

UP-SKILLING RESEARCHERS FOR SUSTAINABLE ENTREPRENEURSHIP BASED ON INNOVATION PROCESS MANAGEMENT



R&I Strategy for Entrepreneurial Ecosystem Development North Macedonia

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1. Executive Summary

This Research & Innovation (R&I) Strategy defines how the University Entrepreneurship and Innovation Center (UEIC) will operationalize the Entrepreneurial University model by acting as the central connector and “one-stop shop” of the university R&I ecosystem, linking internal university capacities (faculties, institutes, laboratories, TTOs, incubators/accelerators) with government, industry, investors and society, and translating national priorities into functional pathways (projects → prototypes → spin-offs → market impact). The scope covers the full “knowledge-to-impact” chain: research excellence and infrastructure, talent development, EU project participation (“grant-to-impact”), technology transfer and IP, start-ups/spin-offs and commercialization finance, multi-level networking, and transparent impact measurement supported by CoARA principles. The Strategy is designed for a widening/low R&I intensity context and aligns tightly with EU integration pathways and national policy frameworks. It is anchored in the Smart Specialisation Strategy (S3) 2024–2027, using S3 priority domains to structure thematic platforms, human-capital pipelines, infrastructure upgrades, and TT/IP frameworks. It also strengthens participation in EU programmes and networks: Horizon Europe, COST and EUREKA, as a route to competitive funding, partnerships, and mission-oriented collaboration that can offset domestic constraints. Finally, it links the university pipeline to national innovation and SME instruments, including INOVA and the SME-oriented funding mix (credit guarantees, venture/hybrid funds, green finance) to enable proof/validation and scale-up. Implementation is expected to deliver: stronger S3-aligned research excellence; upgraded shared infrastructure (“labs-as-a-service”); a stronger talent pipeline; a professional “grant-to-impact” pathway with higher EU participation; institutionalized Quadruple-Helix partnerships; a functional TT and commercialization system (contract research, licensing, spin-offs) with clear incentives; easier IP support and stronger commercialization readiness; a clearer finance pathway (concept→seed→scale); and CoARA-aligned performance measurement with annual public impact reporting.

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2. Introduction

Entrepreneurial ecosystems are increasingly recognized as catalysts for innovation, economic growth, and regional development. An entrepreneurial ecosystem represents “a set of interdependent actors and factors that are governed in such a way that they enable productive entrepreneurship” (Stam, 2015). These actors and factors include startups and small and medium-sized enterprises (SMEs), universities and research institutes, investors and funding sources, supportive government policies, infrastructure, and cultural elements that together foster innovation and new venture creation (Huang et al., 2023). In a vibrant ecosystem, entrepreneurs do not operate in isolation. Moreover, they draw on networks of talent, knowledge, finance, and institutions that help turn ideas into commercial products and services. Importantly, research and innovation (R&I) are at the heart of such ecosystems: scientific research generates new knowledge and technologies, while innovation applies these insights to create economic and societal value. Investing in R&I is therefore key to growth and job creation, as it increases productivity and competitiveness through new products, processes, and businesses (WeBalkans, n.d.).

Conversely, regions that neglect R&I risk stagnation, as innovation gaps directly hamper economic performance (Owen et al., 2021). In recent years, global policy discourse has emphasized building innovation-driven ecosystems to spur sustainable development. The European Union (EU), for example, launched programs under Horizon 2020 and now Horizon Europe specifically to “widen” participation in R&I, thus helping less R&D-intensive countries strengthen their ecosystems and bridge the innovation gap with leading economies (Pollex & Lenschow, 2018). Notably, the Western Balkans, consisting of Albania, Bosnia and Herzegovina, North Macedonia and Serbia, fall into this category and have been designated as Associated Widening Countries under Horizon Europe (Radovanovic et al., 2023). All have ambitions to integrate into the European Research Area and eventually the EU, making the development of robust entrepreneurial and innovation ecosystems a strategic priority.

This R&I Strategy was developed through an evidence-informed and participatory process designed for a widening / low-resource context, where fragmentation, low R&D intensity, and weak academia–industry linkages directly constrain the “research-to-impact” pathway. The work started with desk research and document analysis, synthesizing the current state of the national R&I and entrepreneurship ecosystem, with a specific focus on structural bottlenecks (funding, human capital, research infrastructure, IP barriers, and technology transfer constraints). Second, the team conducted a policy-alignment to ensure that proposed priorities, programs, and KPIs are implementable and “fundable” through national instruments and EU mechanisms—especially the Smart Specialisation Strategy (S3), EU integration pathways, and participation channels such as Horizon Europe, COST, and EUREKA. Third, the Strategy integrates benchmarking and lessons learned from EU partner institutions, and it also draws on a dedicated set of guidelines for local and regional policymakers developed to specify recommendations for upgrading entrepreneurial ecosystems in North Macedonia. These recommendations were produced as part of the USE IPM project through a rigorous mixed-method research process, combining focus groups, the Delphi method, and a needs analysis survey, conducted across the four countries between September 2023 and November 2024.

The following section provides an overview of the entrepreneurial ecosystem in the Republic of North Macedonia, situated within the broader group of widening countries, examines the importance of R&I for its development, outlines alignment with EU and national strategies, and discusses the crucial role of universities in implementing and sustaining these efforts.

2.1 Overview of the Entrepreneurial Ecosystem in North Macedonia

North Macedonia, like other Western Balkan countries such as Albania, Bosnia and Herzegovina and Serbia, shares the context of a transitional economy with a nascent yet growing entrepreneurial ecosystem. Over the past decade, innovation performance in North Macedonia and the wider Western Balkans has improved, but the region still lags behind the European average on most indicators (WeBalkans, n.d.). These countries exhibit strong potential with a young and educated talent pool (including a substantial diaspora), and emerging tech startup communities, yet they face significant structural challenges.

One fundamental issue is underinvestment in research and development (R&D). All Western Balkan economies remain far below the EU's target of 3% of GDP investment in R&D. In fact, R&D expenditure ranges from 0.2% to 0.9% of GDP, compared to an OECD/EU average of about 2.4% (OECD, 2024a). In the case of North Macedonia, R&D intensity remains below 0.4% of GDP, confirming that the country is also significantly under both the EU target and the EU/OECD average (GNM – Government of North Macedonia, 2023; OECD, 2024a). Such figures illustrate the innovation gap where despite huge growth prospects, North Macedonia and the Western Balkan region as a whole still lack sufficient research infrastructure and human capital (partly due to brain drain, too) to fully exploit their innovation potential.

Another major challenge in these ecosystems is the weak linkage between academia and industry, leading to poor commercialization of research. Traditionally, universities and public research institutes in the Western Balkans have operated in silos, with few incentives or mechanisms to collaborate with the business sector. In North Macedonia, similar patterns are evident, with universities carrying out most research but university–industry collaboration and structured technology transfer mechanisms still at an early stage, resulting in relatively few joint R&D projects, spin-offs and commercialization cases compared to the country's scientific potential (GNM, 2023). Indeed, “co-creation between R&D institutes and industry remains the weakest link across the region's Science, Technology and Innovation (STI) systems”, and this lack of collaboration has “hampered the commercialization of research”, meaning the region is not fully capitalizing on its scientific capabilities (OECD, 2024a). Indicators of technology transfer and innovation uptake are correspondingly low. For instance, the income that Western Balkan institutions receive from licensing patents or other intellectual property (a proxy for research commercialization) is negligible, while receipts from foreign use of domestic IP are largely stagnant at less than 0.1% of GDP (OECD, 2024a). In North Macedonia, balance-of-payments statistics and OECD assessments likewise show that receipts from royalties, licence fees and other intellectual property–related services remain very small relative to GDP, indicating that the commercialization of domestic research outputs and export of knowledge-intensive services are still at an early stage (OECD, 2024b; NBRNM, 2023).

Similarly, relatively few firms introduce new products or processes, considering innovative activity in the private sector is limited, especially among SMEs that dominate these economies. Many SMEs lack the resources and know-how to engage in R&I, and there is a shortage of entrepreneurial support services and mentorship in advanced technologies (Gashi Ahmeti & Fetaj, 2021).

Access to funding is another critical bottleneck in the entrepreneurial ecosystem. Domestic venture capital and angel investor networks remain embryonic in the Western Balkans. Aside from a few exceptions (such as an EU-supported regional venture fund and occasional cross-border investors), the region has a scarcity of “smart money” (Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), 2021). This scarcity of seed and early-stage capital makes it difficult for startups to scale up or for research spin-offs to reach the market. Local banks are often reluctant to lend to innovation-driven businesses deemed too risky, and public funding for startup incubation is limited (Cingolani, 2025). Consequently, promising

entrepreneurs frequently relocate to larger markets to seek investment or rely on donor-funded grant programs (Cingolani, 2025).

All these factors, related to low R&D spending, few researchers, weak academia-industry links, and limited financing, form an ecosystem that is still developing rather than mature. However, the foundation is being laid for improvement as innovation hubs, tech parks and incubators have been established in cities like Skopje, Belgrade, Sarajevo and Tirana, a growing number of tech startups (especially in ICT and software outsourcing) are gaining traction, and governments have begun adopting reforms to nurture entrepreneurship. The potential and talent are there, as the EU notes (WeBalkans, n.d.), but substantial efforts are needed to unlock it.

2.2 The Importance of Research and Innovation for Ecosystem Development

Strengthening R&I is crucial for developing the entrepreneurial ecosystem in North Macedonia. This priority is reflected in national strategic documents, which frame research and innovation as key levers for higher value added, export competitiveness and retaining skilled labour (GNM, 2023; Ministry of Economy and Labour, 2024). Globally, R&I drives economic growth, productivity, and job creation. Closing the innovation gap is not just technical but a socio-economic priority, as stronger innovation performance can diversify economies, move industries up the value chain, and create high-quality jobs, which are vital for sustainable development and for preventing the outflow of talent (Fayyaz & Bartha, 2025).

This requires fostering knowledge-based activities and leveraging research to produce new products, services, and processes competitive in European and global markets. Equally important is enhancing mechanisms that translate research into market applications, such as effective intellectual property (IP) rights, technology transfer offices, incubators, and industry partnerships. Robust IP protection ensures inventors and investors can benefit from innovation, which is particularly crucial in emerging ecosystems where private R&D involves higher risks (Burrell et al., 2023).

Technology transfer bridges the gap between research and commercialization, enabling universities and research institutes to license inventions to businesses or support spin-offs. This “third mission” of universities, going beyond teaching and research, is central to creating economic impact from scientific discoveries (Rubens et al., 2017). Successful innovation ecosystems, like those in Western Europe or the US, show how supportive policies, such as the Bayh-Dole Act, empower universities to patent and commercialize research outputs, serving as a model for North Macedonia.

