

# Diagnostic analysis of the innovation ecosystem of the Košice Region in the context of RIS3 and regional transformation challenges

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Results from RIS3 Policy Lab 1,  
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## Abstract

This study presents the results of the first diagnostic policy lab, which focused on the discussion of the current state of the innovation environment in the Košice region. The diagnostic of the regional innovation ecosystem was carried out through a combination of participatory methods, a questionnaire survey and a survey-based network analysis. The findings revealed a number of challenges, particularly in the areas of institutional fragmentation, lack of coordination, limited infrastructure outside the metropolitan centre and lack of sustainable forms of cooperation between actors. In addition, various cross-cutting themes were identified that have the potential to integrate sectoral policies, such as quality education, functional infrastructure, positive communication both internally and externally, and effective governance. An analysis of the correlations between the ratings of the themes from the event participants revealed five thematic clusters that can serve as a basis for further strategic planning in the region. We conclude the study by formulating four questions for the second policy lab of this series, with an emphasis on engaging external experts to avoid locking in local thinking in this area. Our approach focuses on using the business opportunity discovery process as an analytical tool and democratic structure to promote collective change in line with the principles of smart specialization of the region.

Keywords: regional development, innovation ecosystem, RIS3, Košice Region, participatory policy, network analysis, entrepreneurial opportunity discovery process.

## 1 Introduction

In recent years, Slovakia has been going through a new transformation phase, which requires not only technocratic, but above all systemic and participatory approaches in the formulation of public policies. In this context, the issue of innovation potential and its development prerequisites in different regions of the country is particularly highlighted. The Košice region and the more broadly defined Eastern Slovakia constitute a space where the ambitions of digital and industrial transformation meet with persistent development gaps and socio-economic inequalities. Despite the presence of a number of promising initiatives and institutions in the region, the overall innovation environment remains relatively fragmented and largely dependent on the activities of a few individuals and organisations with strong intrinsic motivation.

Analyses such as the European Innovation Scoreboard and similar assessments of Slovakia in the framework of the regional monitoring of innovation capacities repeatedly indicate that the country lags behind the European average in areas such as cooperation between academia and business, the level of commercialisation of research results and overall activity in the field of patent protection and technological applications. Eastern Slovakia, including its southern part - the Košice region, shows low participation in international research and innovation programmes, a significant outflow of young talent and uneven access to services and infrastructure. These factors, together with the lack of structural anchoring of regional development strategies, contribute to the fact that although there are strong individuals, the innovation potential of the region is not developed in a systematic and comprehensive way.

The materials of the American Chamber of Commerce in Slovakia (AmCham Slovakia, 2024), which has long been involved in the analysis of the business environment in the eastern part of the country, were also a valuable analytical basis prior to the implementation of our policy lab. In its publications, it has repeatedly pointed to the need for a closer link between higher and current labour market requirements, as well as to the barriers that hinder the growth of small and medium-sized enterprises. AmCham has also highlighted the lack of systematic collection and sharing of relevant data, which makes it difficult to make strategic decisions and reduces the region's ability to adapt to dynamic global trends. These findings served as the initial framework for defining the thematic focus of our participatory experiment.

The present study, based on the diagnostic policy lab methodology, is designed as a social intervention that focuses on a thorough mapping of the challenges and potential of the innovation ecosystem in the Košice region. Its aim was not only to summarize the existing problems, but above all to uncover the complex relationships between areas - education, infrastructure, institutions, entrepreneurship and innovation - and to understand the mechanisms of their functioning (or not) within the whole. The task was formulated as a semantic-strategic reflection - what terms actors use when thinking about the region, what relationships they perceive between the relevant phenomena, where there is congruence and where, on the contrary, communication fails. The informal knowledge of these actors has proved to be both a valuable source of information for us and a dynamic factor in shaping public policies.

The initiative was implemented as part of the debates on the regional smart specialisation strategy, which, combined with the discovery of business opportunities, acts as an analytical and democratising tool for structural transformation. Our policy lab was therefore not only an analytical event, but also an experiment in participatory regional politics. Its results can serve as a basis for designing effective tools that link investments to real needs and prospective opportunities for regional development.

Given the complexities of the identified challenges and the diverse structure of actors, we opted for a methodological approach that balances qualitative and quantitative analysis, participatory forum and subsequent network analysis of perceived interrelationships. This design allowed us not only to capture a wide range of stakeholder views, but also to identify thematic areas and points of discussion that have great potential for linking fragmented policy actions into meaningful and coordinated interventions. We consider the pursuit of systemic rationality in public policy-making to be a prerequisite for sustainable regional development, including in the context of Slovakia and its peripheral regions.

