

SLOVAKIA CATCHING-UP REGIONS 3

CREATING AN ENVIRONMENT
FOR TECHNOLOGY TRANSFER
AND GREATER R&D COLLABORATION
BETWEEN RESEARCH AND INDUSTRY
IN THE KOŠICE REGION



KOŠICE
SELF-GOVERNING
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MINISTRY
OF INVESTMENTS, REGIONAL DEVELOPMENT
AND INFORMATIZATION
OF THE SLOVAK REPUBLIC

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(MAY 2022)



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ABBREVIATIONS AND ACRONYMS

AmCham	American Chamber of Commerce
CIKE	Creative Industry Košice
CNIC	Cassovia New Industry Cluster
CVTI	Slovak Centre of Scientific and Technical Information
CuRI	Catching-up Regions Initiative
DG REGIO	Directorate-general for Regional and Urban Policy
DIH	Digital Innovation Hub TECHNICOM
EC	European Commission
ESIF	European Structural and Investment Funds
EU	European Union
IPR	Intellectual Property Rights
KSK	Košice Region
KRC	Košice Regional Chamber
MIRRI	Ministry of Investment, Regional Development and Informatization
MoEdu	Ministry of Education, Science, Research, and Sport
MoEcon	Ministry of the Economy
MSME	Micro, Small, and Medium Enterprises
PaIC	Prototyping and Innovation Centre (part of TUKE)
R&D	Research and Development
RD&I	Research, Development, and Innovation
RIC	Regional Innovation Center
RIS	Regional Innovation Strategy
RO	Research Organization
ROI	Return on Investment
SAS	Slovak Academy of Science
SBA	Slovak Business Agency
SCCI	Slovak Chamber of Commerce and Industry
SIEA	Slovak Innovation and Energy Agency
SME	Small and Medium Enterprises
TUKE	Technical University of Košice
TFEU	Treaty on the Functioning of the European Union
TRL	Technology Readiness Level
TTC	Technology Transfer Center
UPJS	University of Pavol Jozef Šafárik
UVMP	University of Veterinary Medicine and Pharmacy in Košice
USP	University Science Park TECHNICOM (operates at TUKE)
VET	Vocational Education and Training
WB	World Bank

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1. EXECUTIVE SUMMARY

This report summarizes results of the Research and Development (R&D) Component of the third phase of the Catching-up Regions Initiative (CuRI3) in the Košice Region (KSK). CuRI is a program initiated and financed by the European Commission's (EC) Directorate-General for Regional and Urban Policy (DG REGIO) and managed by its the Czech Republic and the Slovakia Unit; it is implemented by the World Bank (WB) in collaboration with the regional and national authorities and stakeholders. The national level is coordinated by the Ministry of Investment, Regional Development and Informatization of the Slovak Republic (MIRRI). CuRI3 was implemented between September 2020 and December 2021.

The key objective of the KSK R&D Component was to support the regional administration and selected stakeholders in designing and testing solutions for enhanced collaboration between public research organizations (ROs) and industry. To that end, the WB assisted i) the KSK administration in conceptualizing and designing the Regional Innovation Center (RIC), and ii) ROs in designing and testing a framework for the release of R&D infrastructure purchased with public funds (including European Union [EU] funds), to allow commercial utilization of this infrastructure. These two elements were selected as key priorities to enhance the knowledge transfer system in the region, that is the collaboration between academia and entrepreneurs. The notion of the knowledge transfer system is narrower than the innovation system.

Slovak regions perceive R&D collaboration and the innovation stemming from it, as a means to socioeconomic growth, and a way to overcome some of their developmental challenges. In general, the Slovak Republic heavily invested in R&D infrastructure in the last 20 years, to a large degree thanks to EU funds. This rapidly aging infrastructure is located mostly at public research organizations, which are facing organizational and regulatory problems with using it for commercial purposes. Thus, with the exception of Bratislava, Slovak regions are characterized by a relatively low level of collaboration between research organizations and industry. This is reflected in low outlays on innovation in both the public and private sectors, as well as a low number of R&D collaboration agreements (especially commercial ones) between enterprises and public ROs that could result in knowledge transfer (for example, licensing, selling patents, creating spin-offs, and providing R&D services). This situation has three main consequences. First, knowledge itself and knowledge-based innovations do not flow from academia to companies, which hampers not just innovation development, but also the companies themselves, and in turn, the region's growth. Second, in the absence of flourishing innovation, local talent is tempted to leave the region to seek development opportunities. Third, ROs do not generate revenues that would help them maintain and upgrade their R&D infrastructure, which can lead to increased gap between Slovak and European R&D facilities. On a positive note, as is discussed in the Chapter 5, universities have created technology transfer centers and organizations supporting knowledge transfer. Therefore, there is a potential for increasing the intensity and scope of cooperation and knowledge transfer once the obstacles are removed.

Being a scientific hub and having a strong manufacturing legacy, the KSK is able to offer favorable conditions for developing innovation. The KSK is home to three public universities and a number of research institutes of the Slovak Academy of Science (SAS); it also has a vibrant, though fragmented, entrepreneurial environment including several intermediary institutions. There are examples of this potential: a few spin-off companies created at the University of Pavol Jozef Šafárik (UPJS) in Košice; a number of start-ups supported by different KSK-based institutions; a number (albeit limited) of collaboration arrangements between local companies and ROs; and several regionally based entities whose mission is to support innovation. These elements, however, require further

strengthening, forming into sustainable processes, and coordination. In recent times, the KSK authorities have been actively engaged in shaping the regional innovation policy. After the new Regional Innovation Strategy (RIS) was adopted in June 2021, two interinstitutional entities were established, whose core functions focus on innovation development—RIC and the Cassovia New Industry Cluster (CNIC).

Nevertheless, the overall level of R&D collaboration in the region is low, and this report identifies key bottlenecks. Since CuRI focuses on regions, the analysis mostly pertains to the regional level; however, some aspects have national-level implications or require national-level support. This work also builds on findings of the previous edition, CuRI2, and further develops ideas presented there (without fully repeating them here), especially in terms of the analysis of the national system of innovation support.

The first bottleneck pertains to the low level of trust and the lack of joint vision of the innovation system in the region among the stakeholders of the KSK knowledge transfer system, combined with an inadequate role division. These result from insufficient communication and collaboration among the stakeholders, and the lack of a regional coordinator or facilitator who could bring different parties to one table and establish a regular and trusted communication platform. In general, mutual mistrust causes stakeholders to share their plans only to a limited extent, and as a result, their activities often do not complement each other or they overlap. Since stakeholders are not strongly involved in shaping a joint regional vision of innovation development and decision-making, they focus on their own missions and scope of activities; their roles in the knowledge transfer system are not clearly defined.

Second, both industry and academia have limited knowledge of each other's needs and what each has to offer, as well as limited expertise and skills with which to engage in R&D collaboration. Since stakeholders have limited communication and collaboration opportunities, they don't know each other, and they do not communicate their needs to each other. The KSK ROs' technology transfer units are relatively weak and do not actively reach out to the industry. Furthermore, ROs do not have well-elaborated procedures to engage in R&D collaboration with the private sector. On the other hand, entrepreneurs, especially small and medium enterprises (SMEs), have limited resources to initiate and maintain relations with researchers at public ROs.

Third, there is a lack of clear guidance for the commercial use of R&D infrastructure purchased with public resources, including EU funds. Public ROs indicate this gap as one of the key obstacles for engaging in R&D collaboration with entrepreneurs. No broadly accepted framework currently exists in the Slovak Republic that would guide ROs in this matter. Hence, ROs are afraid that any commercial use of such infrastructure could lead to an obligation to return obtained grants for these purchases.

The fourth bottleneck relates to a lack of high-quality data on innovation in the region. No entity is responsible for regular and reliable gathering, analyzing, and publishing of data related to innovation and the system's stakeholders. Such data would not only let stakeholders get to know and understand each other better, but would also facilitate their better mid- and long-term planning (for example, investments in innovative solutions, and partnerships). Reliable and up-to-date data is also crucial for decision-making related to innovation support and regional innovation strategy implementation.

Fifth, the support offered for enterprises and individuals is fragmented and is largely concentrated in the city of Košice. KSK companies can obtain business and innovation support from many different entities (national, regional, and municipal). These support measures are not mapped out well and some basic services tend to overlap, while more advanced support is lacking. Development opportunities for young talent is limited, and structured and professional offers to shape creative and innovative mindsets are lacking in the region (for example, prototyping facilities, and mentoring courses). Finally, most of the entities providing support focus on the core city, Košice; a broader regional outreach is limited.

The Bank's assistance focused on two specific solutions to help mitigate the above obstacles: i) a framework for the release of R&D infrastructure, and ii) a conceptualization of RIC's initial activities.

The former solution consisted of designing and testing a framework that can be applied by public ROs to utilize their R&D infrastructure for commercial R&D collaboration up to 20% of its annual capacity (the so-called 'ancillary threshold'). The feasibility of such an approach was proven in collaboration with UPJS, and its conformity with European State aid rules and the Slovak regulatory framework was verified. Consultations about the framework were held at the national level, and final clarifications are currently being worked out. The WB team recommends its implementation in other ROs in the Slovak Republic.

The second aspect of this work has resulted in the recommendations for RIC's activities that are proposed in this report. Considering the extent of the identified bottlenecks in the KSK's knowledge transfer system and building on available information about RIC's expected resources and capacity, the Bank team argues that the center needs to prioritize its efforts, rather than attempt to fix all shortcomings from the get-go. Managing expectations laid upon RIC will be one of its critical success factors. Moreover, because RIC is a brand-new entity, the WB suggests planning its initial activities for a period of up to three years to allow for testing different approaches and adjusting its course after that time.

RIC is recommended to have two groups of activities (core and elective) that mostly depend on its ability to obtain additional external resources, and thus its capacity. The core activities could be delivered with limited RIC core staff and budget. They have a twofold focus. On the one hand, they concentrate on building trust among stakeholders, shaping opportunities for enhanced information flow and collaboration, and engaging stakeholders in decision-making. On the other hand, they emphasize curating innovation data for evidence-based decision, thereby providing a solid basis for regional innovation policy. These two go hand-in-hand, and are suggested as core because they contribute to laying the foundation for the regional knowledge transfer. They also deliver public goods, and it is unlikely that other entities without stable (public) funding will take on such responsibilities. The elective activities are also divided in two streams. The first set is oriented toward external actors—it aims to promote the KSK's innovative potential outside the region and attract potential investors and funds (both public and private) to the region. The second set paves the way for RIC to experiment with direct support measures to regional innovation stakeholders (companies, individuals, and ROs). Such experimentation is recommended to test various options at a limited scale to potentially fine-tune and expand in the future. These could include low-cost activities (like prototyping space for talent, and mentoring programs for students) as well as more resource-intensive pilots that cater to the identified needs of regional stakeholders (for example, innovation vouchers, matching companies and researchers, attracting professional acceleration program providers, and training and mentoring for companies).

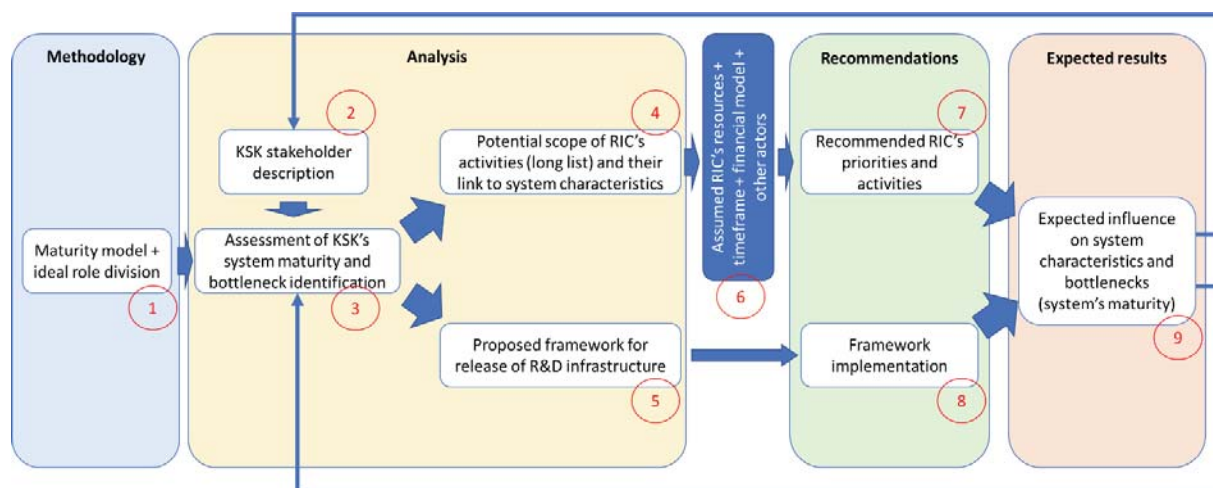
2. INTRODUCTION

The principal objective of the Bank's assistance to the KSK was to support the region and selected Research Organizations (ROs) in analyzing and proposing solutions for an enhanced (commercial) collaboration between businesses and the public research sector. The Bank's support is to help the KSK address the low level of commercial R&D collaboration between research and the private sector, despite the existing R&D infrastructure and the economic potential of the region's companies. The work plan was divided into two subcomponents: first, the provision of support to the KSK administration in designing the Regional Innovation Center (RIC); and second, assisting the selected ROs to design and test a framework for releasing R&D infrastructure purchased with EU funds, that would allow commercial collaboration between ROs and enterprises.

Hence, this document focuses on the regional knowledge transfer system, and not on the entire innovation system. The regional knowledge transfer system is understood as a set of institutions, processes, and regulations related to the exchange of information and knowledge between the R&D supply (public research sector) and R&D demand (mostly focusing on the private sector, but also including the public sector). The knowledge transfer system has a narrower meaning than the innovation system; the latter encompasses elements that are beyond the scope of the current assignment, like, for example, the education system, labor market, and broader entrepreneurship support.

The logic of this report is presented in Figure 1.

FIGURE 1: Logic of the Report



Source: Authors, 2022.

Introduction:

PART 1. The point of departure is a framework for the assessment of the KSK's knowledge transfer system's maturity (Table 1) and an ideal division of stakeholders' roles in it (Table 2). This framework includes three levels of a regional knowledge transfer ecosystem's maturity from 'budding', through 'maturing' to 'developed'. The framework includes 19 characteristics of the knowledge transfer system in the region, referring

to 'soft' and 'hard' R&D infrastructure (a static approach). These include three general processes ('drivers') considered essential for advancing the regional knowledge transfer system's maturity (a dynamic approach). The assumption is that the advancement along the three proposed stages reflects more effective and efficient functioning of the regional system for knowledge transfer. The framework represents an ideal division of key roles among the stakeholder groups that are crucial for the proper functioning of a knowledge transfer system.

Analysis:

- PART 2. The framework is complemented with a description of main actors within the KSK's knowledge transfer system.
- PART 3. Building on the above, the report provides a maturity assessment of the KSK's knowledge transfer system and systemic gaps are derived (Table 3). This enables identification of key bottlenecks of the KSK's knowledge transfer system that need to be addressed for the system to mature (Chapter 5). The bottlenecks constitute the foundation for the description of potential actions to overcome the former, and these are divided into two streams that are complementary.
- PART 4. One stream focuses on RIC and proposes a long list of its potential activities and indicators, which could be treated as a menu of options for this institution (Table 4).
- PART 5. The second stream develops a framework for releasing R&D infrastructure that would help overcome the inability to use this infrastructure for commercial purposes.
- PART 6. Finally, assumptions about resources that RIC will have at its disposal are presented as a proxy for its expected institutional potential. These are used as a filter for recommendations for RIC's key functions and actions in the KSK's knowledge transfer system.

Recommendations:

- PART 7. The first part of the recommendations refers to RIC's functions and activities that are proposed for its initial period of functioning. The key premise is that it is better for RIC to focus on a limited number of priorities and activities where it can exercise significant impact, rather than spreading itself too thin in an attempt to tackle all system bottlenecks.
- PART 8. The second part pertains to the implementation of the framework for the release of R&D infrastructure.
- PART 9. In the final section, links between the recommended actions and the KSK's system characteristics (presented in Part 3) are explicated; they identify areas where RIC and the R&D infrastructure release framework could influence the regional knowledge transfer system.

This approach offers an analytical cycle. It starts with an analytical framework (system characteristics and ideal role division), then it assesses the maturity of the KSK's knowledge transfer system against the proposed 19 characteristics. The next step identifies the system's key bottlenecks and proposes a 'long list' of potential solutions to tackle them. After presenting the assumptions about RIC's resources and expected potential, it recommends areas for RIC's actions. At the same time, the framework for the release of R&D infrastructure offers a solution allowing commercial utilization of this infrastructure. Eventually, expected impacts of the proposed activities will be presented, in order to indicate elements of the maturity model that benefitted from enhancement. This could then lead to another cycle of assessments and actions.

3. METHODOLOGY

3.1. MODEL OF INNOVATION SYSTEM MATURITY

Table 1 is a tool for an assessment of the maturity of the KSK's knowledge transfer system developed by the WB team. It is created, based on a literature review, the WB team's interviews with KSK stakeholders, and international good practice. It is divided in five columns. The first two columns describe key elements of the knowledge transfer system, while the last three columns provide a description of its three maturity stages. Categories and description in this model are adjusted to the KSK's circumstances, so these "maturity levels" would not be fully applicable to much smaller or bigger regions/systems that possess significantly different organizational capacities and innovation potentials.

1. Column 1: "Category"—represents overarching dimensions of a knowledge transfer system. Categories "A" and "B" provide a static snapshot of the knowledge transfer system, while "C" focuses on processes ('drivers') vital for advancing the maturity level of the system (dynamic approach).
2. Column 2: "Characteristic"—describes more nuanced features of a knowledge transfer system vital for its well-functioning.
3. Columns 3-5: "Maturity levels"—describe the three levels of a knowledge transfer system's maturity, from the initial to the most advanced.

TABLE 1: Maturity Model of a Knowledge Transfer System

Category	Characteristic	Budding system (1)	Advanced stage (2)	Developed stage (3)
A. Soft R&D infrastructure (people, skills, and institutions)	Level of trust in the system (Stakeholders' ability to build long-term relations on organizational level)	1. Low trust, cooperation on personal level; no long-term relations; R&D offer limited to standard procedures	1. Moderate trust, mixed cooperation scenarios; few long-term relations; R&D offer includes problem analysis and solving	1. High trust, cooperation on organizational level; long-term relations built; R&D offer also includes strategic partnerships
	Level of agility and flexibility in the system (ROs/higher education institutions' (HEIs) and public administration's ability to adjust to systemic needs and demands)	2. Very low; accidental activities; no systematic communication among stakeholders; fragmented efforts and no/low role definition; no transparent decision-making process	2. Moderate, intentional activities; increased communication, fragmented efforts, and enhanced role definition among stakeholders; transparent, but fragmented decision-making process	2. High; planned and supported activities; systematic communication among stakeholders; coordinated efforts, functioning role and responsibility division; transparent and coordinated decision-making process; public support programs in place
	ROs' business offer development capacity (ROs' ability to provide R&D services that are in demand)	3. Ad hoc; driven by individuals; supply-driven; no targeted resource allocation; no interdisciplinary R&D offer	3. Process-based; driven by individuals, supported by organization; supply-driven; monitored resource allocation; interdisciplinary R&D offer on organizational level	3. Process-based; driven by organization supported by individuals; demand-driven; strategic resource allocation; interdisciplinary R&D offer on system level
	ROs' ability to communicate their business offer (awareness of ROs' business offer among stakeholders)	4. Via personal contacts and networks; fragmented knowledge; no communication at organizational level	4. Via personal contacts and networks supported by Technology Transfer Centers (TTCs); knowledge aggregated at organizational level; passive communication at organizational level	4. Via TTCs supported by personal contacts and networks; knowledge aggregated at the system level; active communication at organizational level; support at the system level via regional, national, and international networks
	ROs' organizational maturity (ROs' organizational capacity for knowledge and technology transfer)	5. Ad hoc; non-repeatable; managed at faculty or laboratory level; lack of expertise; low organizational and regional support	5. Systematic; repeatable & process-based; managed at faculty/laboratory level; distributed expertise; organizational support	5. Systematic; regular & process-based; managed at organizational level; concentrated and managed expertise at organizational level; organizational and regional support
	SMEs' ability to define and communicate their needs on R&D and innovation (awareness of SMEs' needs among stakeholders)	6. Very low; ad hoc subjective opinions exchanged informally in bilateral relations; lack of an assigned responsibility for knowledge aggregating and disseminating	6. Ad hoc; first platforms for exchanging information exist; partial assignment of responsibility for knowledge aggregating and disseminating	6. Regular communication; well-functioning information platforms for all existing stakeholders; strong participation of intermediary organizations; overall responsibility for aggregating and disseminating knowledge assigned; companies' needs reflected in RIS
	SMEs' organizational and financial maturity (SMEs' capacity to engage in highly innovative and risky projects)	7. SMEs focus on increasing production capacity; competitiveness based on low production costs; none or very low R&D budget; none or very limited access to R&D-related public support	7. SMEs launch first R&D projects supported by public funds; competitiveness based on low production costs comes to the limit, so the need for R&D emerges; R&D budgets are based on projects	7. SMEs focus on growing via innovations; competitiveness based on Intellectual Property Rights (IPR) and technology; annual R&D budget to support growth strategy; public support to leverage R&D budget
	Regional stakeholders' ability to generate innovative ideas/projects	8. Suboptimal; individual-driven; short-term view on innovation strategies and return on investment (ROI); focus on personal needs; profit-oriented; no public support	8. Intensified; team- or organization-driven; mid-term view on innovation strategies and ROI; regional needs considered; broader impact considered; fragmented public support	8. High; all stakeholders engaged in generating innovative ideas; long-term innovation strategies; impact and ROI; regional needs considered; proactive international collaboration; balanced, systemic public support
	Regional stakeholders' ability to implement R&D-based innovations and generate growth	9. Accidental; driven by 'innovation zealots' (individuals); ROs' role mostly limited to providing a skilled workforce; companies expanding production capacity and competing on price; region not sharing the risk of innovation; no public support	9. Growing research, development, and innovation (RD&I) focus; driven by organizational culture; ROs provide R&D services for companies; companies grow by implementing R&D-based innovations; region sporadically takes the risk of being a first client; initial regional support measures for RD&I established	9. Systematic; growth in RD&I, key performance indicators (KPIs); regional RD&I culture established; ROs provide strong and well-protected IPR; companies built on IPR coming from ROs; region systematically takes risks of being a first client; balanced, systemic public support
	Regional platforms for collaboration/networking established	10. Ad hoc; personal network based; regional scope; weak, uncoordinated intermediary organizations; no targeted regional support programs	10. Early regional and national networks established; increasing role of intermediary organizations; regional support for building the networks	10. Systemic; strong regional, national, and international networks; strong role of intermediary organizations; national and international support for building networks

Category	Characteristic	Budding system (1)	Advanced stage (2)	Developed stage (3)
B. Hard R&D infrastructure (and related capacity)	National regulatory framework for commercial use or R&D infrastructure	11. No framework implemented; lack of clear responsibility on the national level	11. Limited commercial use allowed (e.g., release of "up to 20% annual capacity"); regulatory frameworks available and agreed upon	11. Comprehensive commercial use allowed (e.g., release of "up to 20% annual capacity" and above 20%, such as a pass-through mechanism); regulatory frameworks available and agreed upon; clear rules for new infrastructure exists
	National legal framework for IPR management and transfer	12. None, or inconsistent, or prohibiting IPR transfer	12. Fragmented framework regulations for IPR transfer; fragmented support for IPR identification, development, and protection	12. Comprehensive framework regulations for IPR transfer; comprehensive support for IPR identification, development, and handling—also on integrational level; international good practices implemented
	ROs' technical and administrative capacity to provide R&D services	13. No procedures for systematic service and maintenance; no strategy for legalization, certification, and accreditation; unknown or unpredictable availability; chaotic sales process	13. Bottom-up approaches for building procedures for services and maintenance; fragmented strategy for legalization, certification, and accreditation; predictable availability; basic sales process in place	13. Centralized procedure for service and maintenance; centralized strategy for legalization, certification, and accreditation; planned availability; integrated sales process supported by IT solutions (e.g., Customer Relationship Management [CRM]).
C. Key processes in the knowledge transfer system¹	ROs' maturity for IPR identification, development, protection, and licensing/selling	14. Researcher's responsibility and effort; none or limited organizational support; none or limited public support	14. Researcher's responsibility and effort; passive organizational support (e.g., TTCs); limited public support	14. Organizational responsibility and effort; active organizational (e.g., TTCs) and regional (e.g., intermediary organizations) support; comprehensive public support, including international
	Presence of competitive R&D infrastructure (public and private)	15. Limited availability; supply-driven; fragmented; no interdisciplinary offer	15. Moderate availability; supply-driven; organized in larger units; limited interdisciplinary offer	15. High availability; demand-driven; organized in larger cooperating units; comprehensive interdisciplinary offer
	Financial sustainability of R&D infrastructure (service, maintenance, and upgrade)	16. Mostly financed from own organization's funds; no public support for academia-industry cooperation	16. Partially financed from own organization's funds; public support focused on building academia-industry cooperation	16. Self-sustainable financially; public support focused on high-impact R&D-driven innovations
C. Key processes in the knowledge transfer system¹	Evidence-based management (are 'How & Why' decisions taken?)	17. No SMART ² goals defined in the strategy; no comparable data; no regular data gathering; no regular data analysis (lacking impact evaluations); lack of transparency in decision making and strategy update process; activities of stakeholders fragmented and not coordinated; data not published and shared	17. First SMART goals defined in the strategy; fragmented comparative data; regular data gathering but mixed data quality; regular data analysis but sporadic impact evaluations; first evidence-based decision and strategy updates made but no framework yet; activities fragmented; data published and shared	17. Functioning evidence-based, decision-making culture; SMART goals defined; reliable data available; regular data collection from verified sources and analysis; well-developed framework for evidence-based decision and strategy updates; impact evaluations embedded in the process; activities of stakeholders coordinated; data published and shared
	Role division ('Who does What?')	18. Stakeholders' roles (functions) not defined; roles taken on spontaneously by stakeholders; some basic functions do not exist & lack of advanced functions; frequent duplication of basic functions; lack of clear responsibility in the system; incomplete stakeholder-mapping	18. Basic roles (functions) defined and agreed; roles taken consciously but still lack some advanced functions; some duplication of basic roles; wide range of services present with limited specialization; all stakeholders included	18. Basic and advanced roles (functions) defined, agreed and taken on by stakeholders; strong specialization, cooperation and competition; inclusion of societal and environmental factors; all stakeholders included; balance between urban and rural, as well as national and regional
	Support to enable R&D collaboration and knowledge transfer ³	19. Mostly national level with fragmented coverage of the innovation cycle; mostly for selected stakeholders, not supporting cooperation; limited support for 'soft' activities, oriented towards trust and human capital building; no coordination among programs; not demand-driven, user-friendly, bureau-cratized processing; risk-averse	19. Combination of national and regional level support for most of the innovation cycle; dedicated for selected stakeholders but with cooperation nexus embedded; intensified support for soft activities; limited coordination among programs; space for experimenting with new support measures; demand-driven; light processing; not risk-averse; less bureaucratized	19. Balance of national and regional level covering the entire innovation cycle; optimization of EU support; well-balanced support for capacity-building, R&D based innovations and soft activities; long-term strategy and coordination among programs; experimentation with new support measures; demand-driven and evidence-based; no bureaucracy, light and fast processing; not risk-averse

Source: Authors, 2022.

