ICT SKILLS IN THE WESTERN BALKANS SIX

Current Landscape, Emerging Needs, and Directions for Action

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LIST OF ABBREVIATIONS

Abbreviation	Full Term
AI	Artificial Intelligence
API	Application Programming Interface
AR	Augmented Reality
AWS	Amazon Web Services
CAGR	Compound Annual Growth Rate
CBAM	Carbon Border Adjustment Mechanism
CEH	Certified Ethical Hacker
CI/CD	Continuous Integration / Continuous Deployment
CISSP	Certified Information Systems Security Professional
CKA	Certified Kubernetes Administrator
CKAD	Certified Kubernetes Application Developer
CRM	Common Regional Market
DACH	Germany, Austria, and Switzerland (Deutschland, Österreich, Schweiz)
DESI	Digital Economy and Society Index
DevOps	Development and Operations
EDIH	European Digital Innovation Hub
ERP	Enterprise Resource Planning
EU	European Union
FinOps	Cloud Financial Operations
GCP	Google Cloud Platform
GDP	Gross Domestic Product
GDPR	General Data Protection Regulation
GenAI	Generative Artificial Intelligence
IAM	Identity and Access Management
ICT	Information and Communications Technology
IoT	Internet of Things
ISTQB	International Software Testing Qualifications Board
JRC	Joint Research Centre (European Commission)
LFS	Labour Force Survey
LLM	Large Language Model
ML	Machine Learning
MLOps	Machine Learning Operations
NACE	Statistical Classification of Economic Activities in the European Community

Abbreviation	Full Term
NLP	Natural Language Processing
OECD	Organisation for Economic Co-operation and Development
OWASP	Open Worldwide Application Security Project
PISA	Programme for International Student Assessment
PMP	Project Management Professional
QA	Quality Assurance
RCC	Regional Cooperation Council
RER	Regular Economic Report (World Bank)
SAP	Systems, Applications, and Products in Data Processing
SME	Small and Medium-sized Enterprise
SOC	Security Operations Centre
SQL	Structured Query Language
SRE	Site Reliability Engineering
UI/UX	User Interface / User Experience
VR	Virtual Reality
WB6	Western Balkans Six (Albania, Bosnia and Herzegovina, Kosovo*, Montenegro, North Macedonia, Serbia)
WEF	World Economic Forum

***** 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

GLOSSARY OF KEY TERMS

Term	Definition as Used in This Report
ICT sector	The information and communications technology sector as classified under NACE Rev. 2 Section J (Information and Communication), encompassing telecommunications, software publishing, computer programming, IT consulting, data processing, and information services. Statistical offices across the WB6 use this classification for the employment and trade data cited in this report.
IT sector	A narrower subset of ICT, corresponding to NACE divisions J62 (Computer programming, consultancy, and related activities). References to software companies, outsourcing firms, or product companies generally concern this segment. The distinction matters because aggregate ICT statistics include telecommunications and media, which have different labour-market dynamics.
ICT services exports	Cross-border/boundary trade in digitally delivered services – primarily software development, IT consulting, and data processing. This is the metric used when discussing export performance (e.g. EUR 6 billion), corresponding to balance-of-payments data reported by central banks and statistical offices.
WB6 level observations	The unit of analysis for intra-regional survey findings. Because some respondent companies operate in multiple WB6, a single company may generate observations for more than one WB6: 31 companies yield 38 market-specific observations. The term reflects the analytical rather than statistically representative nature of the sample.
T-shaped professional	An individual with deep expertise in one technical domain (the vertical bar) combined with broad competencies in business understanding, communication, and project management (the horizontal bar). Contrasted with I-shaped professionals who have deep but narrow specialisation.
Outsourcing model	A business model in which a company provides software development or IT services to foreign clients who define specifications. The company sells labour capacity rather than its own products. This model drove most of the region's ICT export growth but faces pressure from AI automation and evolving client demands.
Product model	A business model in which a company develops and sells its own software products or platforms, typically requiring broader skill sets (product management, UX, business strategy) and generating higher margins than outsourcing.
Skills gap	The difference between the competencies employers require and those available candidates possess, as identified by surveyed and interviewed employers – not based on formal occupational standards or qualification frameworks.

Term	Definition as Used in This Report
AI copilot	An AI-powered tool integrated into a developer's workflow to assist with code generation, completion, or review (e.g. GitHub Copilot). Distinguished from generative AI embedded in products, which refers to AI capabilities built into a company's own offerings for end users.
Seniority levels	Industry-standard categories used in the survey: Junior (0–2 years), Medior (2–5 years), Senior (5+ years), and Lead / Principal (senior technical or architectural roles with team-level responsibility).

INTRODUCTION

Background and rationale

The competitiveness and convergence of the Western Balkans Six (WB6) depend, in large part, on how quickly the region closes its persistent skills gap. The Common Regional Market Action Plan 2025–2028 (CRM 2.0), endorsed by WB6 leaders in 2024, identifies the shortage of relevant skills as one of the key structural constraints to regional integration and EU alignment. Together with the EU Growth Plan for the Western Balkans, it places human capital at the core of the region's growth model – aiming to unlock innovation capacity and workforce quality as the foundations for sustained economic convergence.

The information and communications technology (ICT) sector occupies a very important position in this agenda. Over the past decade and a half, ICT services have evolved from a marginal economic activity into one of the region's most dynamic export sectors, generating billions in revenue, employing hundreds of thousands of professionals, and contributing to a trade surplus that few other sectors can match. This growth was built almost entirely on human capital: skilled professionals, competitive labour costs, strong English proficiency, and geographic and cultural proximity to the European Union.

Yet progress in this regard has not translated into equivalent progress in digital capability. According to the WB DESI 2025 Report, only about 33% of adults across the region possess basic digital skills, compared with 56% in the EU. ICT specialists represent approximately 3% of total employment, below the EU's 5% average. The OECD's Economic Convergence Scoreboard for the Western Balkans 2025 confirms that employer-provided training remains sporadic and the skills base is not adapting fast enough to match the pace of technological change. At the same time, the World Economic Forum Future of Jobs Report 2025 (covering 1,000+ employers across 55 countries) finds that 86% of employers globally expect AI to transform their business by 2030 and that 39% of existing skill sets will require transformation. These global forces are reshaping what the ICT labour market demands – and the WB6 must respond.