## 2 Results

### 2.1 People and skills

Discussions in the first block of the event revealed that the state of human resources and their skills is an essential factor for the development of the innovation potential of the Košice region. It was found that the retention of young talents in the region is most influenced by their family ties and local identity, while the conditions for their professional and personal growth have a less significant impact. In an environment that lacks a clear and motivating vision for the development of the region, regional attractiveness is based on emotional rather than rational aspects. It emerged from several participants' contributions that systematic support through three pillars is needed to keep young people in the region: quality education, available and promising job opportunities, and a positive external presentation of the region. At the level of education, positive changes are initiated primarily within individual schools and through the activity of committed teachers. However, these isolated innovative initiatives also highlight the lack of a systematic approach on the part of public policies.

Two issues have been identified that are considered the most critical. The first issue relates to the demographic makeup of the teaching staff in STEM disciplines. Panelists pointed to the alarmingly high average age of these teachers, which poses a risk to the education system's ability to respond effectively to rapidly changing technological advances. The second problem centres on the content of education, which is not sufficiently adapted to the current demands of practice. These shortcomings are often compensated for by private companies, which in this model, however, take on the role of public service provider, as they finance the correction of the system's shortcomings from their own resources. The need to distinguish between secondary and higher education was also

highlighted during the debate. Participants considered it ineffective to propose uniform solutions and policy measures for these two distinct education systems. Universities are different in nature - they are actively involved in research, have different sources of funding, and have a wider range of competences - and therefore require specific and targeted interventions.

Lifelong learning has emerged as another factor for development. In the context of rapidly changing technologies and labour market demands, it offers adults an important opportunity to adapt to challenges. Despite its undeniable importance, there is a lack of systematic and adequate support in the region. Slovakia as a whole has a significant deficit in this area. The need for an open and constructive dialogue on the region was particularly emphasised during the discussion. Many participants considered it important to improve communication about the region as an area with existing and potential opportunities, rather than as a peripheral area. The importance of strategic marketing and proactive presentation of the region was highlighted as essential to strengthen local identity and motivate young people to stay in the region.

Table 1: Percentage of agreement with statements related to the People and Skills theme. Workshop participants (36) provided responses to 79.5% of the total possible responses on a five-point scale (1 = not at all agree, 5 = strongly agree). Values on the scale were linearly transformed into percentage scores. The 95% confidence intervals, which were calculated using a t-test, are given in parentheses. Three statements that are marked with an asterisk (\*) were added during the discussion.

	Statement	Average
a1	Educational institutions in the Košice Region respond flexibly to the changing requirements of the labour market and technological progress.	38,8 (31,3 - 46,2)
a2	The Košice region has a sufficient number of qualified STEM teachers who are able to prepare students for future challenges.	25,9 (17,0 - 34,8)
a3	In the Košice Region, systematic support for lifelong learning for different age and professional groups is in place.	23,2 (16,3 - 30,2)
a4	Businesses and educational institutions in the region actively cooperate in curriculum development and human resource development.	43,8 (36,0 - 51,5)
a5	Graduates and young talent in the region have a strong motivation to stay and build their careers in their home environment.	31,0 (21,0 - 41,1)
a6*	The retention of young talent in the region is significantly influenced by their family ties.	61,2 (50,0 - 72,5)

a7*	Flexible responses to educational change are largely initiated by individual schools and motivated educators.	84,5 (75,9 - 93,1)
a8*	There is a need to have a positive dialogue about the development of the county, the city and the universities.	83,6 (71,9 - 95,3)

In terms of the statistical evaluation of the claims, Table 1 shows several trends. The highest level of agreement was achieved by the statement that changes in education are mainly initiated by individuals and schools themselves (84.5%), which is in line with the qualitative findings. Similarly, a high level of agreement (83.6%) was also expressed regarding the need for constructive dialogue on the development of the region. On the other hand, systematic support for lifelong learning (23.2%) and the preparedness of teaching staff in STEM disciplines (25.9%) were rated critically by respondents, again confirming the seriousness of these issues. Also interesting is the low percentage of agreement with the statement that young people have a strong motivation to build their careers in the region (31.0%), while their retention, conditioned by family ties, reached a much higher value (61.2%). This difference suggests a discrepancy between passive loyalty and active decision-making about a professional future in the region. The evaluations analysed provide a reflection on the current state of play and also indicate the direction of potential interventions: in areas where there is demonstrable will and potential (e.g. for motivated individuals), it is necessary to create favourable conditions and support systems to facilitate their development and strengthen their integration with the local environment.

## 2.2 Institutions and public administration

The second thematic block focused on the functioning of the institutional environment and public administration within the innovation ecosystem of the Košice Region. The discussion clearly showed the discrepancy between the formal existence of strategic documents and their actual implementation. These documents often become merely an overview of identified problems, instead of serving as effective tools for achieving fundamental changes. Participants identified this phenomenon as a major shortcoming of the current institutional framework. The main cause of this problem is the lack of coordination between actors at different levels of governance and the absence of strong leadership. Potential savings from effective interconnection of institutions and their agile cooperation are not being achieved due to the persistent fragmentation and the existence of many unconnected initiatives. This situation leads to inefficient use of resources and undermines public and business confidence in the ability of the public sector to deliver on its strategic objectives.