3.2. PROPOSED ROLE DIVISION IN THE INNOVATION SYSTEM

A well-functioning regional knowledge transfer system requires that a number of roles and activities are being performed in a balanced fashion by regional stakeholders (as well as national ones). The realization of these functions requires the interaction between, and coordination of, innovation stakeholders, including, in particular, an appropriate distribution of roles and responsibilities. A developed system for knowledge transfer should ensure that all roles are assigned, and that they are allocated to the right stakeholders to perform them. This role division stems from the fact that each of the stakeholder groups has its comparative advantage originating from its entitlements, experience, and resources. For instance, the research sector is best at conducting research and managing R&D equipment; the public sector is better equipped to provide incentives, create framework conditions, and reduce risks; and the private sector innovates, looks for new specific solutions, and creates specific demands, among other activities. In an ideal world, these functions could be clearly separated, though this is not always possible. For example, a demand for R&D results can come from both the public and private sectors, and R&D services can be provided by both public and private ROs. Still, there are some functions that could be firmly attributed. Table 2 proposes such an ideal division of functions among innovation stakeholders.

TABLE 2: Proposed Division of Roles Among the Innovation Stakeholders

Stakeholder	Roles
Regional/Local Public Administration	<ol style="list-style-type: none"> 1. Coordinate and manage an inclusive regional strategy creation and implementation process 2. Encourage creation of frameworks for communication and coordination among the stakeholders (e.g., regional networks, and regional technology clusters) 3. Create frameworks for business risk mitigation when implementing R&D-based innovations (e.g., being a first customer) 4. Create or lobby for subnational and national support programs supporting regional strategy, attract other relevant investment opportunities for innovation projects 5. Promote innovative culture within the region 6. Promote the region and its innovation offer outside the region 7. Create 'quality of life'-related conditions to attract and retain people in the region 8. Create conditions to attract companies to locate their business in the region 9. Create conditions for growth of local business 10. Monitor and increase the level of inclusion (e.g., individuals, stakeholders, and urban and rural areas)
Companies	<ol style="list-style-type: none"> 1. Create and implement R&D-based innovations (take the business and financial risk of innovation activity) 2. Create demand for R&D services and IPR developed by ROs 3. Create demand for skilled labor force and offer high-quality jobs 4. Support creation and implementation of the Regional Innovation Strategy and innovation programs 5. Focus on growth and expansion; hence, contribute to region development 6. Define its RD&I-related needs and communicate them to other stakeholders 7. Get involved in activities of relevant and well-functioning intermediary institutions
Research Organizations	<ol style="list-style-type: none"> 1. Invest in, operate, and maintain R&D infrastructure 2. Conduct high-quality own research (both basic and applied) to develop and protect IPR (take the research risk on lower technology readiness levels [TRLs]) 3. Train both academic and administrative staff to prepare them for knowledge transfer 4. Prepare internal procedures allowing collaboration with the private sector 5. Provide competitively priced and high-quality R&D services to meet the demand 6. Provide high quality labor force for the region (attract young people to study in the region) 7. Support lifelong learning programs 8. Support creation and implementation of the regional innovation strategy 9. Contribute to growth and development of the region (focus on impact)

Intermediary Organizations	<ol style="list-style-type: none"> 1. Create and facilitate frameworks for communication and coordination among the stakeholders (e.g., regional networks, regional forums, and regional technology clusters) 2. Identify, aggregate, and communicate RD&I-related needs of companies 3. Represent groups of stakeholders in relations with the regional (and national) administration 4. Represent groups of underrepresented stakeholders in the innovation environment (increase the level of inclusion) 5. Coordinate own work program with other regional stakeholders (avoid duplication, look for niches, and provide value-added) 6. Create or lobby for support programs oriented for building trust and cooperation in the region 7. Provide basic and specialized trainings, expertise, and guidance for entrepreneurs and companies, either by in-house experts or external collaborators 7. Support creation and implementation of the regional innovation strategy 9. Promote innovative culture within the region 10. Promote the region and its offer outside the region
Society / Citizens	<ol style="list-style-type: none"> 1. Demand efficient and effective public services and monitor their results 2. Help identify challenges to be tackled by innovative solutions 3. Engage in creating solutions and innovation 4. Provide feedback on implemented measures

Source: Authors, 2022.

These roles will be used in the final chapters to formulate recommendations for RIC. The proposed roles and specific activities will not be fulfilled by a single entity. In fact, each of these roles will have several stakeholders active. For instance, there are several KSK-based research organizations, there is a number of intermediary institutions, and there are several public authorities active in the field of knowledge transfer. The ability to understand ‘who is who’ and ‘who is doing what’ are critical to align the functioning of the regional knowledge transfer system. Proper mapping of stakeholders is needed to achieve that end, and to identify strengths as well as gaps.

4. THE KSK AND INNOVATION – A SHORT OVERVIEW

KSK's basic socio-economic indicators are the following. The region covers an area of 6,754 square kilometers and has just above 800,000 citizens (data 2019). The KSK has a relatively low level of urbanization (54%) though this does not translate into high employment in agriculture (2.4%). The population is slightly growing while at the same time it is aging, and the working population is fairly evenly distributed among the three main age cohorts: 24% are 25-34 years old, 29% are 35-44 and 24% of those employed are 54 years-old. Košice is the second-largest city in the country, after Bratislava, the capital. The region contributes 12% to the national GDP. In 2019, an average monthly gross salary in the KSK was € 1,168 (with women earning 218 EUR, or 17%, less than men), which constitutes almost 93% of the national average (€ 1,262) but only 71% of Bratislava's average. The KSK's GDP per capita (€ 15,400) is 42% lower than in Bratislava (€ 21,900) and two times smaller than the European Union's (EU) average (Figure 2). The industry sector is the top employer responsible for 23% work force, followed by public administration and administrative services combined (15%), wholesale and retail (12%) and education sector (11%). Unemployment is at 8%, which is higher than the Slovak average (6%) and second highest among all Slovak regions. 25 to 44 year-olds are most affected by unemployment with a slightly higher rate among those younger (25-34 years-old) in the cohort. On average, food, housing and transport amount to 52% of household income.⁴

The KSK is able to offer favorable conditions for the development of innovation in the SME sector, and for the acceleration of startup companies. Three well-ranked Slovak universities are located in the KSK (more details in the next chapter), as well as a number of institutes of the Slovak Academy of Science (SAS). The region is perceived as the second-biggest science hub in the Slovak Republic, after Bratislava, and is responsible for almost 14% of university graduates in the country (second highest after Bratislava—40%). The number of graduates has been steadily declining, from 5,651 in 2015 to 4,252 in 2019, a 24% drop. The region educates talented and creative people, although keeping them in the region is a challenge, since job opportunities are limited and salaries are much lower than in the country's capital.

Thanks to the long and strong industrial tradition, the region has a highly qualified engineering and technical labor force, although it is currently aging. There are companies operating in the region, and in particular, in Košice City, that have significant innovative potential in various sectors (see more details in the next chapter). Compared to the national economy, the region has more people employed in services, with fewer in manufacturing. The KSK has a growing niche specialization in IT.

FIGURE 2: Regional Economic Profile 2021: Eastern Slovakia

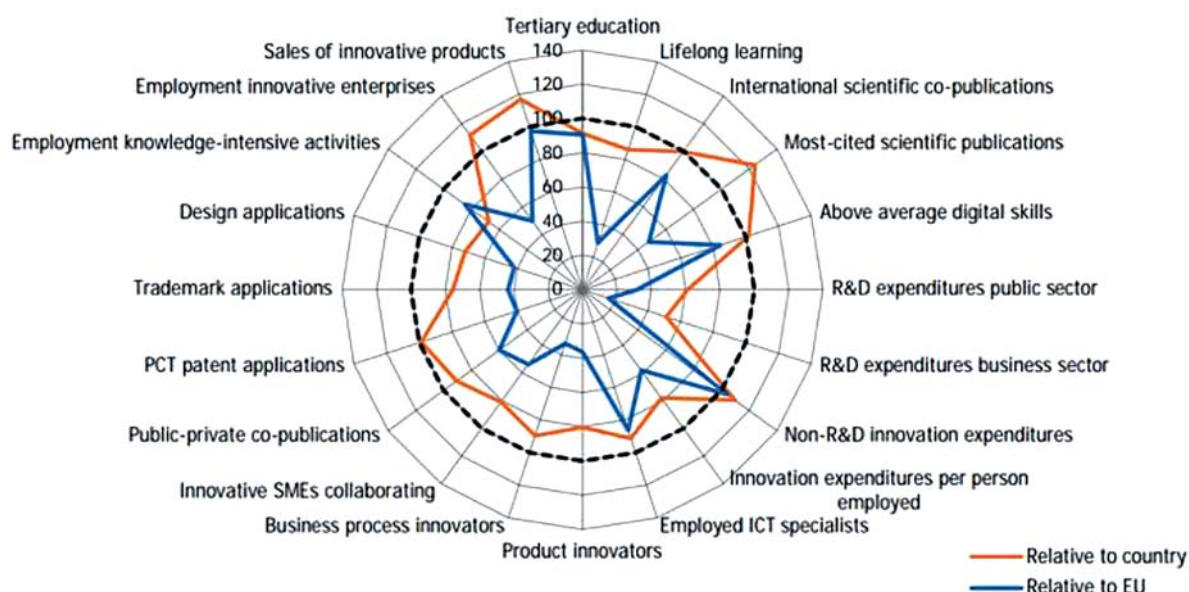
	SK04	SK	EU
Share of employment in			
Agriculture & Mining (A-B)	2.7	2.9	4.6
Manufacturing (C)	21.5	24.7	16.4
Utilities & Construction (O-F)	12.9	11.3	8.2
Services (G-N)	53.1	52.3	62.9
Public administration (O-U)	9.8	8.7	7.1
Average number of employed persons per enterprise	2.9	3.4	5.2
GDP per capita (PPS)	15,400	21,900	31,200
GDP per capita growth (PPS)	0.49	0.46	3.21
Population density	104	112	109
Urbanisation	58.3	62.3	75.3
Population size (OOOs)	1,630	5,460	446,450

* SK04 figures refer to Eastern Slovakia Region

Source: European Commission, Regional Innovation Scoreboard, 2021. <https://ec.europa.eu/docsroom/documents/45962>

However, this potential does not translate into innovation outcomes. This fact is well reflected in the region's performance in the Regional Innovation Scoreboard prepared by the European Union. In this study, the KSK is analyzed together with the Prešov Region as 'Eastern Slovakia' (Figure 3). In general, it scores below the national averages, and significantly below the European averages; it is ranked as 'emerging innovator +', that is, the highest sublevel in the lowest category. It fares well in areas of non-R&D innovation expenditures, tertiary education, and sales of innovative products. Employed information and communications technology (ICT) specialists, international scientific co-publications, and above-average digital skills also score high. The region underperforms in certain areas, such as R&D expenditures by the public and private sector, lifelong learning, product and business process innovators, and protection of intellectual property rights. This is despite the significant investments in R&D infrastructure in recent years, mainly financed by EU structural funds.

FIGURE 3: Regional Innovation Scoreboard 2021: Eastern Slovakia



Source: European Commission, Regional Innovation Scoreboard, 2021.

More business-research collaboration on R&D is needed to stimulate knowledge transfer and enterprise innovation in the region. An important, but still underexploited leverage of the KSK, is the cooperation between industry and academia. The use of the rapidly aging infrastructure is considered suboptimal today and leaves space for improvement. Too little practical and business application of scientific research results, and poor links between researchers and entrepreneurs significantly limit innovation. Intensifying this cooperation and ensuring its effectiveness could contribute to the implementation of new technologies, the creation of new products, and effectively attract financial capital, which is an important catalyst for innovation. In other words, it could increase the return on funds invested in R&D infrastructure both in financial and economic terms.

5. STAKEHOLDERS OF A KNOWLEDGE TRANSFER SYSTEM IN THE KSK

5.1. KSK ADMINISTRATION

The regional authorities are increasingly involved in the innovation and knowledge transfer field. In 2021, the KSK adopted its new Regional Innovation Strategy (RIS), which is to guide the region's innovation policy and contribute to the regional integrated strategy. RIS's two key programs are the establishment of RIC and the Cassovia New Industry Cluster (CNIC).

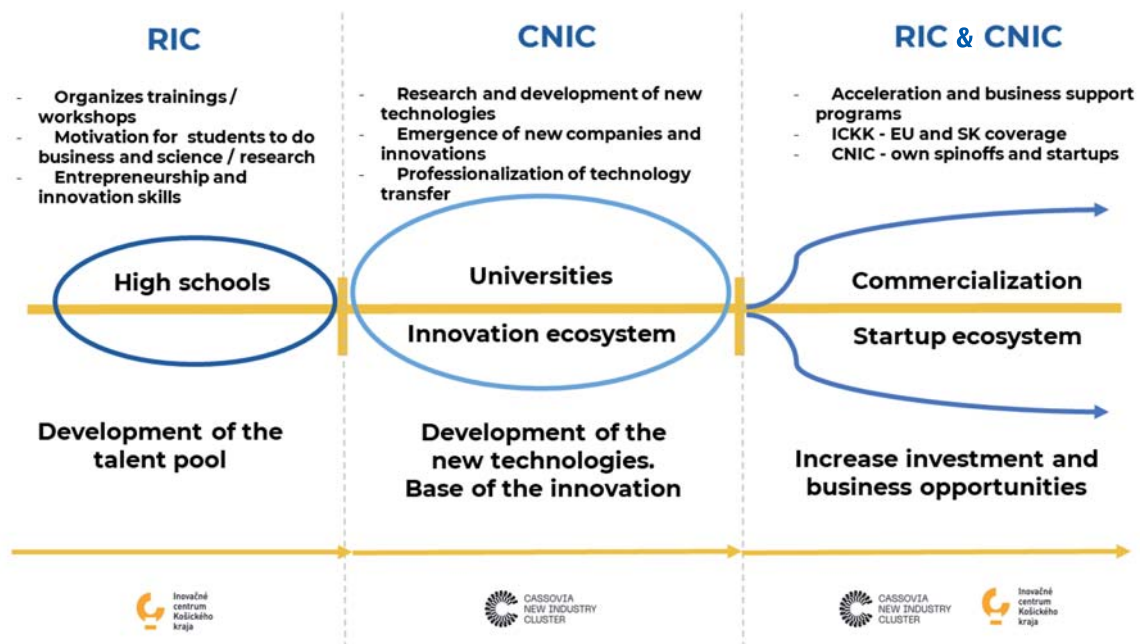
RIC and the CNIC were established in mid-2021 as separate legal entities. Both have a similar membership structure, that is, authorities of the KSK and Košice City, and three regional universities (the Technical University of Košice /TUKE/, UPJS, and the Veterinary University). Additionally, the CNIC also includes a representative of a business association. However, as their envisaged scope of work and resources are quite different, the relationship between these two entities needs to be further clarified. It seems that RIC could play a role of an innovation agency and coordinate local stakeholders, be oriented towards increasing talent pool, supporting companies, supporting IPR transfer from academia to companies and promote entrepreneurial and innovation skills and attitudes in the region. RIC is expected to be operational in the first half of 2022. The CNIC envisages large investments in brand-new research infrastructure (buildings and R&D equipment) and will be leaning towards conducting high-end applied research. It is to focus on three thematic areas: bioscience and new materials, green technologies (including green energy), and quantum computing. Its full operability will take several years. Both entities seem complementary and can benefit from collaboration, since, as it seems, RIC tends to be 'horizontal', while the CNIC is focused on specific research areas ('verticals'). Figure 4 depicts this relation.

BOX 1: Key Observations About the KSK Administration Related to Innovation Support

1. The KSK adopted its new Regional Innovation Strategy (RIS) in June 2021 with two pillars: RIC and the CNIC.
2. Two major initiatives were launched in 2021 in the region—RIC and CNIC were established as separate legal entities with very similar membership (the KSK administration, the Košice City administration, and three key regional universities; in addition, the CNIC also has a representative from the private sector).
3. The KSK administration's focus on supporting innovation is nascent; to date, the KSK has only a limited level of knowledge about the regional innovation landscape, since systematic evidence-based mapping of the innovation sector has not been prioritized and assigned to a dedicated unit. Moreover, innovation policy in the Slovak Republic has been mainly prepared and implemented by the central government.
4. Establishing RIC indicates a more proactive approach to the regional innovation policy; RIC has a public administration and research organization membership, and its management is accountable to RIC's General Assembly.
5. The region obtained € 18 million from the Slovak Ministry of Culture for the development of the Košice Cultural-Creative Center which will cater to the expansion of creative industries in the region.

Source: Authors, 2022.

FIGURE 4: Complementarity of RIC and CNIC in KSK’s knowledge transfer system



Source: KSK Regional Innovation Center, 2022.

The KSK administration counts that RIC (though outside KSK’s organizational structure) will support its innovation efforts, since the region has not yet had a dedicated unit dealing with innovation policy. The innovation agenda has been shared by different departments, so that its budget and responsibilities have also been split, and staff rotation has been taking place. Innovation stakeholders indicated that a single contact point on the KSK’s side was not always easy to identify. The RIC establishment is to address some of these gaps, although it is not embedded into the structure of the regional administration. The KSK decided not to create an innovation-devoted unit in its organizational structure, and details of collaboration with RIC need to be still worked out. In general though, working relationships between the region, the Regional Development Agency and RIC have been established. Furthermore, RIC’s vision and exact scope of work still need to be clarified. While expectations are high, RIC’s resources are limited (see more details in Chapter 8), thus selection of its tasks will be critical for the RIC’s success.

The regional authorities, in collaboration with the Tabačka Center (Arts and Creative Industries Hub), obtained financing for establishing the Košice Cultural-Creative Center. The Cultural-Creative Center has a budget of € 18 million which was provided by the Ministry of Culture in 2021. This project includes refurbishment of existing buildings, construction of a new building, and provision of support services for creative industries. The building is currently under construction; later, a management team will be assembled. This center has potential to complement other regional innovation-oriented initiatives.

5.2. RESEARCH ORGANIZATIONS (R&D SUPPLY)

There are three public universities in the KSK region—UPJS, TUKE, and UVMP, all located in Košice City.

Pavol Jozef Šafárik University in Košice (UPJS) consists of five faculties: Faculty of Medicine, Faculty of Science, Faculty of Law, Faculty of Public Administration, and Faculty of Arts. These faculties conduct research and educate physicians and dentists, experts in natural sciences, mathematics and informatics, teachers, lawyers, specialists for public administration, and specialists for psychology, philosophy, and the theory of communication. The key mission of Pavol Jozef Šafárik University in Košice is to provide higher education based on the newest scientific findings in a wide international context, following the European trends and goals laid down in the Bologna Declaration and other documents.

The Technical University of Košice (TUKE) consists of nine faculties: Faculty of Mining, Ecology, Process Control and Geotechnology, Faculty of Materials, Metallurgy and Recycling, Faculty of Mechanical Engineering, Faculty of Electrical Engineering and Informatics, Faculty of Civil Engineering, Faculty of Economics, Faculty of Manufacturing Technologies (with a seat in Prešov), Faculty of Arts, and Faculty of Aeronautics. TUKE teaches some 10,000 students (5,300 bachelor's, 3,500 master's and some 700 postgraduates) and is fostering an environment with a scientific and technological knowledge basis, innovation, and workforce, in order to create a beneficial and sustainable future, and high quality of life. This will be achieved at TUKE by innovative research, and excellent education in all scientific branches of the respective university faculties.

The University of Veterinary Medicine and Pharmacy in Košice (UVMP) is a one-faculty university providing education in bachelor study programs in Cynology, Safety of Food and Feed, Animal Science, and Man-Animal Relationship and its Use in Canis therapy and Hippotherapy; DVM (Doctor of Veterinary Medicine) degree study programs, which include General Veterinary Medicine and Food Hygiene; and master study programs in Pharmacy and Market and Food Quality. The mission of UVMP in Košice, as a part of the European Higher Education Area (EHEA) and common European Research Area (ERA), is to develop in people a harmonious personality, knowledge, wisdom, goodness, and creativity, and to contribute to the growth of education, science, culture, and health for the welfare of the whole society and the development of a knowledge-based society.

BOX 2: Key Characteristics of R&D Supply in the KSK

1. ROs with R&D potential are concentrated in Košice City.
2. Suboptimal use of R&D infrastructure for commercial purposes.
3. ROs collaborate with each other and seem open to offering commercial R&D services.
4. ROs are relatively advanced in their preparedness for commercial R&D collaboration.
5. ROs designed and advocate the CNIC project.
6. There are a variety of thematic research fields (for instance, bioscience, IT, veterinary).
7. Limited capacity and activities of ROs' technology transfer centers (TTCs).
8. Limited utilization of VET schools, though companies seem interested and VET schools seem flexible.
9. No single framework for the release of R&D infrastructure for commercial use is broadly applied.
10. Recent changes to the status of the Slovak Academy of Science, with regard to its ability to engage
11. in commercialization of R&D results.

Source: Authors, 2022.

The Prototyping and Innovation Centre (PaIC) is a part of TUKE. The mission of PaIC is its active performance in the following areas:

- Implementation of research results of faculty staff and students
- Research, development, and innovations for industry

- Mentoring and manufacturing support for startups and small businesses in the field of prototype development and manufacture
- Enabling students to directly participate in the research of new products and technologies
- Coordination of complex industry-university collaboration projects with international outreach

PaIC also comprises the ICT and publishing center which covers tasks concerning computer technology and informatics, especially related to hardware and software equipment for lecture rooms and faculty premises, server management, as well as the instruction of computer-related subjects, copying services and publishing work. A part of PaIC is **DIH Robotics Hub**.

The University Science Park (USP) TECHNICOM also operates at TUKE. Its mission is to create an ecosystem for the acceleration of technology transfer, innovation, and the support of business. Furthermore, it provides a platform to support the implementation of applied research and development and ensures the transfer of R&D outputs into economic and social practice. USP also enables the establishment and development of businesses that utilize R&D outputs for their innovative products, goods and services, or they themselves carry out the research and development. The goal is to provide an incubation environment enabling the acceleration process, thus making possible the establishment and development of small and medium high-technology (high-tech) companies, or startups and spin-off companies. Part of USP TECHNICOM is the **Digital Innovation Hub (DIH) TECHNICOM**.

Each of the universities in the KSK made significant investments in their research infrastructure in the 2007–2013 and 2014–2020 perspectives. In the case of UPJS, it was over € 50 million in each of the perspectives. In the case of UVMP, investments ranged from € 16–50 million in 2007–2013, and from € 6–15 million in 2014–2020. Investments made by TUKE were the lowest and amounted to between € 1–5 million in 2014–2020. However, the investments made by TUKE should be considered together with the investments made by TECHNICOM, which amounted to more than € 50 million in real estate construction and between € 16–50 million for other infrastructure between 2007 and 2013, and in the range € 1–5 million between 2014 and 2020.

All ROs report the need to increase the commercial use of their research infrastructure. Such utilization is currently hampered by the fact that the infrastructure has been purchased predominantly (over 75%) with public funds, and the rules of its utilization in accordance with the regulations on public aid have not been clearly defined at the national level. Without a clear and broadly accepted framework for releasing R&D infrastructure it can only be used for non-commercial purposes. That, in turn, limits the ROs' ability to involve in cooperation with companies and poses risk to the R&D infrastructure sustainability.

All universities declare that they conduct commercial projects with industry. The number of such projects amounts to 50 projects per year for TUKE, 25 projects per year for UPJS, and 10 projects per year for UVPM. In all cases, these are small-scale projects, generating cumulative annual revenue between € 50,000 (UVPM and UPJS) and € 200,000 (TUKE). TECHNICOM results are reported independently. In 2019, TECHNICOM executed 164 commercial contracts worth € 1.4 million. Universities report a growing trend in this area. Universities also report that they have a history of securing higher-value contracts and therefore have the organizational capacity to handle such projects.

All universities report that they have organizational capacity to conduct activities related to patent protection and intellectual property (IP) licensing. However, today these activities are mostly limited to patent applications and licensing agreements of small value. As with research contracts, TECHNICOM results reported independently are higher and include 30 patent applications, 13 local patents granted, and two international patents in 2020. In terms of spin-off company creation, only UPJS reported creating five companies in the last three years. Currently, they are in the development phase.

All universities declare that they have organizational units responsible for managing commercial cooperation with the industry and for the identification, protection, and management of intellectual property. At TUKE, commercialization activities are mainly organized around PaIC and TECHNICOM, which act as a technology transfer center. These three units together employ 10 full-time and three part-time staff. Commercialization cooperation at UPJS is divided between the TTC and the Business and Marketing Department, which together employ five people dedicated to technology transfer issues. In the case of UVMP, these activities are the least advanced, and the university website does not have a link to the department responsible for cooperation with business. The university indicated it employed three people related to commercialization, who were assigned to the Legal and Human Resources Department, the Projection and Investment Department, and the Project Department.

Those ROs' declarations, activities and achieved results are positive signs that serve as a piece of evidence that the region has innovation potential and commercial R&D collaboration is possible. At the same time, when compared to the R&D outlays, more intensive and advanced commercial R&D collaboration could be expected with a greater impact on regional companies and economy. Furthermore, to considerably enhance the sustainability of existing R&D infrastructure and afford purchasing new one, financial results of such collaboration need to amplify.

5.3. COMPANIES (R&D DEMAND)

The following section focuses on the role of the private sector and industry within the KSK's knowledge transfer ecosystem.