It is against this backdrop that the Regional Cooperation Council (RCC) commissioned this study: to generate a structured, evidence-based understanding of the current and emerging ICT skills landscape across the region and to provide actionable, empirically grounded insights that can inform workforce development and policy planning within the CRM 2.0 framework.

Purpose and scope

The study is primarily analytical, providing an evidence base and directional guidance rather than detailed policy prescriptions. It is designed to help regional institutions and WB6 authorities recognise where skill shortages, systemic bottlenecks, and opportunities for cooperation are emerging. The findings are designed to feed into broader regional efforts, both of which emphasise human capital development as a pillar of competitiveness.

The study covers all WB6 – Albania, Bosnia and Herzegovina, Kosovo*, Montenegro, North Macedonia, and Serbia – with a regional perspective and comparable analytical scope. While contexts in each WB6 differ, the ICT sector across the region shares similar structural characteristics, growth drivers, and skills-related challenges, making inter-regional comparison and peer learning highly relevant. The sectoral scope encompasses software development, data and AI-related services, cloud computing, cybersecurity, and emerging digital-service industries – segments that collectively represent the backbone of the region's digital economy.

The specific objectives of the study are to: analyse the structure and performance of the ICT labour market across WB6, including demand dynamics, occupational patterns, and growth areas; identify concrete skill and competency gaps faced by ICT companies, with particular focus on emerging technologies such as AI, cloud computing, and data analytics; examine how education and training systems are adapting to technological change and employer needs; and deliver evidence-based guidance that can help policymakers and partners prioritise interventions within the CRM 2.0 framework.

Methodology and data sources

The study adopts an employer-centric approach, emphasising how companies experience and respond to the skills challenges documented in the broader literature. Its empirical component combines 38 market-specific survey observations and 18 structured interviews with ICT stakeholders across the WB6. It triangulates three levels of evidence: (1) global and regional assessments, (2) a purpose-built employer survey, and (3) structured qualitative interviews.

1. The study draws on a structured evidence base combining global and regional sources, including the WEF's Future of Jobs Report 2025, the World Bank's Western Balkans Regular Economic Report No. 28, the WB DESI 2024 Report and WB DESI 2025 Report, statistical office data from each WB6 on ICT employment and trade, and sector-specific studies from ICT industry associations and economic research institutes across the region.
2. The employer survey was designed specifically for this study and distributed to ICT companies across the region. It generated 38 market-specific observations,

as some firms provided information covering more than one WB6 market, spanning hiring intent, role demand, skills gaps, candidate rejection reasons, training practices, recruitment channels, technology roadmaps, and growth constraints. While the sample is not statistically representative of the full ICT sector in each WB6, it captures the perspectives of a diverse cross-section of firms – from micro-enterprises to large exporters, from pure outsourcing operations to product companies – and provides structured quantitative evidence that complements the qualitative data.

3. Eighteen structured interviews were conducted between November 2025 and January 2026 with ICT industry stakeholders across the region. Interviewees included representatives of industry associations, ICT company executives, cluster organisations, angel investors, innovation hubs, startup accelerators, digital economy initiatives, and independent economic research institutes. The interviews followed a semi-structured protocol designed to elicit both quantitative estimates and qualitative judgments about skills demand, education system performance, and the strategic direction of the sector.

All interview sources are anonymised throughout the report, referenced by institutional type and WB6 rather than by name. Survey respondents are treated in aggregate. The term 'observations' is used in preference to 'respondents' to reflect the analytical rather than statistical nature of the sample.

Structure of the report

The report is organised in five chapters, each building on the evidence and analysis of its predecessors:

Chapter 1 – ICT Sector as Economic Pillar: Success Built on Skills documents the growth trajectory of the WB6 ICT sector from EUR 600 million to EUR 6 billion in exports, its macroeconomic significance, the human capital foundations that enabled this success, and the warning signs of deceleration visible in 2024–2025.

Chapter 2 – The Changing Rules of the Game situates the regional landscape within the global forces reshaping the ICT labour market: the AI-driven technology shift, evolving client requirements, digital skills gap between the WB6 and the EU, expansion of digital skills as a wider economic imperative, and the narrowing window for adaptation.

Chapter 3 – Ground Truth: What Employers Need, What the Market Delivers presents the study's primary evidence – the employer survey and structured interviews – covering hiring intent, role demand, skills gaps, candidate rejection patterns, training priorities, recruitment channels, technology roadmaps, and structural patterns across the region.

Chapter 4 – Forces Shaping Tomorrow: Emerging Skills Requirements and Policy Challenges examines seven interconnected forces that will define skills requirements

through 2030: the human-skills imperative, AI mainstreaming, cloud normalisation, cybersecurity integration, data analytics expansion, demographic contraction, and global competitive pressure. For each, it assesses the gap between current education system outputs and market needs.

Chapter 5 – From Evidence to Action: Guidance for Policy and Practice translates the findings into five priority areas for action – closing the human-skills gap, building AI readiness, accelerating education-industry alignment, expanding the talent pipeline, and supporting value-chain upgrading – together with a discussion of the regional dimension and areas where regional cooperation within the CRM 2.0 framework can deliver outcomes that no WB6 could achieve alone.

The report is preceded by an Executive Summary that presents the key findings, data, and guidance in a self-contained format for readers who require an overview without the full analytical detail. The report also includes a List of Abbreviations, a Glossary of Key Terms, and a Methodological Note (Annex) that provides full details on the survey design, interview methodology, and analytical approach.

EXECUTIVE SUMMARY

Over the past decade, the WB6 built an ICT services export sector worth just over EUR 6.0 billion annually and employing more than 200,000 people across the region. This represents roughly a tenfold increase in ICT services exports since 2010, alongside a combined ICT services trade surplus of EUR 4.4 billion, equivalent to 2.6% of regional GDP. Unlike many export sectors, this growth was not underpinned by natural resources, heavy infrastructure, or protected domestic markets. It was built primarily on human capital: skilled professionals, competitive labour costs, strong English proficiency, and geographic proximity to the EU.

That model has reached an inflection point. Export growth has decelerated from double digits to single digits, employment gains have slowed from 15% to 3% annually, and Serbia's quarterly data show near-stagnation in ICT hiring by early 2025. Three converging forces are driving this shift. First, artificial intelligence (AI) is restructuring global labour demand: 86% of employers worldwide expect AI to transform their business by 2030, and the routine software development tasks that sustained the region's outsourcing growth are precisely those most vulnerable to automation. Second, demographic contraction is shrinking the talent pool: the region is projected to be 'missing' more than 190,000 workers by 2030, compounded by emigration and remote work for foreign employers. Third, the need for digital skills is extending beyond ICT into every sector, with approximately 20% of the regional workforce – roughly 2.8 million workers – is estimated to be at risk or in need of substantial reskilling as the digital and green transitions spread. Table 1 presents the study's core empirical findings.

