

ANALYSING THE SKILLS DIMENSION OF TECHNOLOGY TRANSFER IN THE WESTERN BALKANS

Comparative report

Disclaimer

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PREFACE

This report is an output of the project ‘**Analysing the skills dimension of technology transfer in the Western Balkans**’, which is part of **ENTRSD WP22 - 2.6 Engaging Enterprises in Skills Development**. The objective of the project was to conduct an investigation into the current systems of Technology Transfer (TT) in the six Western Balkan economies, (Albania, Bosnia and Herzegovina, Kosovo*, Montenegro, North Macedonia, and Serbia), the present provision of skills-based services for enterprises to support TT and the main gaps, needs and improvement actions. This report provides country-specific and comparative findings. The individual reports are available from the ETF.

Based on the academic literature¹, TT can be defined and understood under two broad categories, which are used throughout the individual reports:

Vertical Technology Transfer (VTT)

VTT refers to the ‘*transfer of technology from basic research to applied research to development*’. Although VTT can take place inside an enterprise, the term more typically implies the involvement of an external R&D partner in the form of a Public Research Organisation (PRO) and generally involves the sale or licensing of patent rights. University TTOs (Technology Transfer Offices) and Innovation Centres (ICs) are examples of organisations supporting VTT. The enterprise usually transfers the technology in order to develop a new product or service to place on the market. The enterprise is likely to have to continue with further R&D to increase the Technology Readiness Level (TRL) and bring the technology to market readiness.

Horizontal Technology Transfer (HTT)

HTT refers to ‘*the transfer of established technology from one operational environment to another*’. HTT normally involves fully mature technology (TRL9), but also technology that is already well proven in the final working environment. HTT is also often termed ‘technology adoption’ or ‘technology diffusion’ and typically occurs across international borders and often as a result of Foreign Direct Investment (FDI). In HTT the technology is typically used within the adopting enterprise, e.g. in a new production facility or in quality control. When part of an FDI package, e.g. the building of an automotive production plant in a country with lower labour costs, then it is also seen to be an important aspect of creating ‘knowledge-spillovers’ for the enterprise and the country.

Skills-related services

In this study, the expression ‘skills-related services’ refers to the information, training and consulting services (provided by a broad range of public and private organisations) that support the skills development of individuals, employees and employers so as to enable and implement technology transfer (horizontally and vertically).

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* This designation is without prejudice to positions on status and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence – hereinafter ‘Kosovo’.

¹ See for example: Mansfield, E. (1975), *International Technology Transfer: Forms, Resource Requirements, and Policies*, The American Economic Review, 65(2), 372–376. <http://www.jstor.org/stable/1818878>

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1 COMPARATIVE OVERVIEW OF THE TECHNOLOGY TRANSFER SYSTEMS IN THE WESTERN BALKANS

An overview of the main commonalities and differences of systems for technology transfer in the Western Balkans is outlined below and summarised in Table 1. Economy-specific systems are detailed in Annex 1.

1.1 Policy

Technology transfer is one mechanism for innovation and thus is strongly driven by innovation policy. A strong commonality in the Western Balkans is the introduction of the Smart Specialisation Strategy (S3) which channels RDI (Research Development and Innovation) funding towards priority sectors. However, S3 tends to deal more with VTT (Vertical Technology Transfer) than HTT (Horizontal Technology Transfer) and to focus on technology transfers from public research organisations (PROs) to companies. HTT is much less visible, even in industrial policy and approaches to using Foreign Direct Investment (FDI). **Montenegro and Serbia** are the only countries in the Western Balkans (WB) to have adopted an S3, **North Macedonia** was expected to adopt its S3 in late 2022, indicating a high level of preparation, but this had not been realised as of March 2023. **Kosovo and Albania**⁹ are both in the early stages of S3 development, while **Bosnia and Herzegovina** has not yet initiated its S3 process.

Existing policies in **Albania** support the development of a quad helix model of innovation to support VTT, but this has not been reflected in policy implementation; HTT in **Albania** is not visible in policy documents. The most relevant national policy document for TT in **Bosnia and Herzegovina** is the 'Sustainable Development Goals Framework', where Technology Transfer is explicitly mentioned and VTT and HTT are both addressed. **Kosovo** does not explicitly address TT in policy; the Kosovo Research Programme (NRP)² and National Development Strategy (NDS)³ are relevant documents for RDI and skills development but have no explicit TT aspect. The S3 policy mix in **Montenegro** provides for several interventions related to the development of skills relevant to VTT; HTT is not addressed. Existing policies in **North Macedonia** have set the ground for expanding the capacity of TT centres (VTT) and emphasise the role of Foreign Direct Investments (FDI) and networking with the diaspora to increase the innovation performance of the country (HTT). The S3 in **Serbia** focuses on supporting the creation of start-ups, including those based on university research, e.g. using VTT; HTT is not addressed.

1.2 Legislation

Updates to legislation affecting TT in the WB6 are being driven by the EU accession process. Countries like ME and SR are therefore more advanced than others in aligning with the EU Acquis⁴. However, one commonality between all the countries is that legislation that relates to both VTT and HTT is scattered across different laws, even when they are updated, and issues such as ownership of employee inventions (VTT) are not addressed consistently by different laws. Laws in **Albania** make no distinction between HTT and VTT, but are mainly directed towards VTT; there is clear legislation on ownership of employee inventions/research results and liberal legislation on FDI. Overall, the **Bosnia and Herzegovina** legislative framework is adequate but offers little guidance for the implementation of TT activities; existing laws and bylaws for IP in **Bosnia and Herzegovina** and for science and higher education in Republic of Srpska explicitly deal with setting up the system for TT, but the rest of the

² National Research Programme (draft 2010) <https://www.zsi.at/en/object/news/512>

³ Kosovo National Development Strategy <http://extwprlegs1.fao.org/docs/pdf/kos184213.pdf>

⁴ The European Union (EU) acquis is the collection of common rights and obligations that constitute the body of EU law, and is incorporated into the legal systems of EU Member States.

legal framework only occasionally mentions or implies it. **Kosovo** has two significant laws regarding Technology Transfer^{5,6}, both of which help to regulate the environment for HTT and VTT by identifying the rightful owner of inventions, innovations and other outputs of R&D. Legislation to support TT in **Montenegro** is relatively well developed; however, the framework could be weakened by the low level of implementation (education) and enforcement (Intellectual Property Rights). **North Macedonia** has regulated innovation, including through FDI, by law since 2013; VTT from PROs is addressed under the legal framework for research activities and higher education. Legislation is largely harmonised with the EU, although, like Montenegro, current weaknesses lie in implementation and enforcement. The legislative framework for TT in **Serbia** is rather fragmented and not always consistent, with multiple laws covering particular aspects of TT; VTT is regulated in more detail than HTT.

1.3 Finance mechanisms

Funding to support TT varies widely across the WB6, with Serbia and North Macedonia having established functional Innovation Funds, while Montenegro is still planning this step, whereas Albania, Bosnia and Herzegovina, and Kosovo still lack adequate support for TT activities. Venture capital is at an early stage of development across the entire region.

The government of **Albania** has dedicated funding to open TTOs in HEIs, but this has not yet been implemented; past funding to support VTT and HTT activities in enterprises has come through AIDA (Albanian Investment Development Agency). FDI is seen as one of the primary ways of funding HTT in **Bosnia and Herzegovina** and is supported by a dedicated state agency: FIPA⁷. There is little funding to support VTT and it is scattered across institutions and donors. Like Bosnia and Herzegovina, **Kosovo** also has very limited funding for VTT and it is heavily dependent on donations and grants from foreign and international organisations; FDIs into Kosovo are among the lowest in the region and are in decline. Small VTT bank loans and grants for modernisation are available to enterprises to improve the quality of products, processes and working conditions. Public VTT support in **Montenegro** takes the form of innovation vouchers and grants to cover IPR actions; further support is anticipated from the new Innovation Fund. There are some grants to support HTT – largely in the form of equipment purchase but also as a technology adoption mentoring scheme. Loans are available to allow companies to invest in modern technologies in **North Macedonia** and the Innovation Fund is supporting VTT, but with fewer programmes than are seen from the Fund in **Serbia**. FDI has played an important role in HTT for larger companies in Serbia, while smaller firms are served by the Development Agency of Serbia.

1.4 Institutions, Actors and Network

The number and diversity of organisations to support TT, and thus their strengths and weaknesses varies considerably across the WB6. Some countries like **Serbia** are developing strongly but have chosen to focus on a particular type of TT e.g. support for start-ups. Others are much weaker and still rely on historical structures e.g. organisations providing agricultural extension services in **Albania**. There is an emergence of more modern actors based on EU networks e.g. the EEN (Enterprise Europe Network) and DIHs (Digital Innovation Hubs). But support for HTT is very limited as clusters have not taken over the historical HTT role of sector associations.

VTT support in **Albania** is largely limited to five Agriculture Technology Transfer Centres (ATTCs). Planned TTOs (Technology Transfer Offices) and Innovation Centres (ICs) have not yet materialised. AIDA is the most important institution for HTT, although DIHs are emerging. The TT ecosystem in **Bosnia and Herzegovina** contains a concentration of actors providing services for HTT, while the

⁵ Law No 04/L-135 on Scientific- Research Activities

<https://gzk.rks-gov.net/ActDocumentDetail.aspx?ActID=8660>

⁶ Law No 06/L-049 On Scientific Innovation and Transfer of Knowledge and Technology

https://cps.rks-gov.net/wp-content/uploads/2020/08/LAW_NO_06_L-049_ON_SCIENTIFIC_INNOVATION_AND_TRANSFER_OF_KNOWLEDGE_AND_TECHNOLOGY.pdf

⁷ www.fipa.gov.ba

VTT field is more sparsely populated. Some TTOs exist at PROs and satellite entities include established Innovation Centres, while STPs are planned for the future. The EEN network is present with a consortium in both entities; clusters exist but do not strongly support TT. Support for both VTT and HTT in **Kosovo** is still very limited. There are three visible entities, one embedded in the university and one specialising in ICT startups. EEN has an online presence in Kosovo but without contact details⁸. Clusters do not have a visible presence.

