers

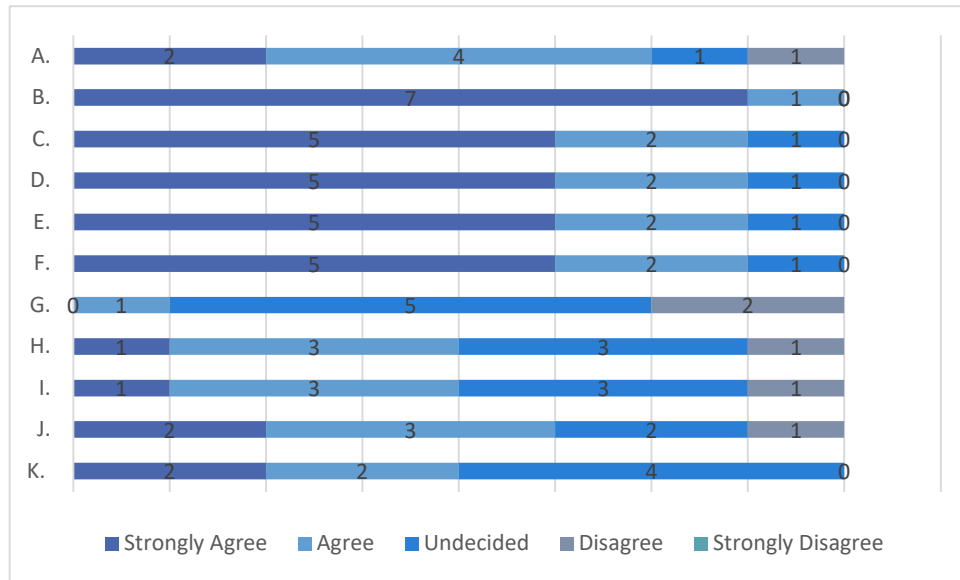


Figure 20 Motives for cooperation between firms and RI/UNI– number of responses

Source: own elaboration based on the interviews with cluster managers

All clusters except one have implemented some type of innovation in the framework of cluster cooperation. Three clusters implemented both product innovation and production process innovation. Two clusters successfully implemented a production process innovation, and two clusters implemented a product innovation. The above innovations were mainly implemented due to a request from the firms that were members of the cluster. These innovations were implemented on the basis of the clusters' focus on agriculture, plastics, information technology and environment. Even the cluster that did not implement an innovation is currently addressing the issue of big data collection, which will result in a product (software) innovation.

Most clusters expressed that collaboration with ROs and Universities has a very important impact. 5 clusters indicated this answer option, 2 clusters answered that this cooperation is important. One cluster indicated that this cooperation is slightly important in terms of their needs. One cluster indicated that in case of their specific focus, research organisations are not able to provide them with relevant assistance. Based on the questionnaire survey, we can conclude that research organisations and universities are an important partner for the cluster,



which can solve problems and tasks requested by firms within the cluster, in some cases even for non-cluster member firms.

Managers of all clusters agreed that the most significant factors for the development and support of cooperation between firms and RI/UNIV, which have been achieved by help of the cluster organization is the improvement of communication between cluster members, mutual assistance in the use of professionals. The creation of new networks, thanks to which mutual cooperation on joint professional and research projects have been developed, is also a great benefit. The results of such cooperation are innovation of products, production processes, as well as cost savings, which has an impact on increasing the competitiveness of individual companies in the cluster. The benefit of cluster activity is the activation of regional stakeholders, which gives opportunities for new challenges in the field of joint research activities.

### 3.2 Researchers' motives for B2R/R2B cooperation in CO

From the perspective of R2B and B2R cooperation, which is hold within the cluster cooperation, it is necessary to observe the factors that have impact on decision of researchers about their connection in the cooperation. Based on the previous literature studies, we provide within the questionnaire survey 7 factors, that could motivate researcher for cooperation with the CO and its members (Table 4).

