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SKILLS FOR TECHNOLOGY TRANSFER IN BOSNIA AND HERZEGOVINA

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This summary was prepared by Jan Otero, ETF.
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PREFACE

This report highlights the importance of “skills-related services” in supporting technology transfer in Bosnia and Herzegovina. 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 sills 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 Bosnia and Herzegovina. The survey encompassed a sample of 21 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

Provision of support for technology transfer in Bosnia and Herzegovina is scarcely populated and is currently dominated by not for profit (NfP) organisations and the public sector, mainly in form of Digital Innovation Hubs (DIHs) and international development agencies. Some organisations claim to be offering different types of skills related services to all types and locations of companies but lack of concrete evidence and the descriptions of the services suggest that, with a few notable exceptions, this may be more an aspiration than current provision and that service providers to do not have a strong grasp of the sort of services that would actually support Horizontal Technology Transfer (HTT) and Vertical Technology Transfer (VTT) rather than simply support business development. Particularly on digital transformation and digitalization related services, there is a strong focus on training to acquire digital skills, and stronger focus on HTT, being it the transfer of established technology from one operational environment to another. In this respect, DIHs in BiH appear to be delivering more strongly on their wider HTT remit. DIHs are also delivering services to SME and larger companies and not just to those that are start-ups or 'local'. Development agencies are also supporting HTT but tend to focus closer to their own base of operations and offer more consulting that training. In BiH there is evidence of focused HTT support for the wood processing and metal processing sectors and manufacturing, with some additional focus on agriculture and food production, while for the service sector there is some focus on supporting the emerging sectors of IT and tourism. There are barely any services for the research sector to support VTT (the transfer of technology from basic research to applied research and development). Overall, both companies and research groups lack significant information, training and consulting services in order to participate more in VTT activities. Some level of VTT support exists for companies to develop their innovation capacity and there are some projects that work on developing the capacities of researchers to produce relevant technology and to cooperate more with industry both in technology development and transfer. However, overall there is a major disconnect between supply and demand, both in terms of technology transfer in general and associated support services and providers. Diminishing this gap by developing services that are complimentary, or offered by the same service provider to both research teams and enterprises would help to reduce the gap. Services to support HTT is a rapidly emerging sector, led by the DIHs. For technology adopters, there is a need to raise awareness (information) of technology benefits and options, and to build capacity of business managers for managing the technology adoption process within the company (training and consulting). However, service providers themselves see a need for support to improve expert capacities (training and coaching of experts) as well as more (stable) funding and sustainability of services as well as a better system to integrate services between providers. Overall, taking the DIHs as a model and expanding this to other sectors might be a useful improvement action for HTT in for BiH. Improvement to the provision of services to VTT is unlikely to happen unless there is more funding for R&D in general to develop technology as well as to stimulate demand to associated support services.

Science, Research and Innovation Capacity

With regard to human capital for research, Bosnia and Herzegovina falls somewhere in the middle, based on the indicators from the Global Innovation Index (GII). This is primarily due to average scores and ranks, with 40.2% tertiary enrolment (rank 74th) and 23.5% of graduates in science and engineering (rank 49). However, when it comes to R&D capacity, BiH ranks lower on both the GII and the Global Competitiveness Index (GCI) scales. These low scores can be attributed to the country's low R&D expenditures, which account for only 0.2% of GDP, resulting in a score of 6.7 and rank of 93 on the GCI. Additionally, the country has a small number of researchers, with only 460.2 researchers per million population (GII). Lack of funding, low enrolment in science and engineering, brain drain, and limited research output contribute to the challenges faced in recruiting new researchers. The business sector in BiH struggles with the capacity to adopt new technology. According to the GII indicators, business sophistication is a definite weakness for the country, with a score of 18.8 and a rank of 99. Companies face difficulties in accessing capital for investment in new and sophisticated

equipment, as well as finding qualified employees to operate the technology. Lack of modern technology and in-house products, coupled with limited marketing abilities, hinders the development of new products and technology and leads to low labour productivity.

Skills related services for technology transfer in Bosnia and Herzegovina

The analysis of skills-related services and actions in support of technology transfer in Bosnia and Herzegovina (BiH) was conducted through an online survey targeting various groups. The majority of respondents were not-for-profit organizations and public sector organizations, while responses from consulting entities and the private sector were limited. The survey revealed that the innovation support service sector in BiH is dominated by NfP organizations and the public sector, particularly digital innovation hubs (DIHs) and development agencies, which serve as important hubs for both vertical and horizontal technology transfer services. The survey results showed that a significant proportion of service providers in BiH claim to offer services supporting innovation, with more than half of the organizations currently providing such services and additional organizations intending to do so in the near future. Among the current providers, a considerable number offer both VTT and HTT services. However, the survey highlighted a potential gap in the development of service offerings tailored to different target groups and purposes. Services for micro-businesses and start-ups are predominantly offered locally, while those for SMEs and large companies are provided at local, regional, and international levels, indicating a stronger focus on these established businesses. Regarding the types of services offered, both VTT and HTT service providers cover information, training, and consulting services. The prevalence of services differs between SMEs and large companies versus start-ups, with a greater emphasis on regional and international services for the former and localized services for the latter. Notably, the survey respondents displayed a clear focus on HTT services, particularly related to digital transformation and digitalization. However, the demand for VTT services may be limited, as indicated by the localization of start-up services and the lack of participation from the Research, Development, and Innovation (RDI) sector in TT activities. The current provision of TT services in BiH primarily focuses on sectors such as wood processing, metal processing, manufacturing, agriculture, food production, and emerging sectors like IT and tourism. The skills dimension of the services offered is predominantly focused on IT skills, with some organizations also offering services related to business development, project management, intellectual property rights (IPR), and organizational improvements.