Strategic documents are primarily produced as an official response to the requirements of European programmes, but they often lack a real grounding in the local environment and the real needs of the region. This leads to the fact that these documents are often unrealistic, formally comprehensive but structurally deficient. They lack a strategic focus with which the various stakeholders can identify -

a unified goal that would become the basis for a common transformation. The experience of Poland was cited as an inspiring contrasting example, where an agreement between different institutions managed to effectively coordinate the use of available resources. In addition to the issue of coordination, the issue of highly centralised decision-making and funding was a recurrent theme.

In practice, Slovak regions are mostly in the position of passive recipients of funds from the state budget, which limits their autonomy in strategic decision-making and reduces their ability to respond flexibly to changing conditions. A dominant system with a strong vertical structure limits the possibilities to find innovative and locally adapted solutions. A positive aspect of the discussion was the recognition of the importance of social innovation and the promotion of entrepreneurship and creativity. Several participants identified the ability to innovate from below, experiment and make connections as a potential starting point from the ineffectiveness of traditional approaches to strategic management. However, these efforts require a broader social consensus and cultural transformation that is based on trust in the process of experimentation and values initiative from lower .

High agreement was expressed with the statement that the city and the region have a rich set of strategic documents, but their implementation is insufficient (75.9%). Similarly high agreement (84.8%) was expressed for the role of civil society in public policy making. These results suggest that existing policies, which are formally present but functionally limited, should be replaced by processes based on strong cooperation and partnership between relevant actors. The strongest disagreement was expressed in the ratings concerning real coordination between national and regional levels (25.0%) and systematic cooperation between universities, local government and business (30.4%). This shows the limited level of existing cooperation between actors, which calls into question the ability of the ecosystem to effectively generate synergies.

Table 2: Percentage of agreement with statements related to the topic Institutions and public administration. Workshop participants provided ratings for 77.1% of all possible responses on a five-point scale (1 = not at all agree, 5 = strongly agree). Values on the scale were linearly transformed into percentage scores. The 95% confidence intervals, which were calculated using a t-test, are given in parentheses. Three statements that are marked with an asterisk (\*) were added during the discussion.

	Statement	Average
b1	The innovation support policy in the Košice Region is effectively coordinated between the national and regional levels.	25,0 (17,5 - 32,5)
b2	Cooperation between universities, local government and the business sector in the region is systematic and focused on long-term goals.	30,4 (21,9 - 38,8)

b3	In the innovation ecosystem, the roles and responsibilities of the different actors are clearly defined.	28,6 (18,5 - 38,7)
b4	The Košice Region has a clearly formulated strategy for the development of information technologies and digital transformation.	35,6 (22,7 - 48,4)
b5	Regional clusters and innovation networks actively contribute to public policy making and strategic decisions.	45,5 (36,4 - 54,7)
b6*	The city and the region have an extensive set of strategic documents, but their effective implementation requires improvement.	75,9 (65,5 - 86,3)
b7*	Civil society plays an important role in the policy-making process.	84,8 (75,6 - 94,1)
b8*	The actors of the innovation ecosystem in the region often have different objectives.	72,3 (61,3 - 83,3)

Low scores were also recorded for the assessment of clearly defined roles and responsibilities of the different actors (28.6%), indicating a lack of organisational transparency. On the other hand, there was strong agreement that the actors in the innovation ecosystem pursue different objectives (72.3%). This fact suggests that in order to strengthen the innovation potential of the region, it is necessary to invest not only in infrastructure, but also in the creation of a platform for strategic discussions, consensus building and the unification of interests of initiatives. The institutional environment of the Košice Region is characterised by significant fragmentation, limited implementation capacity and a low level of coordination between actors. Nevertheless, there are isolated examples of engagement and initiatives, which create favourable conditions for the development of new partnerships and innovative approaches in the field of public policy management.

### 2.3 Business and infrastructure

The third session focused on the relationship between physical conditions in the region and business development. The discussion showed that the quality of infrastructure is a factor that influences not only the attractiveness of the territory for potential investors, but also the opportunities of local residents in establishing and expanding their businesses. Conditions in the Košice region were assessed as insufficient, especially in areas outside the metropolitan centre. The discussion indicated a significant segregation of the quality of life in the region, with peripheral areas facing limited access to services, weaker transport infrastructure and insufficient support for local firms. Some

parts of the county, although geographically close to Košice, show signs of socio-economic exclusion. This not only disadvantages these areas, but also leads to a loss of their potential as part of the regional ecosystem.

Rail transport was mentioned as the most significant barrier as it lags far behind the needs of residents and businesses. Unlike automobile transport, which are considered relatively functional, rail infrastructure remains a weak link. This deficiency is adversely reflected in low regional mobility, limited job availability and overall reduces the attractiveness of the region for investors. The need for a bold approach to the allocation of public resources, which should not be solely dependent on expectations from the national level, was highlighted during the discussion. One of the obstacles to regional development is the persistent centralisation of decision-making and financial competences. Regional actors do not have sufficient autonomy to take decisions that best suit their needs and priorities. Criticism has therefore also focused on the fact that regions are limited to applying for funding in the capital, which severely limits their strategic options.