There are a small number of actors established to support VTT in **Montenegro**; others are anticipated in connection with new infrastructure. EEN has a presence in Montenegro and DIHs are being established. HTT support is limited to the agricultural sector, where it has a traditional presence. In **North Macedonia** the innovation eco-system is evolving and there are a limited number of TT service providers. Clusters are still nascent and do not support TT. The DIH concept is in its infancy. The innovation ecosystem in **Serbia** has developed rapidly over the past 10 years and now includes a range of organisations from both public and private sectors that support VTT. Support for HTT is much less visible and is not provided by cluster associations.

1.5 Scientific/Research capacity

All the countries of the WB have very low investment in R&D (from 0.25% of GDP in **Albania** to 0.9% in **Serbia**). This is reflected in their research capacity, including the number of researchers, scientific publications and patenting activity. **Serbia** is seeing the most sustained improvement as a result of channelling significant EU funding into R&D. In contrast, existing capacity in **Kosovo** means it is struggling to take advantage of new opportunities for R&D funding from the European Commission.

The Global Innovation Index (GII) show that **Albania** has the lowest performance in the region in the dimension of human capital and research. Patenting activity is low and predominantly carried out by companies. **Bosnia and Herzegovina** is also ranked at the lower end of the regional spectrum for scientific and research capacity. The country is ranked and scored low on R&D output, both on patents and scientific publications. **Kosovo** is seeing a negative trend: the University of Pristina was previously able to compete with other similar institutions in the region, but today it is falling behind in the global and regional rankings, although it is still above the University of Tirana. **Montenegro** has a small population of researchers and very few researchers working in the business sector. However, its comparatively good level of research excellence in academic publishing has been recognised and is a result of strict long-term university policies on academic advancement. The number of researchers in **North Macedonia** is also well below the EU average and research outputs are also low. **Serbia**, like Montenegro, breaks the regional trend in terms of scientific capacity, with output improving over the last decade and innovation output standing just below the EU average. However, the share of researchers with PhDs is far below the EU average and 'the volume of publications outweighs their quality.

1.6 Capacity to adopt new technology

Capacity to adopt new technology is very low across the WB region. Competitiveness is based on low labour costs rather than technology. This is exacerbated by brain drain, which also impairs the ability and inclination of companies to collaborate with research organisations.

Albania was ranked 84th in the GII for 2021⁹ and below the regional average in all GII pillars. Performance in innovation inputs exceeded innovation outputs in 2021. **Bosnia and Herzegovina** was ranked 99th in the 2021 GII. Companies in Bosnia and Herzegovina struggle with access to capital to invest in modern equipment as well as qualified employees to operate it. Capacity to adopt new technology in **Kosovo** is less easy to assess and benchmark because it is not represented in standard indicator systems. The **Kosovo** IT strategy notes that the majority of Kosovo IT firms, which are assumed to rank among the more innovative in the country, possess rather limited endowments of

⁸ See <https://een.ec.europa.eu/about/branches/kosovo>

⁹ WIPO (2021), *Global Innovation Index 2021: Tracking Innovation through the COVID-19 Crisis*, Geneva, World Intellectual Property Organization, available at: <https://www.globalinnovationindex.org/analysis-indicator>

physical and human capital. Challenges to productivity and enterprise growth in **Montenegro** have continuously been linked to a skills mismatch between the labour market and education. There is currently a poor balance between the direct or indirect support provided for the purchase of equipment and the support provided for knowledge and skills development for technology adoption. Limited access to finance in **North Macedonia** has a significant impact on the capacity of enterprises to invest in new technology despite the establishment of three providers of technology extension services. The GII 2021 identifies innovation linkages in MK as one of the weaknesses for the country, especially in terms of university-industry cooperation, where the country ranks 112th. Capacity for technology adoption also remains rather low in **Serbia**, with the GII indicators showing comparative performance in the HTT area to be lower than that of VTT.

Table 1 Comparative summary of systems of Technology Transfer in the Western Balkans economies

TT Systems	Policy framework	Legislation	Financing mechanisms	Main Actors	Research Capacity	Capacity to adopt new technology
Albania	S3 in early stage of preparation. VTT anticipated but not implemented. HTT not visible.	Mainly addresses VTT Clear law on ownership of employee inventions	VTT Funding planned but not implemented. HTT funding via AIDA	<ul style="list-style-type: none"> • Agriculture Technology Transfer Centres (ATTCs) • AIDA • Emerging DIHs 	Lowest in the region (GII)	Low (GII). Inputs exceed outputs
Bosnia and Herzegovina	S3 process not initiated Technology Transfer is explicitly mentioned in national policy VTT and HTT are both addressed	Adequate framework but little guidance on the implementation of TT	Little VTT funding HTT funding via FIPA	<ul style="list-style-type: none"> • Multiple actor for HTT • TTOs/Innovation Centres at PROs for VTT • EEN 	Low end of the regional spectrum (GII)	Low (GII) Lack of capital to invest in new equipment and educated employees to operate it.
Kosovo	S3 in early stages of preparation TT is not explicitly addressed national policy	Adequate framework Clear law on ownership of employee inventions	Little funding for VTT HTT funded by donor programmes	<ul style="list-style-type: none"> • Incubator • Innovation Centre Regional Agency 	Negative trend	Low ICT is an emerging focus
Montenegro	S3 adopted VTT is addressed HTT is not addressed	Aligning with the EU Acquis Weakened by low level of implementation and enforcement	Innovation Fund under preparation	<ul style="list-style-type: none"> • EEN • DIHs (being established) • STP • Innovation Centres 	Positive trend Recognition of relative excellence in publications for size	Low. Skills mismatch between labour market needs and education

North Macedonia	S3 close to finalisation HTT and VTT are addressed	Law on innovation since 2013 Aligning with the EU Acquis Weakened by low level of implementation and enforcement	Well established Fund for Technology Development and Innovation Narrow range of instruments	<ul style="list-style-type: none"> • DIH (nascent concept) • Specialised innovation centres 	Low number of researchers Low quality of research outputs	Limited access to finance to invest in new technology Low industry-university linkages.
Serbia	S3 in early stages of preparation. VTT anticipated but not implemented HTT not visible.	Mainly addresses VTT Clear law on ownership of employee inventions	VTT Funding planned but not implemented HTT funding via AIDA	<ul style="list-style-type: none"> • Agriculture Technology Transfer Centres (ATTCS) • AIDA • Emerging DIHs 	Lowest in the region (GII)	Low (GII). Inputs exceed outputs

2 CURRENT PROVISION OF SKILLS-RELATED SUPPORT SERVICES

An overview of the main commonalities and differences in the current provision of skills-related support services in the region is provided below. This is followed by a short narrative summary for each economy, as summarised in Table 2. The main strengths and weaknesses are shown for each economy in Annex 2.

2.1 Overview of skills-related service provision – main strengths and weaknesses

The provision of skills-related support services for both VTT and HTT is extremely low across the entire WB region.

Historically, support for HTT has been provided by sector associations. However, this role has not transferred to newer cluster organisations. Some legacy support persists in the form of ‘extension services’ in the Agricultural field, particularly in **Albania**. Newer Digital Innovation Hubs (DIH) that have a remit in the EU to support adoption of digital technology across sectors and companies are only starting to appear in the WB, where they largely focus on supporting start-ups in the ICT field. The exception is in **Bosnia and Herzegovina**, where they do seem to be offering wider support to the digital transformation of existing companies. Intellectual property rights (IPR) services that may indirectly support HTT, e.g. ‘freedom to operate searches’ to confirm that patents have expired on drugs, are offered in Serbia but this is at the periphery of what would be considered HTT.

Support for VTT is also low, and is largely provided by university Technology Transfer Offices (TTOs) and aimed at researchers with R&D projects – often to help them secure EU funding or encourage entrepreneurship rather than to manage and realise the results of an R&D project. VTT Support services for enterprises (the technology adopter) are not well established, although an aspect of this is seen in **Bosnia and Herzegovina**, where the Enterprise Europe Network (EEN) offers the EU IMProve Innovation Management assessment¹⁰ which has an element that assesses cooperation with an academic technology provider (see below). Services that may indirectly support VTT, e.g. through an enhanced understanding of intellectual property rights (IPR), are offered by some IP offices and chambers of commerce. However, these are not designed specifically for VTT actions. For example, they focus on the patenting process and not on mechanisms for the transfer of associated rights to a new owner. Local information services to help an enterprise identify a VTT technology partner are not visible.

The EEN, which has representatives in all of the WB countries, is one of the few organisations that offers a defined pallet of skills-based services to support TT. This is because the service offering is standardised across the entire international network. Other local service providers like chambers of commerce and development agencies appear to offer support to enterprises on an ad hoc basis. Frequency is sufficiently low that they make no distinction between the size of a company (start-up, SME or large) or its proximity (local, regional or international) or the type of support they offer (information, training or consulting).

The overwhelming impression is that demand for services is currently too low to trigger any tailoring or standardisation of a service offering and this only occurs when it is a requirement of the funding donor, e.g. in order to set up a website with information, to run workshop trainings or to offer a mentoring package. The surveyed service providers either do not understand the term ‘skills-related services’ or indicate a willingness to supply services on demand in the future, but do not have an existing service offering. Finally, service providers do not clearly distinguish between services to support technology

¹⁰ See <https://www.imp3rove.de/>

transfer and those intended to support general business development, e.g. strategy and financial management.

Individual highlights relating to the provision of skills-based services to support VTT and HTT from the six countries are summarised below.