BOX 3: Key Characteristics of R&D Demand in the KSK

1. A number of innovative companies (large and SMEs) operate in the region.
2. There is a strong concentration in Košice City, although there is also considerable innovation potential outside (Spiska Nova Ves, Michalovce, and Kechnec).
3. While there is general public awareness about the region's IT potential, other promising sectors also exist (fertilizers, modern farming, organic chemistry, and manufacturing).
4. There is limited collaboration focused on innovation between companies and ROs, especially when it comes to SMEs.
5. There is a small number of technological startups in the region; some incubation and acceleration programs are provided by TECHNIKOM, Deutsche Telekom (former T-Systems), and the Slovak Business Agency (SBA), but with a limited talent pool.
6. There is only a limited knowledge of innovative companies by ROs and the KSK, as well as companies' needs.
7. Companies do not have a good overview of possible support measures; their corporate social responsibility (CSR) programs, especially of large companies, could be leveraged more to stimulate innovation.
8. The biggest KSK players are not perceived, and do not behave as leaders/champions of the innovation agenda (US Steel, and Deutsche Telekom).

Source: Authors, 2022.

Role of the Private Sector within the Quadruple Helix Model: While there is no exact formula for the creation of a well-functioning regional knowledge transfer ecosystem, the active private sector and industry form building blocks that are instrumental to its vitality and success. Companies absorb, utilize, and further diffuse knowledge produced by research institutions. They innovate through the elaboration of novel products, services, and marketing and business models. Innovations help enhance their productivity that results in higher competitiveness and ability to grow their market share. Growing innovative businesses, in turn, translates in more (and usually better) jobs at the local market and increased tax revenue. This impacts the regional GDP, as well as other intangible factors—for instance, the economy's appeal to young and/or talented people. As investors, companies also play a catalytic role in financing local innovation. A dynamic and well-functioning relationship

between universities and industry therefore constitutes an important vector in the transfer and application of knowledge. The productivity and efficacy of this relationship subsequently have a significant bearing on an innovation ecosystem's competitiveness.

The appeal of the region is reflected in the number of important international companies that have located their activities here. They are modern, global companies (see Figure 5) with strong international networks that can offer great opportunities for local SMEs to join their supply chains and to build their own competitive advantage.

FIGURE 5: International Companies Located in the KSK Region



Source: KSK, Brussels Office, <https://brusel.vucke.sk/en/economic-and-investment-opportunities-in-the-kosice-region,2022>.

Large foreign companies operating in the KSK, such as US Steel, AT&T, or Embraco, in general, cooperate with ROs, initiating innovative projects within their own research facilities. These entities tend to be aware of the benefits of joint R&D projects and knowledge transfer for the development of new products, services, or technologies. The situation looks different in the case of regional SMEs with interest to be innovative. They report limited investment in their own innovative activities, and in building their own R&D base and research teams. R&D infrastructure is available in local universities; ROs are also underutilized by SMES, as is the support of external experts in initiating and implementing research projects. The corollary effect, as illustrated in the *EU Regional Innovation Scoreboard for Eastern Slovakia*, is presented in Chapter 4.

In terms of industrial structure, the most important sectors in the region are the metallurgical, chemical, and electrical industries, and the rapidly growing IT sector. To assess the role of the private sector within the KSK regional knowledge transfer ecosystem, the WB conducted a rapid qualitative assessment of twelve local small, medium, and large companies located in Košice City and outside it. Five sectors within the regional economy were targeted: the information and technology, telecommunications, biotech, and agricultural technology (agri-tech) sectors, and companies providing advisory business services. The rapid assessment was based on structured interviews conducted between April–September 2021. The full list of companies can be found in Appendix 3. The interviews were meant as a rapid assessment of the private sector to better understand the current state of affairs of knowledge transfer, identify key trends on the companies' side, as well as the most important concerns voiced by companies. Interviews confirmed that the IT sector is currently experiencing a boom, and stakeholders often mention it as an important sector of the regional economy. At the same time, companies with big innovation potential were identified in more traditional sectors, such as metallurgy, agriculture, and chemistry.

The ICT sector is an important element shaping the innovation ecosystem in the KSK, employing several thousand specialists, mainly in software development or offering business process outsourcing. The IT startup sector is developing in Košice, namely in industry 4.0, gaming and artificial intelligence technologies. Biomedical engineering is also a promising sector. Yet, according to local companies, despite the high number of IT graduates in the region, the entrepreneurial talent pool needed for the growth and scaling up of the startup sector is insufficiently low. Inadequate focus on the development of business and entrepreneurial skills in formal education is posited as one of the causes for this shortcoming. A similar reasoning is attributed to the low number of spin-off companies emerging from the R&D sector.

Nonetheless, the rapid growth of the ICT sector in the KSK offers significant prospects for supporting innovation and for promoting the culture of innovation. Creating conditions for the formation of new IT startups, coupled with relevant skills development—such as on-the-job training or internships—can significantly open opportunities for the young generation, which constitutes a great value for the KSK’s labor market, and ultimately, for the regional economy. The dynamics of creating startups and spin-offs are expected to increase, as well as the possibility of the better use of financial engineering tools to ensure their survival.

5.3.1. Companies’ views

The interviewed KSK companies identify the following key bottlenecks (apart from those already mentioned), that undermine collaborative RD&I activities:

- **Companies located in the region, especially from the SME sector, rarely, or are rather reluctant to, engage in R&D cooperation due to the high level of uncertainty, bureaucracy, and the lack of knowledge and experience in working with ROs.**
- **Cooperation with scientists is perceived by entrepreneurs as cumbersome, time-consuming, and risky *vis-a-vis* possible results.** Moreover, innovative companies often possess more advanced and current knowledge than is available within the scientific community. Hence, these factors prompt companies to develop R&D capacities ‘in-house’, a feature particularly notable in larger companies.
- **There are no sufficient financial incentives** for effectively encouraging joint private sector-RO collaboration and the subsequent implementation of innovative solutions.
- **Research organizations’ business development units, systems, and procedures** are inadequately pro-business-oriented to provide efficient modalities of collaboration with attractive and competitive business offers.
- **Modern equipment and research infrastructure** owned by research organizations is not widely available for commercial use.
- **Employers have increasing difficulties in recruiting and retaining qualified, motivated staff,** as they seek more attractive employment opportunities and quality of life in Bratislava or abroad. Educated, talented, and creative people, especially in the field of ICT, do not find enough interesting and well-paid job offers to stay in the region or to return from abroad.
- **Companies point out that the local secondary schools and universities do not adequately prepare graduates for the contemporary job market.** Graduates’ knowledge and skills are insufficiently applied, thus requiring costly, often long-term, on-the-job training. This means that companies are forced to hire relevant talent from other regions or from abroad. However, the quality of life in the KSK is often insufficiently competitive for attracting more senior and selective experts.
- Despite the claimed existence of intraregional networks and communication between institutions, organizations, and clusters, cooperation between different sectors in science and business do not yield adequate results.
- **Incentives and support for collaborative RD&I is fragmented and often incompatible with the specificities of regional needs.** Innovation support instruments are dispersed among various agencies, ministries, and other bodies, which significantly constrains companies’ and ROs’ access to them. Local stakeholders interviewed also noted that the latter often do not

adequately cater to regional context and needs. Some areas of support are neglected altogether—such as bolstering the regional investment portfolio—while others are overrepresented—support for startups, acceleration, and incubation.

- **The education system lags behind market and technological developments**, especially in the IT sector. Trends such as transition from labor toward vertical knowledge domains are placing new demands and require agile responsiveness by business and ROs alike. Yet both often lack the necessary soft and managerial skills for developing an agile and scalable entrepreneurial culture related to RD&I activities.
- The vast majority of companies interviewed, while assessing their operations in the region positively, claim that the **regional and national policy framework is not sequentially and strategically oriented to support regional RD&I initiatives**. Companies' access to financial instruments that incentivize mutual collaboration and development of soft business skills in technology and knowledge transfer are needed. Attracting private foreign investment, stimulating the growth of vibrant sectoral networks, and the scaling up of regional RD&I projects could also improve.
- **Targeted support for SMEs' RD&I activities is particularly scarce**. The recently rolled out vouchers scheme for collaborative RD&I projects by the Slovak Ministry of Economy and the Slovak Innovation and Energy Agency (SIEA) is a welcome step in the right direction. Yet, a one-time voucher scheme is insufficient for incentivizing a longer-term, robust impact on RD&I collaboration between business and ROs. The SMEs' needs differ from those of larger companies. SMEs are smaller with limited staff and R&D budgets. Those interviewed explained that paying for certification of products in different markets or for patents, for example, is a financial make-or-break situation for them, if they want to remain competitive. A diversified, needs-based portfolio of support for SMEs, coupled with tailored guidance and streamlined bureaucracy in application processes, need to be considered in future RD&I support measures. Easy-to-access, well-targeted information campaigns on innovation support programs are necessary for regional SMEs.

5.4. INTERMEDIARY ORGANIZATIONS

Intermediary institutions constitute yet another important building block of innovation ecosystems. When functioning well, they can bridge gaps between solution seekers and solution providers, thus contributing to the successful commercialization and appropriation of open innovation by actors within the ecosystem. In various stages of the innovation process, intermediaries foster important relational and collaborative capital by connecting ROs with industry, entrepreneurs, innovation advocates, and policymakers. They build up and sustain innovation ecosystems through capacity development initiatives, hosting business and professional collaborative platforms, networks, and partnerships. They also promote and scale up companies' innovation potential through business acceleration, incubation, and the dissemination of knowledge. On behalf of innovation entrepreneurs and research organizations, they can also play an important advocacy role toward regulatory bodies, facilitate public awareness-building on innovation topics, attract investments, or act as disbursement channels for public and private funding. Innovation is considered to be a highly collaborative process. Thus, when an innovation ecosystem fails or stagnates, it is often attributable to a lack of coordination among participants.

Ensuring the success of regional companies, especially within the industry sector, requires that they actively engage in research, development, and innovation (RD&I) and application of knowledge processes. For this reason, it is important that the KSK focuses on promoting high-quality research and its commercial application to meet the rapidly changing market needs. At the same time, it is important that companies with innovative ambitions are managed by efficient teams that can identify their opportunities and develop their companies in ways that flexibly respond to market challenges and effectively integrate the knowledge and technologies they need. These companies should be encouraged to actively participate in innovation networks and research groups to ensure access to innovative technologies and create new market opportunities.

In the KSK, various intermediaries actively support the innovation ecosystem. Notably these AmCham and the Košice Regional Chamber of the SCCI, Košice IT Valley, Creative Industry Košice (CIKE), regional branches of the Slovak Business Agency (SBA), the Slovak Innovation and Energy Agency (SIEA) and Tabačka (Arts and Creative Industries Hub).

BOX 4: Key Characteristics of Intermediary Institutions in the KSK

1. A number of institutional stakeholders are operating in the innovation/knowledge transfer field in the region. These are national-level stakeholders (SIEA and SBA), regional (KSK, RIC, CNIC, and the Košice Cultural-Creative Center), local (Košice City, and Creative Industry Košice [CIKE]), as well as private sector representatives and associations (the American Chamber of Commerce [AmCham], the Košice Regional Chamber (KRC) of the Slovak Chamber of Commerce and Industry (SCCI), and Košice IT Valley).
2. They have varying footprints in the region. Branches of national agencies manage centrally planned projects; they tend to have limited links to companies and focus mainly on Košice City. Regional and local institutions seem to know their circle of beneficiaries well and have much more limited resources than the national agencies.
3. These entities offer some support measures but operate with weak coordination between each other. The level of provided services is generic and insufficiently targeted to specific regional needs.
4. Košice IT Valley is a successful, active, large, sectoral cluster with 52 members. Its presence could be further leveraged. The KRC of the SCCI has strong connections with companies, including in peri-urban areas. CIKE focuses on city-level activities with a focus on creative industries.

Source: Authors, 2022.

FIGURE 6: TECHNIKOM Košice: Competition for Creative Ideas



Source: TUKE, 2022.

The World Bank CuRI team interviewed all the above-mentioned intermediaries. A consensus emerged from the interviews, pointing to the exponential rise of the IT and creative industries sector in the KSK over the past decade. Apart from the entry of bigger companies such as Deutsche Telecom Systems, Global Logic, and the locally grown Antik Telekom, there are supporting activities of the KSK intermediary organizations. The following are some examples of these activities: TECHNIKOM’s startup and incubation program; AmCham’s organization of the annual *Eastern Innovation Conference*; Creative Industries’ *Art Tech Days*; IT Valley’s *‘live IT projects’* that pair up students with companies to work on practical solutions to real-life challenges; and, the accelerated talent pool cultivation at the high school- and elementary school-level through *IT Academies*. All these endeavors have certainly elevated the visibility and dynamism of the expanding innovation ecosystem in the region.

5.4.1. Intermediaries’ views

Yet, despite these positive contributions, the interviews also showed that the collaborative and networking potential of the KSK’s knowledge transfer system is short of optimal and could improve. This is especially the case if local research organizations, established companies and

startups want to remain competitive on the dynamic regional, national, and international market. Among the mentioned missing links existing within the current regional knowledge transfer ecosystem are the following:

- **Communication**—While the various regional intermediaries do communicate among each other, they note that networks and subsequent collaboration within the KSK ecosystem are largely based on personal contacts, and hence, they are not systemic. There are no open innovation platforms.
- **Suboptimal collaboration: ‘the silo mindset’**—Intermediaries felt that universities and research organizations tend to be insular—‘they are doing their R&D in closed bubbles’—and that they are too bureaucratized—thus not easy to approach—when it comes to collaborative projects. This prompts the private sector and other intermediaries to pursue their own in-house RD&I activities or reach out to partners outside the local context for collaboration. However, the intermediaries interviewed felt that suboptimal collaboration goes beyond the RO-industry relationship. Several pointed to the lack of intersectoral collaborative projects which could additionally boost local innovation potential. CIKE’s initiatives to link the art and technology domains, for example, has been quite successful. More could be done in this regard. Effective ways to intensify links with other stakeholders, including customers, partners, suppliers, as well as science partners/researchers and high-tech knowledge providers are strongly expected.

Insufficient talent pool and brain drain for scaling up innovation—‘the numbers are simply not there’.

An innovation ecosystem needs a critical mass of innovative mindsets. Though the local three universities are among the best ranked in the Slovak Republic and indeed do supply the labor market with technically skilled graduates, the CEOs of local companies pointed to the fact that with the highly dynamic speed of innovation and labor market demands, the volume and specialization of local talent available—for example, Doctoral students in IT—is insufficient to sustain the future scaling and growth of the regional RD&I sector. More support mechanisms and good quality of local life guarantees need to be considered in order to retain local graduates.

“To augment regional competitiveness, graduates’ and local entrepreneurs’ skills need to be continually upgraded to meet market demands. If the numbers [of KSK talent pool] remain as they are—outside international talent will need to be brought in through targeted policies for economic migration.”
CEO Deutsche Telekom

- **Low critical mass of ‘entrepreneurial spiritedness’ and soft skills** – *“It is not that I have many students or entrepreneurs knocking on my door to pitch me new ideas that we could support”*—CEO Deutsche Telekom. While many local and international companies have implemented various incubation and acceleration initiatives as part of their corporate social responsibility mandates, their sustainability and growth is often circumscribed due to the low entrepreneurial and business development skills among local actors. These are critical for the successful transfer and commercialization of knowledge, not to mention, for the formation of profitable spin-offs.
- **Inadequate data collection, assessments of regional needs and joint strategic vision(ing)**—Having a strategic vision matched with implementation is one of the key characteristics of mature regional innovation ecosystems. To develop a shared strategic vision, reliable data, and evidence on the system’s strategic needs, as well as inclusive and open stakeholder consultations and collaborative strategizing are key. Due to the fragmented, ‘silo mentality’ among local intermediaries, joint strategizing—such as wider inclusion of stakeholders in the KSK’s Regional Innovation Strategy drafting process—could improve. More systematic data collection on regional RD&I needs should also be institutionalized. Regional branches of national intermediary agencies whose programs were not always seen as adequately fitting to the specific contextual needs of their regional beneficiaries, should particularly consider this.
- **Low or non-existent domestic and international investment capital for ‘proof of concept’ RD&I projects** to incentivize experimentation and RD&I ‘sandboxing’
- **KSK innovation ecosystem’s reach beyond Košice City: Urban-peri-urban-rural dynamics**—While Košice City certainly acts as the regional hub for RD&I activities geographically, the region and provision of opportunities for potential actors interested, or already active, in innovation spans beyond its capital. The extent to which this is explored and supported is questionable. While the WB team was limited in pursuing this dimension in great depth, the stakeholders interviewed, including the precedent-setting small village of Kechnec on the

outskirts of Košice City, noted that more could be done to extend, explore, and support opportunities for innovation in peri-urban and rural areas. This is especially true as new technologies enable more people to work in more remote locations, and some cities (Michalovce, Rožnava, Trebisov, and Spisska Nova Ves) with several successful companies and technical and vocational education institutions are located in these areas. At the same time, perspectives on the issue were somewhat mixed as some intermediaries saw a very good reason for ‘fully developing the innovation maturity in Košice City as it is still suboptimal, before spatially expanding outwards to its peri-urban and rural areas’.

5.4.2. Overview of KSK-based intermediary institutions

CIKE	
Size	24 employees
Thematic Focus	Creative Industries
Key Innovation Activities	Hub based for crowdsourcing creative and digital innovation for Košice Urban Development solutions—works at multiple levels but namely with city government—e.g., co-developed the Integrated Plan for Urban Development, Košice 2.0 project for Urban Services, connecting the private sector, Košice City & creative industry in design thinking-based solutions. The aim is to support innovative and experimental sustainable urban development projects that would not normally be funded. Košice became the first city in the Slovak Republic with an urban lab. It also houses the Citizen Experience and Well-being Institute or CX Institute which identifies, analyzes, and redesigns the city’s services individually or together with other entities. Its Mobile Urban Lab (MUL) is a research unit and a contact point between the CX Institute and citizens .
Memberships & Partnerships	Member of UNESCO Creative Cities Network, the Slovak Arts Council, the Technical University (arts & economic faculties), Antik, Civitta, Východné pobrežie, Košice Cultural-Creative Center, fine arts, media and open data community.

Source: Authors.

IT VALLEY	
Size	4 employees
Thematic Focus	IT Sector
Key Innovation Activities	Initially set up to prepare the digitization of the regional labor force, it evolved to a regional platform for connecting IT related stakeholders—by promoting ICT as a tool for regional (Eastern Slovakia) development through innovation-education, mentorships, events, and collaboration with high schools, 3 universities, startups, and the region; it promotes successes and good examples from its members to the outside world. 90% of its members are KSK-based; some are PSK-based.
Memberships (if any)	Has 52 members including companies such as: Deutsche Telecom IT Solutions, ABB Solutions Slovakia, Accenture Slovakia, Global Logic, AmCham Košice, Gymnázium Alejova, Biomedical Engineering, CISCO, CIKE, Deloitte, Košice Tourism, Matsuko, Grammar School Postova, Promiseo, Futurum, Košice City, Prešov City, SAP, and the Pavol Jozef Šafárik University in Košice

Source: Authors.

TECHNICOM	
Size	15 employees
Thematic Focus	University Technical Park
Key Innovation Activities	Works to build up an internationally recognized R&D transfer center featuring innovative applications and supporting knowledge technology in: information and communication, electrical engineering, automation and control systems, mechanical and civil engineering (construction, transport, and geodesy), and environmental engineering (mining, metallurgy, and water sciences). TECHNICOM i) operates a business incubator for small and medium high-tech companies, startups or spin-offs generated from research and innovation activities at TUKE; ii) promotes sustainable growth of R&D through transfer of knowledge and technologies (or innovative practice) at the international, national, and regional levels; iii) in cooperation with the University Centre for Innovation, Technology Transfer and Intellectual Property Protection (UCITT) at TUKE works to become the first point of contact for companies interested in collaboration with R&D teams.
Memberships	International Association of Science Parks and Areas of Innovation, British Chamber of Commerce in the Slovak Republic, AmCham, SCCI, Manufacturing Industry Digital Innovation Hubs
Supported Entities (in innovation)	Joint R&D innovation centers with TUKE, Startup Center TUKE, Incubator TUKE, VUKONZE, Competence center ZATIPS, Prototype and innovation center (FME)

Source: Authors.

TABAČKA

Size	18 employees (part-time and full-time)
Thematic Focus	Creative industries, multimedia arts and theater
Key Innovation Activities	Contributes to the development of creative industry in Košice by connecting architects, programmers, creative entrepreneurs, filmmakers, and video creators (HUBa). It promotes art and culture events, festivals, trainings, co-working space for artists, artistic residency programs for domestic and international artists in theater and literature, contemporary dance, circus, music, new media, film. It runs a number of independent arts and culture projects such as `Human Library`, `TBCK forward perform`, discussion forums on topics related to its activities, a fine arts gallery, community garden, Overtime Shop for street artists and muralists, a street food gastronomy court (Bistro Tabačka), and alternative accommodation space (Hostel Tabačka).

Source: Authors.

EASTCUBATOR

Size	Unknown
Thematic Focus	Co-working space in Kultur Fabrik
Key Innovation Activities	It is the largest co-working space in Košice. Home of coding, design, 'disruptive' ideas and creative business

Source: Authors.

SBA office in Košice

Size	19 employees (+ some 30 external experts)
Thematic Focus	Represents the regional office of the Slovak Business Agency (SBA)—a national public and private platform created by the Slovak Ministry of Economy, Association of Slovak Entrepreneurs, and the Slovak Trade Association responsible for providing comprehensive business support at the national, regional, and local levels through its regional offices. SBA's Košice Regional Office offers different forms of support for the SME sector, including: <ul style="list-style-type: none">• Subsidized information services, both one-on-one, and group counseling• Microloans up to € 50,000• Free advisory services for creating new business models or networking• Promotion of successful business practices• Startup Support Program• Surveys and analyses—monitoring and research program for SMEs• Support for strengthening the competitiveness of entrepreneurs that operate on the EU common market and in third-country markets
Key Innovation Activities:	SBA's regional activities related to innovation include: <ul style="list-style-type: none">• Jointly with the Slovak Centre of Scientific and Technical Information (CVTI), the implementation of a national project aimed at creating a one-stop shop National Business Center that provides complex business support for new and established entrepreneurs. Its aim is to strengthen R&D cooperation between academia and industry, and to contribute to enhancing the innovation potential of Slovak companies.• <u>Growth Program</u>—Seminars and individual professional advisory service (short-term and long-term) for enterprises, regardless of their age• <u>Incubation Program</u>—A virtual incubation program up to 3 years long for young companies (below 5 years old)• <u>Acceleration Program</u>—Business and mentorship support for young people, women, seniors, or employees who are thinking about entrepreneurship (not directed to already existing companies)• <u>Internship Program</u>—Facilitates internships in the Slovak Republic and abroad• SBA also organizes competitions to support entrepreneurial activities and innovation, e.g. Start up Awards, European Enterprise Promotion Awards, Slovak Venture Capital Forum, Businesswoman of the Slovak Republic.
Memberships	Member of the Enterprise Europe Network
Supported Entities (in innovation)	Some 1,500 beneficiaries of all activities, including seminars & conferences. Incubation program encompassed ca. 10 companies

Source: Authors.

Košice Regional Chamber (KRC) - Slovak Chamber of Commerce and Industry (SCCI)

Size	5 employees
Thematic Focus:	The Košice Regional Chamber is a branch of the SCCI and it is a membership organization representing KSK businesses. It focuses on the advocacy, support and coordination of its members' interests in business-related activities in the Slovak Republic and abroad. Its services include: i) development of regional, national, and international trade relations; ii) certification of the origin of goods and ATA carnets; iii) educational services—organization of workshops, seminars, training sessions on current issues—and SCCI Information; and iv) advisory services. KRC also undertakes special initiatives such as supporting the retention of talent in the region—the Young Entrepreneur Platform—that supports young entrepreneurs under the age of 30.
Key Innovation Activities	KRC stimulates innovation-oriented cross-border cooperation among entrepreneurs and knowledge providers through modern ICT solutions (e.g., mobile phone applications). As part of an interregional project, KRC started collecting and publicly sharing information on R&D infrastructure and innovation services in the South-East Slovak Republic area. KRC contributed to the elaboration of the Regional Innovation Strategy.
Membership	150 members

Source: Authors.

AmCham Slovakia - Košice Office

Size	Bratislava office—12 employees; Košice office —1 employee
Thematic Focus:	AmCham has been operating in the Slovak Republic for 27 years, and for 18 years in its Košice Regional office. It is a membership-based organization with over 330 members—companies of all sizes, across different sectors. As an advocate for the business community, it influences national policies and legislation through the thematic committees, working groups, and other advocacy activities. One of AmCham's activities is to catalyze networking opportunities for its members through a wide range of meetings, sharing of best practices, and the dissemination of relevant information.
Key Innovation Activities	<ul style="list-style-type: none"> • Networking and connecting potential partners for innovative activities—initiating interdisciplinary and cross-sectoral connections • Preparation of publications about the latest trends, changes in policies, technologies, and business challenges to inform companies' decision-making • Organizes Conferences (e.g. Eastern Innovation Conference), business breakfasts, or workshops with expert speakers to popularize knowledge about innovation for business, including digitization, new technologies, cybersecurity, and the impact of data transfer or technological sovereignty. • Support the expansion of existing Slovak talent pool by improving education and entrepreneurship for students and teachers through the Mentor Network and Train the Trainer Programs
Membership	International network of AmCham
Supported Entities (in innovation)	Business sector, academia, media, and the general public. experts, sectoral professionals and networking potential partners.

Source: Authors.

SIEA regional office

Size	35 employees
Thematic Focus:	The Slovak Agency for Innovation and Energy acts as an intermediary body and agency for the disbursement of EU Structural Funds. Formerly, SIEA focused on the energy sector, including energy efficiency and the use of renewable energy sources. It also provided advisory services for streamlining energy use, developing energy specialists, and providing consultations on energy efficiency. In 2007, SIEA added support for innovation in its portfolio, including the monitoring and evaluation of innovation activities across Slovakia and promoting cooperation among innovation partners. The Košice office has been actively participating in national and international projects, such as: <i>Cluster Fly</i> and <i>Valuable Creativity</i> . The main task of SIEA's regional branch in Košice is to support companies to participate in innovation projects.
Key Innovation Activities:	SIEA's Košice branch is a regional implementing partner of the national project " <i>inovujme.sk</i> " co-financed by the European Regional Development Fund under the Infrastructure Operational Program 2014–2020. The project supports Slovak companies in 5 Slovak cities, including in Košice. In the project, participants receive basic individual counseling through innovation workshops and continued mentorships related to effective innovation in different sectors. Through its national programs, SIEA also supports regional competitions and social innovation 'hackathons' to stimulate creative thinking as well as various dissemination events on innovation such as conferences, seminars, lectures, workshops or through online learning activities. It recently rolled out the Creative Voucher program (4 calls, 1,500 vouchers implemented, 557 supported startups (country-wide) under the Creative Industries Support Scheme which targets <i>de minimis</i> aid for MSME enterprises to incentivize formation of partnerships for innovative solutions in creative industries, advertising, marketing, architecture, information and communication and design technologies.
Supported Entities (in innovation)	MSME, members of the creative industry, startups, creatives.