Improving IP management and strengthening academia-industry collaboration through joint projects, contract research, and innovation hubs can enhance commercialization outcomes, yielding new enterprises, licensing revenues, and innovative solutions to regional challenges. A vibrant entrepreneurial ecosystem grounded in R&I also requires diverse funding pathways – from public research grants and incubator support to venture capital and bank financing to help ideas progress from labs to markets. Expanding these financial structures will enable more innovations to survive the critical transition between research and commercialization.

Finally, integrating digital and green transformations into the R&I agenda is both necessary and strategic for North Macedonia. The world faces twin transitions: the digital revolution, driving widespread adoption of technologies like AI, IoT, and Industry 4.0, and the green transition, which restructures energy, transport, and industry toward sustainability and climate neutrality (Bianchini et al., 2023). R&I is pivotal for advancing both transitions, from renewable energy and clean mobility to digital infrastructure and skills development.

Aligning with these trends is essential for the country, both to tackle pressing societal challenges and to integrate into EU frameworks. The EU's Green Deal targets climate neutrality by 2050, with the Western Balkans committed through the Green Agenda for the Western Balkans (Ignjatović et al., 2024). As an EU candidate country, North Macedonia has endorsed this agenda and is progressively aligning its energy, climate and environmental policies with EU Green Deal objectives (GNM, 2023). Similarly, the EU's Digital Agenda and Digital Decade initiatives promote digital innovation and infrastructure development across member and partner countries by 2030 (Eckert, 2024). Embracing these transitions will position North Macedonia as competitive and future-ready within the European innovation landscape.

2.3 Strategic Alignment with EU and National Policies

As the Republic of North Macedonia progresses toward EU membership, aligning its R&I efforts with EU and national policy frameworks is essential for maximizing impact, accessing support and partnerships, and most importantly, ensuring comparability and generalizability. Central to this alignment are Smart Specialisation Strategies (S3), Horizon Europe, the Green Agenda for the Western Balkans, and national innovation plans, which frame North Macedonia's integration into the European Research Area alongside other widening countries in the Western Balkans.

Smart Specialisation (S3) has emerged as one of the crucial tools for directing R&I investments into priority sectors where each country has competitive strengths. For North Macedonia, the Smart Specialisation Strategy, finalised in 2023, defines priority domains for the 2024–2027 period and provides a strategic framework for orienting public and private R&I investments (GNM, 2023; OECD, 2024b). There are four vertical and two horizontal priority domains: Smart agriculture and food with higher added value; Information and communication technologies (ICT); Electro-mechanical Industry – Industry 4.0; Sustainable materials and smart buildings; Energy for future and Tourism, as horizontal domains, have interrelatedness and cross-innovation with vertical ones. For North Macedonia's universities, this provides a clear basis for aligning curricula, research agendas and collaboration projects with S3 priority domains and EU policy directions.

Participation in Horizon Europe (2021–2027) is another key pillar of North Macedonia's R&I alignment with the EU. Through its association to Horizon Europe, North Macedonia can join EU research networks, access competitive funding and strengthen scientific excellence in areas such as climate, energy, health and digital innovation (Western Balkans Info Hub, 2023; GNM, 2023). At the same time, Horizon Europe's dedicated Widening Participation measures (e.g. Twinning, Teaming and Excellence Hubs) are particularly relevant for North Macedonia and its Western Balkan peers, as they build capacity, upgrade research management practices and link local institutions with top EU partners (Western Balkans Info Hub, 2023). National R&I strategies increasingly seek to leverage these instruments by encouraging HEIs and firms to participate in calls, setting co-funding mechanisms and strengthening support structures for project development and implementation.

The Green Agenda for the Western Balkans (GAWB) mirrors the EU's Green Deal, committing the region to carbon neutrality by 2050 and focusing on decarbonization, circular economy, sustainable agriculture, pollution reduction, and biodiversity (Ignjatović et al., 2024). North Macedonia has endorsed the Green Agenda and is gradually aligning its energy, climate and environmental policies with EU Green Deal objectives, creating demand for innovation in renewable energy, energy efficiency, low-carbon materials and sustainable technologies (GNM, 2023). This alignment also prepares Macedonian companies for EU markets by meeting environmental standards and opens pathways to EU initiatives such as Horizon Europe's Climate cluster and the Innovation Fund. Digital transformation is similarly integrated through

regional efforts like the Western Balkan Digital Agenda, enhancing connectivity, e-governance and support for ICT start-ups, with North Macedonia using these frameworks to guide investments in digital infrastructure and skills in line with the EU's Digital Decade goals (GNM, 2023).

Each country also has national strategies aimed at boosting innovation, and in North Macedonia the innovation policy framework focuses on improving the business climate, digital infrastructure and research excellence through instruments such as the Fund for Innovation and Technological Development (FITD), which as of 2025 is being reorganised into the Agency for Innovation, Scientific and Technological Development and Entrepreneurship (INOVA), and reforms in science, higher education and enterprise support (Fund for Innovation and Technological Development of North Macedonia, 2021; GNM, 2023). Complementary policy documents, including the SME Strategy 2025–2030 and the Growth Acceleration Plan 2022–2026, propose instruments such as credit guarantees, venture and hybrid funds, green finance and better access to EU facilities to crowd in private capital and diversify funding beyond grants (Ministry of Economy and Labour, 2024). Regional cooperation frameworks like the Berlin Process and the EU's Economic and Investment Plan (EIP) further support these efforts, with the EIP allocating €9 billion to stimulate connectivity, human capital and innovation across the Western Balkans, from which North Macedonia is a direct beneficiary (Kaca, 2021).

To sum up, strategic alignment with EU and national policies ensures policy coherence, resource efficiency, and deeper integration of North Macedonia's R&I system into European networks, greatly enhancing the prospects for building a robust entrepreneurial and innovation ecosystem in the country while situating it within the broader group of widening Western Balkan economies.

2.4 The Role of Universities in Implementation and Sustainability of the Strategy

Universities are central to research and innovation ecosystems, particularly in emerging economies like North Macedonia. Beyond their traditional missions of teaching and research, modern universities play a crucial “third mission” of economic and societal engagement, encompassing entrepreneurship, technology transfer, and regional development (Rubens et al., 2017).

First, universities must strengthen their role as knowledge hubs, producing research that translates into marketable products and services. Many universities in the region are establishing technology transfer offices, incubators, and innovation centres to facilitate this process (Radosavljevic et al., 2024; Chichevaliev et al., 2023). Pilot programs, such as startup accelerators, demonstrate growing momentum (Ćudić et al., 2021), though broader scaling is needed. Encouraging faculty entrepreneurship, integrating entrepreneurship training into curricula, and promoting industry-sponsored research are vital steps for universities to function as engines of innovation and economic development (Chichevaliev et al., 2023; Ramadani et al., 2023).

Second, universities are key to building human capital for the innovation economy. They train the next generation of entrepreneurs, engineers, and scientists. To support digital and green transitions, universities must equip students with skills in areas like information, communication and technology, artificial intelligence, climate science, and innovation management (Ordóñez de Pablos et al., 2023). However, gaps remain in aligning higher education programs with Smart Specialisation priorities and evolving market needs. Updating curricula, creating interdisciplinary programs in fields such as renewable energy or data science, and fostering partnerships with industry are crucial to ensure graduates are innovation ready. Additionally, universities should expand lifelong learning and reskilling programs to support workforce adaptation to technological change (Biney, 2023).

Third, universities serve as connectors within the innovation ecosystem, acting as anchors for collaboration between academia, industry, government, and civil society. In the Western Balkans, universities are increasingly participating in public-private innovation councils, EU-funded joint projects, and events like hackathons (Ramadani et al., 2023; Tekin et al., 2021). This shift from linear knowledge transfer to co-creation enables stakeholders to collaboratively define challenges and develop solutions. Universities also provide critical research infrastructure, such as labs, equipment and testing facilities, that startups and SMEs might otherwise lack (Cao et al., 2024; Ramadani et al., 2023). By opening these resources and facilitating partnerships, universities elevate technological capabilities across the ecosystem. Over time, such collaborations should evolve into permanent structures like joint R&D centres and innovation clusters.

Finally, ensuring the sustainability of the innovation strategy depends on embedding entrepreneurial activities into universities' core missions. Successful initiatives, like incubators or technology parks, can become lasting assets, attracting ongoing funding and talent. Universities that adopt supportive policies like rewarding innovation activities and integrating entrepreneurship into their institutional culture can drive continuous renewal and innovation (Cao et al., 2024). This cultural shift, already visible in growing student competitions and innovation labs, will help cultivate an entrepreneurial mindset among graduates.

Undisputably, universities in North Macedonia are pillars for building sustainable innovation ecosystems. Their contributions to research, talent development, and ecosystem connectivity are vital. With adequate support, funding, and strategic alignment to EU and national priorities, these institutions can become powerful engines of innovation, ensuring the entrepreneurial ecosystem's success and resilience in North Macedonia and the wider Western Balkans.

3. Strategic Vision and Objectives

Strategic positioning

In this context, the Center for Entrepreneurship and Innovation at the Faculty of Economics-Skopje at the University of St. Cyril and Methodius in Sekopje is positioned as one of the key connectors of the university R&I ecosystem—connecting the internal capacities of the University (faculties, institutes, laboratories, technology transfer offices, incubators/accelerators) with the government, industry, investors and society—and as a "one-stop-shop" that converts the priorities of national R&I strategic documents into functional paths (projects → prototypes → spinoff companies → market impact). Practically, the Center for Entrepreneurship and Innovation ensures the operationalization of this transformation, while CoARA provides the culture and rules that make the transformation sustainable (a system of incentives that values the valorization of knowledge, not just publication indicators).

