

SKILLS FOR TECHNOLOGY TRANSFER IN NORTH MACEDONIA

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PREFACE

This report highlights the importance of “skills-related services” in supporting technology transfer in North Macedonia. The report is part of a research aiming at analysing innovation systems in the Western Balkans economies, analysing skills related services, needs and gaps faces by enterprises accessing necessary skills for technology adoption, innovation and market expansion. Skills-related services encompass information, training, and consulting services offered by various public and private organizations to assist individuals, employees, and employers in developing and implementing technology transfer.

The report defines technology transfer in two ways: Vertical Technology Transfer (VTT) and Horizontal Technology Transfer (HTT). VTT involves the transfer of technology from basic research to applied research and development, often with the involvement of external partners such as public research organizations. HTT, on the other hand, refers to the transfer of established technology from one operational environment to another, often across international borders and through foreign direct investment.

Through an online survey, a comprehensive analysis was carried out to gain valuable insights into the technology transfer-related services and practices in North Macedonia. The survey encompassed a sample of 13 institutions, ranging from public and private to not-for-profit sectors. Furthermore, to complement the quantitative findings, qualitative data was collected using semi-structured interviews (SSI) and moderated focus groups (FG).

Main Results

An encouraging number of organisations in North Macedonia self-identify as offering both Vertical Technology Transfer (VTT) and Horizontal Technology Transfer (HTT) services. However, closer examination shows that most do not clearly distinguish between general services and skills related technology transfer services and interviews confirmed that none of these services are specifically designed to support VTT, and only a few organizations provide or plan to introduce HTT services. Service providers currently aim their general portfolio of services at local SMEs, with training and information services prevailing over consultancy. There is little evidence for sector specific support.

VTT is seen to be limited by the lack of investment into R&D (little technology to be transferred). HTT is seen to be undermined by the lack of involvement of domestic companies in global supply chains, and the limited technological cooperation with companies making Foreign Direct Investment (FDIs) into the country. Low level of cluster activity was identified as another barrier for both VTT/HTT. Major changes to national level policy are seen to be needed to create real change at the level of support services.

Intermediary starting points for improvement could lie with designing skills related support services to leverage funding from the Innovation Fund (so called 'smart money'). The new planned innovation infrastructures (Science Technology Park and accelerators) also offer a focus to build a small portfolio of information, training and consulting services that could be offered nationally. These could be linked to the emerging priority areas identified under the Smart Specialization (S3) strategy.

Science, Research and Innovation Capacity

North Macedonia's higher education system comprises 21 institutions, with seven of them being public universities. While the focus of these universities is primarily on education, there is evidence of their engagement in research activities, mostly represented by the public universities. However, the public research system suffers from underfunding, with only 0.37% of GDP investment in R&D (2018). The country also faces challenges in terms of the number of full-time researchers, R&D expenditures, and doctorate graduates, which have experienced significant decreases since 2015.

Although North Macedonia has implemented support mechanisms for researchers, such as the Challenge for Young Researchers competition and initiatives to promote the participation of women and under-represented groups in research and innovation, there are still shortcomings in supporting doctoral research and education, making research careers more attractive, and addressing the issue of brain drain. Despite these efforts, the country ranks 59th in the Global Innovation Index, indicating weaknesses in human capital for R&D and knowledge creation. Additionally, North Macedonia ranks low in the Global Competitiveness Index, particularly in the field of R&D.

North Macedonia is classified as an Emerging Innovator according to the 2022 European Innovation Scoreboard, with its performance at 45.6% of the EU average. While the country's performance gap with the EU has been decreasing, overall innovation activity remains low. Although the support infrastructure for start-ups has expanded, more mature innovative firms still lack adequate support, primarily limited to general consultancy services. Investment in R&D by businesses is also low, reflecting constraints in the business environment that hinder resource allocation to more competitive firms. Limited access to finance further hampers firms' capacity to invest in new technology, even though efforts have been made to improve access through initiatives like the Fund for Innovation and Technology Development (FITD). Collaboration opportunities and university-industry cooperation are identified as weaknesses, emphasizing the need for enhanced technology transfer skills and targeted services to support technology absorption in established SMEs.

Skills related services for technology transfer in North Macedonia

According to the survey results, 84.6% of participants provide services to enterprises supporting innovation, while 15.4% do not currently offer such services or have plans to introduce them in the next 12 months. Most of the services provided are not specifically focused on technology transfer, but a significant number of respondents (27.3%) see it as a development opportunity and plan to introduce TT services in the near future.