Source: Authors.

5.5. REGIONAL INNOVATION SUPPORT PROGRAMS

The KSK has limited experience with direct support to innovative companies or stimulating R&D collaboration. As already indicated, during recent years, the region did not have a unit dedicated to innovation support, nor had it a significant earmarked budget for such support. On the other hand, it collaborated with other regional stakeholders to stimulate innovative attitudes and support young entrepreneurs and artists. Such an example is partnership with Tabačka, which utilizes the KSK's premises to promote innovation and creative industries.

In the Slovak Republic, innovation programs are mostly designed and implemented at the national level and involve regional branches of national agencies, such as SBA, SIEA or the Slovak Investment and Trade Development Agency (SARIO). Out of these three, the SBA has the biggest regional team devoted to innovation support. SIEA's regional team predominantly included specialist-focusing on energy efficiency investments, though its central unit that is managing national projects supporting innovation was available to KSK companies. In late 2019, a seed fund, Vision Ventures, was established that currently is located in Košice (capitalization is about € 11 million). It is one of the seed funds financed by the Slovak Investment Holding. This fund provides equity financing to companies from all sectors that ranges between € 100–800,000. The fund has an investment horizon of up to eight years. The national agencies and the region do not collaborate in joint planning or implementing innovation support programs, and it is not clear whether during the current 2021–27 financial perspective such collaboration is envisaged.

The KSK stepped up its efforts to shape the regional innovation policy in mid-2021. First, it obtained funds for establishing a Cultural-Creative Center. Second, it updated its Regional Innovation Strategy (RIS). Third, it became a founding member of RIC and the CNIC. Fourth, through CuRI activities, it has been promoting the regional innovation agenda. Along these actions, the region intends to up its resources earmarked for innovation support *via* financing for RIC (see more in Chapter 9). These actions put the region on a course of more active engagement in the innovation policy and can lead to a gradual buildup of administrative capacity in that area.

BOX 5: Key Characteristics of Innovation Support Programs in the KSK

1. Support programs and financing for innovation are largely dependent on EU structural funds.
2. Support measures are mostly delivered by the ministries/national agencies and their regional branches. Information is lacking about their effectiveness and efficiency.
3. Limited number of instruments are (co-)implemented/managed by the regional level, though changes have been taking place during the last year (initiation of the KSK's Cultural-Creative Center, RIC, and CNIC).
4. Limited support measures are implemented by Košice City and regional research organizations.
5. Private sector financing is highly limited; a seed fund is present in the region.
6. Predominant concentration is on the core city.

Source: Authors, 2022.

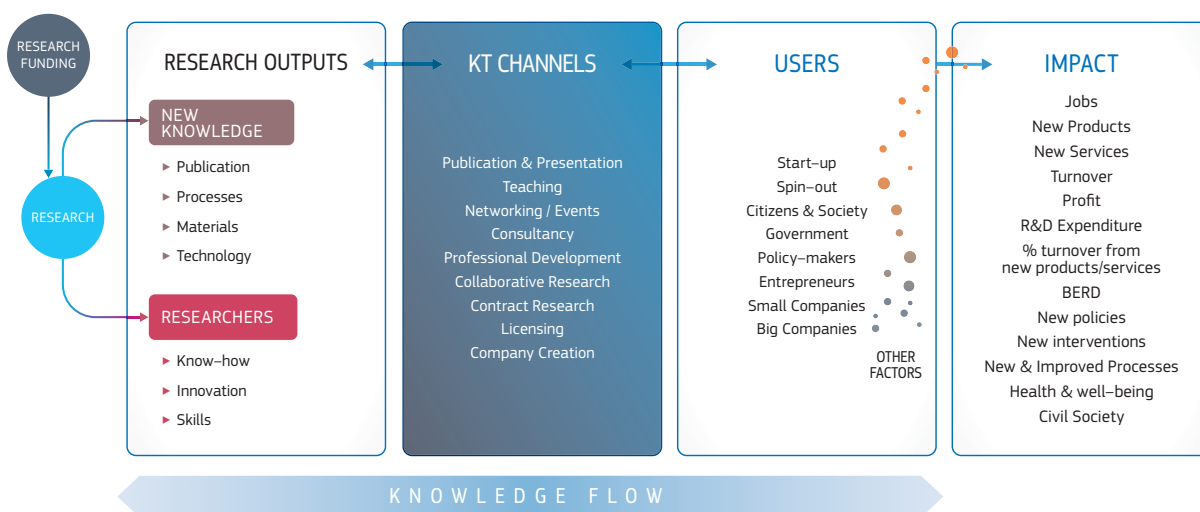
6. ASSESSMENT OF KSK SYSTEM'S MATURITY AND KEY BOTTLENECKS

The following section shares the WB’s findings that assess the KSK’s regional knowledge transfer ecosystem’s maturity, focusing on three dimensions and nineteen corresponding indicators:

- i. Soft R&D infrastructure which includes existing institutions and human capital vested in the innovation ecosystem,
- ii. Applied usage of hard R&D infrastructure, and
- iii. Knowledge transfer which relates to systems and processes that contribute to the flow of technology, intellectual property, ideas, and collaborative networks among companies, academic and non-academic organizations, as well as the public sector.

Jointly, these three dimensions drive the innovation lifecycle that starts in research and knowledge generation, to its transfer and commercialization, and ultimately leading to an impact on regional socioeconomic benefits.

FIGURE 7: Knowledge Transfer: From Research to Impact



Source: Campbell, A., Cavalade, C., Haunold, C., Karanikic, P. and Piccaluga, A., 2020.⁵

To identify KSK system’s existing level of maturity, each of the framework characteristics was separately assessed on a three-point scale representing: 1. a first ‘budding’ maturity level; 2. a ‘maturing’ stage; and 3. a dynamically ‘thriving’ level. The Bank team evaluated the current state of the KSK’s ecosystem, corresponding to each characteristic against the proposed three levels introduced in Table 1 in Chapter 3. This assessment is underpinned by a description of the current status of a specific characteristic in the KSK presented in the second-last column in Table 3. The assessment also identifies selected missing links and recommended actions for individual characteristics. In the further part of this chapter, these are used to discern the key bottlenecks of KSK’s knowledge transfer system.

TABLE 3: Assessment of the KSK System's Maturity (Static and Dynamic)

Category	Characteristic	Assessment of the KSK's System	Description of the KSK's Current Status	Missing Links and Recommended Actions
1. Soft R&D infrastructure (collaborative platforms, networks, coordination)	Level of trust in the system (Stakeholders' ability to build long-term relations on organizational level)	<p>1.5 Budding/Maturing</p> <ul style="list-style-type: none"> - Overall low trust level + First long-term cooperation + First advanced R&D offer 	<p>No clearly assigned responsibility for that area today</p> <p>Networks based on personal contacts; innovation entities are fragmented working in silos; intrasectoral collaboration is fairly well established, but intersectoral collaboration is very nascent</p> <p>Stakeholders express low trust in collaborative relations; inclusion in decision-making processes (e.g. preparation of RIS) is sporadic, not systematic; the Advisory Committee has been established to prepare the RIS, but is lacking clear vision for its functioning; suboptimal participation of key actors in the system – SMEs</p> <p>Initial collaboration between the regional and national level (piloting of Regional Innovation Vouchers with SIEA, participation in interministerial working group on releasing R&D infrastructure)</p>	<p>There is no organization responsible for activities in this area, and at the same time, it should be a shared responsibility for all stakeholders.</p> <p>Limited collaboration between the regional and national level</p>
	Level of agility and flexibility in the system (ROs'/ HEIs' and Public administration's ability to adjust to the system's needs and demands)	<p>1.5 Budding/Maturing</p> <ul style="list-style-type: none"> - very slow - fragmented + building of a clear decision-making process in progress + attempts to build systematic communication in progress 	<p>Low ratings on EU Regional Innovation Scoreboard and low growth over time</p> <p>Unclear role, strategic KPIs, outputs for existing TTCs</p> <p>No mechanism/stakeholder responsible for systematic aggregation and knowledge transfer; no systematic internal evaluation (knowledge transfer on the regional ecosystem's performance)</p>	<p>High-agility level is a result of coordinated actions of all the stakeholders. No organization is responsible for such a coordination today.</p> <p>No entity responsible for intersectoral coordination, strategic data collection, innovation sector profiling, monitoring and corresponding alignment of regional innovation KPIs</p>
	ROs' business offer development capacity (ROs' ability to provide R&D services that are in demand)	<p>1.5 (Budding/Maturing)</p> <ul style="list-style-type: none"> - driven by individuals + resource allocation monitoring in progress 	<p>TTCs tend to be small with limited resources; some but reactive, sporadic engagement with industry</p> <p>Unclear RO's management strategic vision, policies, incentives for business development of R&D services; ROs' research, business development units and internal processes disconnected; R&D services if developed are based on personal contacts, interest, knowledge, capacity of individual research staff</p> <p>Key actors: TECHNICOM, UPJS, CNIC, Promatech</p>	<p>Absence of well-functioning coordination, knowledge transfer mechanisms to connect ROs and industry, researchers, and entrepreneurs</p> <p>Systemic incentives and procedures for the provision of industry-friendly R&D service offers are needed.</p>
ROs' ability to communicate their business offer (awareness of ROs' business offer among stakeholders)	<p>1.5 (Budding/Maturing)</p> <ul style="list-style-type: none"> - very fragmented and limited + TTCs established 	<p>Limited, bureaucratic, not industry-friendly; ROs' R&D services not proactively advertised especially to SMEs – business sector penetration by ROs is too low</p> <p>Responsibility assumed mostly by TTCs, clusters and ROs – in ROs mostly managed at the lab/faculty, not at centralized management level; ROs' capacity to reach out to companies is limited and their knowledge of the private sector's need is also limited; no single website with available R&D services is available. ROs do not have a single contact point for the private sector.</p>	<p>More comprehensive, interdisciplinary, industry-friendly business offers on R&D services are needed, and that do not only focus on technical specification of R&D equipment.</p> <p>Open days for business to be regularly organized</p> <p>More proactive membership and outreach via domestic, international networks is recommended.</p> <p>Regional advocate for innovation at national, and international levels</p>	

Category	Characteristic	Assessment of the KSK's System	Description of the KSK's Current Status	Missing Links and Recommended Actions
	ROs' soft skills, expertise, organizational, procedural capacity for knowledge and technology transfer	1.5 (Budding/Maturing) - <i>ad-hoc</i> / bottom-up - no regional support + TTCs established + first distributed expertise	Key entities: TTCs, TECHNICOM-TUKE, Medipark-UPIS, CNIC, Promatech-TUKE, CVTI (NITT2 project); but scale and impact of its application in the KSK unclear TTCs fragmented, insular with unclear processes Results and impact of technology transfer activities sub-average compared to national (SK) and EU ratings TTC teams tend to be small with insufficient expertise to develop dynamic technology transfer activities Technology transfer activities often at faculty or laboratory level	Shift of technology transfer activities from the level of laboratory/faculties to the university level is recommended Inter-RO collaboration incentives needed Cultivation of technology transfer organizational culture in ROs via long-term training, capacity-building programs for staff Institutionalize efficient internal ROs' procedures for commercial collaboration (e.g., transparent mechanism for co-financing technology transfer activities and sharing revenues)
	SMEs' ability to define and communicate their needs in R&D and innovation (<i>awareness of SMEs' needs among stakeholders</i>)	1.5 (Budding/Maturing) - SMEs preoccupied by regular operations; limited marketing skills and activity – especially in international markets - some activity but low SME-RO collaboration	Insufficient regional data and mapping of SMEs' innovation, competitiveness, and specific needs SMEs' marketing bases on limited internal resources and skills; SMEs often not aware that they are poor marketers International marketing outreach is low Insufficient focus on SMEs; bias toward big companies	Conduct comprehensive SME mapping in the innovation sector Weak engagement of SMEs in decision-making and innovation support program design processes Training and advisory support mechanisms targeting SMEs Evidence, needs-based incentives and regional programs/instruments promoting SMEs' innovation in all stages of development (startup, growing, mature), support in risk reduction – e.g., grants, preferential loans, and bank guarantees Management trainings related to innovation and business development could be explored
	SMEs' organizational and financial maturity (SME's capacity to engage in innovative and risky projects)	1.5 (Budding/Maturing) - SMEs under-resourced for wide spectrum of marketing of innovation activities, certification	Apparent presence of highly innovative SMEs in and outside the region's capital, but focus is on larger players Due to the lack of data collection and mapping, regional SMEs' competitiveness and needs are difficult to comprehensively assess. SMEs predominantly use own resources for innovation activities; large companies have in-house R&D units, do not seek RO services.	
	Regional stakeholders' ability to generate innovative ideas/projects	2.0 (Maturing) + RIC, Cultural-Creative Center, CNIC initiatives + Examples of SMEs involved in R&D projects + Presence of creative spaces - public sector not engaged as a first client	Rapidly growing IT and Creative industries sector (CIKE, Tabačka, forthcoming KSK Cultural-Creative Center) Growing startup culture but lacks sustained talent pool Limited number of spin-off companies established Potential stakeholders outside of Košice are mostly excluded Public sector (regional and national) not engaged in commissioning or introducing innovative solutions as the 'first client'	Regionally targeted, specialized innovation-focused training and advising for scaled impacts are missing. Absence of innovation mentors, role models encourage innovating Absence of innovation support programs that Existing intermediaries only weakly coordinate their activities and offered support Programs to attract, retain talent in the region are recommended. Incentivize interdisciplinary and open prototyping spaces, ateliers for creative individuals in existing facilities Proactively build on, connect to EU/ international networks – e.g., establish regional FabLab(s) Implement pilot program(s) for innovation actors outside of Košice City – e.g., Michalovce, and Roznava

Category	Characteristic	Assessment of the KSK's System	Description of the KSK's Current Status	Missing Links and Recommended Actions
2. Hard R&D infrastructure (and related capacity)	Regional stakeholders' ability to implement R&D-based innovations and generate growth	<p>1.0 (Budding)</p> <ul style="list-style-type: none"> - accidental activities - ROs role very limited - almost no public support 	<p>No growth 2014–2020 in aggregate innovation scores. Description from Point 6 above also applies here. Scale-up programs are missing with poor general public support. Lacking know-how and support for transferring R&D results into products and marketable solutions</p>	<p>Regional coordinating body and catalyst to optimize RO-industry collaboration knowledge transfer and implement innovation. Missing support programs to develop minimum viable products, enter new markets, create growth companies, prepare for dialogue with investors. Lacking relations with investors (venture funds and business 'angels')</p>
	Regional platforms for collaboration/networking established	<p>1.5 (Budding/Maturing)</p> <ul style="list-style-type: none"> - personal network-based - not supported - not coordinated + one strong IT cluster, early regional and national networks + RIC, CNIC established 	<p>No collaborative platforms, networking limited to annual events, fragmented and 'silo-ish'; collaboration is sporadic, personal contact-based; interdisciplinary value-adding is nascent. Early regional and national networks and presence of one strong IT Valley cluster, financed mostly by membership resources. RIC, KSK's Cultural-Creative Center and CNIC established, though their roles are to be still defined</p>	<p>Intermediary institutions to step up support and networking efforts focused on innovation with an interdisciplinary focus. Promotion of the innovation brand of the KSK is recommended.</p>
National regulatory framework for commercial use or R&D infrastructure	National regulatory framework for commercial use or R&D infrastructure	<p>1.0 (Budding)</p> <ul style="list-style-type: none"> - no clear framework implemented - lack of clear responsibility at the national level 	<p>National framework does not provide sufficient guidance to end-users. Lack of clear responsibility on the national level. National level gradually addressing this topic (up to 20% capacity), with MIRRI championing the interministerial group for the release of infrastructure. Clear guidelines for ROs are missing. ROs coordinate among themselves with limited support from the KSK (WB CuRI team supports these activities on the commercial use below 20% of annual capacity)</p>	<p>Enhanced collaboration between the national level and ROs is required to set up a framework for the release of R&D infrastructure—starting with “up to 20% annual capacity”—and then moving above this ancillary threshold.</p>
	National legal framework for IPR management and transfer	<p>1.5 (Budding/Maturing)</p> <ul style="list-style-type: none"> - inconsistent + fragmented framework regulations exist 	<p>Lacking clarity about different types of ROs' to engage in IPR transfer (different rules for public universities, SAS, and research institutes)</p>	<p>National level to clarify the framework and uncertainties related to differentiation of ROs in IPR transfer</p>
	ROs' technical and administrative capacity to offer R&D services (e.g., IT systems, and procedures)	<p>2.0 (Maturing)</p> <ul style="list-style-type: none"> + bottom-up approaches for building procedures for services and maintenance 	<p>ROs are responsible for that area and develop own procedures and systems that facilitate provision of R&D services. Different level of preparedness across KSK ROs</p>	<p>Sole responsibility of ROs that could be supported by trainings, technical assistance and capacity-building activities offered, e.g., by the Ministry of Education, Science, Research, and Sport (MoEdu)/CVTI. Clear guidelines are missing about what is the level of required monitoring of R&D equipment</p>
ROs' maturity for IPR, development, protection, and licensing/selling	<p>2.0 (Maturing)</p> <ul style="list-style-type: none"> - researcher's responsibility and effort - passive organizational support (e.g., TTCs) - limited public support 	<p>ROs are responsible for that area, no systemic solutions and support for researchers, presence of knowledgeable researchers responsible for IPR development and protection. TTCs are to support these activities, but usually too small to offer full-fledged support. Limited public support program</p>	<p>Recommended trainings for administrative staff and researchers regarding technology transfer and IPR protection and transfer. Procedures needed for identification of valuable IPR and its commercialization</p>	

Category	Characteristic	Assessment of the KSK's System	Description of the KSK's Current Status	Missing Links and Recommended Actions
	Presence of competitive R&D infrastructure (public and private)	1.5 (Budding/Maturing) - limited availability - supply-driven	ROs are active in this area; large investments during 2007–13 and smaller during 2014–20 periods Investments mostly driven by public financing Companies do not currently contribute—limited availability, supply-driven, spontaneous, <i>ad hoc</i> contributions by companies; positive cluster formation CNIC, Hydrogen Strategy	National support programs for developing and maintaining R&D infrastructure (with commercial rationale, not duplicative) are recommended. Mapping of available public and private infrastructure is missing.
	Financial sustainability of R&D infrastructure (service, maintenance, and upgrade)	1.0 (Budding) - no self-sustainability - no public support for academia-industry cooperation	Maintenance and upgrade are a challenge due to their costs. Infrastructure is becoming obsolete. Certification is not always maintained. Limited public support for academia-industry cooperation	Utilizing revenues from commercial R&D collaboration is recommended for infrastructure maintenance and upgrading. Sole responsibility of ROs Regional advocacy at nation level needed for tailored support programs incentivizing RO-industry collaboration is advisable.
3. R&D innovation processes focused on knowledge and technology transfer ⁶	Evidence-based management ('How & Why' decisions are taken?)	1.0 (Budding) - data not regularly collected and analyzed - limited experience in carrying out regional innovation policy	Lack of systematic data collection and analyzes to assess innovation as driver of regional growth, no definition of shared SMART goals, limited regional innovation asset mapping, strategic planning, coordination Limited regional resources devoted to the innovation policy, though recent creation of RIC and the CNIC	Designating a unit responsible for regular innovation data gathering, monitoring, and curating to help steer the innovation-related dialogue and policy Procedures and platforms for regular data/analyses sharing among stakeholders are missing. Rigorous monitoring and evaluation of innovation instruments is recommended, combined with piloting and experimentation.
	Role division ('Who does What?')	1.0 (Budding) - stakeholders' roles (functions) not defined - roles taken on spontaneously by stakeholders - lack of advanced functions - frequent duplication basic functions	Critical mass of R&D actors and intermediaries seems present, but efforts are fragmented, strategically uncoordinated, causing overlapping efforts, duplication of basic support functions and lack of more advanced ones; suboptimal use of resources Stakeholders' roles in the knowledge transfer system are not clearly defined and understood (e.g., RIC and the CNIC; the SBA and TECHNICOM); they assume roles spontaneously. Key stakeholders insufficiently communicate, nor do they understand each other's missions and goals or coordinate efforts.	No stable collaborative platform for discussion and coordination among stakeholders. Shaping the culture of communication and collaboration is needed, which implies creation of a joint vision and realization of joint projects.
	Support to enable R&D collaboration and knowledge transfer	1.0 (Budding) - mostly national level with fragmented coverage of the innovation cycle - limited support for soft activities - cumbersome processing /risk averse/ bureaucratized	Innovation support programs are too generic, disconnected, not tailored to specific regional needs. Innovation support programs are mostly managed by national agencies and their regional branches with limited activities and collaboration at the regional and city level. Companies' influence on programming is limited.	Stronger collaboration between regional/local and national agencies is recommended to design tailored interventions and attract national financing to the region. Dedicated, long-term regional financing could focus on specific niches of knowledge transfer activities or testing new solutions. Building regional capacity to manage innovation programs is recommended.

Source: Authors, 2022.

6.1. MATURITY LEVEL OF SOFT R&D INFRASTRUCTURE: PEOPLE, NETWORKS, AND INSTITUTIONS

Soft research and development infrastructure refers to the people, and the institutions, but most importantly, to the professional relationships and collaborative capital between key institutions and stakeholders involved in knowledge transfer activities. In mature systems, intra- and intersectoral partnerships and networks are dynamic, inclusive, collaborative and trust based. They amplify interested actors' synergies by producing new, value-adding collaborative projects, exposing existing and new innovation partners to useful information, and opportunities, as well as to professional networks inside or outside the region. Furthermore, effective soft R&D infrastructure subsystems can significantly mitigate opportunity risks, augment commercialization of innovation and contribute to the scaling of regional innovation potential. Overall, it can be concluded that on most of the dimensions, with values ranging from 1.5 to 2, the KSK's system is in its initial or 'budding' stages of development. Due to its significant potential, this offers great opportunities for its future growth.

Trust and collaboration within the KSK's innovation ecosystem. In the KSK, despite the sizeable number of professional actors vested in innovation activities, the regional stakeholders interviewed express low levels of trust in the regional and national innovation ecosystem. Existing professional networks tend to be fragmented and built on personal rather than professionally based, diversified, strategic and collaborative relationships. There is a tendency among local stakeholders to work in intrasectoral silos (for example, IT Valley, and biomedical engineering) with a low presence in intersectoral collaborative initiatives. While some promising examples such as the annual *Art & Tech Days* (a collaboration between art, creative, and IT sectors organized by Creative Industries Košice) and the *East Innovation Conference* (a multisectoral conference organized by AmCham) have emerged, these are mere 1–2-day events rather than longer-term, intersectoral innovation projects where trust among stakeholders could be cultivated.

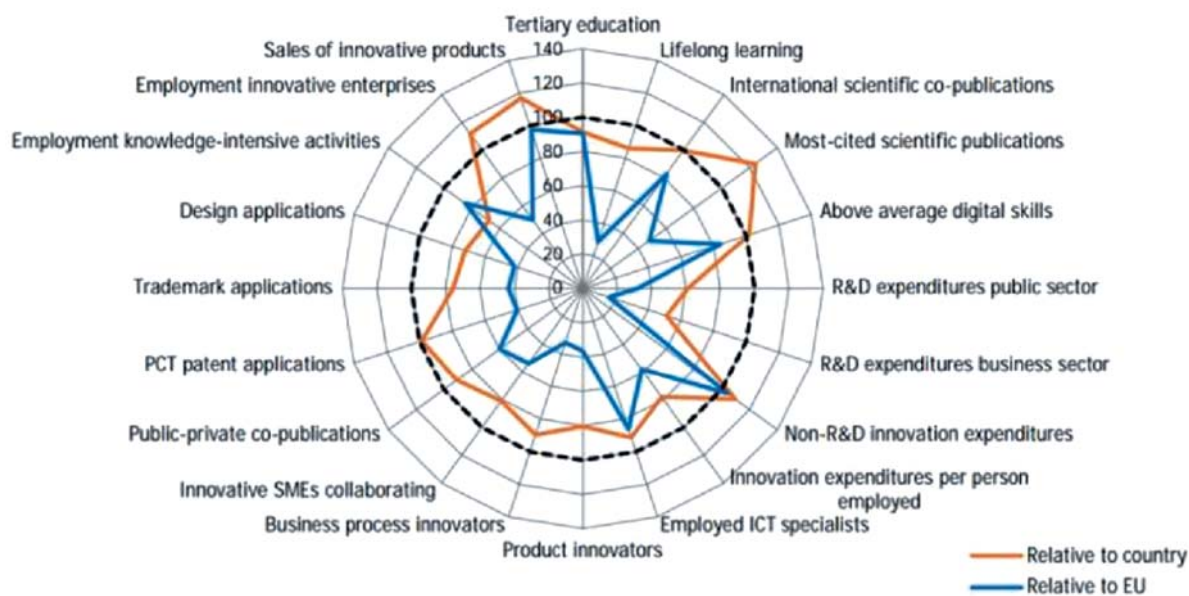
Stakeholders' active inclusion in regional decision-making processes related to innovation activities (for example, the preparation of RIS) is also claimed to be rather sporadic and unsystematic. Though the current regional government did establish a consultative Partnership Council with SMEs, it is uncertain how often it meets, who attends, how representative it is, nor what the council's strategic goals are. Without a strategic and focused approach to coordinate and pool regional assets toward a shared vision, the ecosystem's optimal performance and access to potential resources are jeopardized. Tensions between the CNIC and prospective RIC in accessing national funding is one such example, but collaboration between Tabačka and the KSK regional administration to obtain funding for the new Cultural-Creative Center is a great example of good practice of collaborative synergies. Mechanisms for greater inclusion of stakeholders beyond Košice City—for example, SMEs and vocational education and training institutions in Michalovce, Rožňava or Spišská Nová Ves—could also improve as 45.5% of the population in the KSK lives in non-urban areas.⁷ Due to these reasons, the WB assessed this dimension of the KSK's innovation ecosystem as 1.5 'budding' on a maximum scale of 3 in systemic maturity.

The mapping of the KSK's stakeholders involved in knowledge transfer, their core functions, objectives, infrastructure, and soft assets, as well as comparative advantages would reinforce the system's coordination and functioning. This report provides a snapshot of the mapping of key stakeholders of the knowledge transfer system in the KSK. Such continuous mapping would help local stakeholders better understand each other and could be the foundation for identifying both complementarities and redundancies in the system. It is also a good basis for initiating a dialogue among the key players about their functions and a vision for the overall system and may lead to enhanced collaboration. The mapping of the stakeholders seems a basic step to organize the knowledge transfer system.