Table 1. Headline findings generated by this study

Indicator	Finding
ICT services exports, WB6 (2024)	EUR 6.0 billion+
ICT services trade surplus, WB6 (2024)	EUR 4.4 billion (2.6% of regional GDP)
ICT employment, WB6	200,000+[1]
Annual ICT employment growth, WB6	15% (2023) to 3% (2024)
Firms planning to expand ICT employment	52%
Firms reporting moderate to severe hiring difficulty	84%
Largest skills gap: problem-solving and teamwork	48%
Employers citing non-technical gaps as the critical constraint	67%
Top rejection reason: salary exceeds demonstrated capability	68%
Firms' top training investment: business and client skills	48%

1 Note: The comparable employment aggregate excludes Albania, for which granular sector-level employment data were not available; the true WB6 total is therefore higher.

Indicator	Finding
Firms deploying AI copilots / embedding GenAI in products	77% / 52%
Regional AI competence (self-assessed, 0–5 scale)	2–3
Most effective recruitment channel: internships	58%
Firms that consider no formal certification relevant to hiring	42%

Source: Employer survey (38 market-specific observations), 18 structured interviews, and authors' calculations based on central bank balance-of-payments data, macro-economic accounts, and official statistical office employment data compiled for this study.

Six findings that should reshape the policy conversation

The most critical skills gap is not technical. Problem-solving, business understanding, and communication – not programming languages – are the capabilities employers most struggle to find. When forced to identify the single most binding constraint, two-thirds of employers chose non-technical capabilities. Companies already spend more on training engineers to understand business (48%) than on any other skill area. The sector's transition from outsourcing to consultative, AI-enabled services requires T-shaped professionals – deep in one technology, broad across business and communication – while universities continue to produce I-shaped graduates deep in a single technical track.

AI adoption is widespread; AI capability is shallow. More than three-quarters of firms are deploying AI copilots, and more than half are embedding generative AI into products. AI Engineer was the single most frequently cited future-critical role in the survey. Yet the region's self-assessed AI competence stands at 2–3 on a 5-point scale. The gap between consuming AI tools and building AI-enabled products is the sector's largest vulnerability and its largest opportunity.

The seniority paradox is thinning the talent pipeline. Only 13% of planned hires target junior roles, while AI displaces the entry-level tasks that historically served as the training ground for future senior professionals. At the same time, 84% of firms already report moderate to severe difficulty finding suitable candidates. If juniors are not hired and mentored today, the senior shortage that every interviewee identified as the sector's most pressing constraint will deepen within five to ten years.

The wage-skill disconnect is the sector's price signal. At 68%, salary expectations exceeding demonstrated capability is the single most common reason candidates are rejected. Wages have risen faster than the skills to justify them – in North Macedonia, annual wage increases of 12 to 13% reflect the competitive pressure from global remote-work opportunities. This dynamic reflects the limits of an outsourcing model where price competition has compressed margins while talent competition has inflated costs.

Education systems operate on a different clock. University curricula run on five-to-seven-year accreditation cycles; technology markets evolve on eighteen-month horizons. The result: 87% of firms have built internal training to compensate,

internships (58%) outperform every other recruitment channel, and 42% of employers consider no formal certification relevant to hiring. The system is not failing to produce graduates – the region produces proportionally more ICT graduates than the EU (7% vs 4.5%) – but it is producing graduates whose skills are misaligned with what the market demands.

The challenges are shared across the region but vary in intensity. Kosovo* faces the highest emigration pressure (56% of ICT firms report losing staff). Bosnia and Herzegovina has the most acute education pipeline problem (70% IT student dropout rate, only 200–250 graduates from 800–900 enrolled annually). Albania's ICT sector is the most geographically concentrated (82% of activity in Tirana) and most reliant on mid-career professionals. North Macedonia faces the strongest outsourcing-to-product transition pressure, with business and commercial skills identified as the binding constraint. Montenegro's smaller ecosystem depends most on cluster-level coordination. Serbia, as the largest market, shows the earliest signs of the outsourcing model's growth ceiling, with export growth decelerating to approximately 7%.

Five priority areas for action

The study identifies five priority areas where the evidence is strongest, the urgency is greatest, and the direction of travel is clearest. Its orientation is analytical: it provides a factual base for further policymaking, helping institutions prioritise within the CRM 2.0 framework.

Table 2. Five priority areas

Priority Area	Direction Supported by Evidence
1. Close the human-skills gap	Integrate business understanding, teamwork, and project-based learning as mandatory components of ICT education at all levels
2. Build AI readiness	Three-tier approach: AI fluency for all graduates, integration skills for engineers, advanced specialisation tracks for researchers
3. Align education with industry	Industry advisory mechanisms with curriculum influence, fast-track content updates, structured workplace learning in all ICT programmes
4. Expand the talent pipeline	Activate underrepresented groups, preserve junior development pathways, strengthen retention beyond wages, build reskilling infrastructure
5. Support value-chain upgrading	Enable domain specialisation, develop product and business skills, strengthen ecosystem infrastructure for smaller firms

The regional dimension. The challenges documented in this study are shared across all WB6, creating a clear case for regional coordination. Four areas emerge where intra-regional cooperation can deliver outcomes that no single WB6 could achieve alone: shared competency standards and mutual recognition of ICT qualifications to provide employers and training providers with a common reference point; regional

talent mobility mechanisms that keep professionals within the WB6 rather than losing them to destinations beyond the region; shared training infrastructure and centres of excellence for advanced specialisations – particularly in AI and cybersecurity – where individual markets may be too small to sustain the necessary programmes independently; and strengthened linkages between the ICT clusters and industry associations that exist in each WB6, enabling them to share best practices, coordinate training, and jointly engage with international partners.

The WB6 ICT sector is at a crossroads. The foundations are still present: a proven export track record, proportionally more ICT graduates than the EU, a mature ecosystem of companies and clusters, and geographic proximity to the EU. But the environment has changed. The next phase of growth will depend less on the volume of technical graduates the region produces and more on the quality, breadth, and adaptability of the skills those graduates bring to a labour market being reshaped by AI, demographic contraction, and the transition from cost to capability. The AI disruption is not approaching – it is underway. The evidence assembled in this study identifies where the gaps are, how severe they are, and which directions of intervention the data support. What remains is the commitment to act at the pace the moment demands.