The Center connects the university ecosystem with the quadruple helix system

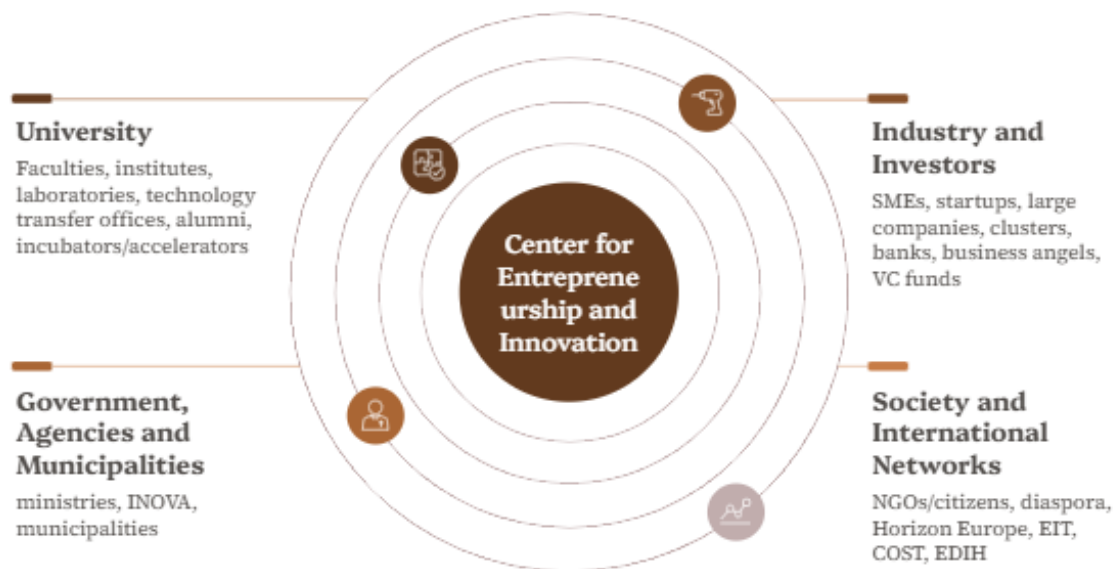


Figure 1. University Research and Innovation (R&I) Ecosystem

Vision

To develop a university research and innovation ecosystem—recognized nationally and internationally as the central connector that accelerates research excellence aligned with the Smart Specialization Strategy, transforms knowledge into innovation and enterprise, and delivers measurable economic, social, and environmental impact—supported by the CoARA principles—a consistent, fair, and transparent system of research evaluation that recognizes diverse academic and innovation outcomes.

Mission

To coordinate research, innovation and entrepreneurship at the University through integrated services and platforms for: development of research excellence, technology transfer and intellectual property (IP) management, development of innovations and their commercialization, creation and growth of startups and spinoffs companies.

This is done through the application of mechanisms of: Continuous multi-layered networking (government-industry-society-international partners) and Reform of assessment and incentives according to CoARA indicators for research quality, with recognition of diverse results (publications, data/software, prototypes, patents/licenses, research contracts, mentoring/team contribution, societal impact).

Strategic Objectives

The objectives directly respond to the challenges of the research and innovation (R&I) ecosystem (fragmentation, low level of knowledge and technology transfer, administrative barriers in intellectual property protection, weak support structures) and add CoARA quality indicators as an institutional mechanism that accelerates the transition to an entrepreneurial university and university research and innovation ecosystem

SO1: Research excellence

Aligned with the Strategy for smart specialization, research excellence and relevance (green/digital transformation), assessed with qualitative assessment and accountable indicators (CoARA).

SO2: Upgrading the research infrastructure

Upgrading and open access to research infrastructure through laboratories and other research centers as a service to companies for research, validation of concepts and demonstration of prototypes.

SO3: Development of young researchers, innovators and entrepreneurs

Integrating research and innovation competencies into teaching, research and extracurricular activities at all faculties in order to prepare young researchers, innovators and entrepreneurs.

SO4: Project support “from grant to impact”

Professionalizing the process “from grant to impact” for participation in Horizon Europe/COST/EUREKA), through strong project support (from idea and application for funding, through project management, up to concrete research results)

SO5: Systemic and long-term networking and partnerships

To establish a permanent structured system of partnerships and networking at local, national, regional, EU and global levels with the aim of continuous flow of knowledge, resources and opportunities for joint projects, commercialization and societal impact.

SO6: Integrated system for technology transfer and commercialization

To establish a functional and integrated system for technology transfer and commercialization with clear rules, transparent processes and appropriate incentives that will motivate researchers to actively participate in the valorization of knowledge.

SO7: Support in intellectual property (IP) management

To provide easy, understandable and reliable support for the protection of intellectual property through awareness-raising, expert advice and simplified procedures.

SO8: Establishing a financial path for commercialization

To establish a clear financial path from initial concept to growth (seed → scale) through appropriate instruments and partnerships that will support research, prototyping, market entry and preparation for investments in order to accelerate the commercialization of university innovations.

SO9: System for measuring and publicly reporting results and impact

To establish a transparent and CoARA-compliant system for monitoring, measuring and communicating results and impact, which will include balanced indicators for research excellence, open science, collaboration with industry, launched startups and spinoff companies, and publishes an annual public report on achievements.

4. Current State of the Entrepreneurial and R&I Ecosystem

4.1. Research and Innovation Capacity

Status of Academic and Research Institutions

The higher education sector is the principal performer of research nationally, confirming universities' pivotal role in knowledge creation and talent development (GNM, 2023). The system comprises 34 HEIs (end-2024), among which 13 public, 1 public-private, and 20 private universities. While private providers broaden access and program variety, public universities and the Macedonian Academy of Sciences and Arts (MASA) remain the core holders of research capacity and international scientific cooperation (GNM, 2023).

In recent years, internationalization has strengthened, with EU framework programs becoming an increasingly important channel for cooperation and funding. North Macedonia's association to Horizon Europe has expanded opportunities for collaborative projects, mobility, and alignment with EU missions. A concrete ecosystem milestone is the EIT Community RIS Hub (2023) at the UKIM Business Accelerator, designed to connect universities, firms and public actors with Europe's largest innovation network and to catalyze knowledge transfer (GNM, 2023).

At the same time, the institutional base faces structural constraints typical of widening contexts: fragmented and limited funding, uneven availability of modern laboratories, and a small research workforce relative to EU peers (GNM, 2023). The policy response set out in the Smart Specialisation Strategy of RNM 2024-2027 translates these challenges into concrete priorities, namely competitive research funding, upgrades of university laboratories, stronger researcher pipelines (PhDs, Industrial PhDs, PostDoc and researcher positions), and professionalized project-support offices, alongside clearer technology-transfer and IPR frameworks (GNM, 2023; OECD, 2024b). Complementary SME policy also emphasizes an enabling entrepreneurial ecosystem that can absorb and commercialize university-generated knowledge.

These conditions translate directly into priorities for a university-level R&I strategy: (i) consolidate disciplinary strengths within public universities; (ii) professionalize international project offices; (iii) leverage the EIT Hub and Horizon Europe for partnerships; and (iv) prioritize S3-aligned investments in people, laboratories and technology transfer (technology transfer offices (TTOs), incubation, and future science-and-technology-park linkages) to deepen HEIs' role as orchestrators of the national entrepreneurial and innovation ecosystem (GNM, 2023).

R&D Funding and Infrastructure

Public investment remains the backbone of North Macedonia's R&D system, with relatively low overall R&D intensity and a funding mix dominated by government and higher education, while business R&D is comparatively weak (GNM, 2023). According to the latest European Innovation Scoreboard (EIS) 2025, North Macedonia is classified as an Emerging Innovator, scoring 40% of the EU average and ranking 34th among the EU and neighboring countries, below the Emerging Innovators' mean of 46% (European Commission, 2025a). This structure constrains scale, continuity, and equipment renewal, and places universities at the center of grant capture and research infrastructure upgrading.

International programs partly offset domestic constraints by providing access to networks, infrastructure and thematic calls that are not available nationally. North Macedonia's association to Horizon Europe has opened broader consortia and thematic opportunities, with early participation improving relative to Horizon 2020. Complementary mechanisms - COST, EUREKA, CERN/IAEA cooperation, and EuroHPC (EuroCC/CASTIEL) access, strengthen research networks and provide routes to advanced facilities and e-infrastructure (GNM, 2023).

Nationally, the Fund for Innovation and Technology Development (FITD), established in 2013, was the pivotal innovation financier, anchoring grant and co-investment schemes for start-ups and firms. From 2025, FITD's functions will transition to the newly established Agency for Innovation, Scientific and Technological Development and Entrepreneurship (INOVA), implying a consolidation and upgrading of the institutional framework for innovation support.

The SME Strategy 2025-2030 and the Growth Acceleration Plan (2022–2026) propose complementary instruments, such as credit guarantees, venture and hybrid funds, green finance, and better access to EU facilities, to crowd in private capital and diversify funding beyond grants (Ministry of Economy and Labour, 2024). These policy lines matter for universities because they define co-funding levers for applied research, proof-of-concept, and spin-out growth.

Research infrastructure has seen incremental upgrades (competitive MES calls, laboratory and equipment funding), yet large gaps persist in modern labs, shared core facilities, and service-oriented RI that industry can use. The Smart Specialisation Strategy (S3) prioritizes upgrading university laboratories, establishing centers of excellence, a national technology transfer office, and science & technology park(s), and deploying innovation vouchers, competitive collaborative grants, and tax incentives to stimulate company R&D and academia–industry projects (GNM, 2023).

Innovation Performance and University–Industry Collaboration

North Macedonia remains an Emerging Innovator with gradual improvement in recent years. The EIS 2025 shows performance still below the EU average, with relative strengths in foreign doctorate students (as % of all), non-R&D innovation expenditures, and exports of medium- and high-tech products, and relative weaknesses in direct and indirect government support of business R&D, design applications, and venture capital expenditures (European Commission, 2025a). In parallel, the Global Innovation Index (GII) 2024 presents a mixed profile, comparatively stronger in infrastructure and business sophistication, weaker in human capital & research and creative outputs, underscoring the need to boost research excellence and knowledge valorization (WIPO, 2024). The OECD SME Policy Index 2022 recognizes advances in innovation policy instruments and internationalization, but stresses the need for a more systematic, targeted approach to business–academia collaboration and to entrepreneurial skills (OECD, 2022).

Commercialization and knowledge transfer remain nascent. Universities' TTO functions and spin-off pipelines are emerging but small-scale. National policy now prioritizes concrete enablers: the Smart Specialisation Strategy (S3) introduces a policy mix to (i) professionalize technology transfer (including a National Technology Transfer Office), (ii) finance centers of excellence, innovation hubs and science & technology park(s), and (iii) expand collaborative R&D instruments (competitive academia–industry grants, innovation vouchers, and tax incentives for firm–university projects), alongside industrial PhD pathways. The EIT Community RIS Hub at UKIM's Business Accelerator further strengthens links to European KICs and networks, creating a channel for market-oriented projects and talent circulation.

Implications for a university-level R&I strategy. (i) Prioritize S3-aligned collaboration platforms (innovation vouchers, collaborative R&D calls, industrial PhDs) and professionalized TTO/IP processes; (ii) set KPIs for contract research, spin-offs and patents; (iii) leverage the EIT Hub for EU-value-chain access; and (iv) integrate INOVA/SME-finance instruments to build proof-of-concept → seed → scale pathways for research-based ventures (GNM, 2023; Ministry of Economy and Labour, 2024).