Key roles in the knowledge transfer system could be more clearly defined and attributed to specific stakeholders. For the innovation and knowledge transfer ecosystem to be effective it is essential that roles are defined and attributed to the right stakeholders. The general role division in the quadruple helix model that is expected to provide the efficiency and performance of the ecosystem, is shown in Table 2. However, analysis conducted during the project indicates that in the KSK, roles are not precisely defined, not communicated, and not agreed upon among different stakeholders; they are assumed to be suboptimal. Due to these reasons, the WB assessed this dimension of the KSK's innovation ecosystem as 1.0 'budding' on a maximum scale of 3 in systemic maturity. Proper role definition and attribution conducted as a structured process involving all the stakeholders should be the first step leading to the development of the entire innovation ecosystem in the KSK as it is the foundation for development of almost every other characteristic of the mature innovation ecosystem.

Role of SMEs in the KSK innovation ecosystem. Of the KSK working population, 2.5% is employed in professional, scientific and technical activities.⁸ Based on the EU Regional Innovation Scoreboard, collaboration among innovative SMEs and employment in innovative enterprises are significantly lower in the KSK when compared to the national (Slovak) and EU averages (Figure 8). Regionally based business process and product innovators also score quite low. These indications coincide with the WB's interviews with stakeholders where larger companies such as US Steel, Deutsche Telekom (T-Systems), Global Logic and Lynx appear to be more active and present in innovation-driven activities (mostly in-house) than SMEs, irrespective of the sector. Comprehensive data on KSK-based SMEs engaged in innovation are not collected, hence are not readily available.

FIGURE 8: Regional Innovation Scoreboard 2021: Eastern Slovakia



Source: European Commission, Regional Innovation Scoreboard, 2021.

ROs' capacity to develop, communicate and market their business offers. For the ecosystem to function effectively with impact, ROs need to proactively market their R&D infrastructure through attractive and competitive business offers to potential industry partners. Yet in the KSK, despite the prominence of well-established ROs, their internal capacity to develop and market their business offers is limited. While ROs claim to have business offers provided directly or *via* dedicated entities (that is, TECHNICOM), these offers are provided upon request, and in many cases, they are not publicly available for prospective partners. The cooperation with business is rather oriented toward the provision of basic services, including prototyping and standardized procedures with underrepresented common research or problem-solving contracts with the industry. To some extent, it is caused by an unclear legal status of the infrastructure purchased from public funds since 2007, which limits its commercial use. The ROs and especially UPJS have recently undertaken activities to release the most prospective infrastructure up to 20% of its capacity that is a good prognostic for

the future. Due to heavy teaching and research agendas, senior academic staff do not have adequate time nor often relevant business development expertise for developing attractive business offers. Moreover, RO's business development units are also either understaffed or non-existent. ROs' ability to proactively communicate their R&D business offers is thus limited. Considering these observations, a score of 1.5 was granted for ROs' internal business development capacity related to R&D services and offers.

Support programs for SMEs require further complementarity, sophistication, and coherence.

The interviewed stakeholders noted that although several intermediary organizations such as the Košice regional chamber of the SCCI, SBA, and SIEA provide some support for innovation-related activities targeting SMEs (see Section 5.4), these are sporadic and inadequately tailored to the regional context and its unique needs. In general, companies can obtain support from different governance levels. For example, various national programs are implemented by different agencies, regional- and city-level instruments. However, the comprehensive character and complementarity of that offer needs further reinforcement. First of all, companies lack a simple one-stop shop for obtaining comprehensive information about the existing innovation-related offer and its quality. Existing support measures tend to offer basic services and lack a more sophisticated offer.

Interviews with several SMEs in Košice City and on its outskirts, also showed that SMEs already do engage in innovation activities and are interested in scaling up, yet they claim that the marketing and cost of certifying their products (on different markets) pose the greatest challenges when trying to do so. The ultimate potential and targeting of support mechanisms for innovative SMEs is thus underexplored and suboptimal, especially as SMEs with 1–49 employees represent 99.6% of the registered companies in the KSK (see Table 4). While support for startups has improved, future support programs need to cater to a wider range of SMEs' needs. Institutionalizing a systematic assessment of regional SMEs' needs would be a good place to start.

TABLE 4: Business Entities Registered in the KSK, 2020

Size category / legal status	Business	Craftsmen	Freelance Professionals	Sole Farmers	Together	
					Number	Share
Micro enterprises (0-9)	25,528	30,232	3,025	531	59,316	97.2%
Small enterprises (10-49)	1,346	100	2	4	1,452	2.4%
Medium size enterprises (50-249)	232	1	0	0	233	0.4%
Large enterprises (above 250)	54	0	0	0	54	0.1%
Together SMEs (0-249)	27,106	30,333	3,027	535	61,001	99.9%
Together all entities	27,160	30,333	3,027	535	61,055	100.0%

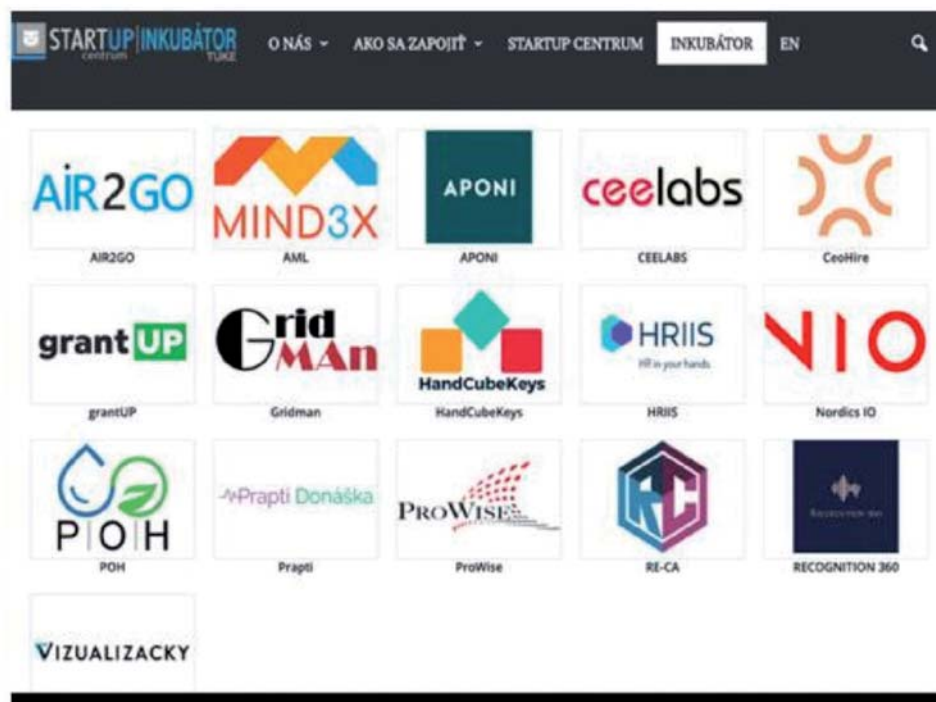
Source: SBA, based on the Statistical Office of the Slovak Republic, 2022.

Absence of a coordination entity for regional innovation activities. The innovation ecosystem's capacity to effectively mobilize and coordinate its vested actors' assets and resources for gaining competitive advantage, is another important aspect of soft R&D infrastructure. These functions are typically carried out by intermediary institutions. In the KSK, the currently active intermediary institutions such as the Košice Regional Chamber of the SCCI, IT Valley, the Slovak Business Agency, SIEA, CIKE or TECHNICOM's Startup Center focus mostly on sectoral (IT Valley, TECHNICOM's Startup Center [ICT] SIEA [energy efficiency], or CIKE [Creative Industries]) or business development activities (the KRC of the SCCI, and the SBA). However, very few carry out explicit joint projects and coordination-driven activities focused on longer-term scaling up of intersectoral collaboration. The current KSK regional administration has tried to fill this gap but the size of its team and resources are too limited to perform this role fully. Moreover, the regional or national government(s) do not target their support programs on commissioning innovative solutions as 'first clients'. Allocating coordination responsibilities to a credible entity, coupled with supportive measures further incentivizing collaborative projects among regional stakeholders, is thus called for.

Challenges with upskilling and retaining talent in the region. To keep up with the rapid pace of innovation and competition, perpetual upskilling and talent cultivation is critical for dynamic and thriving innovation ecosystems. In the KSK, outmigration of young talent post-graduation is evident. Targeted programs and opportunities for the retention of talent post-graduation, however, are less visible. The ongoing incubation and acceleration programs are a step in the right direction, yet the low volume of the talent pool limits their prospects for scaling up innovation. Moreover, the talent that does remain, interviewed stakeholders claim, tends to lack sufficient soft skills in entrepreneurship, business development, and innovative thinking. Retention and cultivation of talent requires a longer-term and multitrack approach.

Retention of local talent will require a longer-term, comprehensive, multitrack approach. Retaining talent is not something that can be addressed with a single program such as innovation vouchers which the Ministry of Economy and SIEA are currently rolling out. Impactful retention and cultivation of talent requires opportunities for on-the-job training (already during high school and university); flexible and competitive employment conditions (part-time employment); continuous, well-targeted training and upskilling programs, and mentorship programs; financing instruments such as microloans, loan guarantees, and grants for R&D pilots, as well as incentive structures with enabling conditions for R&D experimentation, spin-off activities, startup formation and entrepreneurial thinking within ROs; motivational incentives that award entrepreneurial activities, as well as continuous monitoring and evaluation of the regional talent pool’s dynamics and performance to be incorporated in policy and programming cycles.

FIGURE 9: Startups Participating in TECHNICOM’s Incubator Program 2021



Source: TECHNICOM, 2022.

Agility, flexibility, and growth of the KSK’s innovation ecosystem over time. Due to the rapid advancement of new technologies and innovation, to remain competitive, key stakeholders’—ROs’, higher educational institutions’ and regional administration’s—capacity to efficiently and effectively respond to emerging RD&I trends and demand is essential. In this context, mature and thriving innovation systems have the ability to read external trends and competition, and effectively internalize them for their stakeholders’ competitive benefit. In the KSK, it is certainly encouraging to see that TECHNICOM has an Innovations and Technology Transfer Office, and a series of incubation and acceleration programs, while UPJS *via* its Medipark and Cassovia New Industry Cluster (CNIC), is stepping up its acceleration of applied R&D in biomedical engineering. CIKE and Tabačka

have been equally successful in continually reinventing themselves by generating new ideas and successfully securing funds for innovation-driven projects such as the Regional Cultural-Creative Center (implementation to be launched in 2022), Košice 2.0—Urban Innovative Action Project (CIKE), DeuS—European Open Design School for Sustainable Regional Development (CIKE) and EXCITE—Erasmus for Young Entrepreneurs. Yet, when one assesses the KSK's ratings on the regional innovation scoreboard 2021, while scoring rather high on 'public-private' and 'international scientific' co-publications, the KSK's scores on trademarks, design and patent applications, business process and product innovation, sale of innovative products, and employment in innovative enterprises, is on the lower side relative to the Slovak national and EU averages. Moreover, the aggregate regional innovation index scores have remained nearly the same since 2014 at 0.473/1.00 (normalized score) and scoring 0.47/1.00 in 2021. This means that despite the fairly decent employment rates in knowledge-intensive activities and above average rate in ICT specifically, the intrinsic regional innovation capital has remained relatively static and suboptimal in its growth over time, and in its contribution to value-adding innovation activities. For these reasons, the KSK's systemic agility to keep up with competition and capacity to grow over time has been assessed at 1.5, that is, in its 'budding stages' of development.

6.2. MATURITY LEVEL OF HARD R&D INFRASTRUCTURE

Hard R&D and knowledge transfer infrastructure refers to all kinds of technical infrastructure, systems and facilities that are necessary for the release and use of human potential (soft infrastructure). The scope of this report (R&D and knowledge transfer) mainly covers the public ROs' R&D infrastructure which is used to provide professional research services for industry, but also IT systems required to create attractive business offers and to manage the availability, service, and maintenance of research equipment. On the public administration's side, such hard R&D and knowledge transfer infrastructure includes technology parks, creative and innovative spaces, business incubators and accelerators, as well as prototyping spaces. On the business side, it includes commercial laboratories and all facilities used in the lifelong learning process. In mature innovative knowledge transfer systems, actors within the quadruple helix coordinate the creation and use of such infrastructure, while mutual and sustainable commercial relationships supported by public funds allow for its proper service and maintenance, as well as development aligned with the directions of the region's development.

ROs' organizational (systemic) capacity to cooperate with business. An important element of analysis in this report was to assess ROs' systems and procedures for scaling up future R&D offers and related services. Despite the staff shortages and their limited or fragmented experience in R&D commercialization processes, as noted in the previous section, ROs unanimously expressed high interest in adapting their systems and procedures for improved provision of their research services (for example, IT systems for managing infrastructure costs). Maturity in this area was assessed at level 2.0. This characteristic is an important driver that should enable quick scaling of cooperation, once the bottlenecks indicated in this report are removed, especially those that are beyond the competence of ROs and the KSK and that require action at the central level.

ROs' ability to communicate their business offer (awareness of ROs' business offer). The KSK, and especially local businesses, do not have enough capacity to absorb the amount of sophisticated R&D services provided by the local ROs that are required to reach the financial sustainability of the R&D infrastructure in possession of ROs. The existing departments within ROs' organizational structures and other entities responsible for knowledge transfer, are relatively small and not strong enough to be able to build the awareness of the ROs' offer on the national and international levels. This situation is reflected in a relatively low score in that characteristic (1.5). At the same time there is significant potential for rapid development in that area if ROs were able to align their efforts under the common coordination of an entity focused on supraregional promotion. The fusion of all universities and the KSK in the effort to build a common offer and its integrated promotion,

will also allow for the synergy effect and the provision of interdisciplinary services. The entity responsible for coordinating has to be selected carefully to be able to partner with both the ROs and the regional administration.

Lacking framework for commercial use of the R&D infrastructure. All ROs in the KSK made significant financial investments in buildings, facilities, and R&D equipment during the 2007–2013 and 2014–2020 periods. Due to the limitations of State aid rules at the national and EU levels, the use of the purchased infrastructure has been limited mainly to research and educational activities. The infrastructure has not been used in collaborative commercial projects with business, and thus has not been optimized for the development of the regional innovative potential. Moreover, these realities made it difficult to finance the proper maintenance and development of the sophisticated and rapidly aging equipment. ROs in the region have attempted to approach the central administration on the implementation of the principles for the release of R&D infrastructure up to 20% and above, under the ‘pass through’ mechanism. However, these attempts did not result in the development of clear implementation guidelines. This means that R&D infrastructure in KSK ROs is being underutilized, which makes knowledge transfer even more difficult. Legal assessment was also carried out under the CuRI initiative, and a model for the release of R&D infrastructure up to its 20% capacity was developed together with the KSK ROs. The model was implemented in the CIB laboratory at UPJS, which positively proved the potential to remove this bottleneck on a larger scale in the future. It should allow the ROs not only to support the R&D development in the region, but also to secure funds for the servicing and maintenance of the rapidly aging research infrastructure and its future scaling up.

6.3. PROCESSES OF KNOWLEDGE TRANSFER, STRATEGIC FORESIGHT, AND SHARED VISION

Knowledge transfer systems involve inclusive, multistakeholder processes where entities can, and want to, freely exchange ideas, where they can jointly solve problems and share the pooled benefits stemming from their respective memberships. Well-steered knowledge transfer systems proactively map regional innovation assets and catalyze strategic partnerships within them in order to expand their relevant synergies, opportunities for upscaling and specialization, while lowering the associated risks with innovation. Supporting policies and programs should cater to the system’s existing needs and objectives set by its stakeholders. In the KSK, several stakeholders pursue innovation-driven activities. Nonetheless, these tend to be fragmented and lacking a shared, strategic regional vision.

More systematic gathering, monitoring, analyzing, and publishing of credible innovation-related data would help guide actions and expectations of stakeholders of the knowledge transfer system. Additionally, reliable data and a level of coordination, facilitation and collaboration is required to establish a shared vision. For the most part, the latter have been in short supply in the KSK. When asked about a profile or fact sheet about the KSK’s innovation sector, no stakeholder could readily provide it. While national (*Košice Region in numbers* or Data Cube stats) and some regional data exist, they are not regularly updated and consolidated to provide a concise, clear regional picture about the sector’s attributes nor about its past or prospective performance. This would be useful material for any potential investor or media. While the recently developed Regional Innovation Strategy (RIS 2021–2030) provides a level of consolidated ideas and direction on the sector, policy dialogue(s) and strategic visioning processes should not be limited to seven-year intervals, especially with the rapid advancement of innovation and new technologies. They need to be broken down into shorter-term and mid-term action plans. Moreover, strategic decision-making processes and periodic performance evaluations must be inclusive and participatory. Key beneficiaries—ROs, large and SMES, secondary schools, youth and subregional representatives from peri-urban and rural towns—need to be especially involved. Inputs from underserved populations—the unemployed, underemployed, women, and socially disadvantaged populations—should also be considered. In this context, regional stakeholders wish to be more informed and strategically engaged. Systematic evidence-based benchmarking, monitoring and iterative collective learning, and relevant strategic adjustment processes are absent.

Several reasons point to these systemic shortcomings. One is the disproportionate allocation of public resources to the sector's claimed regional importance. While the current regional government is proactively taking concrete steps to promote the sector and to allocate financial resources (within its means), national level support is limited and splintered. Currently national support programs for innovation—such as *innovujme.sk* (by SIEA) or *Innovation Slovakia* (by the Slovak Alliance for Innovation Economy [SAPIE])—are distributed via national agencies. It is notable that these are insufficiently tailored to regional contexts and needs. The low expenditures on RD&I are well reflected in the Regional Innovation Scoreboard 2021 results, where Eastern Slovakia performs below both the national and EU averages. Another reason is the absence of a responsible entity, a unit or department that would catalyze, coordinate, and amplify the role of the innovation sector in the KSK. While this might change with the establishment of RIC, it needs to be kept in mind that this center is not part of the regional administration, and its goals and specific activities are still to be defined. To deliver its objectives, RIC will need a stable and reliable partner at the KSK administration.

7. POTENTIAL SCOPE OF ACTIONS FOR RIC ('LONG LIST')

This section proposes activity streams that could be undertaken by the Regional Innovation Center (RIC) and different KSK stakeholders to address the bottlenecks identified in the previous section. It is clear, though, that RIC will need to be selective when setting up its initial agenda, since it will start with limited resources (both human and financial). It will also need time to gradually build up its capacity. Resources that are expected to be at RIC's disposal will be described in more detail in chapter 8. The final part of this report will then offer recommendations for RIC's priorities.

Five activity streams with a number of specific activities are proposed to address the identified bottlenecks in Table 5. These streams could be addressed at the regional level, though, alignment and collaboration with national agencies and programs will be essential. The latter are responsible for setting national policy and programming priorities, promotional campaigns, as well as national financial support instruments, which should ideally also target the regional innovation agenda. The activities listed below do not include the release of R&D infrastructure since this is a national-level competence and addressed in a separate chapter (see Chapter 8).

In a synthesized manner, these five activity streams address the bottlenecks identified in the previous chapter. The specification and detailed scope of activities should be flexibly elaborated in tandem with progressive developments in the following years. Table 5 is structured with a description of each of the five streams. Corresponding activities for each workstream are then listed in the first column. The expected time horizon and proposed KPIs are then added in the subsequent columns.

TABLE 5: A Potential Menu of RIC's Activities ('long list')

ACTIVITY STREAM I: Consolidation of a shared, strategic vision for the regional innovation ecosystem		
As the innovation support landscape is fragmented among national and regional actors, an enhanced coordination among all stakeholders is required to ensure the efficient use of available resources, and to strengthen the actual transfer of knowledge and technology for impactful regional economic growth. This coordination can take different forms and happen at different levels, starting with the mapping of stakeholders, agreeing on a joint vision for developing innovation in the region, to finally enhancing collaboration among actors.		
Potential Activities	Time Horizon	Potential Indicators
1.1 Stakeholder/institutional mapping of the KSK's innovation/knowledge transfer system	Short-term	<ul style="list-style-type: none"> Completed stakeholder map published on the RIC website, disseminated regionally and nationally (updated twice a year)
1.2 Regional stakeholders jointly decide on and assume their respective roles and responsibilities in the implementation of the regional innovation policy and RIS	Short-term	<ul style="list-style-type: none"> Stakeholder Consultation(s) on RIS is held with different stakeholders Signed memorandum of understanding (MoU) among stakeholders on roles & responsibilities, published on RIC & stakeholders' websites
1.3. Flagship regional RD&I programs / projects	Short-/ medium-term	<ul style="list-style-type: none"> Joint, individual RD&I, sectoral programs / projects are identified and implemented
1.4 Developing regional brand and visual presence for RIC, and regional RD&I	Short-/ medium-term	<ul style="list-style-type: none"> Unified branding for the KSK's innovation policy/measures is prepared (e.g., competition among local stakeholders) and actively used Number & reach of media articles/posts, radio broadcasts

ACTIVITY STREAM II: Management and monitoring of Regional Innovation Strategy (RIS)'s implementation

RIS was adopted in mid-2021 and monitoring of its implementation progress and adjusting its content, if needed, are vital for achieving RIS's objectives. RIS has two pillars—establishing RIC and the CNIC. This activity stream is focused on RIS and is distinct from the Regional Innovation Observatory.

2.1 RIS implementation	On-going	<ul style="list-style-type: none"> Specific RIS-related programs and projects are assigned to RIC and RIC is responsible for their implementation and has dedicated budget/stuff to their implementation
2.2 RIS monitoring and evaluation framework	Medium-term	<ul style="list-style-type: none"> KSK appoints a single entity for coordinating RIS monitoring and evaluation (M&E) Resources are allocated for the M&E purpose Short-, medium-, and long-term monitoring benchmarks are set Data collection system is put in place Annual RIS performance reports are published

ACTIVITY STREAM III: Establishment of a Regional Innovation Observatory (RIO) to cultivate evidence-based planning and dynamic profiling of the region's innovation ecosystem.

RIO would systematically (e.g. on a quarterly or annual basis) collect, manage, analyze and visualize data and knowledge about innovation activities and outputs (volume of funded innovation projects, patents, publications, spin-off activities, growth of production etc.), in order to inform regional innovation policy and related strategic decision-making as well as media and investor briefing materials.

3.1 Establishing RIO	Short-term	<ul style="list-style-type: none"> RIO is established, staffed and 2022-2025 financing is secured RIO's 2-3 year action plan is developed and published
3.2 Curating data (audit, collection, management mechanisms) and preparing regular knowledge products	Short-term	<ul style="list-style-type: none"> An inventory of existing data and publications on KSK's innovation potential is conducted Plan of initial analyses is prepared and published, related data needs are identified, and data collection and management plan is prepared Annual (biannual) strategic regional progress and sectoral RD&I performance reports are published KSK's factsheets, sectoral investor profiles, R&D infrastructure asset maps, human capital profiles etc. are gathered/prepared and published

ACTIVITY STREAM IV: Innovation Gateway (IG) to secure funds for accelerating innovation in the region and enhancing the KSK's innovation brand and visibility

The Innovation Gateway is to ensure a greater flow of external funds into KSK from the EU, national programs, and the private sector to regional actors: local companies (large and SMEs), research organizations, intermediaries, regional administration. That would support initiating and implementing a pipeline of RD&I projects resulting in enhancing the innovation level in the region.

4.1 Lobbying actions to obtain external financing for RD&I projects (e.g., identified in 1.3) in collaboration with regional stakeholders	Short-/ medium-term	<ul style="list-style-type: none"> Number and value of new RD&I projects by KSK actors from national (e.g. MIRR, Ministry of Economy, Ministry of Education) EU and private investor sources.
4.2 Proactive promotion and stimulation of RDD&I partnerships between the KSK and national, international institutions, investors, and networks	Medium-/ long-term	<ul style="list-style-type: none"> (Co-)organization of a regional flagship event focused on innovation (on an annual basis) Number of KSK actors' new memberships in international networks Number of initiatives launched in collaboration with regional and external partners Number of (co-)organized events and their participants (conferences, inter-regional forums, workshops, speaker series, business lunches/breakfasts, etc.), participants' satisfaction measured and incorporated into the future design of events
4.3 Attracting potential investors to the region		<ul style="list-style-type: none"> Number of potential investors and investment capital attracted to the region for RD&I activities

ACTIVITY STREAM V: Provision of services that stimulate R&D collaboration and knowledge transfer

This activity stream could strengthen the provision of affordable, high quality advisory, training, matching and information services to companies, especially SMEs and ROs in the region. Different services can be provided by different stakeholders (both public and private) and their actions should be coordinated to ensure complementarities and to avoid duplication.

5.1 Mapping of innovation-oriented services provided to local companies.	Short-term	<ul style="list-style-type: none">• A baseline audit (with periodic updates) of existing innovation services available to local companies is prepared and published• A list of identified gaps is prepared
5.2 Provision of information services to innovation stakeholders	Short-term	<ul style="list-style-type: none">• Website established with regularly updated innovation-related content, and a database of stakeholders continuously expanded
5.3 Design and provision of support to innovative individuals	Short- and medium-term	<ul style="list-style-type: none">• Interdisciplinary prototyping space for individuals established• Number of organized hackathons and private/public sector partners
5.4 Design and provision of basic innovation and business-development support measures (e.g., company creation, incubation, entrepreneurship, small innovation voucher, basic marketing)	Medium-, to long-term	<ul style="list-style-type: none">• Number of newly offered services• Number of pilot support programs• Number of newly created companies• Number of supported companies• Number of initiated RD&I collaborations• Satisfaction of beneficiaries is measured
5.5 Provision of advanced innovation and business development support to companies and researchers, including technology transfer (IPR-related) services, match-making, investor meetings, establishing an R&D collaboration agenda, scaling up innovations	Medium-, to long-term	<ul style="list-style-type: none">• Number of offered services and companies / individuals who used them• Number of pilot support programs• Number of successful innovation-based companies• Number of spin-offs• Number and value of R&D collaboration contracts with public research organizations• Satisfaction of beneficiaries is measured

Source: Authors, 2022.

8. PROPOSED FRAMEWORK FOR RELEASE OF R&D INFRASTRUCTURE

Alleged ROs' inability to commercially utilize R&D infrastructure for collaboration with industry seems to be one of major obstacles for enhanced knowledge transfer in the Slovak Republic. The problem is urgent as it mostly concerns highly specialized infrastructure purchased mainly in 2007-2014, which is aging very quickly. The lack of quick and decisive actions in this area, including actions on the national institutions level, may lead to the missed opportunity to increase the innovativeness of the regions through the cooperation between academia and industry and suboptimal use of EU funds invested in the R&D infrastructure during last two financing perspectives.