1. ICT SECTOR AS ECONOMIC PILLAR – SUCCESS BUILT ON SKILLS

Chapter Summary

This chapter documents the growth of the WB6 ICT services export sector from EUR 600 million in 2010 to approximately EUR 6 billion in 2024, and its emergence as a macroeconomically significant force – generating a trade surplus of EUR 4.4 billion (2.6% of regional GDP) and employing over 200,000 people. The sector was built on a combination of technical education, English proficiency, competitive labour costs, and geographic proximity to European markets. Evidence from 2024–2025, however, shows a marked deceleration in both export and employment growth, signalling that the conditions which powered the sector's rise are changing. The following chapters examine the forces behind that shift and the skills challenges it creates.

1.1 Introduction: From skills to structural growth

Over the past decade and a half, ICT services have evolved from a marginal activity into one of the most dynamic and structurally important sectors across WB6. As one ICT cluster representative from Serbia recalled, a symbolic turning point came when software exports surpassed raspberry exports, marking ICT as macroeconomically visible in public and policy discourse for the first time. This expansion has proven consistently resilient across economic cycles, including the pandemic, and has elevated ICT from the periphery of economic policy to the centre of discussions about competitiveness, employment, and external balances.

This chapter makes three linked points. First, the WB6 developed a real comparative advantage in ICT services based on human capital, English proficiency, and competitive costs. Second, these advantages were channelled primarily through an outsourcing-based growth model that proved highly effective, but narrow in its value proposition. Third, that model is now encountering structural limits, visible in slowing export and employment growth, tighter labour markets, and changing client demand.

1.2 The Growth Trajectory: From EUR 600 Million to EUR 6 Billion

The ICT services export story in the region is, above all, a story of sustained and rapid growth. In 2010, WB6 together exported just over EUR 600 million worth of ICT

services – a figure that was still macroeconomically modest. By 2024, that figure had reached approximately EUR 6 billion – an approximately tenfold increase that placed ICT among the fastest-growing and most structurally significant export sectors in the region. In the space of fourteen years, a sector that once occupied the margins of the balance of payments became one of the most reliable and substantial sources of foreign exchange earnings in the region.

What distinguishes this expansion from episodic export booms in other sectors is its persistence across very different macroeconomic environments. From 2017 to 2024, regional ICT exports grew at a compound annual rate of approximately 23%. Even measuring from 2020 – the last full year before the post-COVID rebound – the compound annual growth rate remained close to 29%[2]. This growth survived the pandemic shock, energy price volatility, European demand slowdowns, and repeated political uncertainties. The resilience reflects the structural nature of the underlying demand: global businesses continued to invest in digitalisation regardless of cyclical conditions, and WB6 providers were well-positioned to capture this demand.

The acceleration was particularly visible after 2018. That year marks a turning point when several WB6 began registering sustained growth rates above 20% annually, and when ICT began to stand out decisively from the rest of the services export basket. Between 2018 and 2024, ICT exports more than tripled in Serbia and North Macedonia, almost tripled in Albania and Montenegro, grew by approximately 2.7 times in Bosnia and Herzegovina, and multiplied more than six-fold in Kosovo*[3]. The post-2021 acceleration confirmed that the sector benefited substantially from the global shift towards remote work, the digitalisation of business processes, and the offshore sourcing of knowledge-intensive tasks.

Sectoral composition: software development dominates

Although the term 'ICT services' in balance-of-payments statistics encompasses telecommunications, information services, and various other digital activities, the regional export story is overwhelmingly driven by computer programming and software development. In Serbia, these activities account for roughly 94% of all ICT service exports. In North Macedonia, the share is approximately 88%[4]. The pattern holds across the region: telecommunications and legacy ICT categories remain small and largely stable, whereas software development, outsourcing of knowledge-intensive tasks, and digitally delivered professional services are the principal drivers of both scale and growth.

This concentration carries a fundamental implication for policy. The sector's growth is not driven by infrastructure investment, hardware manufacturing, or telecommunications expansion. It is driven by people writing software, managing projects, solving technical problems, and communicating with international clients. As an industry association executive in Bosnia and Herzegovina put it, the sector's

2 Authors' calculations based on central bank balance-of-payments data compiled for this study

3 Authors' calculations based on central bank balance-of-payments data compiled for this study

4 Authors' calculations based on central bank balance-of-payments, export of services, and gross value added by activity data compiled for this study

DNA was shaped not by capital investment but by the diaspora: without the returning or globally connected diaspora, the IT industry as it exists today in Bosnia and Herzegovina would likely not have emerged. The same pattern of human-capital-driven, diaspora-linked growth is visible across the region, from Kosovo*'s freelance-driven export surge to Albania's startup ecosystem.

Geographic distribution: concentrated but diversifying

The geography of ICT exports is highly concentrated. Serbia consistently generates approximately two-thirds of all ICT service exports in the region – about 69% in 2024, with EUR 4.1 billion in absolute terms. North Macedonia occupies a steady second position at roughly 11% (EUR 632 million), followed by Bosnia and Herzegovina at approximately 8% (EUR 470 million). Kosovo*, Albania, and Montenegro account for the remaining shares, at 6%, 4%, and 3% respectively.

Table 3. ICT Services Exports in WB6, 2024

WB6	ICT Exports (EUR m)	Share of WB6 (%)	ICT / GDP (%)	Net Exports (EUR m)	Export / Import Ratio
Albania	222	3.7	0.89	119	2.16
Bosnia and Herzegovina	470	7.8	1.79	335	3.48
Kosovo*	348	5.8	3.37	230	2.93
Montenegro	202	3.4	2.65	76	1.61
North Macedonia	632	10.5	4.03	435	3.21
Serbia	4,133	68.8	4.96	3,232	4.59
WB6 Total	**6,007**	**100.0**	**3.57**	**4,427**	**3.80**

Source: Balance of Payments statistics in each WB6 (central banks, statistical offices), 2024

What stands out in recent years is the emergence of new growth centres.