Insights from USE IPM targeted EU partners' HEI R&I Strategy

Below are the key lessons learned from the project partners regarding effective Research & Innovation and entrepreneurship systems and strategies:

- **Ethics-by-design innovation pipeline (AIDA, France).** Embed ethics, human rights, inclusion, and eco-friendly practice as default criteria from ideation to scale-up. Use programme rules and mentoring to make responsible innovation a practical routine, not a slogan. This strengthens legitimacy with communities and improves real-world uptake of solutions.
- **Operational excellence for R&I delivery (PMO approach) (OCom, Italy).** Manage R&I support as a portfolio with standard workplans, risk management, and quality assurance checkpoints. Combine governance toolkits with digital enablement and continuous improvement to reduce fragmentation. The result is more predictable execution, better learning loops, and scalable support capacity.
- **Structured IP and technology transfer “playbooks” (SME4, Belgium).** Strengthen technology transfer through clear, repeatable processes: disclosure → screening → protection → licensing. Add practical templates and guidance so researchers and partners know exactly how to progress each case. This increases speed, consistency, and confidence in commercialization pathways.
- **Place-based innovation clusters with strong Academy-to-Business interfaces (ISPIM, United Kingdom).** Build collaboration through clusters that provide shared labs/testbeds and brokerage between academia and industry. Use clear A2B interfaces (contract research, industrial MSc/PhD, joint facilities) to turn needs into projects fast. This accelerates adoption and supports responsible/value-based regional innovation.
- **Systematic capacity-building and peer learning across the institution (IIE, Croatia).** Invest continuously in skills for proposal writing, project control, IP, and R&I operations for staff and researchers. Institutionalise peer-to-peer exchange so know-how moves across faculties and with external partners. This raises overall R&I maturity and reduces dependence on a few individuals.
- **R&I strategy anchored in openness and partnerships (UnivPM, Italy).** Make “open university” a research strategy by expanding national/international collaboration at institutional and researcher levels. Use partnerships to drive mobility, projects, and stronger positioning/visibility for the university. This widens opportunity pipelines while keeping research aligned to external needs.
- **Excellence + integration + responsibility as one R&I system (UnivPM, Italy).** Raise research quality through targeted incentives/investments while explicitly enabling interdisciplinary integration. Treat responsibility, sustainability, and ethics as an R&I performance dimension—alongside excellence. This creates coherence where quality, collaboration, and societal relevance reinforce each other.
- **End-to-end “knowledge-to-impact” architecture (UAlg, Portugal).** Link research capacity to impact by connecting research units, research support, and a strong transfer/entrepreneurship interface. Position the interface as the route from results to IP, partnerships, startups, and application outcomes. This makes commercialization and regional impact a designed pathway, not an ad-hoc event.
- **Entrepreneurship as an ecosystem (not a single program) (UAlg, Portugal).** Build entrepreneurship through multiple layers (infrastructure + programs + initiatives) so teams progress step-by-step. Combine incubation/acceleration with training and community activities to sustain deal flow and capability-building. This improves conversion from ideas to viable ventures and strengthens the innovation community.

4.2. Key Challenges in Widening Countries

Challenges from the Guidelines for policymakers

North Macedonia must first overcome several deeply embedded, systemic obstacles in order to create a contemporary, competitive economy. These obstacles, which were found through the research based on focused groups, the Delphi method, and needs analysis conducted in North Macedonia between September 2023 and November 2024 within the USE IPM project..

Soft Skills for Entrepreneurial Business

For young entrepreneurs entering a dynamic and fiercely competitive labour market, developing strong soft skills is crucial. People's ability to exhibit resilience, adaptability, and productive teamwork is still restricted by a number of interconnected problems.

- ***Soft skills are not sufficiently incorporated into formal education.*** There is little room for real-world communication exercises, emotional intelligence training, networking simulations, or conflict-resolution workshops in schools and universities because instruction is still very theoretical. Consequently, students graduate with domain knowledge but lack the interpersonal skills necessary for success in actual business settings.
- ***Inadequate leadership, problem-solving, and managerial skills.*** Many young professionals don't have practical experience setting priorities, managing teams, and making decisions. Interdisciplinary modules that reflect actual organizational challenges or link managerial skills with innovative thinking are uncommon in vocational and professional training programs.
- ***Limited critical thinking and risk-management culture.*** The education system does not consistently encourage analytical reasoning, scenario planning, or reflective evaluation. In workplaces, companies often avoid structured risk-assessment practices, discouraging employees from thinking critically or proposing creative alternatives.
- ***Innovation and creativity are still underappreciated.*** Instead of rewarding experimentation, traditional organizational cultures often mitigate and correct failure. This tests the entrepreneurial spirit required to investigate unique concepts, carry out iterative testing, and react quickly to shifts in the market.

Sustainability and Sustainability Reporting (ESG)

Companies in North Macedonia are unable to unlock the competitive advantages of sustainability due to a complex web of structural, financial, and cultural barriers that hinder the integration of ESG principles. The following issues highlight the crucial gaps.

- ***Inconsistent regulations and poor application of ESG standards.*** ESG adoption is still low, particularly in SMEs. Enforcement mechanisms are inadequate, and current national legislation only partially complies with EU directives. Instead of using domestic regulatory incentives, larger companies typically only comply when mandated by foreign parent companies.
- ***There are few awareness and knowledge gaps in the business sector.*** Instead of seeing sustainability reporting as a chance to boost resource efficiency, increase competitiveness, and build stakeholder trust, many businesses still see it as a financial or administrative burden. Transparency and accountability are hampered by this ignorance, which increases the possibility of greenwashing.

- ***Perceptions of high costs and financial obstacles.*** Digital reporting tools, green certification procedures, and sustainable technologies are frequently regarded as costly. It is particularly difficult for smaller businesses to set aside funds for data collection, environmental enhancements, and ESG reporting.
- ***Issues with governance and cultural resistance.*** Many organizations still put short-term financial results ahead of long-term sustainability objectives. Adoption is slowed down by organizational resistance to change and a lack of knowledge about the advantages of sustainability.
- ***Weak digital infrastructure and technological constraints.*** Businesses don't have access to digital systems and contemporary tools that could simplify ESG reporting and increase accuracy, like artificial intelligence (AI), data analytics, or automated reporting platforms.

Technology Transfer and Open Innovation

There is currently a significant gap between research and the market that threatens North Macedonia's potential for a dynamic innovation economy. Technology transfer is the exception rather than the rule in this fragmented ecosystem because the key players—businesses, governments, and universities—operate in silos. Key actors' lack of coordination and synergy. Universities, SMEs, corporations, and public institutions are all present, but interaction is still irregular and unstructured.

- ***The government's role is unclear, and public services are not fully digitalized.*** Stakeholders frequently believe that the government's support for innovation is erratic. Slow adoption of digital tools, corruption risks, and bureaucratic hold-ups erode trust and diminish the efficacy of support programs.
- ***Limited market orientation and inadequate technology transfer mechanisms.*** Companies hardly ever interact with research institutions, and a lot of innovations fail because they are not sufficiently tailored to the demands of the market. Businesses frequently prioritise local over international opportunities, which lowers the likelihood of technology commercialisation.
- ***Intellectual property (IP) processes are slow, expensive, and complicated.*** Rarely do entrepreneurs seek patents; instead, they rely on NDAs or trademarks. Innovators are deterred from formally protecting their ideas by a lack of knowledge, high administrative costs, and drawn-out legal procedures.
- ***Limited support for innovation, both financial and non-financial.*** Bureaucracy, inadequate distribution, or a lack of follow-up assistance frequently impede grants, tax incentives, and mentoring services. R&D advisory services and digital literacy are not routinely offered.

Innovation Process Management

Promising concepts frequently fail at critical stages, from funding and prototyping to market entry and scaling, not because they are unoriginal but rather due to structural inefficiencies that prevent implementation and growth. The following challenges hinder the entire process, from ideation to commercialization.

- ***Slow administrative processes and inefficient bureaucracy.*** Project implementation is delayed by complicated documentation requirements and sluggish decision-making procedures. Local governments frequently lack the resources to properly support innovation initiatives, which leads to dispersed strategies.

- ***Restricted availability of various financial products.*** Banks provide standardised products that don't meet the needs of impact-driven businesses or early-stage innovators. This limits market validation, prototyping, and experimentation.
- ***Cultural resistance and low public awareness.*** The general public, investors, and some policymakers continue to have a poor understanding of sustainable and socially responsible innovation. This slows the adoption of new solutions and diminishes support for mission-driven endeavors.
- ***Stakeholder collaboration is fragmented.*** There is a lack of coordination between businesses, accelerators, local government, and academia, which leads to redundant projects and wasteful resource use. Expert networks and university labs are still underutilized.
- ***Obstacles to commercialization and knowledge transfer.*** Lack of support for testing, proof-of-concept development, and market entry frequently prevents innovations from moving past the prototype stage. Industry partnerships and organized mentorship are often absent from academic spin-offs.
- ***An imbalance in ecosystem support.*** Hardware and manufacturing innovations lack sufficient incubation or scaling support because ecosystem actors typically concentrate on software start-ups.

Upgraded and/or drafted national or HEI R&I Strategy;

The implementation and success of North Macedonia's strategic objectives, including Smart Specialisation, are directly threatened by the systemic problems that the country's entrepreneurship ecosystem is currently facing. A comprehensive and coordinated approach that concurrently addresses funding, human capital, business competitiveness, regulatory modernisation, and the fundamental governance required to direct the strategy is necessary to build a cohesive ecosystem.

The ensuing sections describe this vicious cycle in detail, dissecting the interrelated problems of an outdated funding model, crucial underinvestment in R&D, structural obstacles for researchers, and a disjointed innovation environment that together impede North Macedonia's potential for intelligent and sustainable economic growth.

- ***A Fragmented and Underfunded R&I Ecosystem.*** A fundamental disconnect is created by the extremely low R&D investment (0.38% of GDP) and the absence of systematic cooperation between businesses, research institutions, and academia (the "triple helix"). The Entrepreneurial Discovery Process (EDP), the foundation of S3, is directly hampered by this. Academic research is not informed by the practical needs of businesses, and valuable knowledge from universities fails to transfer to the market in the absence of strong linkages. Potential areas of smart specialisation are underdeveloped because promising ideas and research lack the institutional support to be commercialised due to the lack of efficient technology transfer offices and innovation hubs.
- ***An Obsolete and Counterproductive Funding Model for Higher Education and R&I.*** A severely underfunded and misaligned incentive structure is at the heart of the issue. It is commonly acknowledged that the current higher education funding model is "outdated, overly rigid, and ineffective in incentivizing innovation or long-term planning" (Republic of North Macedonia, 2023). The national R&D expenditure of less than 0.4% of GDP, which is significantly lower than the EU average of 2.3% (Eurostat, 2024; as also highlighted in the S3-MK document), exacerbates this. The business sector's contribution to R&D (BERD) is extremely low and declining, and universities lack the resources for strategic research as a result of this ongoing underinvestment (Republic of North Macedonia, 2024). The S3-MK confirms that the restrictive, performance-based allocation system fails

to drive quality, necessitating a comprehensive reform towards a results-oriented and transparent model to foster a dynamic R&I ecosystem.