A valuable aspect of the discussion was the idea that innovative activities are always naturally concentrated in urban areas, but that their benefits should also take due account of the needs of locations outside centres. In this context, the creation of a single strategic document for the city of Košice and the Košice Region was proposed, which could harmonise the intentions of the different actors. The analysis of the voting data confirmed this perspective, with a significant number of opinions reaching very low percentages of agreement. For example, only 24.0% of respondents thought that the transport infrastructure in the region effectively supports mobility and attractiveness for investors, and the dynamics of the business environment scored equally low. An even lower level of agreement (14.4%) was found for the statement that business services and support institutions are equally available in peripheral locations. These results indicate an imbalance in the regional development of the territory.

On the other hand, the idea that quality infrastructure is a factor for the development of the business environment received strong support of 82.7%, indicating a consensus among stakeholders. The need to develop a unified innovation strategy for the region and the city was also positively (65.4%) assessed. On the other hand, only 31.7% of respondents believe that the development of digital infrastructure is indeed a strategic priority for the county, indicating a discrepancy between the stated objectives and the results.

Table 3. Percentage of agreement with the statements related to the theme of Entrepreneurship and Infrastructure. Workshop participants expressed their views on 72.2% of the total possible responses on a five-point scale (1 = not at all agree, 5 = strongly agree). Values on this scale were linearly transformed into percentage scores. The 95% confidence intervals, which were calculated using a t-test, are given in parentheses. The three statements marked with an asterisk (\*) were added during the discussion.

Statement

Average

c1	The transport infrastructure in the Košice Region is sufficiently developed and effectively supports regional mobility and attractiveness for investors.	24,0 (14,8 - 33,3)
c2	Business activity in the region is dynamic and residents have a strong incentive to start and successfully develop new businesses.	24,0 (14,8 - 33,3)
c3	Economic growth in the region is balanced and operating costs in Košice are not a barrier to the development of peripheral areas.	19,2 (11,0 - 27,5)
c4	Business services and support institutions are evenly available throughout the entire Košice Region, including its peripheral regions.	14,4 (8,6 - 20,3)
c5	The development of digital and technological infrastructure is a strategic priority for the region and contributes significantly to increasing productivity.	31,7 (22,5 - 41,0)
c6*	Aligning the common goals of the region and the city requires the development of a unified innovation strategy.	65,4 (50,0 - 80,8)
c7*	The level of public transport in the region reaches satisfactory standards.	37,5 (26,7 - 48,3)
c8*	Infrastructure is a key factor for the development of the business environment.	82,7 (71,4 - 94,0)

There is a discrepancy between the value that actors place on quality infrastructure and their assessment of its current state. The viability of business activities in the region is directly affected by the availability of services, mobility and functional links, which are currently severely lacking in the region. In such a situation, it is unrealistic to expect residents to start new businesses, invest capital or stay in the region without adequate provision of basic conditions. If the Košice Region has the ambition to develop its business environment and fully exploit its innovation potential, it must consider addressing infrastructure deficiencies as a strategic priority and not as a peripheral issue. At the same time, it is essential to create favourable conditions for decentralised decision-making and to strengthen a participatory culture that actively involves marginalised groups in the region in the process of formulating and implementing regional development strategies.

## 2.4 Innovation potential and digital transformation

Despite the presence of relevant actors and the growing interest in advanced technologies such as artificial intelligence, the region faces constraints that reduce its ability to effectively exploit these opportunities. The discussion focused on the presence of Ukrainian students in higher . Their presence could strengthen the talent base and invigorate the local environment, but universities do not yet have the mechanisms to integrate them successfully. The high drop-out rate of up to 70% between first and second cycle indicates that they are failing to respond adequately to the needs of this group. However, the inability of universities to provide attractive stable working conditions for academics and practitioners is also a long-standing problem. The precarisation of academic positions, the preference for own graduates (academic inbreeding) and the lack of long-term contracts limit the ability to attract foreign experts or professionals from the business sector. As a result, the system remains closed and insufficiently responsive to changes and current market needs.

Other critical aspects have emerged in the debate on the conditions for SMEs. Representatives of these enterprises experience a feeling of isolation, expressing distrust of public institutions. The inability to communicate and cooperate effectively is a significant obstacle to development. Problems such as inadequate or outdated company databases, lack of functional communication platforms and low levels of support create an environment where innovation remains largely theoretical. Current ambitious projects, such as the construction of a supercomputer, were positively received in the debate, but with the caveat that their actual applicability will depend on the region's ability to use these capacities effectively. During the discussion, the idea emerged that instead of focusing on large-scale technological investments, it would be more sensible to create experimental spaces, such as sandboxes, for practical testing of AI solutions in real regional themes.