WB analyzed the feasibility of preparing an easy implement framework for the release of the R&D infrastructure that allows commercial utilization of this infrastructure up to 20% of its annual capacity. This framework applies to two previous financial perspectives, i.e. 2007-2013 and 2014-2020 (detailed description of the framework is provided in Appendix 1).

This analysis and recommendation constitute the continuation of work delivered under CuRI2 and provides further details to that material. The background for this work was developed during the previous edition of the CuRI and this work does not repeat its content but builds on these findings. It also takes into account the conclusions of discussions with national units over the past years.

WB team designed and tested a model (framework) to monitor the annual capacity of R&D infrastructure. This included i) defining the so-called "relevant entity" and "subject of monitoring", ii) proposing a methodology for monitoring their capacity, and iii) proposing metrics and guidelines to be used for monitoring purposes.

A conservative approach was used to ensure that the use of research infrastructure is kept below the 20% threshold. At the same time the WB team designed the framework to be general to provide high adoptability allowing the universities to tune it to their specific needs, financing sources and infrastructure.

The feasibility to implement this framework with existing systems was tested in collaboration with UPJS. For that purpose the university proposed a laboratory that was financed through multiple grant agreements, mostly during the period 2007-2013 (the most typical situation in the Slovak Republic). The grant agreements are standardized and has been applied to similar projects implemented by other ROs in the Slovak Republic. During this collaboration, it was positively verified that existing university's administrative, technical, organizational and staff capacity allow application of this framework.

The WB team conducted two legal analyzes of the framework in relation to the European State Aid regulations and Slovak regulatory framework. The first one confirmed that the proposed framework and monitoring methodology are in line with the European State Aid regulations. The second one also confirmed that the analyzed representative grant agreement does not include any clauses related to the national law that could prevent the commercial use of the financed infrastructure according to the applicable European regulations.

The proposed framework is ready for dissemination and application by Slovak ROs.

9. RIC'S ASSUMED RESOURCES AND FINANCING

This chapter provides assumptions about resources that RIC will have at its disposal during the initial period of its functioning. The available resources will impose restrictions on how much RIC will be able to take on, hence the presented assumptions are used in the next chapter to provide recommendations for RIC's functions and activities during the initial two–three years of its operation. RIC was established in August 2021, and its manager was selected in December 2021. Some of RIC's framework conditions are defined in its foundation agreement; some will depend on RIC's vision and external sources of financing into which RIC will be able to tap.

RIC should not be perceived as a silver bullet that will fix the functioning of the whole knowledge transfer system on its own. Such effort calls for a concerted effort of many stakeholders (and many of them are active in the KSK), and RIC could help facilitate this process. For that reason, RIC should prioritize networking and collaboration, and identify areas of its comparative advantage and focus on them.

RIC will initially have limited resources (both human and financial). Financing of the Center relies on annual membership fees from its founders that amount to € 50,000 annually. RIC will not own a facility or a building. It is expected that RIC will have a manager and two to four more staff members. These will be full-time employees, mostly performing technical functions; additional functions are likely to be outsourced, for example, accounting. The annual membership fees will not cover expected staffing and do not guarantee the center's financial sustainability during its initial years. Membership fees will need to be supplemented with additional transfers to cover core staff and activities.

Additional financing streams will be critical for RIC's functioning. First of all, the KSK authority plans to earmark in its budget a one-off amount of around € 250,000 as an endowment for the center's operation. This would help the center cover its operating costs during first two years, that is, mostly the core team (salaries) and basic activities (rent, accounting, and basic marketing). Any extension of this financing line from the KSK would require a reconfirmation from the Regional Parliament. Second, additional resources will be needed to expand RIC's capacity and activities. Having limited resources, RIC will need to take advantage of externally financed projects to fuel its activities and scale up both the team and operations. Hence, it should prioritize identifying potential financing sources that match the center's vision and core function. Such opportunities could arise by applying for EU funds, managed by the national level (MIRRI, MoEcon, MoEdu, SIEA, SBA, SARIO, and CVTI) either as standalone projects to be managed by RIC, or projects that are implemented in collaboration with national-level agencies. Collaboration with other regional entities to jointly apply for funding could also be encouraged. At this stage, national-level financing is not confirmed.

Own revenues, while desirable, are likely not to contribute much to RIC's budget during the initial years of functioning. International experience shows that achieving the financial sustainability by RIC-like entities, if successful, takes much time, and usually it's closer to ten years, rather than three–five years. Depending on RIC's future development trajectory and its collaboration with regional and national stakeholders, the revenue-generating activities could pertain to i) offering commercial services (business and innovation support, including income from space rental should RIC own a building at some point); ii) supporting scaling up startups; iii) supporting contractual research; and iv) supporting commercialization of spin-offs. To offer such services, RIC would need

to build a steady team of in-house professionals and a network of external collaborators. This task will take time; hence, while these activities are important for the long-term sustainability of the center, they should not be the core of its initial functioning.

Therefore, a recommended short-term financial model for RIC's will be a mixed one. Initially it would be composed mainly of founders' financial support (membership fees and additional public contributions, for example, € 250,000) to cover core staff and basic expenses. This is the so-called 'core budget'. This would need to be backed up by project-based financing to facilitate scaling up and building sustainable revenue sources (either commercial or project-based), which should in the long-term become the main source of financing. Such a model will impact RIC's institutional structure. During initial two–three years, RIC could operate a small core team performing core functions (see Chapter 10 for recommended actions). Additional team members and activities could only be financed from externally financed projects. Such projects should be selected to support two goals: i) to develop the knowledge transfer ecosystem in the KSK, and ii) to prepare RIC's commercial offer to generate own revenue streams and strive for financial sustainability in the medium- to long-term horizon.

A small core team and limited financial resources will require focusing RIC's functions and activities in specific areas aligned with the context in which RIC was established. As indicated in Chapter 3, each category of stakeholders has its own set of optimal and expected roles to play in the knowledge transfer system (Table 2). Five main categories were identified: i) regional public administration, ii) companies, iii) research organizations, iv) intermediary organizations, and v) society/citizens. These, in turn, were matched with a number of typical activities and responsibilities. RIC founders represent a mix of regional/municipal authorities and research organizations. Yet, its role seems to fall in two of the above categories. The primary one is an intermediary organization and the secondary one is a regional public administration. These two roles may imply a large number of potential activities that RIC could be entrusted with (many already mentioned in Table 5) and require further specification. Being closely related to the regional public administration could, however, create a tendency to allocate to RIC functions that should be covered by the KSK administration itself. Such an attempt could limit RIC's ability to perform its main role that is related to the development of the knowledge transfer and innovation ecosystem in the region. The next chapter offers recommendations in this area.

Finally, while performing activities, RIC's engagement and responsibility for their implementation will vary. For instance, the center may be responsible for the design of some programs, or their implementation (achieving specific targets), or their monitoring. It could also outsource some activities, or simply encourage other stakeholders to engage in some actions, acting as a facilitator or coordinator. This differentiation reflects the depth and breadth of RIC's engagement in specific activities and influences the amount of resources and effort RIC will devote to them. Three categories or 'institutional roles', reflecting different levels of such engagement are proposed here. These are designer, implementer, and facilitator/coordinator/contributor. They are not mutually exclusive, since, for instance, RIC could both design and implement support measures. However, they will require different skill sets, as well as different human and financial resources. It's also important to keep in mind risks related to the conflict of interest (for example, design, implementation, and monitoring by the same entity) and minimize situations where this could arise.

1. **Designer** – responsible for designing and programming certain activities or tasks (for example, strategies, support programs and measures). A designer outlines overarching goals, directions, and targets without operationalizing implementing mechanisms. The designer stay at a relatively high level of abstraction.
2. **Implementer** – responsible for executing or implementing programs, activities, or tasks, that is, responsible for achieving specific targets (for instance, could be responsible for implementing a regional innovation voucher, or provision of specific trainings/advisory to companies). This institutional role includes operationalization of higher-level guidelines and can involve outsourcing of subactivities to other actors, for example, external experts/institutions/companies. For instance, RIC could be responsible for promoting networking, but at the

same time, it could outsource the organization of a series of study visits and events to another regional entity. In general, the assumption is made that when acting as an Implementer, RIC is the owner of the budget allocated for the given activity or task.

3. **Facilitator/coordinator/contributor**—this role implies that RIC’s responsibility is less direct for a specific activity or task. It may include supporting activities of other stakeholders (support promotion of some events, providing premises, or contributing funds), creating platforms for collaboration that need to be used by other stakeholders (for example, regular meetings of an innovation council, and innovation breakfasts), and encouraging joint applications for funding by regional stakeholders. In that case, the assumption is made that RIC does not have to be the owner of the budget allocated for the given activity or task, even if a fraction of the budget is used by RIC.

10. RECOMMENDATIONS FOR KNOWLEDGE TRANSFER SYSTEM IN THE KSK

This chapter offers recommendations aimed at the enhancement of the functioning of the knowledge transfer system in the KSK. Recommendations are divided into two groups—the first relates to RIC, and the second to the R&D release framework. The recommendations mostly target the regional level, which was the main focus of CuRI work.

10.1. RECOMMENDATIONS FOR RIC

Striking a balance between identified gaps in the knowledge transfer system, the potential list of activities, and the amount of resources RIC has at hand, will be a key success factor for the center's initial years of functioning. RIC is a new entity in the KSK, and expectations towards it are high; at the same time, a number of established stakeholders already operate in the KSK that have their own priorities and niches. Hence, setting a bar too high for RIC, may lead to its underperformance, especially when resources do not match expectations and turf wars are likely. For that reason, this report proposes to apply a filter of resources/capacity, which RIC is expected to have (see Chapter 9), when recommending functions and activities for the center (the 'long list' presented in Chapter 7) that are to mitigate some of the identified system bottlenecks (Chapter 6). This report also argues that RIC will not be able to tackle all shortcomings of the KSK's knowledge transfer system that are identified, and it thus needs to be strategic in selecting its priorities. Presented recommendations focus on an initial period of RIC's functioning, that is, 24–36 months and its activities should be reassessed on an ongoing basis and, also toward the end of this period. The period of two–three years is proposed since RIC is a brand-new entity and adjustments to its functioning are likely. This time horizon does not imply that funding for RIC should be planned just for this period, since it is unlikely that the center will achieve financial sustainability by that time.

Roles and activities recommended as RIC priorities will be matched with the center's expected comparative advantage, its institutional nature, and the key system bottlenecks it will face. RIC is a public sector entity with mixed membership (public authorities, and public research organizations). It is recommended that it should contribute to fulfilling two roles in the KSK knowledge transfer system—a regional administrative role and an intermediary organizational role (see description in Table 2, Chapter 3). It is not expected that RIC could fully complete them on its own. Contributions of other stakeholders will be vital. In fact, one of center's key success factors will be its ability to collaborate with other stakeholders that will help amplify other entities' strengths and comparative advantages, as well as define own niches of responsibility.

In general, RIC's initial strength could lie with the provision of public goods, especially reliable information and knowledge about knowledge transfer system/support, that are currently absent. That, in turn, is expected to help overcome the system's overarching bottleneck, which is the lack of trust among innovation stakeholders—the shortcoming most often mentioned by various KSK stakeholders. Actions in this area will include curating innovation data and striving to become a reliable information and knowledge source about innovation in the KSK for different types of stakeholders (public sector, businesses, research organizations, and citizens). These activities will be directed 'inwards', that is, mostly towards regional stakeholders to enhance their knowledge of each other. The second aspect of knowledge provision pertains to disseminating information about the region's innovative potential across the country and beyond. Curating such data, promoting the KSK's stakeholders, and attracting potential investors and partners could be the essence of these tasks.

RIC has potential to become a node for innovation stakeholders and initiatives that complements and amplifies and does not aim at becoming an ‘omnipotent’ entity. Its interinstitutional composition and limited resources conduce such a supporting role. As presented in Chapter 5, there are a number of entities operating in the KSK’s knowledge transfer system and they fulfil different roles that are not strongly coordinated. RIC, building on its role of an information and knowledge provider, could become a catalyst or a platform that brings stakeholders together, proactively identifies gaps and overlaps, and facilitates, encourages, and coordinates activities. Since RIC will not have a formal power over other stakeholders, it will need to be able to connect to its institutional partners and peers; this means it could promote and support further development of their strengths, while building up its own capacities in its core areas.

Finally, RIC could offer limited support to companies, individuals, and research organizations, whether directly or indirectly. Expanding the center’s outreach to stakeholders and building its brand as a go-to place for information about available innovation support should be an important element of RIC strategy. At the same time, the direct provision of services to companies will require specialized resources. Hence, the center could focus on piloting innovation support measures that would be financed by external projects (or other types of external funding) that would allow expanding its staff and capacity. Gradual capacity buildup could lead to future creation of a commercial offer to innovation stakeholders that would enhance RIC’s financial sustainability. In this area, it will be important to clarify synergies with the CNIC and design activities of both entities that complement each other’s comparative advantages, for instance, the strong ‘horizontal’ focus of RIC with the CNIC’s focus on research in specific technical ‘vertical’ areas.

These three general areas divided into four activity streams are recommended for RIC during its initial two–three years of operation. The four streams are matched with recommended activities (divided into one-off and recurring ones). Table 6 offers a summary of these recommendations. Recommended activities constitute a selection from the ‘long list’ of RIC’s potential activities (Table 5) with additional information provided. As indicated in Chapter 9, RIC, due to its resources, skills, and institutional position, will have varying levels of engagement in these activities (three ‘institutional roles’). They are indicated in the three last columns. Additionally, the source of financing is stipulated for each of the activity streams—some being financed from the center’s ‘regular’ or core funding (membership fees and members’ contributions), and some being financed by project-based resources (externally sourced by RIC). The former could be called ‘core activities’, while the latter could become ‘facultative activities’ that depend on available funding. Finally, a link to the maturity model is provided, to map how the recommended actions could influence the current status of the KSK’s knowledge transfer system and address the system’s bottlenecks. It also allows tracking areas that are not covered by RIC.

TABLE 6: Recommended RIC's Scope of Work and its Institutional Roles for the Initial Years?

Activity Stream / Main Function / Proposed Role	Proposed Activities / Outputs	Affected System's Characteristics (Impact)	RIC's Institutional Role			
			Main Source of Financing	Designer	Implementer	Facilitator
ACTIVITY STREAM I: Consolidation of a shared, strategic vision for the regional knowledge transfer ecosystem						
RIC is designing and running a regional communication and coordination platform enhancing inclusion of stakeholders in strategic planning	<ul style="list-style-type: none"> * Platform established and staffed * Stakeholder map completed and maintained * Regional 'Innovation Council' created * Regional innovation digital channel (website/social media) created - regular meetings of regional innovation council - regular regional conferences organized - high level of inclusivity maintained - regular and proactive update of digital channel 	<ol style="list-style-type: none"> 1. Level of trust in the system (Stakeholders' ability to build long-term relations on organizational level) 4. ROs' ability to communicate their business offer (awareness of ROs' business offer among stakeholders) 6. SMEs' ability to define and communicate their needs related to R&D and innovation (awareness of companies' needs among stakeholders) 10. Regional platforms for collaboration/networking established 18. Role division ('Who does what?') 	Membership fees and KSK support (core staff responsibility)	+++	+++	++
ACTIVITY STREAM III: Regional Innovation Observatory (RIO) to introduce evidence-based strategic planning and profiling of the region's innovation ecosystem for multiple purposes						
RIC is designing and running RIO (it acts as a regional 'innovation think tank' that provides reliable knowledge about region's innovation ecosystem)	<ul style="list-style-type: none"> * RIO established, staffed, and financed for 3 years * Knowledge databases created and published - periodic actualization of a stakeholder map - periodic analytical reports - periodic monitoring reports (e.g., RIS, support) - periodic surveys - monitoring of support programs and public interventions 	<ol style="list-style-type: none"> 2. Level of agility and flexibility in the system (ROs'/HEIs' and public administration's ability to adjust to the system's needs and demand) 3. ROs' business offer development capacity (ROs' ability to provide R&D services that are in demand) 17. Evidence-based management ('How & Why?' decisions are taken?) 	Membership fees and KSK support (core staff responsibility)	+++	+++	++
ACTIVITY STREAM IV: Innovation Gateway (IG) for external investors and for enhancing the KSK's innovation brand and visibility outside the region						
RIC is planning and coordinating external promotion of region's innovation brand/ RIC is a contact point (gateway) for external partners regarding region's innovation potential	<ul style="list-style-type: none"> * PR unit established and staffed * Fundraising and lobbying unit established and staffed * Regional innovation branding created * Digital channel for promoting region's innovations - regular communication with national-level/EU agencies - regular participation in domestic/EU/international networks and conferences related to RD&I - regular lobbying to obtain external innovation/business development financing for KSK stakeholders - regular organization of missions for local innovation stakeholders - innovation factsheet created and regularly updated 	<ol style="list-style-type: none"> 4. ROs' ability to communicate their business offer (awareness of ROs' business offer among stakeholders) 6. SMEs' ability to define and communicate their needs related to R&D and innovation (awareness of companies' needs among stakeholders) 10. Regional platforms for collaboration/networking established 19. Support to enable R&D collaboration and knowledge transfer 	Membership fees and KSK support (PR and lobbying units) + Externally financed projects	++	+	+++

ACTIVITY STREAM V: Provision of services—supporting R&D collaboration and knowledge transfer	
<p>RIC is initiating and implementing / coordinating activities and courses aimed at shaping entrepreneurial skills and mindset (in collaboration with other stakeholders)</p> <p>* 'Hard' infrastructure for prototyping designed and implemented ('innolabb/protolab') with a focus on individuals (not companies) and not R&D-related activities</p> <p>* 'Soft' infrastructure for supporting entrepreneurial skills development designed and implemented (mentors, courses, activities)</p> <p>- regular provision of workshops/courses related to enhancing entrepreneurial skills and mindset (demand-driven)</p> <p>- coordination and support of other stakeholders' activities to develop entrepreneurial and innovative skills and mindset</p>	<p>8. Regional stakeholders' ability to generate innovative ideas/projects</p> <p>Membership fees and KSK support +</p> <p>Other stakeholders' budgets ++</p> <p>+++</p> <p>++</p> <p>++</p>
<p>RIC is identifying and addressing gaps in the regional innovation ecosystem</p> <p>- identification of gaps impeding enhanced R&D collaboration between academia and industry, as well as implementation of R&D-based innovation</p> <p>- identification of resources (of regional stakeholders, and external public or private) and abilities to address the above gaps with dedicated support programs</p>	<p>7. SMEs' organizational and financial maturity (SMEs' capacity to engage in innovative and risky projects)</p> <p>8. Regional stakeholders' ability to generate innovative ideas/projects</p> <p>9. Regional stakeholders' ability to implement R&D-based innovations and generate growth</p> <p>14. ROs' maturity for IPR identification, development, protection, and licensing/selling</p> <p>16. Financial sustainability of R&D infrastructure (service, maintenance, and upgrade)</p> <p>19. Support to enable R&D collaboration and knowledge transfer</p> <p>Membership fees and KSK support +</p> <p>Externally financed projects ++</p> <p>+++</p> <p>+</p> <p>+++</p>
<p>RIC is testing pilot R&D / innovation support programs for regional stakeholders</p> <p>- implementation of pilot support programs, e.g. regional innovation voucher, regional innovation fund, mentoring programs for companies, innovation development support</p>	<p>7. SMEs' organizational and financial maturity (SMEs' capacity to engage in innovative and risky projects)</p> <p>8. Regional stakeholders' ability to generate innovative ideas/projects</p> <p>9. Regional stakeholders' ability to implement R&D-based innovations and generate growth</p> <p>19. Support to enable R&D collaboration and knowledge transfer</p> <p>Externally financed projects</p> <p>+++</p> <p>+++</p> <p>+</p>

Legend: * one-off activity (specific target); - regular activity; +++ RIC's recommended institutional role (a strong comparative advantage); ++ RIC's secondary institutional role (RIC could lead or share with other stakeholders); + RIC's tertiary institutional role (RIC could be engaged, but not as a key player)

Source: Authors, 2022.

RIC's recommended 'core activity streams' focus on rallying stakeholders around a joint vision of the knowledge transfer system and providing reliable knowledge about the KSK's innovation ecosystem. These two activity streams (numbers I and III) could be financed from RIC's 'regular' or core budget (that is, membership fees and contributions) and the center would have core staff responsible for the design and implementation of activities in these streams. Hence, the very strong score ('+++') attached to designer and implementer institutional roles. That suggests that these could be RIC's core activities. At the same time, they should be performed in an inclusive manner with other key stakeholders on board. In other words, while RIC would program and deliver own activities in these two streams, it would also closely work with other stakeholders in supporting their activities in these two areas to build synergies and capitalize on their capacities and resources. That is why its role as a facilitator is also rated high.

Stream I: 'Consolidation of a shared, strategic vision for the regional knowledge transfer ecosystem' focuses on establishing a communication platform and encouraging stakeholders' interactions. The KSK needs more cross-sectoral communication and collaboration to stimulate innovation, and this would be one of the goals of this stream. It seems that sectoral collaboration is working fairly well (for example, IT Valley), yet cross-sectoral and cross-institutional initiatives are rare and various institutions do not know each other well. For that reason, activities such as a 'regional innovation council' that would bring different stakeholders to a single table (especially including a strong representation of the private sector) is recommended. The key feature of this stream will be to build activities that are oriented towards long-term and do not stop after a one-off event. Activities included in this stream do not require high outlays and could be financed from RIC's core budget.

Stream III: 'Regional Innovation Observatory' is to generate regular and high-quality knowledge about the regional ecosystem. Knowledge is understood as the analyses and periodically updated information about what is happening in the KSK's knowledge transfer system. It is not about re-publishing data from the public statistics, but about gathering primary data and analyzing the regional landscape. This stream is to establish RIC's position as a 'go-to' place when one needs comprehensive information about innovation in the region and its stakeholders. Under this stream, RIC could, for instance, publish monitoring and evaluation analyzes of ongoing and past support measures that could be conducted by the center or outsourced (hence the strong score on the designer and implementer roles). It is believed that access to reliable knowledge helps build partnerships, allows stakeholders develop more accurate strategies and approaches, and can stimulate collaboration.

These two streams address some of the key system's bottlenecks, such as the low level of trust, role division and data-based management. They also directly affect key actors of the quadruple helix, that is, companies, research organizations, public sector, intermediary institutions, and citizens, by enhancing their ability to communicate. This would help stimulate better understanding among knowledge transfer stakeholders and could lead to more collaboration. These two activity streams would shape and systematize a framework for enhancing knowledge transfer in the KSK. Enhanced coordination of innovation support efforts in the region could help other actors in the KSK adjust their current and future programs and seek complementarities, while avoiding redundancies.

The two 'secondary' streams relate to awareness-raising and promotion (internal and external), and service provision to companies, individuals, and research organizations. The first of them (Stream IV: 'Innovation Gateway') refers to broadly understood marketing of the KSK's innovation potential that is currently missing. The second one (Stream V: 'Provision of services') concentrates on catering to the needs of mostly companies and individuals (and, to a limited degree, ROs) and developing their readiness and ability to engage in R&D-based collaboration with other stakeholders. The service provision stream has a twofold division. On the one hand, it addresses the needs of individuals, that is, mostly young people (high school and university students) and aims at shaping their innovative and entrepreneurial mindset and skills. It is about creating a talent pool in the KSK that will constitute the basis for future innovators. On the other hand, it is to support companies in their innovating to become more productive and competitive by offering (and testing) various support measures.

Due to the limited RIC expected resources, these two streams are proposed to be mostly financed from external (project-based) funds. In the RIO stream, RIC's role as a facilitator is emphasized to indicate its coordinating function. It can also play an important role as a (co-)designer and a much smaller role as an implementer. Many activities in this stream could be outsourced to other stakeholders or performed hand-in-hand with them. For example, economic missions could be organized by intermediary bodies, communication with the national level could take place in collaboration with the KSK regional administration and regional ROs, and regular regional innovation factsheets could be produced by regional partners. The facilitator and designer roles usually require smaller amounts of resources (time and funds); hence during its initial years, RIC could focus on them in this stream. Direct implementation of such activities is usually more resource-intensive and, in fact, not always desirable for RIC, since it does not need to specialize in every aspect of knowledge transfer system support. Thus, during the first two–three years, the center could both rely on, and help further develop, implementing capacities of other KSK stakeholders, while gradually building up its own team and brand in its specific niches.

Experimenting with support measures tailored to the local context, could become RIC's future priority. Such measures could start during RIC's initial years with small-scale projects aiming at testing new approaches, solutions, procedures to support stakeholders of the knowledge transfer ecosystem. There is a plethora of different activities that one might suggest that RIC could deliver, from supporting young talent in building their creative and innovative attitudes and skills, through innovation management training, product/service development, innovation incubation and acceleration, IPR protection, market analyses, match-making of entrepreneurs and researchers, to scaling up activities, offering innovation financing, and finding investors. It will be RIC's responsibility to select a set of specific activities that best fit its goals and the region's needs. Non-core financing will be necessary to pursue such experimentation since core funding will not be sufficient for many of the above. Thus, RIC could be responsible for identifying potential funding streams and depending on them to adjust its role in the design and implementation of such schemes. In the context of EU funds, an interesting model, which is not popular in the Slovak Republic, could be the collaboration with national-level entities, where both parties contribute to project programming and implementation. If other resources were to be available, RIC could take sole responsibility for such activities. The service provision stream is divided into three substreams that differ in activities and their proposed financing sources.

The first substream of 'Provision of services' recommends RIC acting as an initiator of activities oriented on shaping innovative skills and attitudes of local talent. These are directed mostly towards young people or 'would-be' innovators. This substream would include developing hard and soft infrastructure. The former is the prototyping of physical spaces with relatively basic equipment—similar to the Innolabb in the Banská Bystrica Region (BBSK), the ProtoLab in Rzeszow, or the Aalto Design Factory in Aalto, Finland. The latter would include the establishment of a network of mentors and trainers as well as an offer of creative- and entrepreneurship-oriented courses. These activities do not require large outlays and could be partly financed by RIC's core budget (core staff) and partly by budgets of other engaged stakeholders. The core staff could be strongly engaged at the design stage (hence, the strong score in the designer function). Depending on the available source of funding, RIC could take a role of an implementer or coordinator.