- ***Systemic Barriers for Researchers and the Academic "Brain Drain"*** Human capital is directly impacted by the funding crisis. Academic staff members' engagement in research is severely limited by their heavy teaching and administrative workloads, as well as their lack of training in scientific writing and project development (Republic of North Macedonia, 2018). This is confirmed by the S3-MK, which highlights the absence of institutional mechanisms to ensure dedicated research time, which are typical in European systems. This environment stifles scientific productivity and erodes international cooperation, especially when combined with restricted access to databases, modern research infrastructure, and committed funding. The emigration of professional employees, or "brain drain," is a direct result that is specifically mentioned in the S3-MK. This depletes the nation's core of highly qualified researchers and innovators, further undermining the R&I base.
- ***A Disconnected Innovation Ecosystem and Lagging Performance.*** Poor national innovation outcomes are a direct result of the shortcomings in the research and higher education systems. North Macedonia is classified as a "Emerging Innovator" on the European Innovation Scoreboard due to its performance being only 40% of the EU average (European Commission, 2025a). This lag is especially noticeable in low patent activity, low business R&D spending, and poor new technology commercialization (Ibid.). A detailed picture of this problem is given by the S3-MK, which emphasizes a serious lack of organized collaboration and knowledge sharing between academic institutions, research centres, and the commercial sector. Due to this disjointed "triple helix," businesses do not profit from academic expertise and research is rarely commercialized, which causes the nation to lag behind regional rivals.
- ***Low Innovation Capacity of SMEs and an Unsupportive Environment.*** The last issue appears in the business sector, especially in SMEs. According to the S3-MK analysis, SMEs lack the scale, expertise, and financial resources necessary to invest in R&D and adopt new technologies. Instead of creating innovative, branded products, they frequently concentrate on low-value production and outsourcing. An antiquated and complicated regulatory framework that does not promote innovation, circular economy principles, or green growth makes this worse. Businesses are further cut off from the information and resources required to innovate and compete globally due to the absence of strong institutional support platforms, such as technology transfer offices and innovation hubs (as mentioned in the S3-MK).

5. Key Pillars of the R&I Strategy

A comprehensive approach to research and innovation excellence, designed to strengthen the ecosystem through focused strategic priorities and cross-cutting reforms

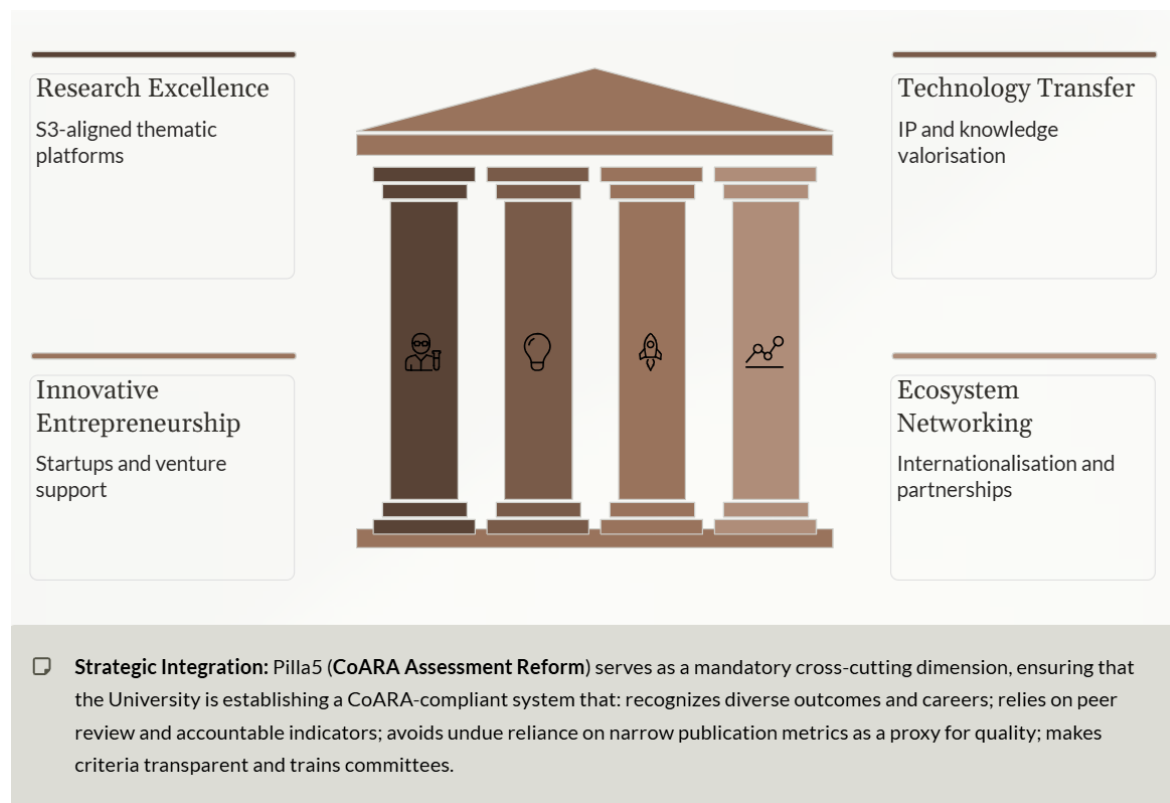


Figure 2. Strategic Framework: Five pillars of the R&I strategy

5.1 Pilar 1 – Research Excellence and Alignment with Smart Specialisation Areas

Purpose: Strengthening excellence in the domains of the Smart Specialisation Strategy, Research Human Resource Development, Research Centres and Internationalisation.

CoARA integration: “excellence” is demonstrated through qualitative assessment and narrative evidence of contribution/impact, supported by qualitative indicators.

Programmes/actions:

- **Development of human resources for research and development:** support for PhDs, Industrial PhDs and Postdoctoral positions (PostDoc), with organised stays and cooperation with companies/public sector for practical experience in priority S3 areas. Industrial PhDs and postdoctoral positions are developed with joint supervision of academic and industrial supervisors, and doctoral schools include modules on innovation, entrepreneurship and research project management to strengthen the career and employability of researchers.

- **Modernization of research infrastructure and open access:** upgrading laboratories and equipment and establishing “common access” to the infrastructure through a clear service model and a catalogue of services for SMEs, start-ups and large companies. Laboratories and e-infrastructure are organized as shared services with transparent access rules and clearly defined Service-Level Agreements (SLAs), so that both university teams and SMEs can count on predictable conditions for the use of equipment, data and expertise.
- **Applied research for green and digital transformation:** development of research and development projects oriented towards practical solutions, prototypes, testing and pilot demonstrations in areas related to energy efficiency, sustainability, digitalization and technological modernization. In each selected priority area, lighthouse research programmes are established, co-defined with external partners and updated annually through thematic challenges (challenge briefs), ensuring that the topics remain demand-oriented and aligned with market and policy priorities. The portfolio is balanced between basic, applied and interdisciplinary projects.
- **Internationalisation of research and integration into European networks:** systemic support for participation in Horizon Europe, COST and EUREKA and involvement in European research infrastructures and consortia through partnerships, mobility and joint projects.
- **CoARA-compliant tools for assessing and stimulating research:** introduction of narrative CV, discipline-specific criteria and recognition of open science results such as; data, software, open innovation, mentoring, knowledge and technology transfer, innovation, commercialisation and societal impact.

5.2 Pilar 2 – Technology Transfer, Intellectual Property (IP) and Knowledge Valorization

Purpose: Strengthening commercialization by professionalizing processes and reducing IP barriers.

CoARA integration: patents/licenses, prototypes, standards, industrial contracts are treated as legitimate results in the assessment (not "second tier" to papers).

Programs/actions:

- **Technology Transfer Office within:** establishing a "one-stop-shop" through which companies, researchers and investors will receive information, guidance and full support for collaboration, contractual research, IP procedures, licensing and spin-off formation. Technology Transfer Offices function as the main entry point ("front door") for all valorization activities, offering IP clinics, model contracts (NDA, MTA, license and option agreements) and standard rules for revenue sharing and equity participation for founders and faculties. A Standing IP Committee makes decisions on protection, ownership and path to market within set deadlines and manages potential conflicts of interest.
- **Simplifying intellectual property management:** providing practical advice and step-by-step support for the protection and management of intellectual property, with ready-made templates, as well as measures to reduce costs and duration of procedures. The valorisation path starts with a formal notification of the result by the researcher, followed by a rapid assessment of novelty and freedom-to-operate, combined with a short market screening for potential users and value paths. On this basis, an IP decision is made – whether to protect the result (patent/utility model), treat it as know-how or follow open access – and the appropriate path to market (license or spin-off) is defined.

- **Instruments for encouraging academia-industry cooperation:** activating and using measures such as innovation vouchers, collaborative grants and industrial PhDs for joint R&I projects, and accelerated commercialization of solutions.

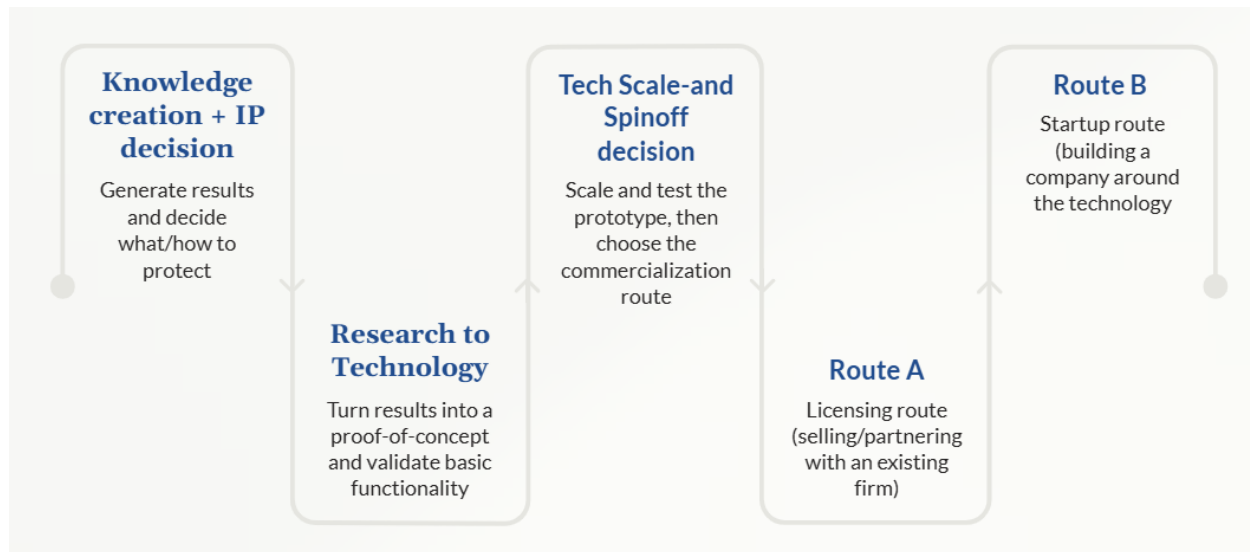


Figure 3. “Research-to-market” pathway

5.3 Pillar 3 – Development of highly innovative entrepreneurship

Purpose: creating a pipeline for knowledge-based companies that attract funding and scale to global markets.