**Table 4 Factors motivating researchers for cooperation with the CO and its members**

Motives	1	2	3	4	5
Ability to extend my network (networking)			1		3
Receiving research funding	1		2	1	
Commercializing research findings			2	1	1
Necessity to undergo employee assessment at the UNI/RI/other institution		1	2	1	
Gaining access to infrastructure (e.g. lab equipment)	1		1	1	1
Receiving non-financial research assistance (e.g. access to data, exchange of knowledge with practitioners, developing technology)			3	1	
Personal financial benefits	2		2		

*Source: own elaboration based on the interviews with researchers*

We asked researchers, to what extent the following factors have motivated them to pursue cooperation with the CO and its members. Researchers could rate their motives for cooperation

on 5-point scale (1-Not at all important, 2-Slightly important, 3-Moderately important, 4-Very important, 5-Extremely important). The researchers' answers we can see in the Table 4. We can state that at 75%, the most significant motive for researchers for cooperation is the ability to extent their network. As not at all important motive, researchers stated the personal financial benefit. As a very important motives for cooperation, based on personal communication we can also consider the commercializing research findings and gaining access to infrastructure.

## 4. Forms of B2R/R2B cooperation in cluster organizations

### 4.1 Forms of B2R/R2B cooperation in CO from the point of view of COs' managers

When it comes to the forms of cooperation between firms and RI/UNI within a cluster the occasional cooperation appears to be the most frequent way used by all clusters followed by also very useful method by means of being a member of a cluster and by establishing an alliance. As illustrated in Table 5, the least frequent options of collaboration forms are long-term agreements and ended up by endowed chairs and advisory boards being used only by one cluster.

**Table 5 Forms of cooperation between firms and RI/UNI**

Forms of cooperation between firms and RI/UNIV	Percentage
a) RI/UNIs as members of cluster	70
b) long-term agreement of RI/UNI about cooperation with cluster/association contracts	30
c) technology platform	40
d) alliance (common initiatives for cooperation)/informal channel	70
e) occasional cooperation	100
f) endowed chairs and advisory boards	10

*Source: own elaboration based on the interviews with cluster managers*

Regarding the types of activities between firms and universities and research organizations there could be seen just slight differences. As shown in Table 6 the peak spot belongs to activities such as information exchange forum creation and cooperation within the R&D&I projects followed by students' involvement in firms' projects type of activity within a cluster. At the bottom of the ranking there can be seen activities such as the RI/UNIV/industry facility usage and students' internships undertaken in clusters and the liaison offices and staff mobility are the least types of activities, which could be more enhanced going forward to bring up more benefits both for firms and RI/UNI not to be underrated.

**Table 6 Types of activities undertaken in cooperation between firms and RI/UNI within the cluster**

Types of activities between firms and RI/UNIV	Percentage
a) information exchange forum (eg. meetings of cluster members)	70
b) participation in seminars, conferences, exhibitions, fairs	60
c) use of RI/UNIV/industry facility	40
d) liaison offices (in RI/UNI or industry)	30
e) domestic/international cooperative R&D&I projects	70
f) students' internships	40
g) students' involvement in firms' projects	60
h) staff mobility	30

Source: own elaboration based on the interviews with cluster managers

In terms of models of cooperation, the collaborative R&D project organized and managed by cluster project manager appears to be the suitable type for the most followed by the individual members collaboration management suitable for the major number of clusters. At last, as it can be assumed from Table 7 open cluster center option is to be not very important model of cooperation. It could be implied that the cluster project manager is a strong link in terms of collaboration management and that element ought to be enhanced and highlighted.

**Table 7 Models of cooperation between firms and RI/UNI in percentage**

Models of cooperation	Very important	Important	Moderately	Slightly	Unimportant
a) collaborative R&D&I projects organized and managed by cluster project manager	60	0	25	0	15
b) collaborative R&D&I projects between cluster members organized and managed by individual members	25	55	10	0	10
c) open cluster center for industrial R&D&I (individual facilities are owned by the cluster)	0	0	10	45	45

Source: own elaboration based on the interviews with cluster managers

## 4.2 Forms of B2R/R2B cooperation in CO from the point of view of researchers

In this part of research, the research could comment on task/activities, which they carried out when cooperation was taking place with the CO and its members. We provide them 8 specific options and 1 in which they can express themselves:

- A. Conducting research
- B. Consulting
- C. Ad hoc services
- D. Conducting trainings
- E. Management/admin services (e.g. cluster coordination services)
- F. Writing applications
- G. Member of the board of the cluster organization etc.
- H. Supervision of thesis on demand: bachelor, master, doctoral
- I. Other (please specify).