2.2 Albania

Visibility of TT-related services in Albania comes from government-led agencies and research and educational institutions (public VET and HEIs). The supply of services from the private sector is much less visible.

Services to support VTT are very limited. HTT services are more prevalent but still limited, and are dominated by government-led, top-down, donor-funded initiatives to increase the competitiveness of some sectors. Historically, there has been a strong emphasis on technology extension services for Agriculture that support both VTT and HTT. However, this is diminishing due to a number of factors, including changes to legislation governing R&D providers. Digital industries are an emerging focus for HTT support.

Private sector organisations provide support services of different types, but while these have an appearance of supporting ‘innovation’ they are primarily designed to support general business development, and in some cases are not skills-based but financial support schemes (subsidy schemes and grants). In general, there is a lack of local private sector providers who can support technology adoption in smaller companies and across sectors. Knowledge Transfer (KT) is more common for HTT than pure TT and is seen as the introduction of modern methods and management procedures designed to improve competitiveness.

HEI and VET providers offer ‘educational’ services, but these are not aimed at enterprises but at individual students. There is no clear distinction in service provision regarding the size of companies, but most services seem to be aimed locally. ‘Services’ like training are often part of a donor-funded project rather than being a continuous commercial offering. There is also evidence of university researchers offering consulting support to enterprises on a personal rather than institutional basis.

2.3 Bosnia and Herzegovina

The provision of support for technology transfer in Bosnia and Herzegovina is sparse and is currently dominated by not-for-profit (NfP) organisations and the public sector, mainly in the form of DIHs and development agencies. Some organisations claim to offer different types of skills-related services to all types of companies, but lack any concrete evidence for this, and the descriptions of the services suggest that, with a few notable exceptions, this may be more an aspiration than reality, and that service providers do not have a strong grasp of the sort of services that would actually support HTT and VTT, rather than simply support business development.

Like Albania, there seems to be a stronger focus on HTT than VTT, particularly on digital transformation and digitalisation services. In this respect, DIHs in BiH appear to be delivering more strongly on their wider HTT remit and not simply supporting IT-based start-ups, as is the case in Albania. DIHs are also delivering services to SMEs and larger companies and not just to those that are start-ups or ‘local’. There is a strong focus on training to acquire digital skills. Development agencies are also supporting HTT but tend to focus closer to their own base of operations and offer more consulting than 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. Overall, both companies and research groups lack sufficient information, training and consulting services in order to participate more in VTT activities.

2.4 Kosovo

Survey results and interviews indicate that the provision of support services for both VTT and HTT is extremely limited in **Kosovo**, with only three organisations self-identifying as offering services. VTT support primarily comes from Pristina University. However, their ‘enterprise’ focus is on graduate start-ups and their services are strongly defined by project funding, e.g. an agreed number of training sessions on pre-defined topics and mentoring support to teams inside the overall project. VTT support is also offered by a development agency that predominantly serves SMEs and larger enterprises. An international aspect is visible, but this appears to be mainly with other countries or regions that share a common language, e.g. Albania and Tetovo in North Macedonia.

HTT support is provided by the Regional Development Agency and by an ICT Innovation Centre supporting start-ups, making ICT the only sector in Kosovo benefiting from sector-specific support. However, neither the Innovation Center nor the Regional Development Agency was able to clearly define their HTT support services or distinguish them from more general business development support activities.

2.5 Montenegro

A number of service providers in Montenegro indicate that they offer different types of skills-based services that support innovation, but close examination suggests that these are again more aligned with business development than with technology transfer. Overall, the current provision of skills-related services to support VTT and HTT was confirmed through interviews to be almost non-existent – a result of the nascent state of the environment. There is a lack of understanding about the overall topic and what technology transfer entails.

2.6 North Macedonia

An encouraging number of organisations in North Macedonia self-identify as offering both VTT and HTT services. However, closer examination again shows that most do not clearly distinguish between general services and skills-related technology transfer services. Interviews have confirmed that none of these services are specifically designed to support VTT, and only a few organisations 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.

2.7 Serbia

In Serbia, support for VTT in start-ups prevails over HTT; this mirrors the innovation policy and funding.

General entrepreneurship-type support is more obvious than tailored VTT support and is provided ad hoc rather than as part of a clear portfolio of services. VTT services also tend to focus on the early part of the process and a gap has been identified for more specialised services for the point of transfer, e.g. deal-making and technology licensing. Few services are available to support post-transfer activities, e.g. manufacturing and sales of commercial products.

In VTT, the provision is presently focused on the early-stage development segments where there are a number of service providers who mainly target local start-ups and SMEs. Very few services in VTT are designed for regional or international enterprises. Although some providers claim to cater to large companies, in reality the vast majority of their clients are start-ups and SMEs.

Services from TTOs in Serbia are provided to researchers rather than enterprises, although start-ups from the faculties gain benefits in the early stages of their formation and continue to benefit if they have academic staff working in the start-up.

HTT services seem to be mainly offered to the local market and focused on SMEs. Apart from a few organisations who are specialised in providing support in line with the S3 priority domains, most of the

offering is focused on ICT or is sector-agnostic. This reflects the current size of the local market. An exception is the pharmaceutical sector, where the intellectual property office offers an FTO (Freedom to Operate) service which is used by domestic pharmaceutical companies intending to start manufacturing generic drugs from expired patented medication.

Table 2 Comparative summary of provision of skills-based services

TT Systems	Skills-related services for VTT	Skills-related services for HTT
Albania	<p>Established government provision of 'extension services' in the Agricultural sector</p> <p>Little support outside agriculture</p> <p>Some individual (personal) consulting is provided to SMEs by researchers</p>	<p>Established government provision of 'extension services' in the Agricultural sector</p> <p>No other clear service providers (public or private)</p> <p>Donor-led initiatives for policy-defined sectors</p>
Bosnia and Herzegovina	<p>EEN portfolio including the IMProve service for SMEs</p> <p>Little support from PROs</p>	<p>Emerging strengths from DIHs, particularly for skills training</p> <p>Some consulting support from Regional Development Agencies, including evidence of support for some specific sectors</p>
Kosovo	<p>Support from Pristina University VUP – largely project based/donor defined</p>	<p>Some unstructured support from ICK and development agencies</p>
Montenegro	<p>Little visible support</p>	<p>Little visible support</p>
North Macedonia	<p>Some pockets of support 'services', but usually defined by donor projects, e.g. provision of training</p>	<p>Little visible support</p>
Serbia	<p>Strong support services for start-ups from multiple actors, driven by government policy</p>	<p>Intellectual Property services related to 'Freedom to Operate'</p>

3 MAIN NEEDS, GAPS AND IMPROVEMENT ACTIONS

An overview of the main commonalities and differences in gaps and proposed improvement actions is provided below, with corresponding summaries in Table 3. Further details for each economy are provided in Annex 2.

3.1 Overview

While the provision of skills-based services to support TT is low across all six economies, there are clear differences in the corresponding stages of development. **Montenegro and Kosovo** currently lag behind and stakeholders are still focused on developing the overall ecosystem in a top-down manner, including improving legislation and investing in new innovation infrastructure. This is an area where donor funding may be useful, but bottom-up sustainable initiatives should also be encouraged. Despite the existence of an established Innovation and Technology Development Fund, **North Macedonia** is also at a very early stage of development of services to support TT, with almost none provided for VTT and only a few organisations genuinely supporting HTT. **Albania** shows pockets of good provision of services, e.g. in agriculture, but this has a historical basis and the trend is diminishing under reforms to the R&D system. Support for VTT beyond agriculture is very low and, as for Montenegro and Kosovo, there is an expectation that new structures, e.g. TTOs, will help change the situation. **Serbia** shows a clear specialisation in VTT and this is being driven by its innovation policy, the S3 and the instruments of the innovation funds; support for HTT is much less visible. **Bosnia and Herzegovina** has a stronger focus on HTT, which seems to be driven by the arrival of DIHs (Digital Innovation Hubs), in marked contrast to Serbia.

All economies would benefit from raising awareness on the benefits of TT among technology adopters and from investing in the development of a basic portfolio of services (information, training and consulting) to support both VTT and HTT. The provision of a more specialised and a standardised set of services to support S3 implementation may also have benefits for all economies and reduce the need to ‘create the full system’ in a top-down manner.

The lack of a linkage between industrial policy and HTT support services to modernise and adopt new technology at enterprise level is notable in all economies. Support for technology adoption might help to shift the focus away from low-cost labour and towards higher quality goods and services. As it also requires a corresponding increase in the skills of the workforce, this might also be an action for VET providers linked to education.

Improvement actions can be identified for all economies (see below). Where services are already established, the service provider may be well placed to identify possible improvement actions, including internal capacity building and sector specialisation. In those economies where there are still almost no services at all, a preliminary action would be to investigate the demand for different services and the corresponding benefits before planning any ‘improvements’.

3.2 Albania

At this time, gaps and barriers in the overall ecosystem for TT in Albania predominate over clear gaps in TT service provision. A number of suggestions have been made by stakeholders to address this situation, including stronger provision of capacity building for government agencies who provide V/HTT support services and more investment in infrastructure, human resources and funding for R&D. Extending sector-specific support to areas beyond agriculture that are being identified under the S3 is a logical improvement action as is trying to stimulate stronger support from the private sector and raising awareness of the differences between VTT and HTT, thus encouraging a more targeted approach to supporting both activities.

3.3 Bosnia and Herzegovina

Gaps in the provision of services to support VTT are currently greater for VTT than for HTT in BiH. Some level of VTT support exists for companies to develop their innovation capacity and some projects focus 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. Developing services that are complementary, or offered by the same service provider to research teams and enterprises, would help to reduce the gap.

Services to support HTT form 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 among 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), more (stable) funding and increased sustainability in 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 BiH. Improvements in the provision of services to support VTT are unlikely to happen unless more funding is provided for R&D in general to develop technology and to stimulate demand for associated support services.