CoARA integration: mentoring, entrepreneurial education, team development and the creation of spinoffs and start-ups are recognized as academic/institutional contributions.

Programs/actions:

- **Entrepreneurial path from idea to growth:** establishing a clear process with phases of idea generation and verification → pre-incubation and concept development → incubation and product/service development → acceleration and market entry → scaling and internationalization with specific criteria and support at each stage.
- **Mentoring system and programs with alumni and diaspora:** establishing a base of mentors (entrepreneurs, industry experts, investors), organized mentoring sessions as well as a structured “bridge with the diaspora” for access to international markets, knowledge and contacts. Clearly defined cohorts, milestones and criteria for team advancement are established. Partnerships are established with regional accelerators and relevant EIT Knowledge & Innovation Communities (KICs) to help validated teams refine their business model, secure early customers and prepare for investor presentations.
- **Investment readiness and connection to financial instruments:** development of an investment readiness program and systematic connection to grants, banks, business angels and VR funds. Co-investment frameworks are established with angel networks, VC funds and international financial institutions, using standard instruments (e.g. convertible notes) and structured “investment-readiness coaching”.

- **SME Academy (executive education)**, offers micro-credentials in areas such as finance, export, digital and green skills, and conducts applied clinics through which the most promising SME initiatives are directed towards lab vouchers and PoC calls.

5.4 Pilar 4 – Ecosystem Networking and Internationalization

Purpose: The Center for Entrepreneurship and Innovation is permanently connected at all levels and becomes a practical coordination node.

CoARA integration: cooperation and social engagement are recognized as results with clear evidence and criteria.

Programs/actions:

- **Advisory Board with the quadruple helix system:** establishment of a council composed of representatives of the University, the business sector, public institutions and civil society, which will co-define priorities, propose thematic challenges and monitor the progress of the Center through regular meetings and clear recommendations.
- **Formal partnerships with key institutions and intermediaries:** conclusion of memoranda and operational protocols for cooperation with ministries/agencies, municipalities and regional bodies, as well as with chambers of commerce and industrial clusters, for the implementation of joint projects, pilot solutions, contract research and programs to support innovation in companies.
- **EU integration through European programs: systemic:** support for participation in Horizon Europe and use of the EIT (European Institute of Innovation and Technology) and its communities/accelerator networks. access to partnerships, expertise, funding and faster development of market-oriented innovation projects.

5.5 Pilar 5 – CoARA reform for qualitative assessment and indicators for measuring the impact of the Center

Purpose: To ensure that all priorities work in practice, the University establishes a CoARA-compliant assessment system that combines qualitative evidence + responsible metrics, recognizing diverse R&I contributions and measuring UEIC impact transparently.

- **CoARA assessment policy + rubrics:** Adopt UEIC-wide evaluation rules that prioritize quality, integrity, openness, collaboration and impact (not “where published”), with discipline-sensitive rubrics for research, TT/IP, entrepreneurship and societal engagement.
- **Narrative evidence:** Introduce standardized short formats—Impact Case, Innovation Case, Collaboration Case—with contribution statements (team roles) and supporting evidence (links, prototypes, partner proof).
- **Balanced CoARA KPI set:** Implement a scorecard that tracks capacity → process quality → outputs → outcomes/impact (e.g., PoCs/prototypes, datasets/software, disclosures/licenses, adoption, jobs, policy uptake), while avoiding JIF/h-index as decision rules.
- **Open Science & integrity integration:** Make DMPs, open access, data/code sharing (where feasible), ethics and governance checks part of the evidence base and value open outputs as first-class results.

- **Stakeholder-validated impact:** Collect external validation (partner letters, pilots, adoption evidence) and run an annual partner value/satisfaction survey, using a Quadruple-Helix lens for selected flagship cases.
- **Incentives + digital dashboard + annual reporting:** Align internal rewards with CoARA (mini-grants/recognition for mentoring, TT and engagement), support evidence collection via a digital dashboard/evidence hub, and publish an annual UEIC Impact Report combining KPIs and verified impact stories.

6. Implementation Framework

In a widening/low-resource context—characterised by fragmented financing, limited modern infrastructure, and a relatively small research workforce—these enablers are not “add-ons”, but the core conditions for delivery at scale.

Governance

A robust governance set-up ensures decisions are fast, transparent, and aligned with national priorities and stakeholder needs, while protecting academic integrity and public value. The governance model should be built around three complementary layers:

(1) Strategic steering. The Center for Entrepreneurship and Innovation is positioned as a key connector of the university R&I ecosystem, linking internal capacities (faculties, institutes, labs, TTOs, incubators/accelerators) with government, industry, investors and society, and converting national priorities into implementable pathways.

(2) Ecosystem accountability. A Quadruple-helix Advisory Board composed of the university, business sector, public institutions and civil society should co-define priorities, propose thematic challenges and review progress through regular meetings and recommendations.

(3) Operational governance. To reduce fragmentation and bureaucracy, operations should be managed as a portfolio (PMO logic) and supported through clear “playbooks” for technology transfer and IP—disclosure → screening → protection → licensing/spin-off—backed by templates and set decision deadlines.

National R&I Strategy Alignment

The Strategy must remain tightly aligned with the Smart Specialisation Strategy 2024–2027, national innovation instruments, and EU integration pathways. This alignment is an implementation enabler because it: Creates a clear investment logic (priority domains, infrastructure upgrades, human capital pipelines, technology transfer frameworks); Improves access to EU programmes and Widening instruments (e.g., Horizon Europe, COST, EUREKA) and strengthens international networks and mobility; and Enables “blended finance” pathways by linking university projects to national instruments and reforms (e.g., the transition from FITD functions to the new INOVA agency; and SME-oriented instruments such as credit guarantees, venture/hybrid funds, and green finance).

Universities

Universities are the primary national performers of research and therefore the key delivery platform for this Strategy. The university-level enablers focus on *institutional capacity*, not only individual excellence: Professionalized project support (“grant-to-impact”). A strengthened project support function is essential for increasing participation and success in Horizon Europe and similar programmes; Open and service-oriented research infrastructure. Upgrading labs and equipment and organizing them as shared services (catalogue of services, clear access rules, service-level agreements) makes infrastructure usable for SMEs and partners and accelerates validation and prototyping; Functional technology transfer interface. The Strategy’s “one-stop-shop” logic—support for collaboration, contract research, IP procedures,

licensing, and spin-off formation—reduces barriers and increases conversion from research to impact; Human capital pipelines (PhDs/Industrial PhDs/PostDocs) linked to S3 needs. Joint supervision with industry and modules on innovation/entrepreneurship/project management increase employability and strengthen academia–industry linkages.

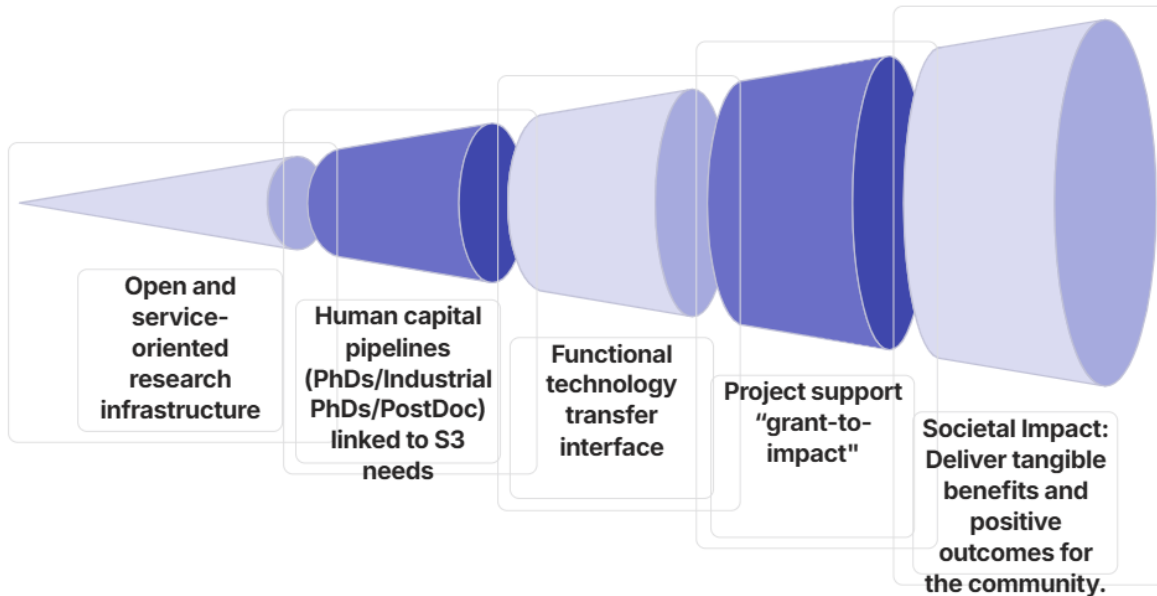


Figure 4. University-Level R&I ecosystem (internal ecosystem)

Cultural Change

In widening contexts, “culture” is often the hidden constraint that prevents good initiatives from scaling. Implementation therefore requires intentional cultural change, anchored in incentives and routines: CoARA-based incentives that treat prototypes, patents, licenses, data/software outputs, mentoring, and societal engagement as legitimate outcomes—reducing the “publication-only” logic and making valorisation a normal academic behaviour; Institutionalised peer learning and capacity building across faculties (proposal writing, project control, IP, R&I operations), so know-how spreads beyond a few individuals and becomes a shared capability; Ethics-by-design and responsibility embedded as default criteria in the innovation pipeline (inclusion, eco-friendly practice, legitimacy with communities).