In 75% of cases the researchers conducted common research with CO and its members. Other tasks/activities, which were carried out by researchers in case of cluster cooperation were: consulting, realization of training, e.g. in form of presentation to innovations, and supervision of the final thesis, based on specific requirements. The supervision of final thesis related to cluster cooperation was also realized by researcher, but this thesis was not provided within CO. or its member. The writing of application related to the projects is also one of activities realized in cluster, but researchers stated, that it is the collaborative work with representant of CO and its member, not only a requirement from the CO.



**Figure 21 Tasks/activities carried out by researchers when cooperating with the CO and its members**

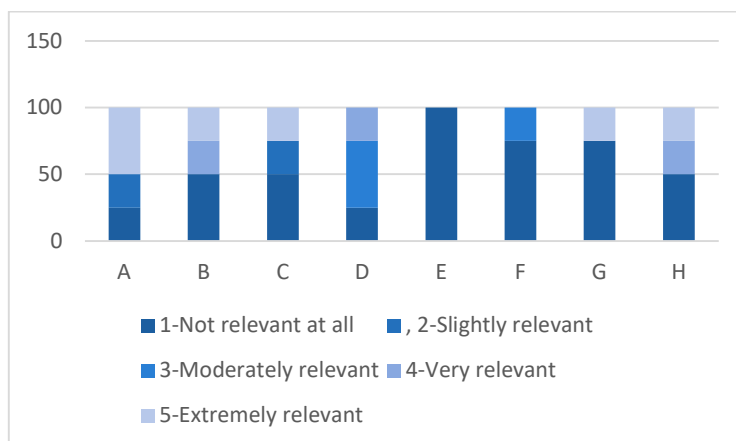
*Source: own elaboration based on the interviews with researchers*

When we evaluated the forms of cooperation among researchers and CO and its members, we focused also on various types of projects and other forms of cooperation. Due to the fact, that researchers could work on various types of projects, we divided them on two areas: according to locality (international, domestic) and according to the part of their work (research, education) We listed following forms of cooperation for researchers' evaluation of the relevance for their cooperation:

- A. Research projects (international)
- B. Research projects (domestic)
- C. Education-related projects (international)
- D. Education-related projects (domestic)
- E. Staff mobility (incoming or outgoing)
- F. Individual contracts (e.g. preparing expertise, etc.)
- G. Continuous cooperation (e.g. consulting, etc.)
- H. Occasional cooperation (ad hoc events, nonformal meetings, etc.)
- I. Other (please specify)

For the evaluation, the scale with 1-5 points was used (1-Not relevant at all, 2-Slightly relevant, 3-Moderately relevant, 4-Very relevant, 5-Extremely relevant). The results are stated in Figure 22 The most relevant forms of cooperation researchers considered mainly international research projects that provides important sources of experiences. This type of research projects is important for RI/UNI/RO due to the financial sources, that enable to help them to provide their activities in the field of R&D&I. What is important on this side, it is the personal characteristics of the researchers. The results of the realization of such projects depend on their individual characteristics, and personal dedication, not on characteristics of their UNI/RO/RI.

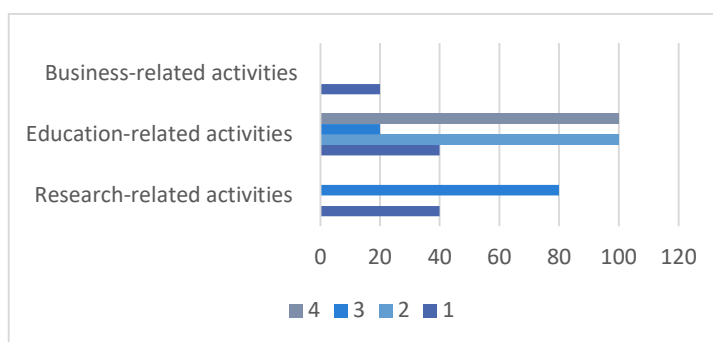
For all researchers the form of cooperation related to staff mobility was not relevant at all. Another forms of cooperation, that are not relevant for researchers are: individual contracts and continuous cooperation.



**Figure 22 The relevance of the listed forms in cooperation between researchers and CO**

*Source: own elaboration based on the interviews with researchers*

Researchers evaluated the range of the profile activities indicating the time each of them occupies regarding their cooperation with the CO and its members. We offer them 3 profile activities for selection and determination of the scope: research-related activities, education-related activities, and business-related activities. Or they could present another activity that is important for them. All researchers only indicated 3 main profile activities. They can divide 100% among these activities. 2 researchers stated as a profile activity the activities related to education. The figure 23 represents the rest of researchers' answers.