3.4 Kosovo

Kosovo has a strong lack of services to support either VTT or HTT that are not linked to time-limited, donor-funded project activities, despite evidence that TT is taking place and that ad hoc support is beneficial. The development of more sector-specific VTT support is being driven by individual technology-based projects coming through the main university incubator or the ICT start-up focus of the innovation centre. Specialised support beyond ICT is not visible despite service providers recognising 'potential' in some sectors to benefit from this.

Lack of HTT services is linked to a lack of funding to supply services and, at a higher level, a lack of FDI in Kosovo. Low levels of VTT services can be linked to very low levels of public spending on R&D and limit the technology actually being developed for transfer. It is not clear if enterprises have the financial resources to invest in TT services for themselves. Need and ability to pay should be a starting point for any improvement action to ensure long-term provision of service, as this may point towards information rather than consulting services.

3.5 Montenegro

The current provision of skills-related services to support technology transfer of both types is almost non-existent in Montenegro. No clear plans have been identified to change this situation. Improving the framework conditions is seen to be the major priority for most stakeholders.

The clear sector priorities of the adopted S3 do offer a starting point for establishing VTT services, as do the planned new infrastructure and support units (Centralised TTO and the Science Technology Park). Support for HTT services could be improved by providing more information, e.g. through the new DIH. The expansion of HTT services to other sectors needs to be tied strongly to the country's competitiveness and industrial policy. The small size of Montenegro tends to limit the number and diversity of support service providers. Small initiatives linked to priority sectors (S3) may be a useful starting point to explore the need for and benefits of HTT services with the technology adopters themselves. Such an action could be used to help define an improved service offering.

3.6 North Macedonia

Services to support TT in North Macedonia are starting from a very low level, with almost no coverage for VTT and very low coverage of all types for HTT. As with Montenegro and Kosovo, there is a tendency by stakeholders to focus on improving framework conditions before expanding the service offering. These include a lack of specialised service providers themselves as well as specialised support structures and formalised and established industry-academia collaborations.

VTT is seen to be limited by the lack of investment in 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 FDIs into the country. Low levels of cluster activity were also identified as a barrier for both VTT/HTT. Major developments in national policy are seen to be needed to create real change at the level of support services.

Intermediary starting points for improvement could involve 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) with their associated teams 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 S3. Information to raise awareness on the benefits of technology transfer was seen to be an important early step.

3.7 Serbia

There is currently a gap in the provision of HTT services in Serbia compared to VTT. There are only few real providers of HTT services and there is very little provision of training and consulting services for all sizes and types of enterprises. Services to support digital transformation through HTT are seen to have potential for expansion. However, a general lack of understanding of HTT beyond the digital sector suggests a need to raise awareness and build capacity among service providers before expanding the service portfolio.

Stronger overall support from TTOs as VTT service providers is suggested as a current need. This is based on the perceived poor 'results' that have been achieved by TTOs in Serbia over the last decade. This might suggest a need for more capacity building, but VTT 'results' are always linked to a complex set of variables, including transfer skills, but are also highly influenced by the strength of the technology available to transfer and the local environment, e.g. the culture of the HEI and the support of the Rectorate and Faculties. These latter factors are not under the control of the TTO and are relatively unaffected by TT skills development.

More mentoring support (consultancy) is highlighted as the main improvement action in the VTT space. Information and training are often provided to a broad audience and may indicate the way forward and motivate companies to deal with the issues they face, but mentoring enables companies to target and tackle real problems and therefore produces more concrete results.

Representatives of the EEN suggested that despite the provision of support services by the IPO, specific support is still lacking in the field of IP and technology-based company valuation -patents in particular.

Overall, improvement actions for both HTT and VTT can be identified. However, more investigation is needed to establish a tangible link between the perceived 'gap' in the current provision of support and a genuine need by the market.

Table 3 Comparative summary of main needs, gaps and improvement actions

TT Systems	Needs and Gaps	Improvement Actions
Albania	Overall support is very low. Support for all types of services for HTT and VTT beyond Agriculture is needed. The current ecosystem needs to be addressed to provide the basis for service provision.	Start with the overall ecosystem. Provide capacity building for government agencies who deliver extension services. Extend support services beyond agriculture to align with the S3 priorities. Stimulate support from the private sector. Raise awareness of the specifics of HTT and VTT to encourage tailoring of support services.
Bosnia and Herzegovina	Overall support is very low. Greater need to develop VTT support than HTT. Gap in the provision of support to both public and private entities, e.g. organisations that can serve both 'sides' of TT.	Raise awareness in enterprises of the benefits of technology adoption (information services). Build capacity of business managers for managing the technology adoption process within the company (training and consulting). Expand on the successful DIH model to serve other sectors.
Kosovo	Overall support is very low. There is a need for services that are not linked to time-bound donor-funded projects. Little specialised support beyond the ICT sector.	Raise awareness in enterprises of the benefits of technology adoption (information services). Investigate the need for and ability to pay for support services (market assessment).
Montenegro	Overall support is very low. The current framework conditions need to be addressed to provide the basis for service provision.	Begin to develop VTT services based on established actors and the S3 priorities. Explore the need for and benefits of HTT services with the technology adopters themselves.
North Macedonia	Overall support is very low. Almost no coverage for VTT and very low coverage of all service types for HTT.	Design skills-related support services to leverage funding from the Innovation Fund ('smart money'). Begin to develop VTT services based on established and planned actors and the S3 priorities.
Serbia	Reasonable support for VTT/ Low support for HTT. Only a few real providers of any types of services.	Strengthen support from TTOs towards enterprises. Expand consulting support to enterprises, including from private sector providers.

Very little provision of training and consulting services for all sizes and types of enterprises.

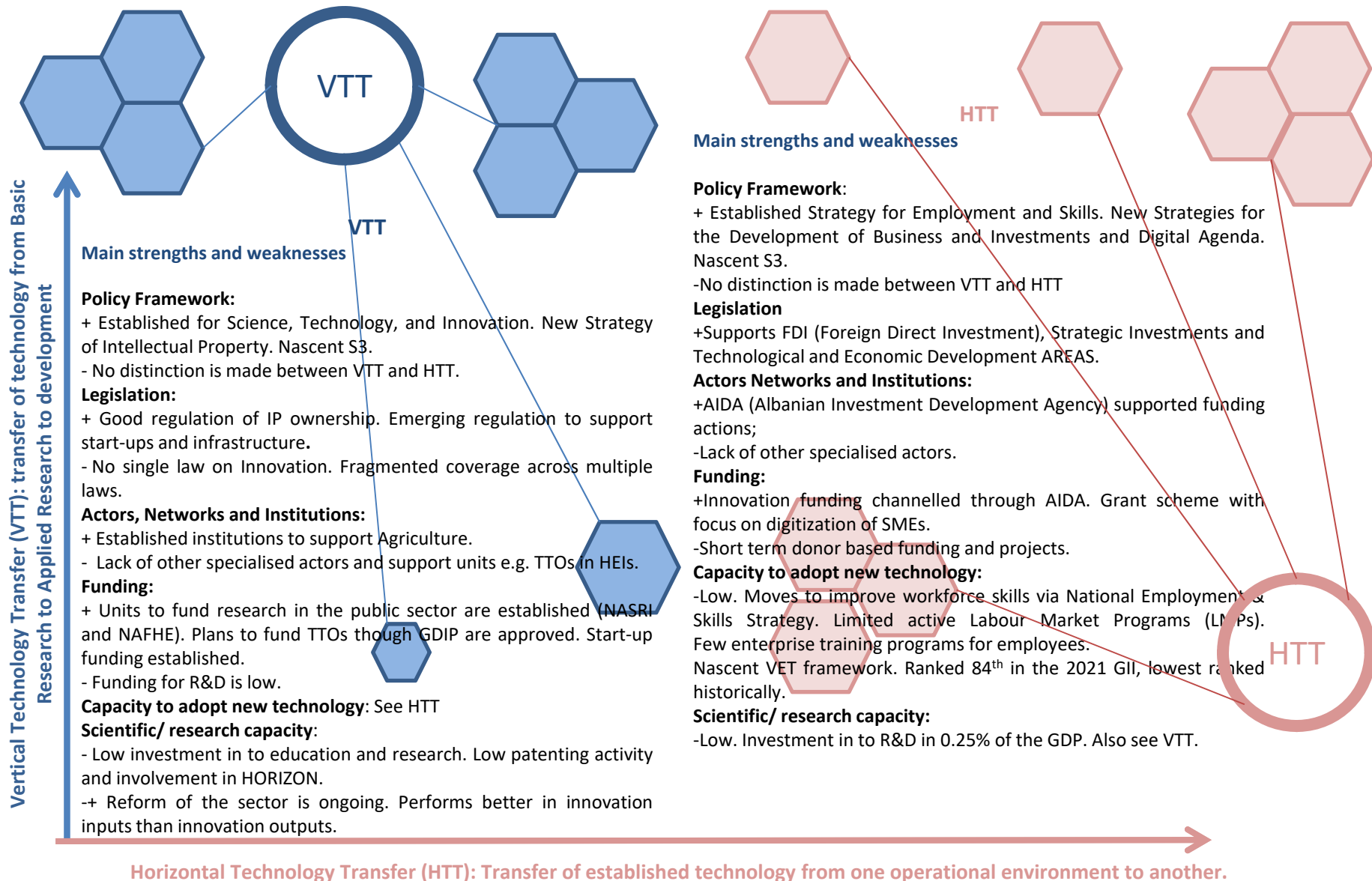
Investigate market 'need' for services and ability to pay for them.