High agreement was expressed with the statement about the potential of Ukrainian students (77.1%) and with the statement that the benefits of a supercomputer depend on the existence of adequate capacity (74.0%). Actors in the region are aware that achievements are closely linked to the availability and quality of technological and human resources. On the other hand, the assessment of the systematic aspects of the innovation environment showed lower results. The quality of the links between business, academia and public administration was rated at only 27.1%, while the success rate of research commercialisation was even lower, at 25.0%. Activities aimed at attracting foreign experts also scored low (22.9%). The strategic link between innovation initiatives and business activities was 30.2%. Thus, despite the existing ambitions in the field of innovation, the region does not yet have a sufficient systemic framework to effectively support the efforts.

Table 4. Percentage of agreement with statements related to innovation potential and digital transformation. Workshop participants expressed their views on 66.7% of the total possible responses on a five-point scale (1 = not at all agree, 5 = strongly agree). Values on this scale were linearly transformed into percentage scores. The 95% confidence intervals, which were calculated using a t-test, are given in parentheses. The three statements marked with an asterisk (\*) were added during the discussion.

Statement

Average

d1	The Košice region has a well-developed and dynamically growing infrastructure for the information technology sector and startup environment.	50,0 (40,2 - 59,8)
d2	Knowledge linkages between business, academia and public administration are stable and systematically developing in the region.	27,1 (18,9 - 35,3)
d3	Innovation activities in the region are closely linked to long-term business development strategies and complement each other.	30,2 (20,9 - 39,5)
d4	The results of research and development in the Košice region are effectively commercialised and successfully applied on the market.	25,0 (14,2 - 35,8)
d5	The region is actively implementing a strategy to attract foreign experts and talent to its innovation ecosystem.	22,9 (12,2 - 33,7)
d6*	The presence of Ukrainian students represents a significant potential for the socio-economic development of the region and the city.	77,1 (68,9 - 85,3)
d7*	Communication between SMEs and relevant actors in the region and the city is characterised by a limited level of trust.	47,9 (34,4 - 61,5)
d8*	The potential benefit of the supercomputer to the county and city is contingent on the existence of adequate capacity for its effective use.	74,0 (62,1 - 85,8)

The quality of communication between SMEs and relevant stakeholders was rated as poor (47.9%). This aspect represents a potential point of high added value interventions: the creation of stronger links and effective mechanisms for sharing relevant information and best practices. The innovation potential of the Košice Region remains latent in many areas. Despite existing initiatives and efforts, their effectiveness is directly dependent on infrastructure support, quality communication channels between sectors and the availability of qualified experts. Without achieving strategic coherence, active internationalisation of universities and targeted support to business communities, it will not be possible to fully exploit the opportunities presented by digital transformation and other technologies.

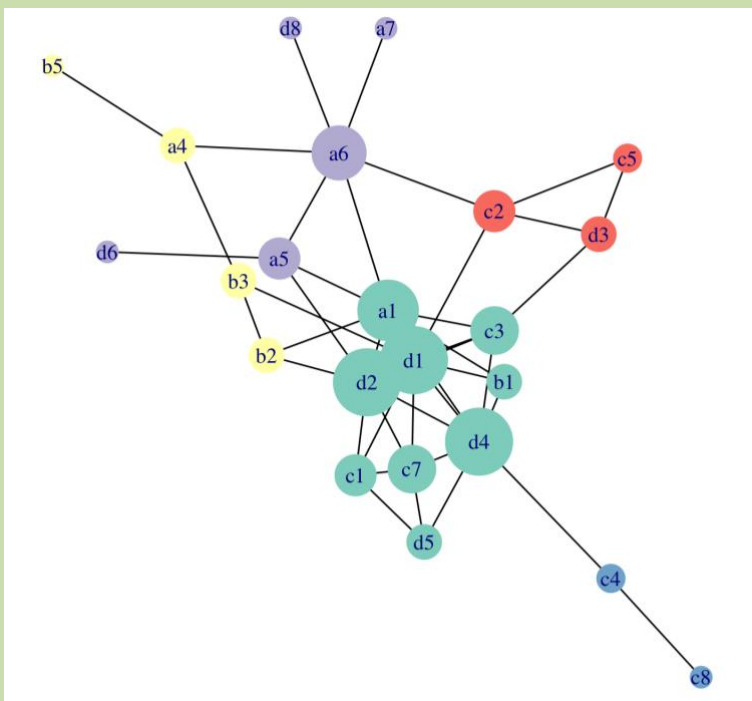
## 2.5 Semantic links

In this section, we will focus on the horizontal integration of the themes we have analysed so far within the different thematic blocks. Our aim is to uncover the natural relationships between the

different propositions and then explore how they can be structured into thematically related units using network analysis that relies on correlation coefficients. The premise of this analysis is that the statements rated similarly by respondents not only share a common thematic basis, but also share the same interpretive framework in the thinking of the event participants. These hidden patterns and co-occurring evaluations allow us to identify the axes of thought that influence the functioning of the innovation ecosystem.