International Orientation

International orientation is a practical enabler—bringing partnerships, funding, benchmarks, and talent circulation that compensate for limited domestic resources. Key mechanisms include: Systemic support for Horizon Europe/COST/EUREKA participation and structured partnership building at institutional and researcher levels; Leveraging concrete ecosystem assets such as the EIT Community RIS Hub at UKIM’s Business Accelerator to connect with Europe’s innovation networks and catalyse knowledge transfer; Diaspora and alumni bridges for mentoring, market access, and investor networks, linked to the idea-to-growth entrepreneurial pathway.

Stakeholders Communication

Strategic communication should therefore: Use the Advisory Board as a permanent feedback loop and legitimacy mechanism; Translate strategy into clear “front door” entry points (TTO services, IP clinics, model contracts, innovation vouchers/collaborative calls) that external stakeholders can easily use; Publish

an annual public report on achievements and impact, based on transparent KPIs (projects, PoCs/prototypes, start-ups/spin-offs), strengthening accountability and stakeholder confidence.

Digital Transformation

Digital transformation is both a strategic priority and a delivery method. The implementation framework should include: Digitised workflows for project pipeline management, partner onboarding, and portfolio oversight (PMO approach), reducing administrative burden and enabling quality assurance and learning loops; Digital enablement of open science and CoARA evidence (narrative CVs, repositories for data/software, dashboards for KPIs and outcomes); Support for S3-aligned digital innovation domains (e.g., ICT, Industry 4.0), while ensuring the Center functions as the operational node that turns priorities into implementable projects and services.

Green Transformation

Green transformation must be embedded across research priorities, commercialization pathways, and stakeholder engagement, especially given the region’s commitment to decarbonisation and the need for innovation in energy efficiency, sustainable materials, and circular solutions. Implementation should: Prioritize applied R&D and pilot demonstrations in sustainability-relevant areas and maintain demand-oriented portfolios updated through thematic challenges co-defined with external partners; Strengthen green finance and other instruments that support proof-of-concept and scale-up pathways, linked to national SME policy instruments; Treat sustainability, responsibility, and ethics as performance dimensions in R&I, reinforcing legitimacy and long-term impact.

7. Expected Outcomes and Impact

The R&I strategy is designed to deliver measurable change in a *low-to-moderate R&I intensity* (“widening”) context, where North Macedonia remains below the EU target for R&D investment and faces systemic constraints in funding continuity, infrastructure renewal, and commercialization pathways. In this setting, **the University and its R&I centers are positioned as the “anchor” and central connector of the national ecosystem**, bridging internal capacities (faculties, institutes, laboratories, TTOs, incubators/accelerators) with government, industry, investors, and society—operationalized through the UEIC as a one-stop shop translating national priorities into “projects → prototypes → spin-offs → market impact.”

7.1 Expected outcomes

Outcome 1: Stronger S3-aligned research excellence and relevance (green/digital focus). UEIC-supported thematic platforms will increase the quality and usefulness of research in Smart Specialisation (S3) priority domains, including green and digital transformation topics. This shifts the system from fragmented project activity to a portfolio that is strategically coherent, internationally benchmarked, and aligned with EU missions and market needs.

Outcome 2: Upgraded, shared research infrastructure (“labs-as-a-service”). Improved laboratories and research centers—opened through shared access and service models—will directly address uneven infrastructure availability and enable validation/demonstration of prototypes with companies. This also strengthens the University’s role as a national infrastructure provider, particularly relevant where public and higher education funding dominates R&D and business R&D remains comparatively weak.

Outcome 3: A stronger talent pipeline of researchers, innovators, and entrepreneurs. By integrating R&I competencies across teaching, research, and extracurricular tracks, UEIC will grow a university-wide “pipeline” of young researchers and founders, including stronger links to S3 priorities and intersectoral exposure. This responds to constraints in human capital formation within widening contexts and supports retention of skilled labour through higher-value opportunities.

Outcome 4: A professional “grant-to-impact” pathway and higher participation in EU programs. UEIC will professionalize the end-to-end process from opportunity identification and proposal development to delivery and exploitation of results, increasing participation in **Horizon Europe / COST / EUREKA** and improving implementation quality. This is crucial because international programs can partially offset domestic constraints by providing networks, infrastructure access, and mission-oriented calls.

Outcome 5: Institutionalized multi-level networking and durable partnerships (Quadruple Helix). UEIC will build a permanent partnership system across local–national–regional–EU–global levels, enabling continuous flows of knowledge, resources, and collaboration opportunities. The expected result is a shift from ad-hoc cooperation to structured co-creation—addressing the recognized weakness of academia–industry links and enabling ecosystem-wide learning loops.

Outcome 6: A functional technology transfer and commercialization system (TTO + clear incentives). UEIC will implement an integrated framework for technology transfer and commercialization (including contract research, licensing, and spin-offs), supported by transparent rules and incentives that motivate researchers to engage in knowledge valorisation. This directly targets a core regional bottleneck: weak co-creation with industry and low commercialization outcomes.

Outcome 7: Easier, more reliable IP support and stronger “commercialization readiness.” Through awareness, expert advice, and simplified procedures, UEIC will reduce perceived barriers to IP protection and strengthen the bridge from research outputs to market applications. This aligns with the strategic need to improve mechanisms that translate research into applications (IP rights, TTOs, incubators, industry partnerships).

Outcome 8: A clearer finance pathway: concept → seed → scale. UEIC will establish a structured financial path—from early proof/validation toward growth—through instruments and partnerships that support prototyping, market entry, and investment readiness. This directly mitigates the ecosystem bottleneck of limited early-stage capital and weak “smart money” availability for scaling innovations.

Outcome 9: CoARA-aligned performance and impact measurement with annual public reporting. UEIC will implement a transparent system for monitoring and communicating results, using balanced indicators that recognize diverse outputs (including prototypes, data/software, patents/licenses, contracts, mentoring, and societal impact)—and publish an annual public impact report.

7.2 Expected impact

Economic impact. Stronger R&I capacity, better technology transfer, and more spin-offs translate into productivity, competitiveness, and job creation—consistent with the role of R&I as a driver of growth in entrepreneurial ecosystems. The University’s “labs-as-a-service” and contract research pipelines also expand SMEs’ innovation capabilities, helping firms move up the value chain.

Societal impact. UEIC’s partnership model enables challenge-driven R&I with government, civil society, and communities, turning research into solutions for national priorities and improving talent retention by creating higher-value opportunities domestically.

Environmental and digital transformation impact. With green and digital transitions embedded in priorities, UEIC will catalyze applied research and innovation that supports decarbonization and digital modernization aligned with EU frameworks and regional agendas.

8. Conclusion and Recommendations

8.1. Summary of key strategic priorities

This Strategy positions the University Entrepreneurship and Innovation Center (UEIC) as the *central connector* of the university R&I ecosystem—linking internal capacities (faculties, institutes, labs,

TTOs, incubators/accelerators) with government, industry, investors and society, and converting national priorities into implementable pathways.

In a widening/low-resource context, where fragmented financing, limited modern infrastructure and a relatively small research workforce constrain continuity and scaling, the Strategy treats implementation enablers as “core conditions”, not add-ons. Across the Strategy, five priority directions define how UEIC operationalizes the “entrepreneurial university” model:

1. **Governance and portfolio delivery:** a three-layer governance model - strategic steering, ecosystem accountability via a Quadruple-Helix Advisory Board, and operational governance using PMO logic and playbooks for TT/IP processes with templates and deadlines—reduces fragmentation and accelerates decisions while protecting public value.
2. **Tight national and EU alignment:** the Strategy remains anchored in the Smart Specialisation Strategy (S3) and EU integration pathways, using them to structure investment logic (domains, infrastructure, human-capital pipelines, TT frameworks), widen access to EU programmes (Horizon Europe/COST/EUREKA), and enable blended finance routes by linking university projects to national reforms and instruments (including the transition from FITD functions to INOVA and SME-oriented finance instruments).
3. **University capacity that converts research to impact:** professionalized “grant-to-impact” project support, open/service-oriented labs (“labs-as-a-service”), a functional technology transfer interface (“one-stop-shop”), and human capital pipelines (PhD/Industrial PhD/PostDoc) linked to S3 needs.
4. **Networking and international orientation as a permanent capability:** structured partnership-building and systemic participation in EU instruments (Horizon Europe/COST/EUREKA), leveraging ecosystem assets like the EIT Community RIS Hub at UKIM’s Business Accelerator, and activating diaspora/alumni bridges for mentoring, market access and investor networks.
5. **CoARA-aligned performance and impact measurement:** balanced indicators that recognize diverse outputs (prototypes, data/software, patents/licenses, mentoring and societal engagement) and annual public impact reporting to strengthen accountability, trust and learning loops.

8.2. Next steps for implementation and policy adoption

To move from strategy to routine practice, implementation should progress in three reinforcing tracks:

(A) Institutional adoption and governance activation. First, formalize UEIC’s coordinating mandate through the governance layers: deploy the Strategic Steering function to translate S3 priorities into annual portfolios; convene the Quadruple-Helix Advisory Board as a standing mechanism to co-define thematic challenges and review progress; and implement PMO-style operational management supported by TT/IP playbooks and templates (e.g., disclosure → screening → protection → licensing/spin-off) with defined decision deadlines.

(B) Operational “front door” services for stakeholders. In parallel, convert the Strategy into a clear, usable service offer for external partners. Strategic communication should create recognizable entry points (TTO services, IP clinics, model contracts, innovation vouchers/collaborative calls), while the Advisory Board provides a permanent feedback loop and legitimacy mechanism.

This “front door” approach is critical for making the University’s ecosystem role visible and practical for ministries, municipalities, SMEs, clusters, investors and civil society partners.

(C) Policy alignment and funding pathways. Finally, embed national/EU alignment into implementation mechanics: structure calls, labs, human-capital actions and TT instruments around S3 logic; scale participation in Horizon/COST/EUREKA; and build blended finance pathways by connecting university pipelines to national instruments and reforms (including INOVA and SME finance tools), so promising results can move from PoC to market entry and scaling.