ANNEXES

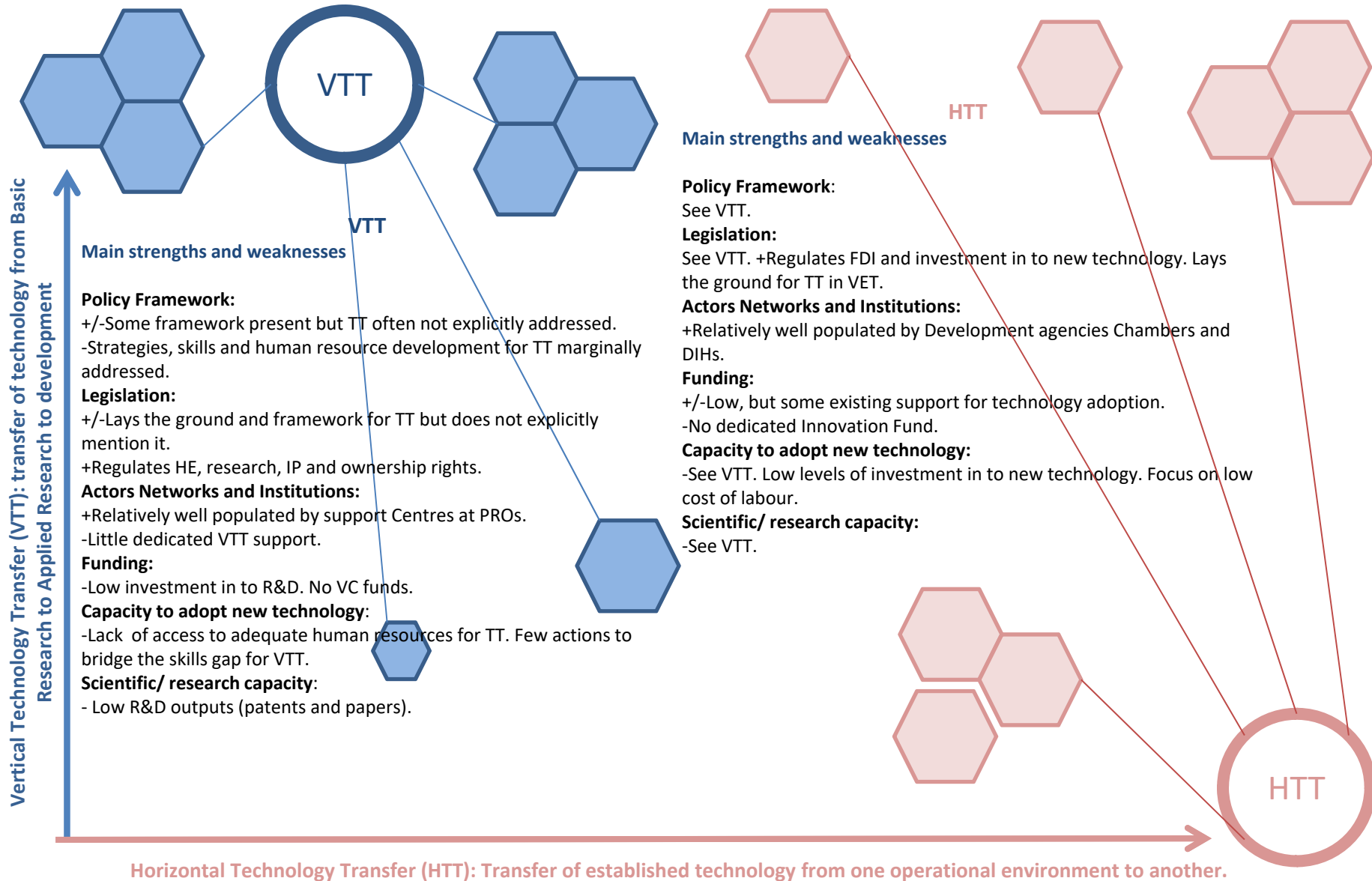
ANALYSING THE SKILLS DIMENSION OF TECHNOLOGY TRANSFER IN THE WESTERN BALKANS

Annex 1: Economy specific
summaries of technology transfer
systems

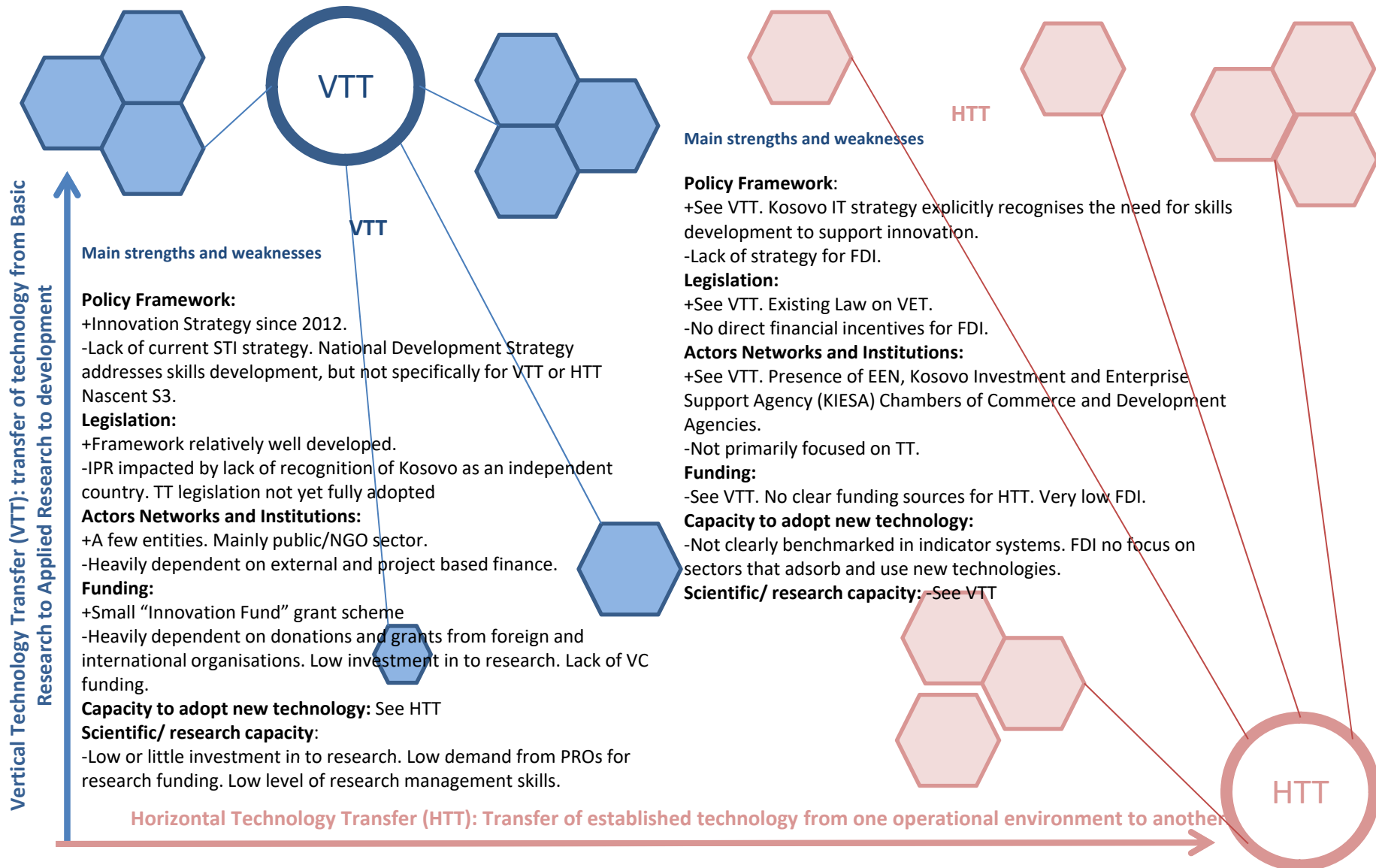
TECHNOLOGY TRANSFER ECOSYSTEM OF ALBANIA