Figure 1 shows a network of questionnaire items, where the nodes represent specific theses and the edges between them illustrate the correlation coefficients calculated from the respondents' answers. The construction of this network relies only on statistically significant correlations (moreover, only with a value above 0.5), which allows us to produce an interpretable and structured graph with a clearly identifiable pattern of connections. The shape of the graph clearly shows that some of the questionnaire items act as links between the different thematic areas. An example is the statements related to a positive vision of the region, which show a high correlation not only with the topics of education, but also with aspects of entrepreneurship and coordination of public policies. Table 5 summarises the questionnaire items in terms of their centrality within the network created. The network centrality metrics suggest that some items play a mediating role in the network, linking otherwise relatively separate entities.

Figure 1. The network of relationships between the theses from the event. In this network, the nodes represent the statements, which are labelled with the topic block code and the question number. Edges connect statements between which a significant correlation in ratings was found. The size of each node corresponds to the number of its links (degree). The visualization reveals five well-defined meaning clusters in the discussion, which collect statements with similar evaluation patterns from policy lab participants.



Items related to the quality of infrastructure and the ability to coordinate between institutions have reached a high centrality, related to several other themes of the discourse. These items are natural foci for the views of the interviewees and suggest areas where public policies could effectively intervene in a broader context. By applying Louvain's algorithm, natural clusters of these were identified in the network, forming content-consistent clusters. These represent the thematic axes as perceived by respondents. Together they form an interpretative framework that goes beyond the sectoral perspective and shows that the challenge for the development of the Košice Region is not isolated problems, but their interconnectedness and the lack of ability to address them in an integrated way. The integration of these findings serves as a starting point for the need for comprehensive interventions and policy measures aimed at the overall transformation of the ecosystem.

- (1) **Visibility and identity:** the first cluster of theses deals with positive discourse about the region, its presentation, marketing support and the level of local loyalty. The linkages found suggest that the creation of a strong collective identity and self-esteem for the region is closely linked to its development prospects. Positive communication is also shown to have wide-ranging and multiplier effects, which also extend to the areas of education and business.
- (2) **Linkages and cooperation:** the second segment integrates statements about coordination between city, regional and national levels, cooperation between universities, businesses and municipalities, as well as the definition of the competences of the different actors. This ensures organisational transparency and highlights the need for effective institutional links.
- (3) **Business Environment and Infrastructure:** the third cluster clusters statements about the quality of transport infrastructure, the availability of public and business services in peripheral areas, the development of digital infrastructure and the attractiveness of the region for investors. There is a strong correlation with the results of the business-focused discussion. Without adequately meeting the basic physical prerequisites, it will not be possible to strengthen the viability of existing institutions or attract and retain skilled talent.
- (4) **Education and skills:** the quality of the teaching staff, existing innovative projects in the school system, the lack of systematic support for lifelong learning and the effective involvement of universities in practical tasks are key aspects. The cluster has strong links to the business sector, demonstrating that well-developed skills and human capital underpin the region's transformative capacity.
- (5) **Innovation and Digitalization:** Includes arguments on supercomputer construction, the success of research commercialization, the causal relationships between AI development and applied public policies, and the promotion of talent internationalization. This cluster includes a technological dimension.

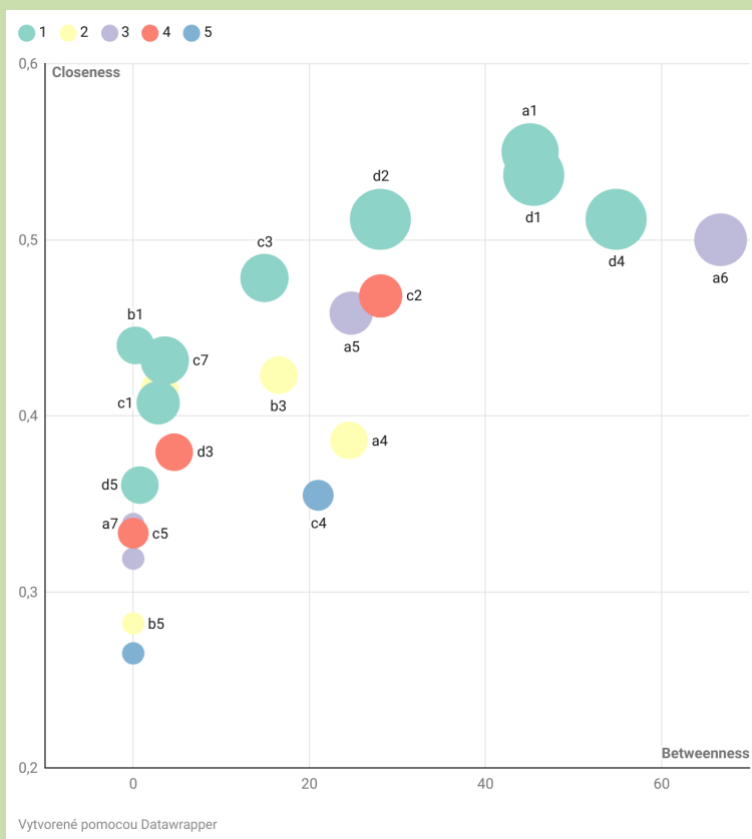
Table 5. Network centralities summarize the relationships between theses based on statistically significant correlations. They quantify the extent to which ratings of different items change, increase or decrease synchronously. The edges of the graph contain statistically significant