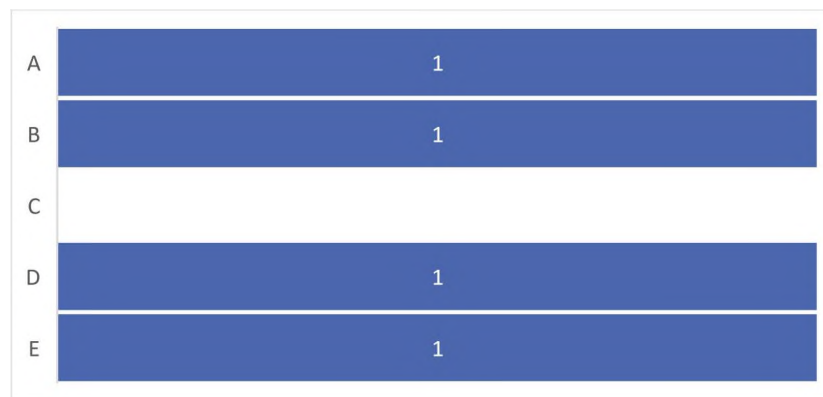
**Figure 23 Profiles of researchers' activities indicating the time each of them occupies with regard to their cooperation with the CO and its members**

*Source: own elaboration based on the interviews with researchers*

The previous research pointed on three main models of cooperation among UNI/RO/RI and CO and its members. We asked researchers, which models of R&D cooperation with CO and its member have they applied to. There were following possibilities:

- A. Collaborative projects managed/facilitated by the cluster organization
- B. Collaborative projects managed by my university/research organization
- C. Collaborative projects managed / facilitated by other members of the cluster organization
- D. Other (please specify) .....
- E. I have not conducted R&D (research&development) cooperation in this regard

One of the researchers stated that in case of R&D projects they didn't realize the cooperation with CO. One of the researchers specify, that they realize project related to improvement of cooperation. The distribution of respondents' answers is shown in the Figure 24.



**Figure 24 Models of R&D cooperation with the CO and its members applied by researchers**

*Source: own elaboration based on the interviews with researchers*



## 5. Factors conditioning B2R/R2B cooperation in cluster organizations

### 5.1 Factors conditioning B2R/R2B cooperation in CO from the perspective of researchers

Barriers and accelerators to inter-organizational collaboration were examined based on 15 criteria (see Table 8).

**Table 8 What does hinder and what does facilitate cooperation between business and research institution within your cluster – heat map**

	Hinders	Neutral	Facilitate
a) Financial resources	57,14	0,00	42,86
b) Human resources	42,86	14,29	42,85
c) Facility	0,00	14,29	85,71
d) Capacity constraints of R&D&I in SMEs	71,43	28,57	0,00
e) Geographic proximity	0,00	71,43	28,57
f) Communication between cluster members	0,00	14,29	85,71
g) Mutual trust (and personal relationships) between cluster members	0,00	14,29	85,71
h) Cross-sector differences	0,00	71,43	28,57
i) Cross-sector similarities	14,28	42,86	42,86
j) Organization interests and culture (differences between the world of RI/UNland industry)	28,58	57,14	14,28
k) Organization structure (RI/UNiversity administrative structure and firm structure)	42,86	57,14	0,00
l) Cost of collaboration due to administrative overheads	42,86	57,14	0,00
m) Capacity and fields of research of RI/UNiin relation to needs of firms in the cluster	28,57	42,86	28,57
n) Personnel exchange	0,00	57,14	42,86
o) Enhancement in reputation/prestige	0,00	28,57	71,43

*Source: own elaboration based on the interviews with cluster managers*

Results show that cooperation is facilitated by factors as follows: Facility (85,71%), Communication between cluster members (85,71%), Mutual trust (and personal relationships) between cluster members (85,71%), Enhancement in reputation/prestige (71,43%). On the other hand, as the factors that mostly hinder cooperation were identified Capacity constraints of R&D&I in SMEs (71,43%) and Financial resources (57,14%). Realized interviews also show

that Geographic proximity (71,43%) and Cross-sector differences (71,43%) are perceived as neutral. As positive and at the same time also neutral was declared Cross-sector similarities (42,86%) factor. A relatively paradoxical situation arose with the Human resources factor, as respondents considered this factor to be both a barrier and an accelerator of cooperation in equal measure.