TECHNOLOGY TRANSFER ECOSYSTEM SYSTEM OF BOSNIA AND HERZEGOVINA

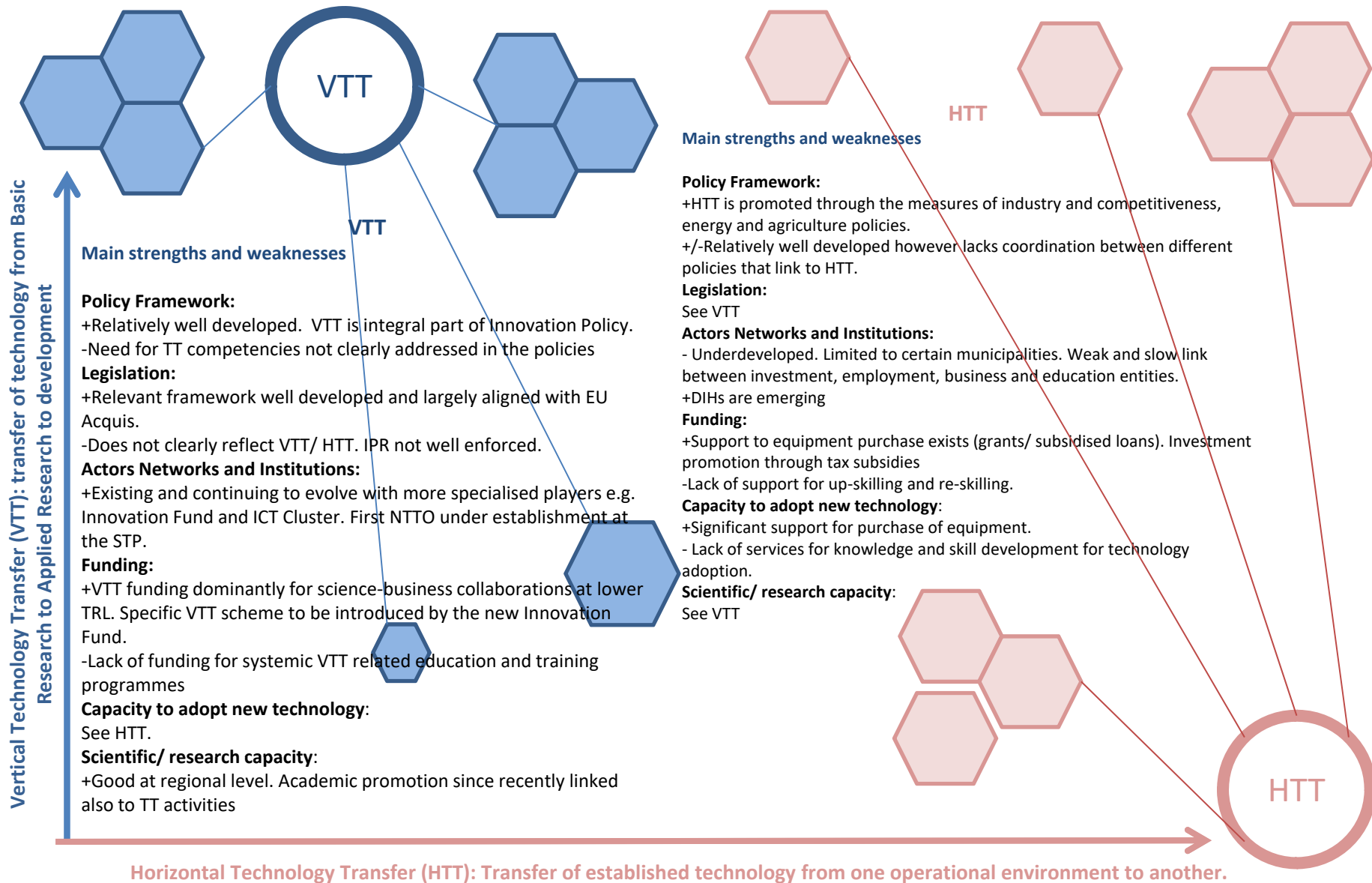


TECHNOLOGY TRANSFER ECOSYSTEM OF KOSOVO*

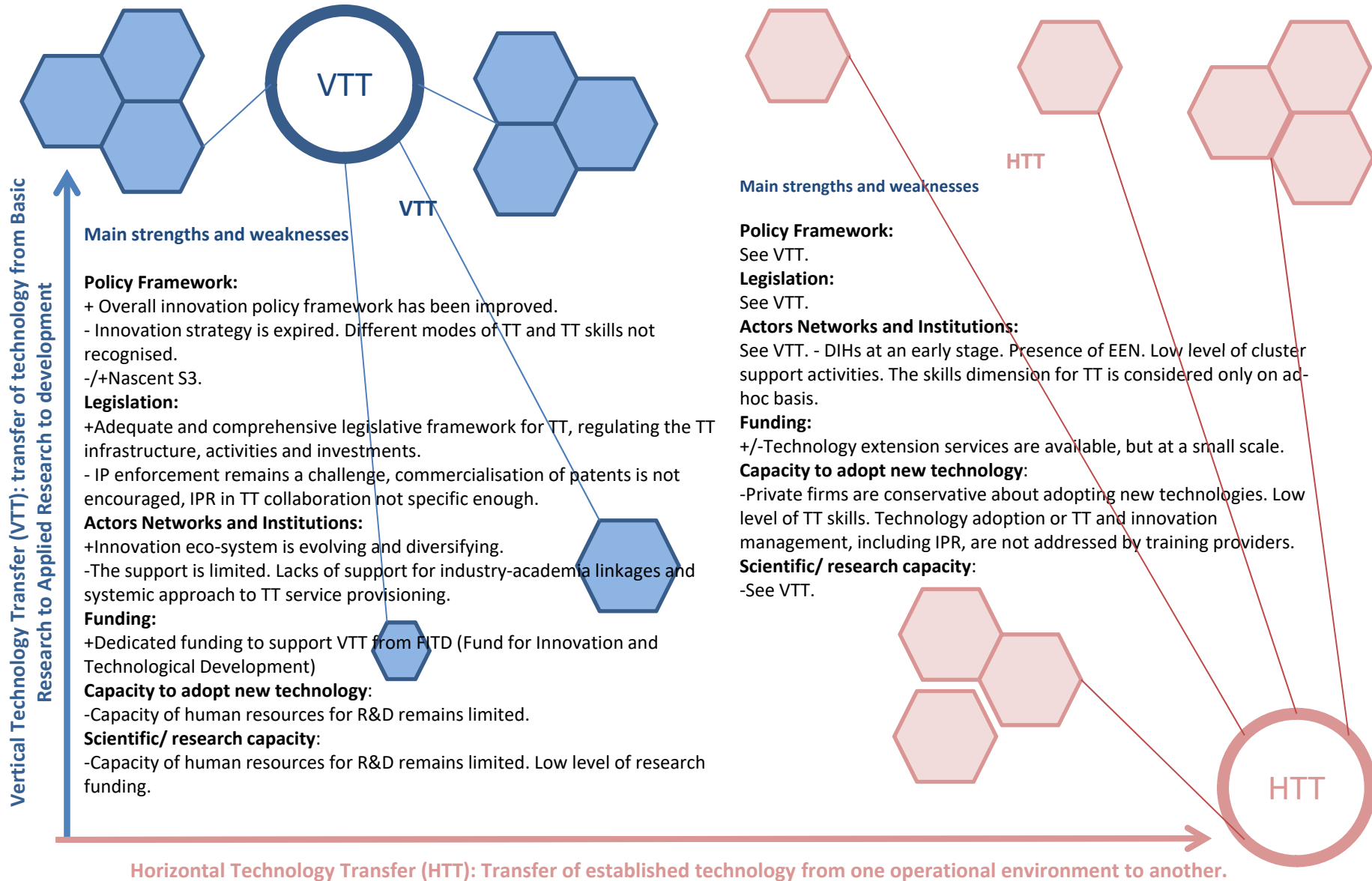


* This designation is without prejudice to positions on status and is in line with UNSCR 1244/99 and the ICJ Opinion on the Kosovo declaration of independence.

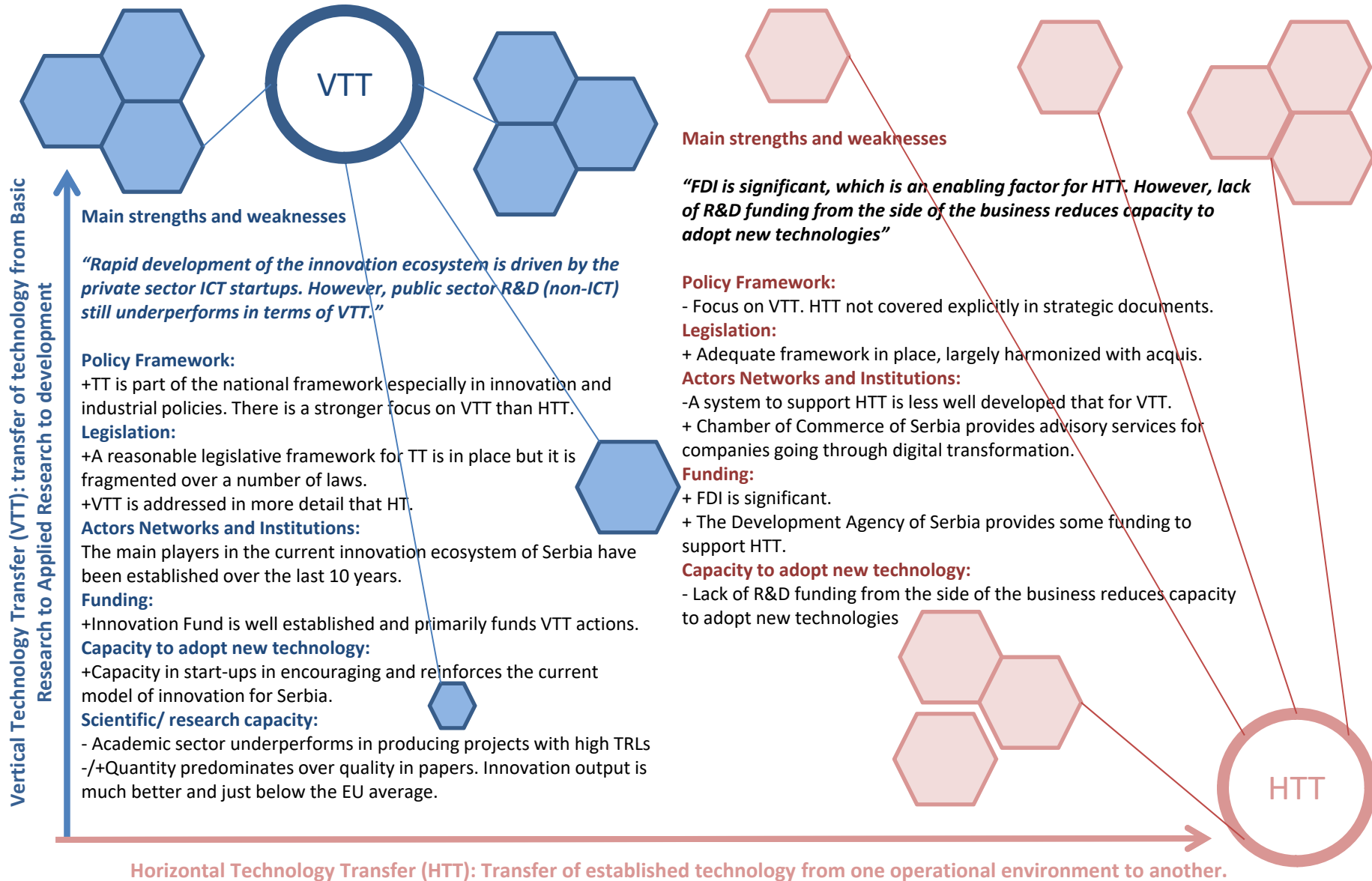
TECHNOLOGY TRANSFER ECOSYSTEM OF MONTENEGRO



TECHNOLOGY TRANSFER ECOSYSTEM OF NORTH MACEDONIA



TECHNOLOGY TRANSFER ECOSYSTEM SYSTEM OF SERBIA



ANALYSING THE SKILLS DIMENSION OF TECHNOLOGY TRANSFER IN THE WESTERN BALKANS

Annex 2: Economy specific summaries
of service provision: Strengths,
Weaknesses, Needs, Gaps and
Improvement actions

PROVISION OF SKILLS RELATED SERVICES TO SUPPORT TECHNOLOGY TRANSFER IN ALBANIA

Skills related services: Services provided by a broad range of public and private organisations, of **information, training and consulting**

The support the development of skills of individuals, employees, and employers to develop and implement VTT and HTT.