Needs and gaps in skills-based services for technology transfer in Bosnia and Herzegovina

The analysis of qualitative data collected through interviews and focus groups reveals several provisions, gaps, needs, barriers, and possible improvement actions concerning skills-based services in technology transfer in Bosnia and Herzegovina. The study indicates a lack of both supply and demand for early-stage technology coming from research organizations (PROs), leading to a major disconnect between supply and demand in technology transfer and associated services. The field of service support providers is sparsely populated, with limited services available for both companies and researchers. All three groups lack significant information, training, and consulting services to actively participate in VTT activities. There is a need for improving capacities, raising awareness, and building expertise in technology adoption, innovation management, and access to funding. On the other hand, the analysis shows a good base of both supply and demand for services related to HTT in BiH. Organizations included in the qualitative analysis either already provide or intend to provide some form of HTT support. Additional support needs were identified for technology adopters in terms of raising awareness of technology benefits and options, building capacity for managing the technology adoption process, and improving expert capacities in service providers. The HTT sector in BiH is rapidly emerging, and there is a need for more stable funding, sustainability of services, and better integration of the provided services. Services in BiH are primarily provided by Chambers of Commerce (CoCs), Development Agencies (DAs), Digital Innovation Hubs (DIHs), and similar associations. These services are predominantly aimed at HTT, with limited elements for VTT. Information services cover

various topics relevant to TT, such as technology adoption benefits, funding sources, available technologies, and general information on Intellectual Property Rights (IPR). Training services range from basic digital literacy to general management topics but lack explicit focus on VTT or HTT. Consulting services cover all stages of HTT, including needs assessment and technology integration, with sporadic services on IPR for both VTT and HTT. However, there are gaps in the continuity of providing all types of services, limited availability of IPR-related services, and a lack of services specifically targeting VTT.The main barriers to skills-based services for TT in BiH include low adoption capacities of companies, limited capacity and interest in VTT, and the absence of viable technology for transfer. Support providers face challenges related to the continuity and sustainability of services, limited availability of experienced experts, and low staff capacity and knowledge in VTT-related issues. Ecosystem-level barriers, such as the lack of a systemic approach, specialized TT institutions, and coordination among involved parties, further hinder effective technology transfer. While support is primarily directed towards the wood and metal processing sectors, other sectors with potential or specific needs, such as health/pharmacy, chemicals, plastics, and the financial sector, are not adequately addressed.

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
• Implement tailored policies and support programs for VTT, addressing both supply-side (researchers and PROs) and demand-side (companies) challenges. • Improve the innovation capacity of Small and Medium-sized Enterprises (SMEs) through assistance for product development, access to investment capital, and raising awareness about the benefits of innovation and technology development. • Increase funding and support for PROs to enhance their capacity for technology transfer by focusing on applied research and fostering stronger connections with industry. • Address gaps in the VTT ecosystem through comprehensive national and entity-level innovation policies, streamlining support systems, and investing in technology transfer infrastructure. • Introduce incentives to encourage companies to collaborate with universities and PROs on technology transfer projects, such as grants or tax benefits. • Raise awareness among company owners and managers about the potential benefits of VTT, innovation, and technology	• Evaluate existing policies and support programs for HTT, identifying areas for improvement and implementing targeted programs and incentives to address the needs of technology adopters, particularly in manufacturing sectors and agri-food industries. • Prioritize efforts to enhance the quality and quantity of HTT services available, providing information, training, and consulting services covering the entire HTT process. • Ensure managers/owners have access to information and consulting, and employees receive relevant training for effective technology adoption. • Improve coordination and integration of support programs and service providers in the HTT ecosystem to streamline service delivery to technology adopters. • Address the scarcity of experienced technology adoption consultants by attracting foreign experts and facilitating knowledge transfer through training and mentorship. Establish capacity-building programs for digital transformation experts

adoption through targeted information campaigns and training programs. • Ensure consistent and continuous VTT services for companies by establishing funding and support mechanisms that enable ongoing service provision. • Enhance the range and diversity of VTT services available to companies, including information, consulting, new product development, design, marketing, and intellectual property-related services. • Invest in training and capacity-building programs for service providers to systematically integrate VTT services into PROs and BSOs. • Develop local expertise for innovation support, particularly through training and capacity building for innovation management consultants, to enhance the capabilities of local experts in supporting companies' innovation efforts.	with internationally recognized certifications. • Invest in training and capacity building for service providers to enhance systemic integration of HTT services at public Business Support Organizations (BSOs), improving coordination and effectiveness of support programs.