As the most important financial source of cooperation respondents identifies private sources (48,57%). The least important are considered to be membership fees (5,71%). (see Table 9). At the same time, it can be stated that the clusters have no other financial sources as public, private or membership.

**Table 9 Financial sources for collaborative R&D&I projects in last three years in average**

	Mean	Std Dev	Median
<b>a) public sources</b>	17,14	29,84	0,00
<b>b) private sources</b>	48,57	44,13	40,00
<b>c) membership fees</b>	5,71	5,35	10,00
<b>d) others</b>	0,00	0,00	0,00

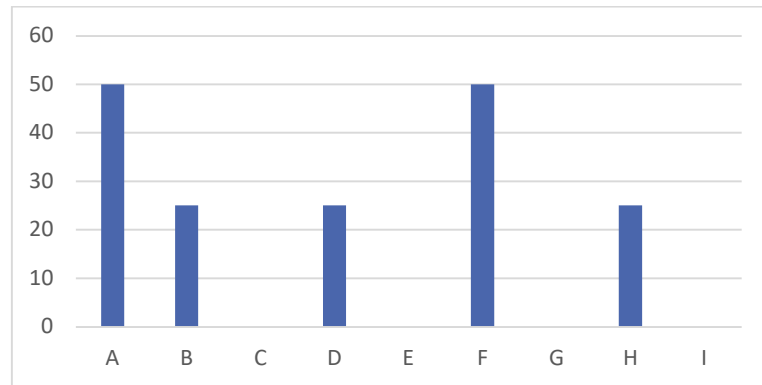
*Source: own elaboration based on the interviews with cluster managers*

## 5.2 Factors conditioning B2R/R2B cooperation in CO from the perspective of researchers

The issue of cluster funding is an important part of the solution of this project. In developed countries, with support for science, research and innovation, the cluster issues are under the adequate attention and the budgets of several cluster programmes are relatively high. Among the possibilities of cluster funding, we can include private financing, public financing, or their combination. These sources can be directed from both national and international levels. In our project we have asked researchers about three most important funding sources for their cooperation with the cluster organization and its members in the last 3 years. They could choose from the following options:

- A. University/research organization internal budget
- B. Cluster organization's budget
- C. Companies – members of the cluster organization
- D. External research grants (international)
- E. External research grants (domestic)
- F. External education grants (international)
- G. External education grants (domestic)
- H. Other (please specify) .....

I. I have not collaborated with the cluster organization within the last 3 years



**Figure 25 Most important funding sources for researchers' cooperation with the CO and its members in the last 3 years (% of respondents)**

*Source: own elaboration based on the interviews with researchers*

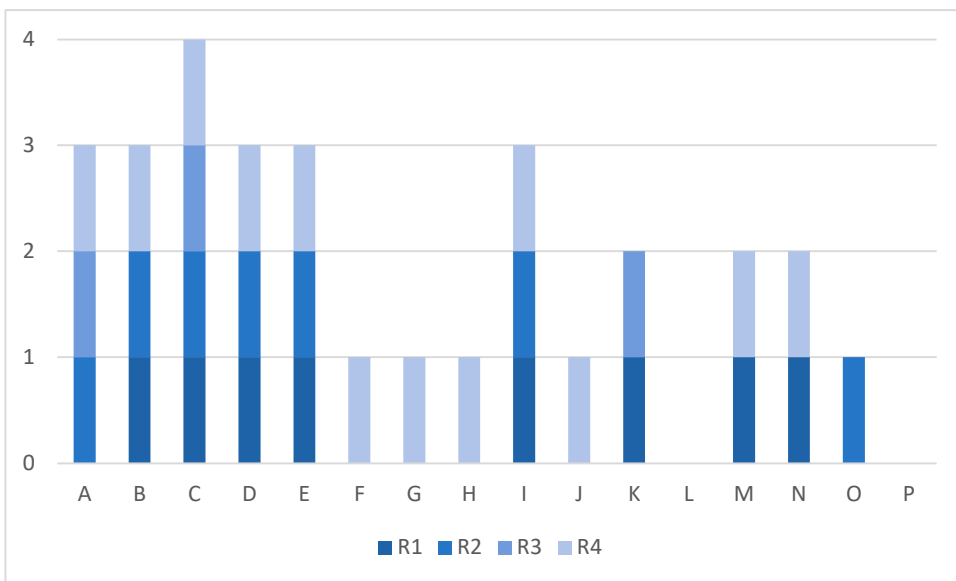
The researchers pointed on 4 important funding sources. Half of respondents stated that they consider as the most important funding sources for their cooperation with CO University/research organization the internal budget and external international education grants. One respondent has collaborated with CO in last three years without financing.