- → Kosovo* recorded the fastest compound annual growth rate in the region – 48.5% between 2020 and 2024 – driven by diaspora-linked firms and freelancers supplying software development and digital services to Western European clients. According to the ICT Association (STIKK) IT Barometer, approximately 68% of surveyed ICT companies export services, with the primary destination markets being the DACH region (Germany, Austria, Switzerland) and North America. More than half of ICT companies were founded after 2020, illustrating the dynamism of its young, entrepreneurial ecosystem. It shows how a very small market can use digital exports to leapfrog some of the traditional constraints of market size and geography.
- → Albania and Montenegro, while still at earlier stages of ICT export development, showed growth rates above 30% over the same period. In Albania, a compre-

hensive ICT labour market study commissioned by the Albanian-American Development Foundation (AADF) documented 4,065 active ICT employers and 22,972 professionals across Albania, with 51% of ICT companies exporting services – embedding its firms into international value chains at a scale that would have been unimaginable a decade ago. This suggests that the ICT export model, initially pioneered in Serbia, is increasingly replicable across the region.

The concentration, however, also represents a vulnerability. When nearly 69% of regional ICT exports originate from one WB6 and 94% of activity is concentrated in software development, both geographic and sectoral risks are elevated. Any disruption to Serbia's competitiveness – whether through talent shortages, wage escalation, or policy changes – reverberates across the regional aggregate.

1.3 Macroeconomic Significance: ICT as a Stabilising Force

The significance of ICT services extends well beyond the technology sector itself. For the WB6 – a group of small, open markets historically dependent on remittances, foreign direct investment, and commodity-based trade – the emergence of a large, skill-driven export sector represents a structural shift in how they generate and manage their external balances.

A sector that now shapes the macro picture

ICT service exports now account for approximately 3.6% of combined regional GDP, up from roughly 1.7% in 2018. For a single export category, this is a substantial share in small open markets. In Serbia, the figure has reached nearly 5% of GDP – a level that places ICT among the most important tradable activities, comparable in scale to several traditional export industries combined. In North Macedonia, it stands at just over 4%. In a comparative analysis prepared by ICT Chamber of Commerce (MASIT) reported that total ICT employment in North Macedonia reached nearly 24,000 in 2024, with average gross salaries of EUR 2,376 per month and total salary expenditures of EUR 314 million – figures that underscore the sector's growing weight in both the labour market and the fiscal base. Corporate income tax contributions from ICT companies increased from EUR 20 million to EUR 33 million in a single year, signalling both improved profitability and deepening formalisation. Kosovo*, despite its shorter track record, has crossed the 3% threshold. Even in Montenegro, where tourism dominates, ICT services represent 2.65% of GDP – a sector that is beginning to offer a structurally different, non-seasonal source of external earnings.

Within the export structure, the shift is even more visible. ICT services now represent close to 18% of all services exports at the regional level, up from about 11% in 2018. In Serbia, nearly one euro in every three and a half earned from services exports comes from ICT. In North Macedonia, the ratio is approximately one in five. As a share of total goods-and-services exports, ICT rose from about 4% in 2018 to more than 7% in 2024. In Kosovo*, the increase was particularly visible: ICT services were just under

3% of total exports in 2018 and reached 8% by 2024, making them one of the few clearly dynamic tradable activities in WB6 where a large share of services earnings is otherwise linked to diaspora-related inflows. As an economic think tank from Kosovo* lobserved, ICT stands out as one of the few sectors with clear export potential and productivity leverage in WB6 whose overall growth model remains consumption-driven.

Trade balance stabiliser

Perhaps the most consequential macroeconomic role of the ICT sector is its contribution to external balance. WB6 have historically run large and volatile deficits in goods trade, financed through remittances, foreign direct investment, and occasionally sovereign borrowing. The growing surplus in ICT services provides a qualitatively different buffer: it is generated by firms and individuals selling high-value services on international markets, tied directly to domestic productive capabilities rather than expatriate transfers or one-off capital inflows.

In 2018, the region's net exports of ICT services stood at approximately EUR 800 million, equivalent to 0.8% of GDP. By 2024, the surplus had reached roughly EUR 4.4 billion – equivalent to 2.6% of regional GDP. In Serbia, the ICT trade surplus of EUR 3.2 billion covers a substantial portion of the goods trade deficit. The regional export-to-import ratio in ICT services increased from approximately 1.9 in 2018 to 3.8 in 2024, with Serbia reaching 4.6 – meaning that the region exports nearly four times more ICT services than it imports. Even those WB6 that were net importers a decade ago have shifted into surplus: Kosovo* moved from a small deficit in 2018 to a surplus worth more than 2% of its GDP.

A growing employer: ICT's weight in the labour market

The ICT sector's macroeconomic significance is reflected not only in trade and output, but in employment. Available labour market data indicate that the broader ICT sector employed approximately 196,000 people across five WB6 in 2024. Albania, for which sector-level employment data are not available in comparable form, would bring the regional total above 200,000 – given that AADF's ICT labour market study documented nearly 23,000 ICT professionals only in this WB6. Within this broader category, the narrower IT and programming subsector (NACE J62) – the segment most directly associated with the export-driven software development model – accounted for approximately 100,000 workers across the region.

These figures should be interpreted with appropriate methodological caution. The data for Serbia are drawn from formal employment registers and provide quarterly resolution over a decade, offering the most detailed picture in the region. For North Macedonia, Bosnia and Herzegovina, Kosovo*, and Montenegro, the data derive from Labour Force Surveys, which capture a broader employment concept (including informal and part-time work) but are subject to greater sampling variability, particularly for smaller subsectors. For Bosnia and Herzegovina, quarterly data are

available only from 2021. Albania lacks the sectoral granularity needed for inclusion. Definitional differences across sources mean that absolute figures are not perfectly comparable across WB6. Nevertheless, the data provide a reliable indication of the scale and trajectory of ICT employment in the region.