Regarding support for horizontal technology transfer (HTT), 63.6% of respondents currently provide services, and an additional 18.2% plan to do so in the near future. These HTT support services are mainly provided at the local level to SMEs, with training and information services being more prevalent than consultancy.

The analysis of the survey responses reveals challenges in the understanding of TT services and the lack of a systematic approach to addressing TT as an integral part of innovation policy, programs, and services. Some targeted participants did not participate in the survey, and the lack of responses from cluster associations may suggest limited progress in cluster development in the country. The provision of innovation-related services is mainly focused on start-up support, business modeling/development, and mentoring, with limited access to finance services and capacity building for innovation or TT. There is also a need for sector-specific service offerings and awareness raising and capacity building within the support ecosystem.

Needs and gaps in skills-based services for technology transfer in North Macedonia

The qualitative data shows that, while all involved organizations offer a set of services, none of these services are specifically designed to support VTT, and only a few organizations provide or plan to introduce HTT services. The findings highlight the lack of a systematic approach to addressing technology transfer in the country, leading to common needs and barriers for both VTT and HTT.

To improve the conditions for VTT and HTT, adequate national and institutional policies need to be defined, considering aspects like intellectual property and alignment with other relevant strategies in the country. There is a need for increased funding for R&D and technological development, as well as increased awareness and skills for technology transfer among all stakeholders. The participants identified several gaps, including the lack of specialized support structures, formalized industry-academia collaboration, resources and training for technology transfer, and involvement of companies in global supply chains. The absence of sector-specific concerns identified in the interviews and focus group discussions underscores the necessity for more precise information regarding technological potentials and requirements within various sectors.

It is concluded that there is a lack of a systematic approach in provisioning both VTT and HTT-related services. There is a need for in-depth analysis of the existing potentials and needs for information, training, and consulting, as well as the establishment of strategic guidance and consideration of skills aspects. The main gaps identified include the lack of national and institutional policies, inadequate investment in R&D and technology development, and insufficient skills for TT. The main needs revolve around mapping VTT and HTT processes, addressing skills and information gaps, strengthening support structures, and securing funding opportunities. The key barriers include a lack of understanding, insufficiently regulated IP aspects, and a lack of funding, training, and consultancy support.

Sector-specific issues were not identified due to insufficient available information on technological capacities, potentials, and barriers. The participants noted that existing data, such as S3 development, may provide some initial insights, but they are not fully comprehensive or considering all VTT/HTT relevant aspects.

Improvement Actions

To improve Vertical and Horizontal Technology Transfer, the following key actions are suggested, based on the results of the interviews and focus groups:

Vertical technology Transfer	Horizontal Technology Transfer
<ul style="list-style-type: none"> • Implement a national policy to stimulate VTT through efficient IP systems, coordinated public funding, and dedicated programs for supporting Technology Transfer (TT) centers. • Develop a clear and transparent IP policy for research institutions, simplifying and transparentizing procedures related to IP management. • Boost funding for research and development activities to encourage more R&D results and technologies that can be transferred through VTT. • Improve the framework and funding for university spin-off and spin-out companies to foster entrepreneurship and commercialization of research results. • Enhance the capacity of TT centers, especially in terms of IP management and marketing of patented technologies and research results. • Strengthen the capacity of service providers to offer a wide range of skills-based services for VTT, including IPR, technology transfer, innovation management, and related fields. • Identify and address the skills and information gaps for each step in the VTT process, providing researchers with relevant information and building capacities to close the gaps. 	<ul style="list-style-type: none"> • Integrate HTT aspects into the innovation framework, explicitly addressing the need for HTT support in innovation policies and strategies. • Develop technology transfer skills among stakeholders, particularly service providers and consulting companies, to provide effective HTT support. • Introduce public and donor-funded schemes, like a national technology transfer program, to stimulate HTT and provide financial support and incentives for companies engaging in technology transfer activities. • Support the establishment and promotion of Digital Innovation Hubs (DIHs) as valuable platforms for technology transfer and collaboration between businesses, academia, and research institutions. • Ensure capacity building for all types of service providers through formal training programs to create verified experts in the field, especially in connection to consulting services. • Offer a range of skills-based services to support the HTT process, including information, training, and consulting, targeting different business groups and key sectors like agrifood, processing, and metal manufacturing. • Conduct a comprehensive mapping of sectors and fields where HTT occurs, assessing related needs for training and advisory services to identify areas requiring support and targeted interventions. • Stimulate HTT cooperation between foreign and local companies, encouraging Macedonian companies to participate in global supply chains and enhance their technological performance to meet globalization requirements.