Vertical Technology Transfer (VTT): transfer of technology from Basic Research to Applied Research to development

VTT

VTT

Main strengths and weaknesses

- ✓ Support is established in organisations with a tradition in supplying this – primarily in agricultural sector.
- ✓ Strong provision of training services and some consulting.
- ✗ Support is diminishing due to a range of factors. Services strongly linked to time limited projects. Little evidence of support beyond the agricultural sector. Consulting support for VTT that requires access to facilities and expertise is becoming increasingly curtailed.

Main Needs and Gaps

- General gap in all three types of services beyond the agricultural sector.

Improvement actions - services

- Increase support for start-ups. Extend services beyond agriculture.

Improvement actions - environment

- Inclusion of TT as a key action in national and institutional policies.
- Capacity building for government agencies organisations delivering services.
- More investment in to infrastructure, human resources and funding for R&D.

Sector related issues

- Strong but diminishing support for Agriculture.
- Little evidence of support for other sectors.



HTT

Main strengths and weaknesses

- ✓ Knowledge Transfer exists to support introduction of modern methods and management procedures designed to improve competitiveness.
- ✗ Support is very low and dominated by government lead, top down, donor funded initiatives to increase the competitiveness of some sectors.
- ✗ Lack of local private sector providers who can support technology adoption in smaller companies and across sectors.

Main Needs and Gaps

- Lack of a clear portfolio in of well defined skills based services to support HTT
- Lack of information services.
- Consulting is less well represented than training

Improvement actions - services

- Increase support for SMEs and start-ups.
- Build capacity in private service providers.

Improvement actions – environment

- Inclusion of TT as a key action in national and institutional policies.
- Strengthening of linkages between technology supply side, technology adopters and the intermediary support service provider.

Sector related issues

- Lack of a clear linkage between services and priority sectors.

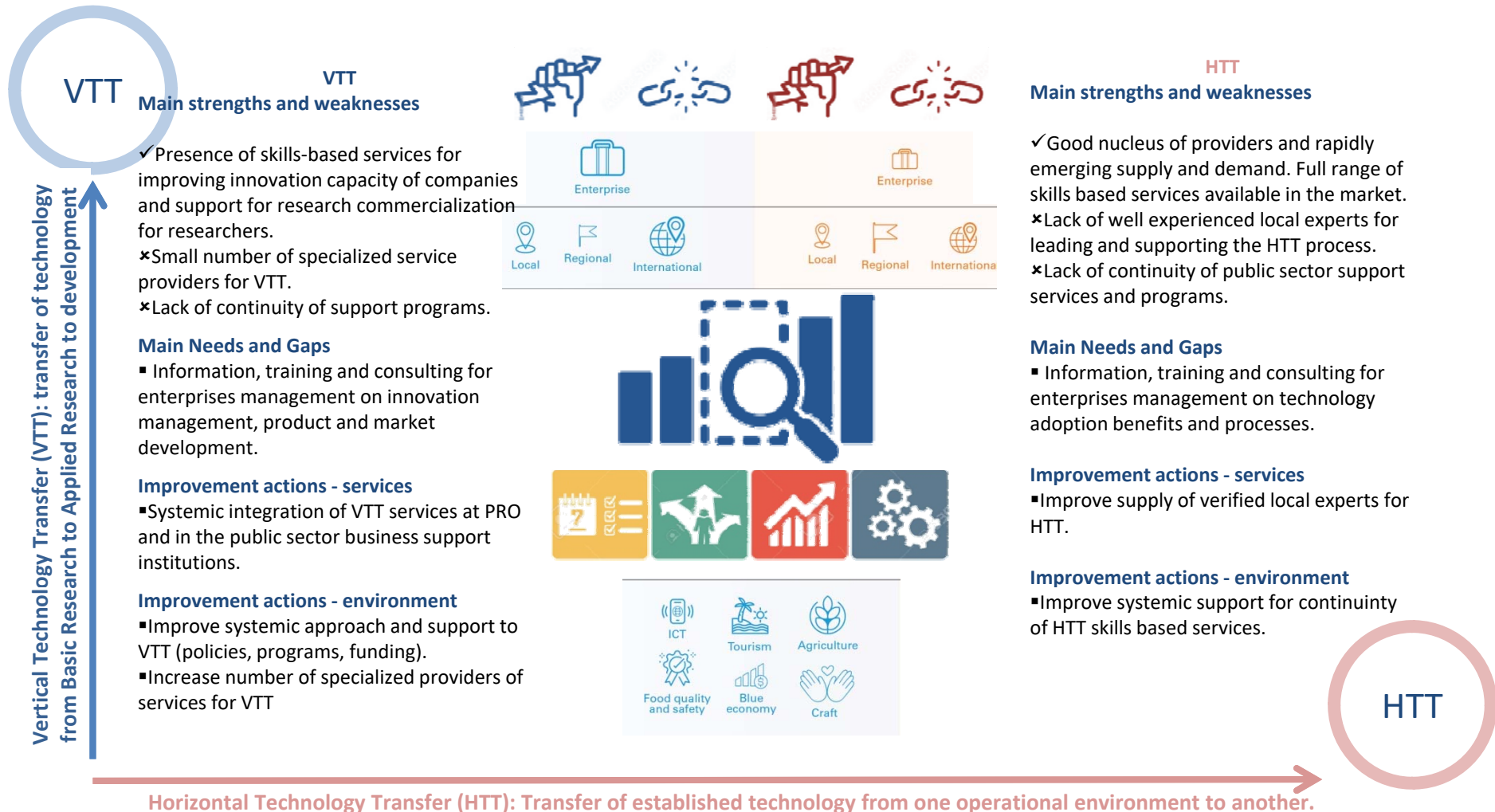
HTT

Horizontal Technology Transfer (HTT): Transfer of established technology from one operational environment to another.

PROVISION OF SKILLS RELATED SERVICES TO SUPPORT TECHNOLOGY TRANSFER IN BOSNIA AND HERZEGOVINA

Skills related services: Services provided by a broad range of public and private organisations, of **information, training and consulting**

The support the development of skills of individuals, employees, and employers to develop and implement VTT and HTT.

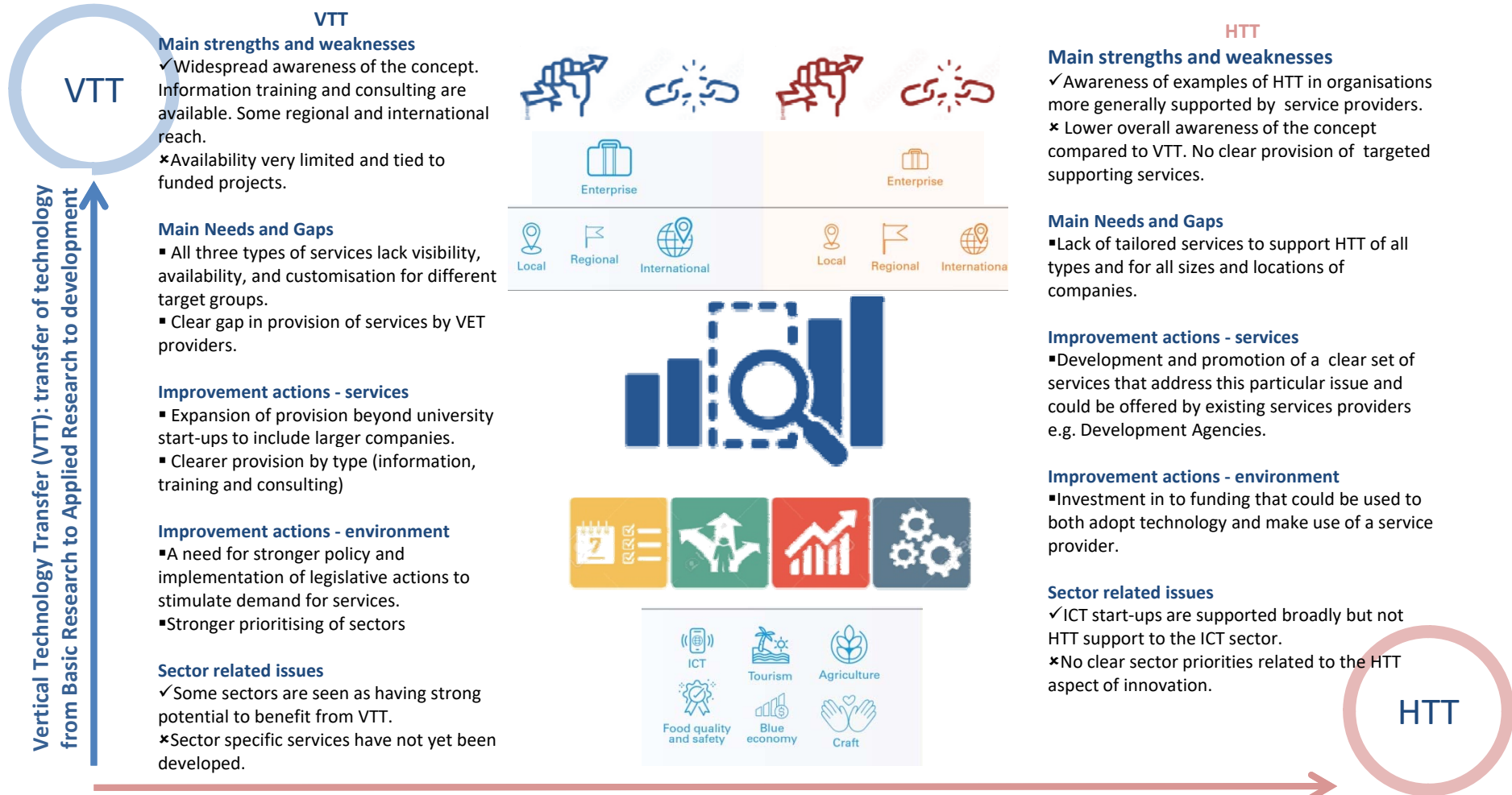


Horizontal Technology Transfer (HTT): Transfer of established technology from one operational environment to another.