The essence of cluster cooperation lies in obtaining synergy effects of cooperation among education, science, and firms. Universities are focusing on research (knowledge production and education - knowledge transfer), but they are not as consistent in innovation or the use of their results for society. However, industry is the main user of knowledge, it is important that the results of university research reach industry. Therefore, university-industry interaction is an essential element for knowledge transfer. In our research, the researchers should have indicated which of the following results can be associated with their cooperation with the CO and its members:

- |   |                                     |
|---|-------------------------------------|
| A. Scientific papers and/or monographs        | D. Receiving grants (international) |
| B. Other publications (e.g. research reports) | E. Receiving grants (domestic)      |
| C. Preparing applications/project proposals   | F. Trademarks                       |
|   | G. Patents                          |
|   | H. Prototypes                       |
|   | I. Extending my network             |

- J. Product innovations
- K. Business innovations
- L. Marketed product/service
- M. Cluster members' training
- N. Presentations, panels, etc. for the purpose of the cluster organization or its members

- O. Final theses prepared in cooperation with the cluster organization or its members (e.g. PhD, MSc, etc.)
- P. Other (please specify) .....



**Figure 26 The researchers' indications associated with the results of cooperation with the CO and its members**

*Source: own elaboration based on the interviews with researchers*

Researchers stated 2 main factors that significantly facilitates their cooperation with CO: Mutual trust and personal relationships and Available human resources. The motive, which significantly hinders their cooperation is the Capacity constraints of R&D&I in SMEs.

**Table 10 Factors motivating researchers for cooperation with the CO and its members**

Factor	significantly hinders	hinders	neutral	facilitates	significantly facilitates
Available financial resources	0	0	3	0	1
Available human resources	0	0	0	2	2
Available facilities (e.g. laboratories etc.)	0	0	2	0	2
Capacity constraints of R&D&I in SMEs	2	0	2	0	0
Geographic proximity			2	1	1
Communication between cluster members			1	1	2
Mutual trust (and personal relationships)			1		3
Cross-sector differences		1	1	2	
Cross-sector similarities			1	3	
Organization interests and culture (differences between universities/research organizations and business)			4		
Organization structure (differences between universities/research organizations administrative structure and firm administrative structure)		2	2		
Cost of collaboration due to administrative overheads	1		3		
Capacity and fields of research of UNI/RO in relation to needs of firms in the cluster			2	2	
Personnel mobility			3	1	
Enhancement in reputation/prestige			1	2	1

Source: own elaboration based on the interviews with researchers

## 6. Challenges and barriers for B2R/R2B cooperation

We asked cluster managers what kinds of facilitates or hinders there are regarding the collaboration between business and research institutions within the cluster. In the table below we show the number of responses that identified a given factor as a barrier or neutral. For this reason, the sum of the responses is not equal to the number of respondents (see table 11).

**Table 11 Factors hindering cooperation between business and research institution within the cluster**

Factor	Neutral	Hinders	Significantly hinders	Hinders + signific. hinders
a) Financial resources	0	1	3	<b>4</b>
b) Human resources	1	1	2	3
c) Facility	1	0	0	0
d) Capacity constraints of R&D&I in SMEs	2	3	3	<b>6</b>
e) Geographic proximity	5	0	0	0
f) Communication between cluster members	1	0	0	0
g) Mutual trust (and personal relationships) between cluster members	1	0	0	0
h) Cross-sector differences	6	0	0	0
i) Cross-sector similarities	4	1	0	1
j) Organization interests and culture (differences between the world of RI/UN and industry)	4	2	1	3
k) Organization structure (RI/UNiversity administrative structure and firm structure)	3	5	0	<b>5</b>
l) Cost of collaboration due to administrative overheads	4	3	1	<b>4</b>
m) Capacity and fields of research of RI/UN in relation to needs of firms in the cluster	3	2	0	2
n) Personnel exchange	4	0	0	0
o) Enhancement in reputation/prestige	3	0	0	0

*Source: own elaboration based on the interviews with cluster managers*

In this case, the other respondents marked the factor as facilitating cooperation. Respondents identified capacity constraints of R&D&I in SMEs as the most important barrier. The second factor that hinders cooperation is Organization structure (RI/UNiversity administrative structure and firm structure). Financial resources were identified as the third most important

factor, with the same number of responses as in the case of cost of collaboration due to administrative overheads. Financial resources were identified as a significant barrier by 3 respondents. Among the barriers, the respondents further included: human resources, organization interests and culture (differences between the world of RI/UNI and industry), capacity and fields of research of RI/UNI in relation to needs of firms in the cluster, cross-sector similarities.