8.3. Recommendations for long-term sustainability and EU integration

1. **Institutionalize culture and incentives (CoARA in practice).** Treat valorisation and societal engagement as “normal academic behaviour” by embedding CoARA-based incentives that recognize prototypes, patents/licenses, data/software outputs, mentoring and engagement—reducing a publication-only logic.
2. **Sustain the UEIC operating model with diversified resources.** Ensure stable core capacity (project support, TTO/IP, lab services, portfolio management) that can survive funding volatility typical for widening contexts.
3. **Make infrastructure usable for the economy (“labs-as-a-service”).** Treat labs and equipment as shared services with clear access rules and service-level agreements so SMEs can validate, prototype and co-develop with the University.
4. **Lock in EU integration through networks, not only projects.** Systematically leverage Horizon Europe/COST/EUREKA and connect via ecosystem assets such as the EIT Community RIS Hub to access KIC networks, expertise and market-oriented partnerships; reinforce this through diaspora/alumni bridges for mentoring and investor access.
5. **Digitize delivery and evidence.** Implement digitized workflows for pipeline management and portfolio oversight, and enable open-science/CoARA evidence through repositories and KPI dashboards—reducing administrative burden while improving quality assurance and learning.
6. **Embed green transition across priorities and commercialization.** Prioritize applied R&D and pilot demonstrations in sustainability-relevant areas, strengthen green finance links for PoC and scale-up, and treat sustainability/ethics as performance dimensions reinforcing legitimacy and long-term impact.
7. **Maintain transparency and public trust with annual impact reporting.** Publish an annual public report based on transparent, balanced KPIs (projects, PoCs/prototypes, start-ups/spin-offs and broader CoARA-recognized outputs), demonstrating the University’s anchor role in the national ecosystem and improving stakeholder confidence.

9. References

- Bianchini, S., Damoli, G., & Ghisetti, C. (2023). The environmental effects of the “twin” green and digital transition in European regions. *Environmental and Resource Economics*, 84(4), 877-918.
- Biney, I. K. (2023). Adult education and entrepreneurship: getting young adults involved. *Journal of Innovation and Entrepreneurship*, 12(1), 13.
- Burrell, R., Jee, S. J., Hötte, K., & Ring, C. (2023). Intellectual property rights, climate technology transfer and innovation in developing countries. *INET Oxford Working Paper*.
- Cao, Z., Verreynne, M. L., & de Oliveira, R. T. (2024). Reflecting back and looking forward: A systematic literature review of SME–university collaborations. *International Journal of Management Reviews*.
- Chichevaliev, S., Debarliev, S., & Iliev, A. J. (2023). How is social entrepreneurship pursuing the path of development? Regional perspectives in the Western Balkans. In *Entrepreneurship Development in the Balkans: Perspective from Diverse Contexts* (pp. 33-68). Emerald Publishing Limited.
- Cingolani, M. (2025). Promoting SME innovation in the Western Balkans. In *Innovation in Capitalist Economies* (pp. 48-61). Routledge.
- Ćudić, B., Klemenčić, M., & Milošević, M. (2021, June). Start-Up Community and the Acceleration Services in the Danube Macro-Region: Cases of Austria, Bosnia and Herzegovina, Hungary and Slovenia. In *International*

- Conference of Experimental and Numerical Investigations and New Technologies* (pp. 275-298). Cham: Springer International Publishing.
- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). (2021). *The Western Balkans Startup Ecosystem Report: Assessment and Development Roadmap*. <https://wbc-rti.info/object/document/23888.html>.
 - Eckert, D. (2024). A Digital Agenda. In *40 Years of European Digital Policies: Forgotten Lessons*. 97-114. Cham: Springer Nature Switzerland.
 - European Commission. (2025a). *European Innovation Scoreboard 2025: North Macedonia—Country profile*. Brussels: DG Research & Innovation, available at: https://ec.europa.eu/assets/rtd/eis/2025/ec_rtd_eis-country-profile-mk.pdf
 - European Commission. (2025a). *European Innovation Scoreboard 2025: Country Profile North Macedonia*. [online] Available at: https://ec.europa.eu/assets/rtd/eis/2025/ec_rtd_eis-country-profile-mk.pdf [Accessed 15 October 2025].
 - European Commission. (2025b). *European Innovation Scoreboard 2024: Croatia—Country profile*. Brussels: DG Research & Innovation, available at: https://ec.europa.eu/assets/rtd/eis/2025/ec_rtd_eis-country-profile-hr.pdf
 - Eurostat. (2024). *R&D expenditure*. [online] Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=R%26D_expenditure [Accessed 15 October 2025].
 - Fayyaz, A., & Bartha, Z. (2025). Research and development as a driver of innovation and economic growth; case of developing economies. *Journal of Social and Economic Development*, 1-21.
 - Fund for Innovation and Technological Development of North Macedonia. (2021). *Law on Innovation Activity*. <https://fitr.mk/wp-content/uploads/2021/11/Law-on-Innovation-Activity.pdf>.
 - Gashi Ahmeti, H., & Fetaj, B. (2021). Determinants of Financing Obstacles of SMEs in Western Balkans. *Management dynamics in the knowledge economy*, 9(3).
 - Government of North Macedonia (GNM). (2023). *Smart Specialisation Strategy of the Republic of North Macedonia 2024–2027 (S3-MK)*. Skopje: Ministry of Education and Science, available at: <https://mon.gov.mk/stored/document/Draft%20S3%20MK.pdf>
 - Government of North Macedonia (GNM). (2025). *Национална развојна стратегија 2024–2044* [National Development Strategy 2024–2044]. Skopje: General Secretariat of the Government, available at: https://www.nrs.mk/content/NDS%206.11.2024_EN.pdf
 - Huang, Y., Li, P., Bu, Y., & Zhao, G. (2023). What entrepreneurial ecosystem elements promote sustainable entrepreneurship?. *Journal of Cleaner Production*, 422, 138459.
 - Ignjatović, J., Filipović, S., & Radovanović, M. (2024). Challenges of the green transition for the recovery of the Western Balkans. *Energy, Sustainability and Society*, 14(1), 2.
 - Kaca, E. (2021). The EU Economic and Investment Plan for the Eastern Partnership Countries: Prospects and Challenges. *PISM Bulletin*, 144(1840).
 - Ministry of Economy and Labour (Republic of North Macedonia). (2024). *Нацрт Стратегија за МСП 2025-2030 на Република Северна Македонија [Draft National SME Strategy 2025–2030]*. Skopje: Ministry of Economy and Labour.
 - Ministry of Science and Education. (2023). *Research Infrastructure Development Roadmap of the Republic of Croatia 2023–2027*. Zagreb: MSE, available at: <https://mzom.gov.hr/UserDocsImages/dokumenti/Znanost/ZnanstvenaInfrastruktura/ZnanstvenaOprema/znan-oprema-29-12-2023/Research-Infrastructure-Development-Roadmap-of-the-Republic-of-Croatia-2023-2027.pdf>
 - Ministry of Science, Technological Development and Innovation of the Republic of Serbia. (2021). *Strategy for the Development of the Startup Ecosystem in the Republic of Serbia*. <https://nitra.gov.rs/images/ministarstvo/dokumenta/STARTUP%20ECOSYSTEM%20DEVELOPMENT%20STRATEGY.pdf>.
 - National Bank of the Republic of North Macedonia (2023), External Statistics, <https://nbstat.nbrm.mk/pxweb/en/Eksterni%20statistiki/>
 - OECD. (2022). *SME Policy Index: Western Balkans and Turkey 2022—Assessing the implementation of the Small Business Act for Europe*. Paris: OECD Publishing.

- OECD. (2024a). *Western Balkans Competitiveness Outlook 2024: Regional Profile*. https://www.oecd.org/en/publications/western-balkans-competitiveness-outlook-2024-regional-profile_170b0e53-en.html.
- OECD. (2024b). *Western Balkans Competitiveness Outlook 2024: North Macedonia*. https://www.oecd.org/content/dam/oecd/en/publications/reports/2024/06/western-balkans-competitiveness-outlook-2024-north-macedonia_4dc5c34c/8207326d-en.pdf
- Ordóñez de Pablos, P., Almunawar, M. N., & Anshari, M. (Eds.). (2023). *Developing Skills and Competencies for Digital and Green Transitions*. IGI Global.
- Owen, R., Von Schomberg, R., & Macnaghten, P. (2021). An unfinished journey? Reflections on a decade of responsible research and innovation. *Journal of Responsible Innovation*, 8(2), 217-233.
- Pollex, J., & Lenschow, A. (2018). Surrendering to growth? The European Union's goals for research and technology in the Horizon 2020 framework. *Journal of Cleaner Production*, 197, 1863-1871.
- Radosavljevic, N., Dragicevic, S., & Djoković, M. (2024). Empowering Student Entrepreneurship Education: The Role of Academic Innovation Incubators. In *10th International Scientific Conference Technics, Informatics and Education-TIE 2024*. Faculty of Technical Sciences Čačak, University of Kragujevac.
- Radovanovic, N., & Benner, M. (2019). Smart Specialisation and the Wider Innovation Policy Context in the Western Balkans. *Publications Office of the European Union*.
- Radovanovic, N., Gerussi, E., Reid, A., & Jevremovic, A. (2023). Unlocking the potential for regional collaboration in the ICT domain in the Western Balkans. *Publications Office of the European Union, Luxembourg*.
- Ramadani, V., Kjosev, S., & Sergi, B. S. (2023). Entrepreneurship development in the Balkans: Past, present, and future. In *Entrepreneurship Development in the Balkans: Perspective from Diverse Contexts* (pp. 1-14). Emerald Publishing Limited.
- Republic of North Macedonia. (2018). **Strategy for Education 2018-2025**. Skopje: Government of the Republic of North Macedonia.
- Republic of North Macedonia. (2023). *National Development Strategy 2024–2044*. Skopje: Government of the Republic of North Macedonia.
- Republic of North Macedonia. (2024). **Smart Specialisation Strategy 2024-2027 (S3-MK)**. Skopje: Government of the Republic of North Macedonia.
- Republic of North Macedonia. (2024). *Draft National Programme for Higher Education*. Skopje: Ministry of Education and Science.
- Rubens, A., Spigarelli, F., Cavicchi, A., & Rinaldi, C. (2017). Universities' third mission and the entrepreneurial university and the challenges they bring to higher education institutions. *Journal of Enterprising Communities: People and Places in the Global Economy*, 11(03), 354-372.
- Stam, E. (2015). Entrepreneurial ecosystems and regional policy: a sympathetic critique. *European planning studies*, 23(9), 1759-1769.
- Tekin, E., Ramadani, V., & Dana, L. P. (2021). Entrepreneurship in Turkey and other Balkan countries: are there opportunities for mutual co-operation through internationalisation?. *Review of International Business and Strategy*, 31(2), 297-314.
- WeBalkans. (n.d.). *Innovation and Research*. <https://webalkans.eu/en/themes/innovation-and-skills/innovation-and-research/>.
- Western Balkans Info Hub. (September, 2023). *A Spotlight on the Western Balkans in H2020*. <https://westernbalkans-infohub.eu/documents/focus-article-a-spotlight-on-the-western-balkans-in-h2020/>.