Table 4. ICT Employment in WB6, Annual Averages (thousands)

WB6	Source	2021	2022	2023	2024	Share of total (2024)
Bosnia & Herzegovina	LFS	23.0	30.5	36.9	37.3	3.1%
Kosovo*	LFS	12.4	10.1	10.6	12.5	3.0%
Montenegro	LFS	6.2	8.5	11.1	11.0	4.3%
North Macedonia	LFS	19.1	21.2	24.3	23.6	3.4%
Serbia	Register	82.7	94.5	107.5	111.9	4.8%
Total for 5 of WB6	–	143.4	164.7	190.5	196.3	4.0%
Albania (ICT professionals; memorandum item)					23.0	–

Source: Authors' compilation based on official statistical sources. Serbia: Statistical Office, formal employment register. North Macedonia, Bosnia and Herzegovina, Kosovo, Montenegro: Labour Force Surveys. Albania: AADF ICT Labour Market Study (2024).*

Note: Data are indicative rather than fully comparable across WB6. Serbia's figures are based on formal employment registers, while those for North Macedonia, Bosnia and Herzegovina, Kosovo, and Montenegro are based on Labour Force Surveys, which differ in coverage, methodology, and sampling precision. Albania does not publish employment data in a sufficiently comparable NACE Section J breakdown and is therefore excluded from the aggregate for five WB6. The Albania figure shown as a memorandum item refers to an AADF estimate of ICT professionals and is not directly comparable with the register- and LFS-based figures reported for other WB6. Figures rounded.*

Across the region, the employment evidence points in the same broad direction: ICT has become a materially more important employer in the WB6 over the past several years. The increase has been most visible in Serbia, where the sector's share in formal employment rose steadily and the programming subsector expanded particularly quickly, but strong gains are also evident in North Macedonia, Bosnia and Herzegovina, and Montenegro. Kosovo* follows a more volatile trajectory, but the available data likewise indicate that ICT has become an established part of the labour market. Albania is not included in the comparable aggregate shown in Table 4, but available evidence from the AADF study also points to a sizeable ICT workforce. Taken together, these trends confirm that ICT is no longer a niche activity in the WB6 labour market, but a structurally relevant source of employment growth.

By 2024, however, the pace of job creation had begun to slow across much of the region. This inflection is examined in more detail in Section 1.5 and, for Serbia, in Box 1 below.

Box 1: Serbia – A Decade of ICT Employment Growth in Detail

Serbia offers the most granular employment data in the region, with quarterly formal register data spanning a full decade (2016–2025). The trajectory illustrates both the scale of the sector's expansion and the precision with which the growth inflection point can be identified.

Between 2016 and 2025, the broader ICT sector (NACE Section J) grew from approximately 55,500 to 115,400 formally employed workers – a doubling that occurred while total employment in Serbia grew by only 21%. The narrower IT and programming subsector (NACE J62) grew even faster, from 20,000 to over 70,700 – a 3.5-fold increase. As a result, IT programming alone now accounts for 3.0% of all formal employment in Serbia, up from 1.0% a decade ago.

The growth acceleration and its peak.

Annual growth in ICT employment was relatively steady at 5–7% in 2017–2019, accelerated to 9–12% in 2020–2021 as remote work expanded global demand, and reached its peak in 2022 at 14.2% for the broader ICT sector and a notable 23.5% for the IT programming subsector. At the quarterly level, the single fastest period was Q4 2022, when ICT employment grew by 6.5% in a single quarter and IT programming by 9.4% – a pace that would imply annualised growth rates above 25%.

The deceleration from early 2023.

The inflection is visible from Q2 2023 onwards. Quarterly ICT growth dropped from 3.4% (Q1 2023) to 1.6% (Q2 2023), then to approximately 1.0% per quarter through the remainder of 2023 and 2024. By the first quarter of 2025, quarterly growth had fallen to 0.4% – effectively near-stagnation in hiring. On an annual basis, ICT employment growth fell from 14% in 2022–2023 to 4% in 2024 and 3% in 2025. IT programming growth fell from 23% to 5% to 3% over the same period.

What the data show.

Serbia's employment register confirms the narrative visible in export data: a sector that experienced fast growth through 2022, reached a peak of hiring intensity in late 2022 and early 2023, and has since transitioned to a markedly slower growth regime. Employment continues to grow – it is not declining – but the pace has fallen by roughly 75% from its peak. The factors behind this transition – from talent constraints and wage dynamics to shifting client expectations and a broader global technology correction – are examined in the chapters that follow.

Source: Statistical Office of Serbia, formal employment register (NACE Rev. 2, Section J and Division J62). Quarterly data, 2016–2025

1.4 The Skills Foundation: What Enabled This Success

The EUR 6 billion ICT export sector did not emerge from favourable geography, natural resource endowments, or large-scale foreign investment in infrastructure. It was built, fundamentally, on human capital. Understanding what enabled the WB6 ICT success requires examining the specific combination of competencies and conditions that made the region attractive to international clients and competitive in global markets.

Technical education as launching pad

The WB6 benefited from educational traditions that, despite many structural shortcomings, produced graduates with solid foundations in mathematics, engineering, and the natural sciences. University-level computer science and electrical engineering programmes expanded significantly in the 2000s, creating a growing pipeline of technically trained graduates. The region's strength in this area is measurable: according to the WB DESI 2024 Report, 7% of all graduates in the WB6 held a tertiary degree in ICT in 2022, exceeding the EU average of 4.5%. This comparatively robust ICT education pipeline supplied the growing sector with a steady stream of new entrants. In Albania, this pipeline has produced a substantial workforce: AADF's ICT labour market study documented 22,972 professionals, including over 10,000 software developers, with 80% at mid- or senior level – a sign of accumulated human capital and a decade of learning-by-doing within international project teams.

Graduates entering the workforce in the 2010s were widely seen by employers as having solid foundations in mathematics, engineering, and structured problem-solving, even where exposure to modern software engineering tools and practices remained limited. They could write code, understand algorithms, work with databases, and solve structured technical problems. This was sufficient for the initial phase of growth, which was predominantly based on implementing specifications provided by foreign clients. As an angel investor and technology park operator from North Macedonia reflected, the region possesses "substantial technical talent and strong engineering fundamentals" that represent a clear baseline advantage. A recruiter at a major engineering firm in Serbia confirmed that standard technical profiles – Java, .NET, Angular – can still be hired without significant difficulty, reflecting a commoditised supply of foundational skills built up over years of sustained investment in engineering education.

English proficiency as competitive differentiator

A factor that is frequently underestimated in macroeconomic analyses but consistently emphasised by industry participants is the role of English language proficiency. Unlike manufacturing exports, where the product speaks for itself, software services require continuous communication with clients: daily stand-up meetings, requirement discussions, code reviews, and client presentations. Interview evidence consistently points to English proficiency as one of the region's practical competitive advantages

relative to many alternative outsourcing destinations – partly through media consumption patterns (subtitling rather than dubbing), partly through educational emphasis, and partly through the aspirational pull of international opportunities.