## 7. The best practices of B2R/R2B cooperation in cluster organizations that can be transferred and implemented in other V4 countries

Table 12 Description of best practice

Detailed description	
<b>Short summary of the practice:</b>	Establishing the data platform to create cooperation B2R/R2B for the joint research projects development
<b>Detailed information on the practice:</b>	<p>Realization of Innovation days for the purpose of presenting the activities of individual companies and ROs, finding overlaps in mutual focuses and objectives, creating new collaborations, strengthening competitiveness, and networking. In order to successfully implement this practice, it is essential that such meetings are carried out with the personal participation of representatives of the above mentioned entities. The presentations must not be general but must present the specificities of the individual entities.</p> <p>At the Innovation Days, companies focus on presenting their requirements in the field of research development and innovation, for specific products and services. They define clearly what activities are expected from the RO e.g. MSc. and PhD. theses, research projects at national and international level.</p> <p>It is ideal to present the results of R&amp;D&amp;I already achieved, whether in the form of innovation of products and services, production processes, as well as acquired patents. The RO minimises the presentation of common knowledge about its activities (history, staffing, student numbers).</p>
<b>Resources needed:</b>	Financial resources used for the practise are private sources and membership fees.
<b>Timescale (start/end date):</b>	One time per year
<b>Evidence of success (results achieved):</b>	<ul style="list-style-type: none"> <li>- Establishment of mutual cooperation in solving scientific and research problems of companies through the final theses of students of MS and PhD grade.</li> </ul>



	<ul style="list-style-type: none"> <li>- Participation in new projects in the field of applied research.</li> <li>- Connecting the study programmes with practice, the possibility of internships for university students in companies, the possibility of gaining experience and possible easier application on labour market.</li> </ul>
<b>Potential for learning or transfer:</b>	The implementation of this form of best practice is not based on the problems of inter-relationships between participants and cultural differences. Each subject comes to such a meeting on the basis of individual needs with the aim of obtaining solutions for his/her problem. The implementation of such a meeting on a regional level is not organizationally demanding, which cannot be confirmed in case of implementation on a national or international level. It is also not costly. It is also possible to ask for a symbolic fee from corporate participants, while we do not recommend asking for this fee from ROs.
<b>Keywords related to your practice</b>	Innovation days, networking, cooperation, new challenges

*Source: own elaboration based on interviews with cluster managers and researchers*

## Conclusions and recommendations

Based on the survey conducted between CO and RO it is necessary to state that in the conditions of the Slovak Republic most of the cluster cooperation is realized in terms of mutual trust, informal relations as well as mutual knowledge of the cluster members.

This results from the size of the Slovak Republic, which does not allow such a scope of cooperation as in other V4 countries. It can be stated that the friendly environment is one of the key pillars of work or cooperation in the cluster. The absence of cluster policy, low awareness of clusters and their possibilities are the reasons for this form of cooperation.

A serious finding for the research team was that there have been no significant changes and shifts in the field of cluster policy within the Slovak Republic in the last decade.

Despite the fact that clusters have become eligible applicants for projects in the European area (Horizon 2020), the absence of a cluster policy, strong bureaucratic burden made it impossible for clusters to access these projects. Based on our findings from previous internal as well as international projects focused on Slovak clusters. We conclude that there is no will on the part of the political authorities to solve this problem. As we were told by cluster representatives, even the expected change after the change of government did not bring the expected improvements in this area. Clusters continue to be depended on the enthusiasm of their founders (representatives), with their financial resources mainly coming from membership fees and private sources.

Therefore, we recommend that the area of clusters should not be omitted from the policy framework and as soon as possible a complete cluster legislation and cluster policy should be created, the content of which will be the definition of clusters, forms and instruments of support. This will prevent complications in the implementation of development, research, innovation, and scientific projects at national and international level.

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