correlations with an absolute value above 0.5. The centrality measures illustrate which items have the highest level of connectedness to others (degree), which act as a link between (betweenness) otherwise disconnected parts of the network, and which form groups of statements with similar rating patterns.

State ment	Network centrality			Cluster
	Degree	Betweenness	Closeness	
a1	7	45,07	0,55	1
a4	3	24,50	0,39	2
a5	4	24,75	0,46	1
a6	6	66,70	0,50	2
a7	1	0,00	0,34	2
b1	3	0,25	0,44	3
b2	3	3,00	0,42	1
b3	3	16,53	0,42	2
b5	1	0,00	0,28	2
c1	4	2,83	0,41	3
c2	4	28,10	0,47	4
c3	5	14,90	0,48	3
c4	2	21,00	0,35	5
c5	2	0,00	0,33	4
c7	5	3,58	0,43	3
c8	1	0,00	0,27	5
d1	8	45,48	0,54	3
d2	8	28,07	0,51	1
d3	3	4,65	0,38	4

d4	8	54,83	0,51	3
d5	3	0,75	0,36	3
d6	1	0,00	0,32	1
d8	1	0,00	0,34	2

Figure 2. Relationship between centrality (betweenness, closeness) of individual theses. The horizontal axis shows how often a given proposition appears on the shortest paths among the others in the graph. The vertical axis shows the average distance of that thesis from the others. The size of the symbol is proportional to the number of connections of that item (degree). The color corresponds to identified clusters that bring together items with a similar ranking pattern. The top right quadrant of the graph contains the potentially most effective locations for targeted interventions in the innovation ecosystem. Conversely, the items located in the bottom left quadrant do not represent effective points for intervention, similar to statements that were not even included.



Betweenness and closeness centrality are two complementary measures that together reveal the structural significance of theses in the architecture of the innovation ecosystem debate. Statements with high scores in the first centrality function as bridges between topic areas and provide communication links. Targeted interventions, such as initiatives to promote positive communication about the region or to build effective collaboration between relevant actors, can fundamentally

affect the overall convergence of discourse and disrupt the persistent fragmentation of themes. On the other hand, closeness measures the average distance of a given statement from others in the network: statements with high closeness centrality are strategic starting points for the implementation of system-wide inputs. By combining the two metrics, it is possible to identify those propositions that are promising communication nodes and distribution points for new ideas. These points are suitable for targeted interventions because they allow to effectively change the dominant narrative, link isolated themes and influence the configuration of ecosystem knowledge without the need for unnecessarily large-scale structural interventions.

### 3 Discussion

The present study focuses on a diagnostic view of the innovation ecosystem in the Košice region. In this chapter, we will review the empirical findings in the context of the theoretical discourse captured in the introductory section. In particular, our attention is focused on the identified contradictions, and possible starting points for future actions in the field of public policy making and support for regional development. One important finding that emerged from the discussion and network analysis is the persistence of significant fragmentation of regional actors, lack of coordination and absence of defined competences. Within the framework of regional innovation ecosystem theory (Asheim & Gertler, 2005; Autio et al., 2014), the innovation capacity of a region is influenced not only by the quality of the individual actors, but above all by the intensity of their interconnections, the existence of functional linkages and the sharing of a strategic vision. In the Košice region, a situation persists where even established and strong actors operate in relative isolation, without adequate synchronization of activities and with limited ability to create synergies.

The discussion showed the willingness of relevant actors to actively participate in the development of strategic documents. At the same time, however, it revealed the limitations of the participatory potential in an environment marked by centralised decision-making, lack of mutual trust and unclear roles of individual actors. These findings are in line with findings on the necessary preconditions for an effective entrepreneurial opportunity discovery process (McCann & Ortega-Argilés, 2016; Gianelle et al., 2020) - which requires the existence of a long-term people-centred institutional infrastructure. Without the systematic development of mechanisms targeted at long-term collaboration (effective communication, systematic collection and sharing of relevant information, joint decision-making), the process itself is reduced to a formal procedure, but with no real impact. The Košice Region needs not only to actively promote the involvement of relevant actors, but also to create adequate institutional capacities that will be able to effectively process these inputs and transform them into actions.