This linguistic advantage meant that professionals from the region could participate directly in international project teams, reducing the coordination costs that make offshore development expensive and unreliable. Stakeholders interviewed for this study consistently identified English proficiency as one of the three or four factors that initially distinguished the region from competitors offering similar technical skills at comparable prices. An investor from North Macedonia noted that the newest cohort of startups increasingly position as "born global" – pitching in English from day one and designing products for multiple markets from the outset, a pattern that would not be possible without the region's linguistic foundation.

The wage arbitrage window

The third foundational advantage was straightforward: cost. Through much of the 2010s, WB6 ICT professionals could deliver work of comparable quality to Western European developers at significantly lower rates. For clients in the United Kingdom, Germany, Scandinavia, and the United States, engaging development teams from Serbia or North Macedonia represented substantial savings compared with local hiring in Western Europe and the United States, often without a commensurate loss in delivery quality. This value proposition was reinforced by lower office costs, competitive social contribution regimes, and favourable tax policies across several WB6.

Internal price differentials within the region further deepened the competitive offer: a recruiter at a major regional engineering firm estimated that Bosnia and Herzegovina remained approximately 20% cheaper than Serbia, with North Macedonia's rates positioned below Belgrade levels – creating layered arbitrage opportunities for companies staffing projects across multiple WB6.

European location provided additional advantages that purely remote competitors in Asia or Latin America could not easily replicate: time zone alignment with major client markets, cultural familiarity with European business norms, and geographic proximity that enabled face-to-face meetings at modest cost. These factors made the WB6 a natural nearshoring destination for European companies seeking to balance cost savings with operational convenience.

The winning combination – and its limits

The ICT sector's rapid growth rested on the convergence of these elements: technical competence, communication capability, cost advantage, and European proximity. Each was necessary; none was sufficient alone. The WB6 occupied a favourable intersection of all four, and the resulting growth – sustained rates above 20% annually for the better part of a decade – was the payoff. An ICT cluster representative from Serbia captured the dynamics of the early years: fifteen years ago, anyone with basic coding skills could find a job, as demand massively outstripped supply.

These advantages drove the ICT sector's rise – but they coexist with a much less favourable picture across the broader population. While the export sector is globally competitive, the digital skills base of the wider economy remains well below European benchmarks, creating a structural tension that affects both the talent pool from which the sector recruits and the domestic ecosystem in which it operates. Box 2 sets out the scale of this gap.

Box 2: Digital Readiness Beyond the ICT Sector – The Horizontal Challenge

The ICT export sector's strength coexists with a significant digital literacy deficit across the region. WB DESI 2025 Report provides a structured assessment of this gap.

Population-level digital skills remain far below EU benchmarks.

While 88% of people in the WB6 used the internet in 2024, only 33% had at least basic digital skills – compared to 56% in the EU. Advanced digital competencies, essential for quality employment and business innovation, were even more limited: only 9% of WB6 citizens possessed above-basic digital skills, versus 27% in the EU.

Business digitalisation lags, limiting the domestic ecosystem.

Only 59% of SMEs in the WB6 reached at least a basic level of digital intensity in 2024, compared to 73% in the EU. Cloud computing adoption stood at 23% (EU: 38%), data analytics at 29% (EU: 32%), and AI at just 6% (EU: 13%). Enterprise Resource Planning use was 25%, nearly half the EU average of 42%.

E-government readiness: a mixed picture.

Only 54% of citizens in the WB6 interacted with public administration online in 2024, compared to 75% in the EU. Digital public services for citizens scored 53 points (EU: 82), while services for businesses scored 65 (EU: 86). These gaps limit both the efficiency of public administration and the domestic demand for digital solutions that could anchor ICT firms in local markets.

The dual reality and its implications.

A competitive ICT export sector operating within the region where general digital readiness is weak creates a structural tension. As ICT companies increasingly serve clients demanding data-driven, AI-enabled, and digitally integrated solutions, they need employees and ecosystems that understand digital tools and processes at a fundamental level. The horizontal skills deficit constrains the talent pool from which the ICT sector recruits, limits the sophistication of domestic clients and suppliers, and reduces the absorptive capacity of the broader economy for digital transformation. Strengthening digital literacy across the population is therefore not separate from ICT sector competitiveness – it is a precondition for sustaining it.

One area of relative strength deserves recognition.

The WB6 produces ICT graduates at 7% of all tertiary graduates, exceeding the EU average of 4.5%. Only 3% of employed persons are ICT specialists (EU: 5%), suggesting both room for growth and a pipeline that, while not yet sufficient, is comparatively well-developed for the region's level of economic development.

Source: WB DESI 2024 Report and WB DESI 2025 Report

1.5 Warning Signs: The 2024–2025 Deceleration

The growth trajectory documented in the preceding sections is not an unqualified success story with an open-ended future. Evidence from 2024 and early 2025 indicates that the sector's rapid expansion phase is giving way to a more complex period – one that demands careful analysis rather than either complacency or alarm.

The deceleration in numbers

After years of growth rates consistently above 20%, ICT export growth has decelerated across the region. Serbia – the engine of regional ICT exports – recorded year-on-year growth of approximately 7% in early 2025, a sharp moderation compared to the double-digit expansion that characterised the 2018–2023 period. Montenegro and Bosnia and Herzegovina both recorded year-on-year declines in ICT service exports in the first two quarters of 2025. Bosnia and Herzegovina's ICT export growth has slowed for four consecutive years, dropping below 10% in 2024 before turning negative in early 2025. The pattern is partly reflected in employment and salary data. In Serbia, a major industry salary survey prepared by Netokracija covering nearly 5,000 professionals found that the past three years did not show significant changes in salary levels – a marked departure from the rapid wage escalation that characterised the preceding decade. A separate study by Netokracija of nearly 2,500 professionals and over 700 companies reported that 62% of employers did not change salaries in the prior 12 months, with the period described as 'conservative' in the aftermath of the 2022 crisis.

The pattern is visible not only in export receipts but in the labour market. As documented in Section 1.3 and detailed for Serbia in Box 1, ICT employment growth has slowed sharply across most WB6 with comparable data.

Some deceleration is natural after a period of very rapid expansion – growth rates of 20–30% annually cannot persist indefinitely. The global technology industry itself experienced a cyclical correction in 2023–2024, with reduced venture capital funding, corporate spending rationalisation, and widespread layoffs at major firms. WB6 ICT exporters, deeply integrated into global value chains, could not remain entirely insulated from these dynamics. An industry association executive from Bosnia and Herzegovina captured the sector's psychological adjustment to this new reality: local IT professionals, he observed, have been "spoiled by years of 20–30% growth", and when growth slows to 5%, they perceive it as a crisis, while in other industries that would count as stability or success.