The second substream relates to the identification of gaps that hamper the implementation of R&D-based innovations in the region and the search for funding streams that could help address them. In its role of being a regional node, RIC should have a good overview of what's working and what is not in the knowledge transfer system. Stating hypotheses and designing solutions could be one of its roles. Since shortcomings may refer to the system's different aspects (for example, ROs, intermediary bodies, national programs, and the regulatory framework), it is unlikely RIC will have a direct influence over them, which explains the emphasis on its coordinating role here, while implementation by RIC is put on a back burner. It is also expected that financing for these activities will mostly come from external sources, such as national projects, with little contribution from RIC's core budget

The third substream assumes RIC will be testing pilot solutions financed by external projects. RIC, thanks to its proximity to young talent, entrepreneurs and ROs, should develop a good understanding of their needs to reinforce R&D collaboration. Such knowledge will help it design pilot measures aimed at supporting R&D-driven innovation in Košice. These programs could be small scale and their objective would be to conduct real-life experiments dedicated to specific solutions/procedures. An example of such an approach could be the regional innovation voucher tested in the BBSK that revealed strong demand for such a support measure among local companies. Such testing would generate invaluable knowledge about stakeholders' real preferences, sometimes specific to a given region; they could also serve as a basis for the design of larger programs. If RIC obtains external funding for such activities, it could hire additional staff responsible for design and implementation, thus a high score is given for these two roles. Funding could come both from the regional and external resources, including collaboration with the national agencies.

The proposed 'core activity streams' could help mitigate system bottlenecks related to the lack of trust, insufficient definition and division of roles, information flow and system agility. Their role is to enhance the functioning of the knowledge transfer system in the region and improve the framework conditions for innovators. Thanks to a smoothed information flow, information asymmetries could be limited, roles in the system better divided, and data-driven decision-making could improve public interventions.

The recommended 'secondary activity streams' have two distinct sets of goals. The first one has a strong external dimension and is about communication of the KSK's R&D potential to an external audience (as opposite to internal audience, which is tackled by 'core' streams) and attracting external funding to the region. The second one aims at supporting regional companies and individuals in their efforts to become more creative, innovative, and entrepreneurial. In general, it's about enhancing the stakeholder's ability to generate and implement innovative ideas. Depending on specific activities that RIC could be implementing, the focus of this stream may vary and could help address some of the bottlenecks faced by ROs, such as the financial sustainability of R&D infrastructure, or support with some commercialization-linked activities. Especially during the initial stage, RIC could strive to achieve 'quick wins', that is to prioritize these activities that may bring quick results. A series of such quick successes could build momentum around the center and its activities.

All in all, the recommended core and secondary streams have the potential to relieve bottlenecks related to soft R&D infrastructure and key processes in the knowledge transfer system in the KSK. To a much smaller extent, they could address shortcomings related to hard R&D infrastructure, as these are mostly in the purview of national stakeholders and research organizations. Since RIC does not have a leverage over them, its influence in this area remains limited.

10.2. RECOMMENDATIONS FOR R&D INFRASTRUCTURE RELEASE FRAMEWORK

The WB team recommends organization of a national-level workshop to present the framework for the release of R&D infrastructure to all relevant national-level stakeholders. Such a workshop would clarify the premises of the framework and the proposed mechanism for monitoring and calculating 20% annual capacity. It would also help build consensus about next steps needed to promote this framework among Slovak ROs.

The WB recommends that the proposed framework for the release of the R&D infrastructure that allows commercial utilization of this infrastructure up to 20% of its annual capacity, is shared with public ROs to allow its use across the Slovak Republic. Distributing information about the framework could raise awareness among Slovak ROs about existing opportunities for engaging in commercial R&D collaboration. This could have a potential positive influence on the level of innovation in the country as well as the level of revenue streams for public ROs. It could also help standardize ROs' approach to calculating and monitoring capacity of their R&D infrastructure utilized for commercial purposes.

**ANNEX 1.
FRAMEWORK FOR
THE RELEASE OF R&D
INFRASTRUCTURE IN THE
SLOVAK REPUBLIC**

1. INTRODUCTION

This document was developed as part of the CuRI Project—KSK R&D component.

This document describes a framework for releasing research and development (R&D) infrastructure purchased with public funds for non-commercial purposes up to 20% of its annual capacity. The term “release of R&D infrastructure” should be understood as the implementation of rules allowing the use of the infrastructure (hereafter “*Guidelines*”) in question in the manner described in Appendix 1.1.

This document should be regarded as a set of rules for defining and implementing a procedure for the release of research infrastructure (“*Infrastructure*”) purchased by Slovak research organizations with public funds in the 2007–2013 and 2014–2020 perspectives in a manner consistent with the Guidelines.

When preparing this recommendation, the most conservative position was adopted, ensuring compliance with the Guidelines. The above does not exclude a situation where, during the adaptation of the rules, the implementing entity will adopt less stringent restrictions after considering the risks and conducting their own, extended analyzes. Adaptation of the Guidelines contained in the document to the needs of a specific research infrastructure is the sole responsibility of the entity making such adaptation.

2. INFRASTRUCTURE TO BE MONITORED

2.1. Duration of restrictions

In the context of the duration of restrictions, Infrastructure can be divided into three groups:

1. Infrastructure purchased as part of projects that that have not been completed or are in the durability period.
2. Infrastructure purchased under projects that are after the durability period and which has not yet been fully depreciated.
3. Infrastructure purchased under projects that are after the durability period and which has already been fully depreciated.

The rules defined in the Guidelines, allowing use of the Infrastructure up to 20% of its annual capacity, should be applied to Infrastructure belonging to groups 1. and 2.

The rules defined in the Guidelines do not have to be applied to infrastructure belonging to group 3. Such infrastructure may be used for commercial purposes without restrictions.

2.2. Buildings vs. Equipment

In the context of the proposed model, it is important to distinguish between the two main types of fixed assets that make up Infrastructure:

4. Buildings—have very long depreciation periods, often significantly exceeding the durability periods of the projects from which they were financed, and may be financed repeatedly (e.g., construction, extension, renovation) under different projects and in different financial perspectives (“*Buildings*”).
5. Equipment—has shorter depreciation periods, often shorter than the durability periods of the projects from which it was financed and is typically financed entirely within a single project (possibly extended or retrofitted) (“*Equipment*”).

TIP 1: The typical metric for determining the capacity of a Building is net floor area. Typical metrics for determining the capacity of Equipment are hours of work or cycles.

TIP 2: For Equipment, it is recommended that metrics identical to those used in the valuation of services performed with the Equipment be used to determine capacity and its subsequent monitoring. Such an approach will enable a proper audit trail to be ensured in the future.

3. RELEVANT ENTITY

According to the Guidelines, the determination of the capacity of the Infrastructure and the subsequent monitoring of its use for commercial purposes should take place in annual cycles at the level of relevant entity (“**Relevant Entity**”). There is no strict and official definition of a Relevant Entity in the Guidelines and it is only generally referred in:

(<https://eur-lex.europa.eu/legal-content/PL/TXT/?uri=CELEX%3A52014XC0627%2801%29>)

supported by unofficial interpretations published by European Commission.

Taking into consideration examples from different EU member states (e.g., Poland) we recommend defining one Relevant Entity for each Project. Multiple subjects of monitoring (“SoM”) may be defined for a single Relevant Entity (single project or grant agreement). For each defined SoM it is permissible to define a different SoM-specific metric that defines its annual capacity.

Monitoring of the commercial utilization should be done independently for each defined SoM and the results should be aggregated at the level of the Relevant Entity. To ensure compliance with the Guidelines we recommend a conservative approach, according to which the 20% commercial utilization limit defined in the Guidelines applies independently for each defined SoM. Such an approach guarantees automatically that the 20% limit will not be exceeded at the level of the Relevant Entity. To aggregate monitored commercial utilization of individual SoMs at the level of the Relevant Entity, “maximum” function can be used which is again the most conservative approach.

3.1. Buildings

For Buildings, it is recommended that the SoM be defined at the building level and that the floor area be adopted as the capacity metric.

The proposed approach enables preparation of a single procedure for monitoring and reporting on the commercial use of the Building in the situation of financing a given Building from many projects in various financial perspectives.

TIP 3: For projects aimed at adapting a well-defined and independently functioning part of a Building (e.g., a floor), it might be justified to adopt for such projects a SoM covering only the part of the building concerned by the project.

3.2. Equipment

In the case of Equipment, it is recommended to define SoM at the level of detail identical to the one used for calculating cost estimate (valuation) of services rendered with the use of given Equipment.

TIP 4: This approach will enable the provision of a proper audit trail in the future.

The proposed approach mostly means defining the SoM at the level of the stand-alone laboratory stations.

The principle should be applied that a single device should be assigned entirely to one SoM. In other words, assigning one device to multiple SoMs is not allowed.

In the case of auxiliary equipment, which is necessary for the operation of many laboratory stations and for which, at the same time, an unambiguous assignment to a particular laboratory station is not possible, it is recommended to define an independent SoM.

EXAMPLE 1: In the example below, twelve SoMs are defined, of which ten are stand-alone laboratory stations and the remaining two are ancillary equipment. The laboratory presented in the example was funded by two different projects (INTERFERON and CEVAII) that should represent two separated Relevant Entities. The assignment of the defined SoMs to the laboratories is for organizational purposes only.

SoM Composites		Capacity	I	CV 1
Auxiliary equipment				
1	CIB/AE/INTERFERON	1 800 [h]	x	
2	CIB/AE/CEVAII	1 800 [h]		x
Lab 1 - Protein Engineering				
3	CIB/01/01 Laminar flow cabinet	1 760 [h]	x	
Lab 2 - Biotechnology and Cell Physiology				
4	CIB/02/01 Incubator	4 800 [h]	x	
5	CIB/02/02 Hypoxic chamber	1 920 [h]		x
6	CIB/02/03 Set of objectives for confoc. microscope	1 800 [h]	x	
Lab 3 - Laser Spectroscopy				
7	CIB/03/01 Optic tweezers	1 800 [h]		
	CCD camera			x
	Optomechanical components			x
	Voltage source			x
	Vibration isolation optical table			x
	NIR laser diode			x
	Quadrant photodetector			x
	Acousto-optic intensity modulator			x
	Acousto-optic position modulator			x
	Detection unit – preamplifier			x
8	CIB/03/02 Singlet oxygen detection	1 800 [h]		
	Photomultiplier A			x
	Multichannel counter – analyzer			x
	Microscope			x
	TEM00-He-Ne laser			x
	Dye laser – tunable part			x
	Tunable part: OPO			x
	Lens for infrared			x
	Monochromator			x
	Piezo table			x
Lab 4 - Optical Spectroscopy and Biothermodynamics				
9	CIB/04/01 Isothermal titration calorimeter	480 [h]		x
10	CIB/04/03 Spectrophotometer (stopped flow)	100 [h]		x
Lab 5 - Molecular Biology & Cell Cultures				
11	CIB/56/01 Laminar flow cabinet	1 080 [h]		x
12	CIB/56/02 Incubator	4 800 [h]		x

Source: Authors, 2022.

4. ANNUAL CAPACITY AND MONITORING

An annual capacity shall be defined for each SoM, the commercial use of which shall then be monitored. For a SoM consisting of multiple components/devices the annual capacity shall be defined once at the SoM level and not for every individual component/device (e.g., Lab 3 in the table above where annual capacity is defined for the *Optic tweezers* station consisting of multiple devices).

4.1. Buildings

For Buildings, it is recommended to use the net floor area as a metric for determining the annual capacity. Monitoring the commercial use of a Building then boils down to defining a list of activities carried out in the Building and defining to what extent these activities are commercial in nature (weights).

EXAMPLE 2: A research laboratory is located in a Building with a net floor area of 1,000 m². The building is subject to monitoring of its commercial use. The laboratory occupies the entire net floor area of the Building. The proportion of commercial activities conducted in the laboratory does not exceed 20% of the laboratory annual capacity as laboratory itself is also subject to monitoring of its commercial use.

Activity	Description	Occupied building area [m ²]	Occupied building area [%]	Expected max commercial usage (weight)	Consumed building capacity [%]
Room 1	R&D Lab 1	200,00	20,00%	20,00%	4,00%
Room 2	R&D Lab 2	300,00	30,00%	20,00%	6,00%
Room 3	R&D Lab 3	500,00	50,00%	20,00%	10,00%
Total R&D Lab:		1 000,00	100,00%		20,00%
Building Net Area [m²]:		1 000,00	Total Consumed Building Capacity:		20,00%

The capacity utilization of the Building for commercial purposes is 20.00%.

Source: Authors, 2022.

EXAMPLE 3: A commercial laboratory that is not subject to any restriction and was built to provide only paid services for the industry is located in a Building with a net floor area of 1,000 m². The building is subject to monitoring of its commercial use. The laboratory occupies 190 m² of the Building's net floor area. The remaining net floor area of the Building is used for non-commercial activities.

Activity	Description	Occupied building area [m ²]	Occupied building area [%]	Expected max commercial usage (weight)	Consumed building capacity [%]
Room 1	Commercial Lab 1	120,00	12,00%	100,00%	12,00%
Room 2	Commercial Lab 2	70,00	7,00%	100,00%	7,00%
Total R&D Lab:		190,00	19,00%		19,00%
Building Net Area [m²]:		1 000,00	Total Consumed Building Capacity:		19,00%

The capacity utilization of the Building for commercial purposes is 19.00%.

Source: Authors, 2022.

EXAMPLE 4: A canteen occupying 100 m² and a research laboratory occupying 170 m² are located in a Building with a net floor area of 1,000 m². The building is subject to monitoring of its commercial use. The share of commercial activities carried out in the laboratory does not exceed 20% of the laboratory annual capacity as the laboratory itself is also subject to monitoring of its commercial use. The canteen is considered a commercial activity at 100%. The remaining net floor area of the Building is used for non-commercial activities.

Activity	Description	Occupied building area [m ²]	Occupied building area [%]	Expected max commercial usage (weight)	Consumed building capacity [%]
Room 1	Lab 1 - Protein Engineering	19,14	1,91%	20,00%	0,38%
Room 2	Lab 2 - Biotechnology and Cell Physiology	40,26	4,03%	20,00%	0,81%
Room 3	Lab 3 - Laser Spectroscopy	39,85	3,99%	20,00%	0,80%
Room 4	Lab 4 - Optical Spectroscopy and Biothermodynamics	43,20	4,32%	20,00%	0,86%
Room 5	Lab 5 - Molecular Biology	27,55	2,76%	20,00%	0,55%
Total R&D Lab:		170,00	17,00%		3,40%
Canteen	Canteen with kitchen (commercial use)	100	10,00%	100,00%	10,00%
Total Other		100	10,00%		10,00%
Building Net Area [m²]:		1 000,00	Total Consumed Building Capacity:		13,40%

The capacity utilization of the Building for commercial purposes is 13.40%.

Source: Authors, 2022.

For each activity for which commercial use of less than 100% is declared, it is necessary to implement a monitoring procedure identical to the one described in this document, even in the case when such activity is not subject to regulations defined in the Guidelines. Such action is necessary to provide an audit trail in case of control of the commercial use of the Building in which such activity is carried out.

4.2. Equipment

For Equipment, it is recommended that the same metrics are used to determine annual capacity as those used to price services performed with the Equipment. The most commonly used metrics are hours of work or cycles. This approach will provide an audit trail in the event of an audit of the commercial use of the Equipment.

TIP 5: The procedure for monitoring the use of Infrastructure should allow for verification of the annual report with completed contracts (e.g. invoices issued, quotes provided).

The annual capacity of each SoM should be determined with due diligence, at a level resulting from the type and scope of services performed with the use of the given Equipment. The adopted value of the annual capacity should be justified in each case.

TIP 6: Monitoring of the use of Infrastructure is done on an annual basis. For this reason, the monitoring procedure should allow for proper reporting of contracts executed at the turn of the year.

EXAMPLE 5: Sample report monitoring the use of Infrastructure.

	Capacity	Usage	Usage [%]	Contract 1	Contract 2	Contract 3	
				From:	2021-08-01	2021-01-01	2021-08-03
				To:	2021-12-31	2021-04-23	2021-08-15
Auxiliary equipment							
1	CIB/AE/INTERFERON	1800 [h]	0	0,00%			
2	CIB/AE/CEVAII	1800 [h]	0	0,00%			
Lab 1 - Protein Engineering							
3	CI B/01/01 Laminar flow cabinet	1760 [h]	0	0,00%			
Lab 2 - Biotechnology and Cell Physiology							
4	CI B/02/01 Incubator	4 800 [h]	130	2,71%	15	15	100
5	CI B/02/02 Hypoxic chamber	1920 [h]	25	1,30%		10	15
6	CI B/02/03 Set of objectives for confoc. microscope	1800 [h]	20	1,11%			20
Lab 3 - Laser Spectroscopy							
7	CIB/03/01 Optic tweezers	1800 [h]	0	0,00%			
8	CI B/03/02 Singlet oxygen detection	1800 [h]	0	0,00%			
Lab 4 - Optical Spectroscopy and Biothermodynamics							
9	CI B/04/01 Isothermal titration calorimeter	480 [h]	100	20,83% Over limit	50	50	
10	C1 B/04/03 Spektrofotometer (stopped flow)	100 [h]	25	25,00% Over limit	5	20	
Lab 5 - Molecular Biology & Cell Cultures							
11	CIB/56/01 Laminar flow cabinet	1080 [h]	0	0,00%			
12	CIB/56/02 Incubator	4 800 [h]	10	0,21%		10	

If the assumed annual capacity utilization limit is exceeded, independent of the implications of the Guidelines, the monitoring reports for Buildings must also be updated (see examples 3, 4 and 5) as such an exceedance may lead to further exceedances on the Building level.

Source: Authors, 2022.

5. LEGAL ANALYSIS

The proposed model above has been verified against EU State aid regulations. Legal analysis confirmed that “[...] the proposed R&D infrastructure release model for Slovakia (as described in a separate document provided by the wB) complies with EU State aid law”. The full text of the opinion is provided in Appendix 1.

The proposed model above has been adopted by the UPJS in Košice for the CIB laboratory. As part of the adoption process, a representative grant agreement (“ZMLUVA O POSKYTNUTI NENAVRATNEHO FINANČNEHO PRISPEVKU - ČÍSLO ZMLUVY: 040/2014/4.1/OPVaV”) between the Ministry of Education, Science, Research and Sport of the Slovak Republic and SHIMADZU SLOVAKIA, organizacna zlozka has been analyzed (“Grant Agreement”). Key aspects that were analyzed included:

- To examine the length, expiration/termination of the contractual obligations, and a potential survival of certain obligations beyond expiration of the agreement;
- To identify and assess key legal clauses potentially hindering and/or creating opportunities for commercial utilization of purchased R&D Infrastructure by grant recipients (public research organizations);
- To provide recommendations on how to tackle potential obstacles and/or use the opportunities for the commercial use of this infrastructure; and
- To identify a potential conflict with contractual obligations for grant recipients (public research organizations) towards the financing authority in the case of commercial use of the R&D Infrastructure developed with grant proceeds.

The legal analysis was performed considering only the Slovak law in addition to the general analysis considering the EU State aid regulations that was conducted independently.

The Grant Agreement was published on February 14, 2014 in the Central Register of Contracts, where such agreements must be disclosed, and thus took effect on February 15, 2014.

The legal opinion “[...] concluded that:

- *contractual obligations resulting from the Grant Agreement ceased to apply at the latest on 15 January 2021;*
- *there may be an obligation related to the storage and archiving of accounting documentation surviving the termination of the Grant Agreement;*
- *contractual provisions that could create obstacles to the commercial utilization of the R&D Infrastructure are limited by the validity and effectiveness of the Grant Agreement and, since the Grant Agreement has already expired, no contractual provisions creating obstacles or limits to the commercial utilization are applicable”.*

The full text of the opinion is provided in Appendix 1.2.

APPENDIX 1.1.

LEGAL OPINION ON EUROPEAN LAW (STATE AID)

1. INTRODUCTION

1. This document has been developed at the request of the World Bank as part of the CuRI Project and its purpose is to assess whether the proposed R&D infrastructure release model (as described in a separate document provided by the WB) complies with EU State aid law.

2. BACKGROUND INFORMATION

2. During the periods of 2007–2013 and 2014–2020, Member States eligible for the European Union Cohesion Policy spent significant amounts of the European Structural and Investment Funds (ESIF) to support the construction and upgrade of research¹⁰ and teaching¹¹ infrastructure. Financing was extended mainly to universities and research institutes, which are research and knowledge dissemination organizations, as defined by the Framework for State Aid for Research and Development and Innovation (RDI Framework)¹².
3. Due to restrictions stemming from the EU State aid law and limited access to private financing, the majority of infrastructure projects at public ROs were funded with an assumption that infrastructure will not be used for commercial purposes. This arrangement was adopted in order to escape qualification of financing as State aid.
4. Following entry into force of the RDI Framework which introduced the concept of the so-called ‘ancillary economic activity’, and confirmation from the European Commission that this concept can be lawfully implemented also in respect to those projects which received ESIF funding before the RDI Framework become binding, it has been identified that certain pieces of research and teaching infrastructure in the Slovak Republic could be released for commercial activity. Provided that such commercial use is limited in scope and properly monitored, change in the use of infrastructure will have no negative impact on previously granted State support.
5. In order to implement the concept of ‘ancillary economic activity’, a general model has been developed for releasing up to 20% of the annual capacity of research infrastructure purchased with public funds for non-commercial purposes. In order to conduct an assessment of compliance of the model with the EU State aid law, a reference to relevant State aid rules is needed.

3. STATE AID FRAMEWORK

6. Article 107 (1) of the Treaty on the Functioning of the European Union (TFEU) defines State aid as any aid granted by a Member State or through State resources in any form whatsoever which distorts or threatens to distort competition by favoring certain undertakings or the production of certain goods, in so far as it affects trade between Member States. The elements of the notion of State aid are thus the following:

- a. The imputability of the measure to the State and its financing through State resources
- b. Selective advantage addressed to undertakings
- c. Effect on competition
- d. Effect on trade between Member States

In the majority of cases concerning qualification of funding of research and teaching infrastructure as State aid, the analysis focuses on whether the infrastructure is to be used for economic (commercial) purposes.

7. The European Commission (EC) elaborated the *Notice on the notion of State aid as referred to in Article 107 (1) of the Treaty on the Functioning of the European Union (NoA)*¹³. This document describes the notion of State aid, including the notion of economic activity. Additionally, specificities of the research and development activities in the context of State aid are described in the RDI Framework.

3.1. Economic activity

3.1.1. Notion of undertaking—general remarks

8. When State funding (including ESIF) is extended to ROs, it is crucial to identify whether financed activities will be of an economic character, that is, whether the beneficiary can be considered an undertaking. In EU competition law, undertakings are defined as entities engaged in an economic activity, regardless of their legal status and the way in which they are financed.
9. Consequently, the legal status of the entity is irrelevant in assessing whether it is an undertaking. What matters is whether it carries out an economic activity, i.e., is engaged in offering goods and services on the market. Therefore, it cannot be excluded, merely on the basis of its legal character, that a public RO has a status of an undertaking, and any external public financing of its activity should be assessed in the context of the State aid rules. Additionally, the application of the State aid rules as such, does not depend on whether the entity is set up to generate profits.
10. **Additionally, the EC clarified that**¹⁴: *“(...) it is also settled case-law that the concept of economic activity is a functional one. This means that even if most of an entity’s activities are non-economic and hence it is not undertaking as a whole, it may yet qualify as such in respect of certain functions if they are of economic nature. This is usually the case if the State directly engages in economic activities. By its nature the State as a whole is not an undertaking but if it directly (i.e. not via an incorporated company of which it is the owner) engages in an economic activity, for that particular function it is to be regarded as an undertaking.”*

3.1.2. Notion of undertaking—research and development (R&D) activity

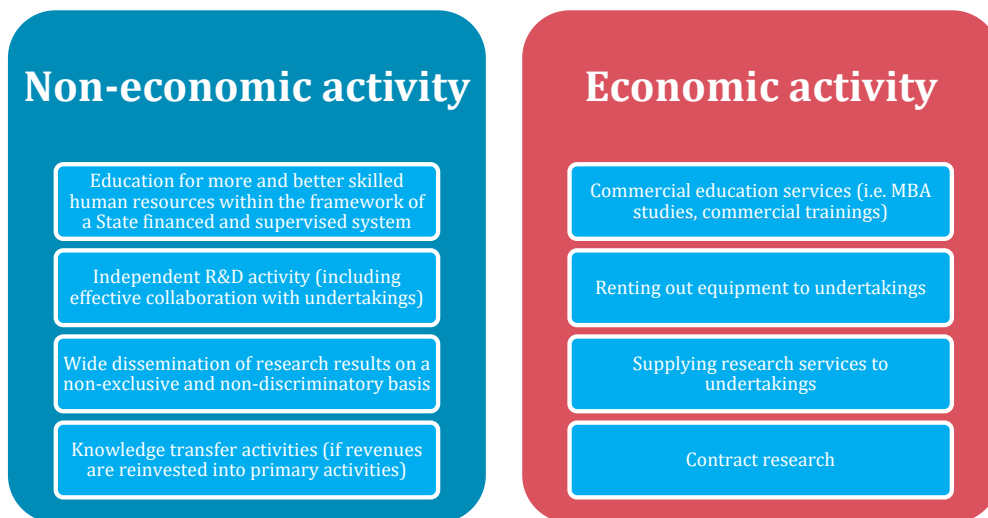
11. General definitions concerning the notion of undertaking and economic activity in the EU State aid law require more detailed analysis in the context of public financing of R&D activities. The EC has presented its approach with regard to the presence of State aid in financing of R&D activities in the RDI Framework.
12. First, ROs are recipients of State aid if their public funding fulfils all conditions of Article 107 (1) TFEU. This, in particular, means that ROs have to conduct economic activity (or use their infrastructure for economic/commercial purposes).

13. Second, the following activities are in principle non-economic (non-commercial) and therefore, their performance excludes that the given research organization or infrastructure can be considered an “undertaking” (see Figure 1.1.1):

- a. **Primary activities** of research organizations and research infrastructures, in particular:
 - ii. Education for more and better skilled human resources, understood as public education organized within the national educational system, predominantly, or entirely, funded by the State and supervised by the State;
 - iii. Independent R&D for more knowledge and better understanding, including collaborative R&D¹⁵ where the research organization or research infrastructure engages in effective collaboration. Pursuant to point 15(h) of the RDI Framework, “*effective collaboration*’ means collaboration between at least two independent parties to exchange knowledge or technology, or to achieve a common objective based on the division of labour where the parties jointly define the scope of the collaborative project, contribute to its implementation and share its risks, as well as its results. One or several parties may bear the full costs of the project and thus relieve other parties of its financial risks. Contract research and provision of research services are not considered forms of collaboration”;
 - iv. Wide dissemination of research results on a non-exclusive and non-discriminatory basis, for example, through teaching, open-access databases, open publications or open software.