PROVISION OF SKILLS RELATED SERVICES TO SUPPORT TECHNOLOGY TRANSFER IN KOSOVO*

Skills related services: Services provided by a broad range of public and private organisations, of **information, training and consulting**

The support the development of skills of individuals, employees, and employers to develop and implement VTT and HTT.



VTT

VTT

Main strengths and weaknesses

- ✓ Widespread awareness of the concept. Information training and consulting are available. Some regional and international reach.
- ✗ Availability very limited and tied to funded projects.

Main Needs and Gaps

- All three types of services lack visibility, availability, and customisation for different target groups.
- Clear gap in provision of services by VET providers.

Improvement actions - services

- Expansion of provision beyond university start-ups to include larger companies.
- Clearer provision by type (information, training and consulting)

Improvement actions - environment

- A need for stronger policy and implementation of legislative actions to stimulate demand for services.
- Stronger prioritising of sectors

Sector related issues

- ✓ Some sectors are seen as having strong potential to benefit from VTT.
- ✗ Sector specific services have not yet been developed.



HTT

Main strengths and weaknesses

- ✓ Awareness of examples of HTT in organisations more generally supported by service providers.
- ✗ Lower overall awareness of the concept compared to VTT. No clear provision of targeted supporting services.

Main Needs and Gaps

- Lack of tailored services to support HTT of all types and for all sizes and locations of companies.

Improvement actions - services

- Development and promotion of a clear set of services that address this particular issue and could be offered by existing services providers e.g. Development Agencies.

Improvement actions - environment

- Investment in to funding that could be used to both adopt technology and make use of a service provider.

Sector related issues

- ✓ ICT start-ups are supported broadly but not HTT support to the ICT sector.
- ✗ No clear sector priorities related to the HTT aspect of innovation.

HTT

Horizontal Technology Transfer (HTT): Transfer of established technology from one operational environment to another.

* This designation is without prejudice to positions on status and is in line with UNSCR 1244/99 and the ICI Opinion on the Kosovo declaration of independence.

PROVISION OF SKILLS RELATED SERVICES TO SUPPORT TECHNOLOGY TRANSFER IN MONTENEGRO

Skills related services: Services provided by a broad range of public and private organisations, of **information, training and consulting**

The support the development of skills of individuals, employees, and employers to develop and implement VTT and HTT.

VTT

VTT

Main strengths and weaknesses

- ✓ Growing number of organisations offering support services for 'innovation' that also support VTT e.g. IPR training.
- ✓ Some mentoring support for start-ups linked to commercialisation of university research.
- ✗ Lack of tailored and targeted services.
- ✗ Formal availability very limited due to lack of service providers and weak institutional tradition.
- ✗ 'Grey market' for consulting being supplied on a personal and pro-bono level by researchers.

Main Needs and Gaps

- Need for all three types of services for all types of enterprises (extremely low baseline)
- More support needed for SMEs (beyond start-up).

Improvement actions - services

- TT trainings to be structured and standardised, and not one-off and general
- Improved approach to marketing of existing services.

Improvement actions - environment

- Establishment of specialised and active units to support delivery of services e.g. TTOs.
- Capacity building for service providers.

Sector related issues

- Non identified



HTT

Main strengths and weaknesses

- ✓ Some provision of services designed to support innovation, including IPR.
- ✓ First EU Digital innovation hubs show good effects in HTT skill development
- ✗ Lack of awareness of specific needs (HTT services not differentiated from general business services).
- ✗ Lack of tailored and targeted services.

Main Needs and Gaps

- Need for all three types of services for all types of enterprises (extremely low baseline)
- Extension beyond training and in to consulting services

Improvement actions - services

- Capacity building for existing service providers

Improvement actions - environment

- Stronger involvement of cluster organisations in provision of services requires increased capacity
- Awareness of HTT opportunities

Sector related issues

- Stronger link needed to S3 priority sectors.
- Lack of expertise on technologies for green transition.
- Some support for ICT and 'Blue Economy' sectors.

HTT

Vertical Technology Transfer (VTT): transfer of technology from Basic Research to Applied Research to development

Horizontal Technology Transfer (HTT): Transfer of established technology from one operational environment to another.

PROVISION OF SKILLS RELATED SERVICES TO SUPPORT TECHNOLOGY TRANSFER IN NORTH MACEDONIA

Skills related services: Services provided by a broad range of public and private organisations, of **information, training and consulting**

The support the development of skills of individuals, employees, and employers to develop and implement VTT and HTT.

VTT

VTT

Main strengths and weaknesses

- ✓ Reasonable understanding of the need and benefit of support.
- ✗ Few if any services to specifically support VTT in enterprises. Lack of IPR services.

Main Needs and Gaps

- General need to develop all types of service for VTT at this time.

Improvement actions - services

- Development of different types of services to specifically support VTT, including information, training and consulting on TT, IP, commercialisation, innovation management.
- Capacity building in service providers.

Improvement actions - environment

- Systemic integration of VTT services accompanied will well defined IP policy and service portfolio.
- Increased funding for R&D to stimulate technology development and demand for services.
- Increase the number of specialised VTT service providers, including consulting companies.

Sector related issues

- Support for digital technologies to realise potential.



HTT

Main strengths and weaknesses

- ✓ Some defined support for HTT from a number of organisations including 'test before invest'.
- ✗ Lack of specialised HTT support compared to general portfolio of skills related support services.

Main Needs and Gaps

- Improved promotion of the benefits of HTT in enterprises (information and training).
- More tailored consulting services.

Improvement actions - services

- Capacity building for service providers. Formal training in the field for verified expertise.

Improvement actions - environment

- Raised awareness of the benefits of HTT in enterprises.
- Improved innovation policy and national framework conditions for HTT, systematically addressing skills dimension across all relevant strategies.
- Financial support for HTT activities.

Sector related issues

- Support for the agrifood and processing sector and metal processing "and light manufacturing (in particular wood processing), to improve competitiveness.

HTT

Vertical Technology Transfer (VTT): transfer of technology from Basic Research to Applied Research to development

Horizontal Technology Transfer (HTT): Transfer of established technology from one operational environment to another.

PROVISION OF SKILLS-RELATED SERVICES TO SUPPORT TECHNOLOGY TRANSFER IN SERBIA

Skills related services: Services provided by a broad range of public and private organisations, of **information, training and consulting**

The support the development of skills of individuals, employees, and employers to develop and implement VTT and HTT.

VTT

Vertical Technology Transfer (VTT): transfer of technology from Basic Research to Applied Research to development

Main strengths and weaknesses

“Reasonable understating of the concept and services needed to support it. Range of services being offered by several providers. Support from TTOs not seen to be adequate effective.”

Main Needs and Gaps

- Clear gaps in provision of services to enterprises (compared to services offered to researchers).
- Lack of mentoring (and other consultancy) compared to information or training.

Improvement actions - services

- Provision of training and consulting services on more business-specific topics e.g. IPR and technology valuation, and for late stage innovation (higher TRLs).

Improvement actions - environment

- Increased capacity to offer support (overcoming resource constraints)

Sector related issues

- Need for more support for agriculture and food, manufacturing, green energy, medical/pharmaceutical and biotechnology to align with the S3.



Main strengths and weaknesses

“Apart from strong support to digital transformation, the concept is not well understood and the services needed to support HTT are lacking.”

Main Needs and Gaps

- Lack of defined services of all types beyond the digital transformation sector and local offerings aimed at startups. Lack of interest for HTT services among service providers.

Improvement actions - services

- Diversification of service providers and tailored service offerings.
- Capacity building for staff and easing of resource constraints.

Improvement actions - environment

- Lack of a clear national strategy for HTT beyond FDI. National technology adoption program incl. expert (consulting) support.

Sector related issues

- Needs for tailed support for agriculture and food, green energy, healthcare and machine production.

HTT

Horizontal Technology Transfer (HTT): Transfer of established technology from one operational environment to another.

ACRONYMS

AL	Albania
ATTC	Agriculture Technology Transfer Centres
BiH	Bosnia and Herzegovina
DIH	Digital Innovation Hub
EEN	Enterprise Europe Network
ETF	European Training Foundation
EU	European Union
FDI	Foreign Direct Investment
FITD	Fund for Innovation and Technological Development
FTO	Freedom to Operate
GII	Global Innovation Index
HEI	Higher Education Institution
HTT	Horizontal Technology Transfer
PRO	Public Research Organisation
IC	IC Innovation Centre
IP	Intellectual Property
IPR	Intellectual Property Right
KO	Kosovo
KT	Knowledge Transfer
ME	Montenegro
MK	North Macedonia
NDS	National Development Strategy
NfP	Not for Profit
R&D	Research & Development
S3	Smart Specialisation Strategy
SR	Serbia

TTO	Technology Transfer Office
TRL	Technology Readiness Level
TT	Technology Transfer
VET	Vocational Education and Training
VTT	Vertical Technology Transfer
WP	Work Package