The discussion also focused on the discrepancy between the positive narrative about the region and its actual material conditions. Participants explicitly supported the need for positive communication and effective marketing of the region, but the assessment of the current state of infrastructure, the availability of business services and the readiness of educational institutions remained low. Within the framework of innovation ecosystem theory (Stam, 2015), where symbolic capital such as visibility and reputation contribute significantly to attracting investment and business development,

this situation presents a clear paradox that may lead the region to further reputational losses if not supported by genuine efforts to grow the quality of the regional environment.

The follow-up policy lab should serve as a platform for a critical assessment of the main findings of the first event, already involving independent external experts. The primary objective is to avoid the risk of local lock-in thinking and to ensure openness to internationally recognised approaches or innovative solutions. The following thematic areas represent our suggestions that can enrich the regional discussion on the next steps in updating the strategy. They also offer an opportunity to redefine the nature of dialogue on innovation policies - to transform it from passive consultation to active collaboration, from a reactive approach to proactive shaping of desired changes. We propose four thematic headings:

- (1) Ensuring coordination and distribution of competences in institutions: the Košice Region faces problems resulting from the fragmentation of the decision-making process and the unclear position of different institutions. In this context, we should focus on discussing effective methods for determining responsibilities, creating synergies between the municipal, regional and state levels of governance, as well as tools for resolving potential conflicts between different sectoral approaches.
- (2) Linking symbolic capital to environmental transformation: positive stories about the region are undoubtedly important, but their long-term sustainability is contingent on a real material basis. The aim of this discussion is to explore how other regions have successfully managed the potential tension between ambitious vision and actual reality, and to identify effective communication, branding and reputation strategies that contribute to regional development.
- (3) Participatory capacity development: although there is a strong willingness of relevant actors in the region to engage in political decision-making, there is a lack of long-term platforms and stable structures to enable effective participation. In this area, there is a need to explore best practices in building sustainable institutional foundations for exploring business opportunities, effective linkages between formal and informal participatory mechanisms, as well as realistic timeframes for their successful implementation in the regional context.
- (4) Addressing peripherality in innovation policies: the Košice Region faces complex problems related to peripherality, which is manifested not only in its internal structure - marginalisation of areas outside the metropolitan centre - but also in its position on the external border of the European Union. The debate in this area should focus on identifying policy instruments and institutional structures that effectively contribute to strengthening regional inclusion, making good use of multilevel governance mechanisms and setting up systemic policies that respond adequately to the different levels of development of the different parts of the territory.

## 4 Conclusion

The event and study combined a discussion forum with participants, a survey through questionnaires, network analysis and thematic analysis of the information gathered. The main

objective was to comprehensively assess the current state of play, but above all to gain a deeper understanding of the dynamics and context in which regional policies, institutional frameworks and innovation initiatives are being shaped. The research findings confirmed the existence of actors with the ambition and capacity to initiate and implement change. Nevertheless, the region faces significant fragmentation, lack of linkages between sectors and poor coordination at city, regional and national levels. The results of the network analysis and the discussions held suggested that themes such as positive communication about the region, coordinated institutional cooperation, quality education adapted to market needs and developed infrastructure can serve as natural points around which a new, integrated innovation logic can gradually take shape.

Despite the willingness of stakeholders to engage in the policy-making process, there is a lack of stable platforms and effective mechanisms for long-term knowledge sharing, coordination of joint activities and co-decision making. Without these tools, the business search process becomes a formal procedure rather than part of a democratically oriented innovation policy. The theoretical frameworks of regional innovation systems, the importance of network linkages and participatory models of public policy making are also proving to be relevant in the context of the Košice region. The semantic analysis showed that relevant actors in the region do not think in isolation within individual sectors, but form a complex picture of the region as a whole, where human resources, infrastructure, institutional frameworks and dominant narratives are organically interconnected. The identified clusters of these represent natural interpretive units that can serve as a basis for the design of strategic interventions.

At the same time, there remain open questions that should be further discussed at a second policy debate with the participation of independent experts: what mechanisms will ensure effective coordination and a clear division of responsibilities between the relevant institutions? How can we successfully translate the positive image of the region into concrete transformative policies and turn its visibility into sustainable symbolic capital? What structural measures are needed to strengthen participatory capacities and create an enabling institutional environment for the discovery of new business opportunities? How to comprehensively address regional disparities and peripherality within the EU - the position of the region in the context of the regional innovation strategy for smart specialisation?

The Košice Region is neither passive nor ineffective. On the contrary, it is in a dynamic process of searching for an optimal model of organisation and effective cooperation. In order to fully exploit its innovative potential in a sustainable and inclusive way, it needs an environment that encourages an open exchange of ideas, innovative forms of cooperation that transcend traditional boundaries and an active willingness to learn from the relevant experiences of others. The second policy lab should therefore function as a space for an in-depth redefinition of current challenges, a constructive confrontation of different views and the subsequent joint design of intervention strategies that are not only locally relevant and meaningful, but also instructive for other regions.