- b **Knowledge transfer** activities¹⁶:
 - i. Conducted by the research organization/research infrastructure (including their departments or subsidiaries) or jointly with, or on behalf of other such entities, and
 - ii. Where all profits from those activities are reinvested in the primary activities of the research organization or research infrastructure. The non-economic nature of those activities is not prejudiced by contracting the provision of corresponding services to third parties by way of open tenders.

FIGURE 1.1.1.: Non-economic and Economic Activity of R&D Infrastructure



Source: World Bank, 2022.

14. Third, where the same entity is engaged in both economic and non-economic activities, the public funding of the non-economic activities will not be considered State aid if the two kinds of activities and their costs, funding and revenues can be clearly separated so that cross-subsidization of the economic activity is effectively avoided. Evidence of due allocation of costs, funding, and revenues can consist of annual financial statements of the relevant entity. Where a research organization/research infrastructure is used for both economic and non-economic activities, public funding falls under State aid rules only insofar as it covers costs linked to the economic activities.

15. Fourth, where the research organization/research infrastructure is used almost exclusively for a non-economic activity, its funding may fall outside State aid rules in its entirety, provided that the economic use remains purely ancillary, that is to say, corresponds to an activity which is:
 - a. directly related to, **and**
 - b. necessary for the operation of the research organization/research infrastructure **or**
 - c. intrinsically linked to its main non-economic use, **and**
 - d. limited in scope, namely the economic activities consume exactly the same inputs (such as material, equipment, labor and fixed capital) as the non-economic activities and the capacity allocated each year to such economic activities **does not exceed 20 % of the relevant entity's overall annual capacity**¹⁷.

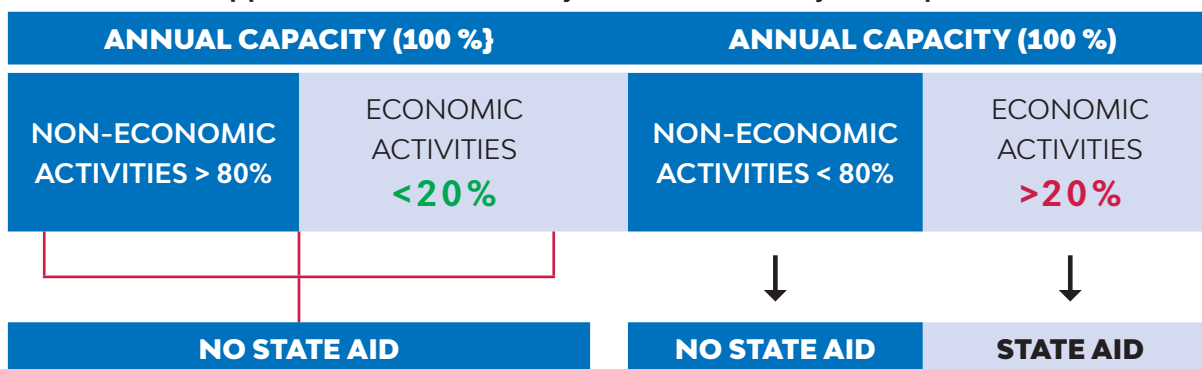
The **concept of ancillary economic activity** has been introduced in the RDI Framework as of July 1, 2014 and **was not included in the 2007–13 Community framework** for State aid for research and development and innovation¹⁸.

The concept of ancillary economic activity is also reflected in paragraph 207 of NoA:

“If, in cases of mixed use, the infrastructure is used almost exclusively for a non-economic activity, the Commission considers that its funding may fall outside the State aid rules in its entirety, provided the economic use remains purely ancillary, that is to say an activity which is directly related to and necessary for the operation of the infrastructure, or intrinsically linked to its main non-economic use. This should be considered to be the case when the economic activities consume the same inputs as the primary non-economic activities, for example material, equipment, labour or fixed capital. Ancillary economic activities must remain limited in scope, as regards the capacity of the infrastructure. Examples of such ancillary economic activities may include a research organisation occasionally renting out its equipment and laboratories to industrial partners. The Commission also considers that public financing provided to customary amenities (such as restaurants, shops or paid parking) of infrastructures that are almost exclusively used for a non-economic activity normally has no effect on trade between Member States since those customary amenities are unlikely to attract customers from other Member States and their financing is unlikely to have a more than marginal effect on cross-border investment or establishment”.

16. Fifth, where research organizations or research infrastructures are used to perform economic activities, such as renting out equipment or laboratories to undertakings, supplying services to undertakings or performing contract research, public funding of those economic activities is considered State aid (provided that the remaining criteria of Article 107 (1) TFEU are met, and with the **exception of instances where economic activities do not engage more than 20 % of the relevant entity's overall annual capacity**. In other words, when an economic use of a given R&D infrastructure by an RO in a given year remains below 20% of the annual capacity of this infrastructure, it is assumed that no State aid was passed on by the RO. Hence the RO is not obliged to return any financial resources that financed the purchase of this R&D infrastructure (left-hand side of Figure 1.1.2). In cases where an economic use exceeds the ancillary threshold, e.g. a RO uses 30% of the annual capacity of a given R&D infrastructure for economic activities (i.e. above the 20% ancillary threshold), then the full amount of 30% capacity falls into the State aid regime (right-hand side of Figure 1.1.2). In consequence, the RO should in principle return a part of the granted financing that is attributable to this 30% in order to ensure that the retained amount of financing complies with applicable State aid intensity.

FIGURE 1.1.2.: Application of the Ancillary Economic Activity Concept



Source: World Bank, 2022.

3.2. Applicability of the ancillary economic activity concept to 2007–2013 R&D infrastructure projects

17. Since the concept of ancillary economic activity is linked to the existence of State aid¹⁹ (and not its compatibility), after the entry into force of the RDI Framework (which introduced the concept of an ancillary economic activity), the Polish administration proposed to apply it not only to projects that will be granted support in the future, but also to projects funded in previous years (as this could improve their financial viability).
18. The Polish administration requested the Directorate-General for Competition (DG COMP) to confirm that the concept of an ancillary economic activity may be applied also to R&D infrastructure projects financed in the multiannual financial perspective 2007–2013. In August 2015, the Polish government received a confirmation from the DG COMP that limited economic use of research and teaching infrastructure (up to 20% of infrastructure’s capacity) does not affect a no-Aid character of previously granted financing.
19. In the next step, the Polish Ministry of Infrastructure and Development (the Managing Authority [MA]) for all centrally managed operational programs) confirmed with the DG REGIO that the concept of ancillary economic activity can be applied to infrastructure projects financed within the framework of the financial perspective 2007–2013. This concept is also applicable to R&D infrastructure projects financed in the present Multiannual Financial Framework (MFF 2014–2020).
20. Following the above arrangements with the European Commission, the MA, in cooperation with other institutions involved in the disbursement of ESIF, offered the beneficiaries an opportunity to use R&D infrastructure financed within the framework of the financial perspective 2007–2013 for economic purposes. To this end, the MA developed a guidance document “Monitoring and claw-back mechanism”²⁰.

4. ASSESSMENT OF THE R&D INFRASTRUCTURE RELEASE MODEL FOR THE SLOVAK REPUBLIC

21. The Commission has not provided detailed guidelines as to the application of the concept of ancillary economic activity. Thus, the assessment of the arrangements described in the R&D infrastructure release model for the Slovak Republic relies on the wording of the RDI Framework and available interpretative guidelines presented by the EC.
22. The R&D infrastructure release model for the Slovak Republic relies on the following assumptions:

- a. Economic use of infrastructure will be allowed provided that conditions set out in point 20 of the RDI Framework are satisfied, in particular that the capacity allocated each year to economic activities does not exceed 20% of the relevant entity's overall annual capacity;
- b. In line with the Commission's interpretative guidance, monitoring is supposed to relate to economic (commercial) activity v. non-economic activity of the infrastructure, i.e. of the so-called 'relevant entity' which should be understood as every individual entity (such as a laboratory or department) that, with the organizational structure, capital, material and workforce that it effectively has at its disposal, could alone perform the activity concerned, regardless of whether or not such a 'relevant entity' has a separate legal personality.

For practical reasons, in the case at hand it is justified to consider that:

- i. Monitoring should relate to infrastructure that has been granted financing from ESIF (not to the entire infrastructure of the given entity, e.g., the entire university),
- ii. Monitoring should be performed separately for each piece of infrastructure that is capable of performing activities on its own—because of the organizational structure, capital, material, and workforce that it effectively has at its disposal,
- iii. Monitoring should be conducted separately for each piece of infrastructure, in particular where a different parameter for measuring the capacity is used for each piece.

In order to ensure that conditions set out in point 20 of the RDI Framework are satisfied in respect of each and every ESIF-supported project, 'the relevant entity' is defined at the level of such an ESIF-funded project, i.e., in respect of the set of assets acquired or modernized within the framework of an individual ESIF-supported project/operation. This arrangement is in line with explanations provided by the EC to the Member States;

- c. In order to demonstrate that the economic use of infrastructure does not exceed the 20% annual threshold, a parameter should be chosen to best reflect the characteristics of the given infrastructure and ways it is used. In most cases it will be time, which is easy to measure and register. Other parameters (e.g., space, or the total value of inputs consumed yearly) can be used as well²¹. Depending on the individual circumstances, a combination of parameters is also possible. Once chosen, parameter(s) cannot be changed throughout the monitoring period.

In the context of the proposed model, two main types of fixed assets that make up Infrastructure have been distinguished:

- iv. Buildings—have very long depreciation periods and may be financed repeatedly (e.g., construction, extension, renovation) under different projects and in different financial perspectives,
- v. Equipment—has shorter depreciation periods and is typically financed entirely within a single project (possibly extended or retrofitted).

The model does not impose an obligatory parameter, but provides information that "The typical metric for determining the capacity of a Building is net floor area. Typical metrics for determining the capacity of Equipment are hours of work or cycles", which is in line with the approach of the Commission.

Taking into consideration examples from different EU Member States (e.g., Poland), it is recommended to define one 'relevant entity' for each ESIF-supported project/operation (as described in letter b. above). Multiple subjects of monitoring ('SoM') may be defined for a single relevant entity. For each defined SoM, it is permissible to define a different SoM-specific metric that defines its annual capacity.

Monitoring of the commercial utilization should be done independently for each defined SoM and the results should be aggregated at the level of the relevant entity. To ensure compliance with the RDI Framework, a conservative approach is recommended, according to which the 20% threshold set out in point 20 of the RDI Framework applies independently for each defined SoM. Such an approach guarantees automatically that the 20% threshold

will not be exceeded at the level of the relevant entity. To aggregate monitored commercial utilization of individual SoMs at the level of the relevant entity, 'maximum' function can be used which is again the most conservative approach.

The above arrangement are in line with State aid rules;

- d. At present the Commission's position is that monitoring should be carried out for the economic life of the infrastructure, i.e. for the depreciation period of the relevant assets.

However, in the draft Communication from the Commission – Framework for State aid for research and development and innovation²² ('Draft RDI Framework'), the EC has explained that the monitoring of the ancillary character of the economic activity shall apply for at least 10 years from the start of operations of the infrastructure²³.

The Draft RDI Framework will come into force on January 1, 2022 and will replace the currently applicable RDI Framework.

Be it at least for 10 years or for the entire economic life of the infrastructure, where various assets have different depreciation periods, it is forbidden to apply an 'average' depreciation period of various assets for the entire relevant entity. It is correct instead to apply an approach where periods of monitoring are different for various assets of the relevant entity (e.g., different for buildings and different for equipment).

In the case at hand, for the sake of legal certainty, it has been assumed that monitoring will be carried out for the depreciation period of the relevant assets, separately for equipment and immovable property. This arrangement is in line with State aid rules;

- e. The Commission makes it clear in the RDI Framework that with regard to the ancillary economic activity the *'the capacity allocated each year to such economic activities does not exceed 20% of the relevant entity's overall annual capacity'*²⁴.

Therefore, the monitoring of the economic use of assets will be conducted on an annual basis and the 20% capacity threshold will need to be respected in each and every year. In particular, it is not foreseen to rely on an average level of economic use over the monitoring period. This arrangement is in line with State aid rules.

5. CONCLUSION

23. Considering the above, the proposed R&D infrastructure release model for the Slovak Republic (as described in a separate document provided by the WB) complies with EU State aid law.

APPENDIX 1.2. LEGAL OPINION ON SLOVAK FRAMEWORK

Noerr

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Bratislava, 7 December 2021

ANALYSIS ON COMMERCIAL USE OF R&D INFRASTRUCTURE ACQUIRED USING PUBLIC FUNDS

Dear Krzysztof,

Upon the request from the World Bank (“**WB**”) and in accordance with the Terms of Reference sent by Grzegorz Wolszczak to Pavol Rak per email on 6 October 2021 (the “**ToR**”), we have conducted a review of the Grant Agreement (in Slovak: “*Zmluva o poskytnutí ne-návratného finančného príspevku*”) between the Ministry of Education, Science, Research and Sport of the Slovak Republic as the provider of the financial aid and SHIMADZU SLOVAKIA, organizačná zložka as the recipient (the “**Grant Agreement**”) for the purchase of Research and Development Infrastructure (the “**R&D Infrastructure**”), which has been selected by WB.

The Grant Agreement was published on 14 February 2014 in the Central Register of Contracts, where such agreements must be disclosed, and thus took effect on 15 February 2014.

According to publicly available resources, there were four amendments to the Grant Agreement. As these amendments contain information relevant for this analysis, we found it necessary to include them in our review.

The key aspects that WB requested to be the focal point of our legal analysis are as follows (the “**Key Aspects**”):

Alicante
Berlin
Bratislava
Brussels
Bucharest
Budapest
Dresden
Düsseldorf
Frankfurt/M.
Hamburg
London
Moscow
Munich
New York

- i. to examine the length, expiration/termination of the contractual obligations, and a potential survival of certain obligations beyond expiration of the agreement;
- ii. to identify and assess key legal clauses potentially hindering and/or creating opportunities for commercial utilization of purchased R&D Infrastructure by grant recipients (public research organizations);
- iii. to provide recommendations on how to tackle potential obstacles and/or use the opportunities for the commercial use of this infrastructure;
- iv. to identify a potential conflict with contractual obligations for grant recipients (public research organizations) towards the financing authority in case of commercial use of the R&D Infrastructure developed with grant proceeds.

In accordance with the ToR, we focused on the review only in light of Slovak law, in particular legislation referred to in the Grant Agreement, i.e.:

- Act No. 528/2008 Coll. on Assistance and Support from European Community Funds as amended (the “Act on ASECF”);
- Act No. 502/2001 Coll. on Financial Control and Internal Audit and on Amendments to Certain Acts as amended (until 31 December 2015);
- Act No. 357/2015 Coll. on Financial Control and Audit and on Amendments to Certain Acts as amended (from 1 January 2016);
- Act No. 523/2004 Coll. on Budgetary Rules of Public Administration and on Amendment to Certain Acts as amended;
- Act No. 25/2006 Coll. on Public Procurement and on Amendment to Certain Acts as amended.

The relevant provisions of the EU legislation have been excluded from our review. However, as the Grant Agreement is also governed by EU legislation, we strongly recommend reviewing this legislation and all relating acts.

A. LEGAL ANALYSIS

With regard to the ToR, in our review we focus exclusively on the Key Aspects. Below is our analysis regarding each of the Key Aspects:

- i. ***to examine the length, expiration/termination of the contractual obligations, and a potential survival of certain obligations beyond expiration of the agreement***

In order to provide a structured answer, we will divide this question into two sub-questions. First, we examine the length and expiration of the contractual obligations, and then we will proceed with the review of potential survival of obligations beyond the expiration of the Grant Agreement.

Length, expiration/termination of the Grant Agreement's contractual obligations

The general rule on termination of contractual obligation is found under clause 6.2 of the Grant Agreement: *“The Agreement is concluded for a definite term and its validity and effectiveness shall end upon approval of the last Follow-up Monitoring Report which the Recipient is obliged to submit to the Provider in accordance with clause 3 sub-clause 4 of the General Contractual Conditions.”*

In accordance with clause 3 sub-clause 4 of the General Contractual Conditions (the “GCC”), the recipient is obligated to submit the Follow-up Monitoring Reports to the provider for a period of five years after the completion of the project. The Follow-up Monitoring Reports must be submitted at the latest on the 15th of the month following the monitored period.

The deadline for the completion of the project activities was, in accordance with clause 2.4 of the Grant Agreement, 30 September 2015. This deadline was prolonged by Amendment No. 2 and Amendment No. 4 to the Grant Agreement until 31 December 2015.

We were not provided with the actual date of completion of the project activities. Nevertheless, from the above we are able to conclude that the contractual obligations arising from the Grant Agreement ceased to apply at the latest by 15 January 2021, i.e. five years after the last Follow-up Monitoring Report had to be handed in – assuming the last Follow-up Monitoring Report was approved.

Potential survival of certain obligations beyond expiration of the agreement

Several clauses of the Grant Agreement and the GCC do not follow the general rule on termination of contractual obligations as stated in clause 6.2 of the Grant Agreement.

Obligations arising from clauses 10, 12 and 18 of the GCC terminated on 31 August 2020 or even after that date by the *“settlement of financial relations between the Provider and Recipient on the basis of this Agreement”*. The deadline may even be prolonged in case circumstances described in Article 90 of the Council Regulation (EC) No. 1083/2006 arise.

We are not aware that any of the two situations prolonging the termination period has occurred; thus we assume that the obligations arising from clauses 10 (*Settlement of financial relations and contractual penalties*), 12 (*Review/Audit*) and 18 (*Document archiving*) of the GCC ceased to apply on 31 August 2020.

With regard to clause 18 of the GCC we would like to draw your attention to section 30 (3) of the Act on ASECF, according to which the recipient is obliged to archive documentation regarding the project according to specific regulations, namely the Act No. 431/2002 Coll. on Accounting (the “**Act on Accounting**”). Under section 35 of the Act on Accounting, accounting documentation must be archived for the period of 5 or 10 years, depending on the type of documents stored. Therefore it may be that, for certain types of accounting information relating to the Grant Agreement, the obligation of storage might have survived the termination periods of the Grant Agreement.

ii. to identify and assess key legal clauses potentially hindering and/or creating opportunities for commercial utilization of purchased R&D Infrastructure by grant recipients (public research organizations)

We were able to identify some provisions of the GCC that could create a hindrance to the commercial utilization of the purchased R&D Infrastructure:

- Clause 5 sub-clause 2 of the GCC imposes restrictions on the transfer, encumbrance, use, and other disposal over assets acquired using the grant provided. Without the previous written approval of the grant provider, the assets may not be transferred, encumbered, leased, or otherwise used by a third party. If the recipient breaches these restrictions, the recipient is obliged to return the provided grant or its part. However, these restrictions are limited to the validity and effectiveness of the Grant Agreement.
- Clause 8 sub-clause 2 of the GCC includes a notification duty for the recipient towards the grant provider. Under this duty, the recipient is obliged to notify the grant provider of all changes and circumstances, which could affect or relate to the Grant Agreement or if the recipient has doubts about their compliance with the obligations resulting from the Grant Agreement.
- Under clause 10 sub-clause 1 lit. j) of the GCC the recipient is obliged to return any net income generated within the validity and effectiveness of the Grant Agreement or in the following five years from the completion of the project activities. This provision does not create an obstacle or hindrance to the commercial utilization per se, however any net income generated within the specified time frame would have to be returned to the provider; and therefore rendering any commercial utilization for the purpose of creating profit impossible.

However, as the contractual obligations ceased to apply and the period of five years after the completion of the project activities lapsed, the above mentioned restrictions or obstacles are no longer applicable.

iii. to provide recommendations on how to tackle potential obstacles and/or use the opportunities for the commercial use of this infrastructure

In the provided Grant Agreement we did not identify any provisions that would create an obstacle to the commercial utilization of the purchased R&D Infrastructure after the expiration of the Grant Agreement.

iv. to identify a potential conflict with contractual obligations for grant recipients (public research organizations) towards the financing authority in case of commercial use of the R&D Infrastructure developed with grant proceeds

See answer to question ii. above.

B. CONCLUSION

Taking the above mentioned into account, we concluded that:

- contractual obligations resulting from the Grant Agreement ceased to apply at the latest on 15 January 2021;
- there may be an obligation related to the storage and archiving of accounting documentation surviving the termination of the Grant Agreement;
- contractual provisions that could create obstacles to the commercial utilization of the R&D Infrastructure are limited by the validity and effectiveness of the Grant Agreement and, since the Grant Agreement has already expired, no contractual provisions creating obstacles or limits to the commercial utilization are applicable.

We would like to point out that other grant agreements that have not been subject of our review could possibly contain different provisions that may create obstacles to the commercial utilization of the R&D Infrastructure obtained through public funds.

Therefore, we recommend that the opinion stated in this legal analysis should be used solely for the purposes of the commencement of the commercial utilization of the R&D Infrastructure obtained through the Grant Agreement under review.

Yours sincerely,
Noerr s. r. o.

**ANNEX 2:
LIST OF INTERVIEWED
COMPANIES**

INFORMATION TECHNOLOGY SECTOR

Global Logic
Lynx
Matsuko (startup)

TELECOMMUNICATIONS SECTOR

Antik
T-Systems

BIOTECH SECTOR

Saftra Photonics s.r.o
Biomedical engineering s.r.o
RV Magnetics s.r.o

AGRI-TECH SECTOR

Rokosan
Humac

ADVISORY AND BUSINESS SERVICES

Novitech
Infinitelambda

NOTES

- 1 Selected as most relevant based on CuRI work and the current level of KSK development.
- 2 Specific, Measurable, Achievable, Relevant, Time-bound
- 3 This description would not apply to countries with much stronger regions that have higher economic and scientific potential due to their size and a level of regions' autonomy.
- 4 Statistical Office of the Slovak Republic (2020), Košice region in numbers.
- 5 Campbell, A., Cavalade, C., Haunold, C., Karanikic, P. and Piccaluga, A. (2020) Knowledge Transfer Metrics - Towards a European-wide set of harmonised indicators, Karlsson Dinnetz, M. editor(s), EUR 30218 EN, Publications Office of the EU, Luxembourg.
- 6 Selected as most relevant, based on CuRI work and the current level of KSK development.
- 7 Statistical Office of the Slovak Republic (2020), Košice region in numbers.
- 8 Statistical Office of the Slovak Republic (2020), Košice region in numbers.
- 9 Activity stream II related to the implementation and monitoring of RIS is not included in this recommendation table. While RIC could play an important role in both processes, the responsibility for the overall RIS implementation and monitoring should stay with the KSK administration.
- 10 Pursuant to point 15 (ff) of the Communication from the Commission – Framework for State aid for research and development and innovation (OJ C 198, 27.6.2014, p. 1; “the RDI Framework”), “research infrastructure’ means facilities, resources and related services that are used by the scientific community to conduct research in their respective fields and covers scientific equipment or set of instruments, knowledge-based resources such as collections, archives or structured scientific information, enabling information and communication technology-based infrastructures such as grid, computing, software and communication, or any other entity of a unique nature essential to conduct research. Such infrastructures may be ‘single-sited’ or ‘distributed’ (an organised network of resources) (See Article 2(a) of Council Regulation (EC) No 723/2009 of 25 June 2009 on the Community legal framework for a European Research Infrastructure Consortium (ERIC) (OJ L 206, 8.8.2009, p. 1)”.
- 11 For example, lecture rooms, laboratories, and other facilities used for educational purposes.
- 12 Pursuant to point 15 (ee) of the RDI Framework, “research and knowledge dissemination organisation’ or ‘research organisation’ means an entity (such as universities or research institutes, technology transfer agencies, innovation intermediaries, research-oriented physical or virtual collaborative entities), irrespective of its legal status (organised under public or private law) or way of financing, whose primary goal is to independently conduct fundamental research, industrial research or experimental development or to widely disseminate the results of such activities by way of teaching, publication or knowledge transfer. Where such entity also pursues economic activities, the financing, the costs and the revenues of those economic activities must be accounted for separately. Undertakings that can exert a decisive influence upon such an entity, for example in the quality of shareholders or members, may not enjoy a preferential access to the results generated by it”.
- 13 OJ C 262, 19.7.2016, p. 1.
- 14 Commission Decision of 26 November 2008 on N 293/2008 –Hungary – Aid for multifunctional community cultural centres, museums, public libraries, recital 18.
- 15 Collaborative research does not relate to the provision of R&D services and R&D carried out on behalf of undertakings. Such activities are considered to be of an economic character.
- 16 As defined in point 15 (v) of the RDI Framework.
- 17 In one of its interpretations, the EC provided clarification on how “the relevant entity” should be defined.
Question from the Member State:
„The previous statement from the European Commission to our questions on RDI (September 2014) states that the 20% threshold for performing economic activities refers to the “relevant entity”, which can be a department or laboratory belonging to the “legal entity” and is able to perform itself the actions concerned with respect to its organisational structure, capital, material and workforce.

Must a research and knowledge dissemination organisation (research organisation) have a separate legal personality? Must a research infrastructure have a separate legal personality? Can a “legal entity” designate the entire university, which has legal personality and a “relevant entity” designate individual faculties, which do not have legal personality?”

Reply from the EC:

“Indeed the 20% threshold for considering that an economic activity is limited in scope will be assessed at the level of the “relevant entity”, that is to say every individual entity (such as a laboratory or department) that, with the organisational structure, capital, material and workforce that it effectively has at its disposal, could alone perform the activity concerned, regardless of whether or not such “relevant entity” has a separate legal personality”.

18 OJ C 323, 30.12.2006, p. 1.

19 In line with Union courts’ case law, State aid is an objective and legal concept defined directly by the Treaty. Interpretation of Article 107(1) TFEU is thus not limited in time, unlike rules on compatibility which in their majority are adopted for a strictly defined period.

20 http://www.mojregion.eu/files/dokumenty%20rpo/konkursy_nabory/6.4.3_Inwestycje%20w%20infrastruktury%20kształcenia%20zawodowego%20w%20ramach%20ZIT_nr_317_26_09_2019/Mechanizm_monitorowania_i_wycofania.pdf

21 Taking the approach that ‘one size does not necessarily fit all’, the Commission does not impose application of concrete parameters. On the other hand, the EC explained that profits or revenues recorded by a particular infrastructure cannot be used as parameters.

22 https://ec.europa.eu/competition-policy/public-consultations/2021-rdi_en

23 Cf. point 22 of the Draft RDI Framework.

24 The same wording is proposed in the Draft RDI Framework.