The factors behind this deceleration are not purely cyclical. Talent constraints, rising wages, evolving client expectations, intensifying global competition, and demographic contraction are all playing a role – and they interact with one another in ways that compound the pressure on the existing growth model. These structural forces, and the specific skills challenges they create, are examined in detail in the chapters that follow.

1.6 The Road Ahead: From Cost Competitiveness to Capability Competitiveness

The evidence presented in this chapter shows that the WB6 have built an ICT sector of genuine macroeconomic significance, but that the model which enabled its rise is now approaching its structural limits. Over the past decade and a half, WB6 successfully developed a skill-based export sector that generated foreign exchange, created high-value employment, and strengthened the role of knowledge-intensive services in the region long shaped by remittances, foreign investment, and more traditional tradable activities. That success rested on a combination of human capital strengths and a business model well suited to the conditions of the 2010s.

The challenge now is not whether the WB6 can sustain an ICT sector, but whether they can upgrade the skills base fast enough to sustain competitiveness as market conditions change. The evidence assembled in this chapter points to a shift in what the sector now requires: less reliance on cost advantage alone, and greater emphasis on capability. That means deeper technical sophistication in areas such as AI, cloud, cybersecurity, and data; but it also means stronger business understanding, communication, teamwork, and client-facing problem-solving. In other words, the next stage of growth will depend not only on how many ICT professionals the region produces, but on how adaptable, commercially aware, and solution-oriented those professionals are.

Despite the pressures documented above, the WB6 ICT sector enters this transition from a position of considerable strength. Several structural advantages – accumulated over more than a decade of sustained growth – provide a foundation on which the next phase can be built. Box 3 summarises these assets.

Box 3: Structural Strengths Shaping ICT Sector Competitiveness

Factors supporting continued growth:

- → Strong ICT graduate pipeline, providing a comparatively solid base for workforce expansion.
- → Demonstrated export competitiveness – a regional export-to-import ratio of 3.8 confirms that WB6 providers deliver value well above what domestic markets consume, reflecting genuine international competitiveness.
- → EU integration momentum – the EU Growth Plan for the Western Balkans and CRM 2.0 provide frameworks, funding, and incentives for digital transformation, including alignment with the EU Digital Decade targets.
- → Emerging geographic diversification – Kosovo*'s 48.5% CAGR and strong growth in Albania and Montenegro demonstrate that the ICT export model is replicable beyond the initial hubs.
- → Resilient demand base – structural global digitalisation trends ensure continued demand for ICT services, even amid cyclical corrections.
- → Accumulated human capital – in Albania, 80% of ICT professionals are at mid- or senior level; in North Macedonia, ICT employment grew 10.7% in a single year. The region has built a substantial base of experienced practitioners, not just graduates.

The following chapters examine that transition in more detail: first by looking at the global and regional forces reshaping ICT labour demand, then by presenting employer-level evidence on the skills gaps firms face, and finally by identifying the policy directions that follow from that evidence.

2. THE CHANGING RULES OF THE GAME

Chapter Summary

This chapter shows that the conditions which enabled the WB6 ICT sector's earlier rise are no longer sufficient in a rapidly changing global environment. AI is reshaping the structure of digital work, employer demand is shifting from routine execution towards deeper technical and business capability, and the region's wider skills base remains too shallow to support that transition at scale. The challenge is no longer confined to the ICT sector itself: as digital and green transitions spread across the broader economy, the ability to build, adapt, and continuously renew skills is becoming a central determinant of future competitiveness across the WB6.

2.1 Introduction: From tailwinds to headwinds

Chapter 1 showed how the WB6 built a successful ICT export sector on a combination of human capital strengths and a business model well suited to the conditions of the 2010s. That model is now under growing strain. The recent deceleration in export and employment growth is not a temporary anomaly, but a signal that the external environment for digital services and digital skills is changing in more structural ways.

This chapter examines the global and regional forces behind that shift. It starts with the broader labour-market transformation associated with AI, digitalisation, and demographic change, and then considers what those trends mean for the specific conditions of the WB6. The central argument is that the region's earlier advantages have not disappeared, but they are no longer sufficient on their own. As AI changes the nature of work and digital skills become relevant across the wider economy, competitiveness will depend less on cost and more on the depth, adaptability, and diffusion of skills.

2.2 The global technology shift: AI as a structural break

The pace of technological change has accelerated sharply, and the WEF's Future of Jobs Report 2025 identifies AI and information-processing technologies as the single most transformative force expected to reshape business by 2030. Fully 86% of employers surveyed expect these technologies to transform their operations within five years.

The scale of projected disruption is considerable. Global job creation is expected to remain strong in technology-intensive roles such as software development, AI, data, and cybersecurity, but these gains will coexist with the decline of many more routine

and administrative occupations. For the WB6, this matters in two ways: the region is relatively well positioned in some of the growth domains, but far more exposed if lower-complexity roles begin to contract.

Just as importantly, the WEF estimates that 39% of existing worker skill sets will be transformed or become obsolete by 2030. The fastest growing competencies are not only technical – such as AI and big data, networks and cybersecurity, and technology literacy – but also human and cognitive, including creative thinking, resilience, flexibility, and lifelong learning. This signals a clear shift in what employers value: not narrow technical execution alone, but the combination of technical capability with judgment, communication, and adaptability. For the WB6, where education and training systems have historically rewarded technical specialisation more than interdisciplinary or client-facing capability, this finding is especially important. Box 4 presents the key figures from the WEF assessment.

Box 4: The WEF's Future of Jobs 2025 – Key Figures

The WEF's Future of Jobs Survey 2024, covering 1,000+ employers representing 14.1 million workers across 22 industry clusters and 55 countries, provides the most comprehensive forward-looking assessment of global labour-market transformation for the 2025–2030 period.

Indicator	Figure
Employers expecting AI to transform their business	86%
Net new jobs created globally by 2030	78 million
Jobs created (gross)	170 million
Jobs displaced (gross)	92 million
Worker skill sets that will be transformed by 2030	39%
Workers who will need training by 2030 (of 100)	59
Workers unlikely to receive needed training	11 of 100
Employers citing skill gaps as biggest barrier	63%
Employers planning to upskill workforce	85%
Employers planning to hire staff with new skills	70%
Employers planning to reduce staff in declining roles	40%
Employers anticipating higher wage share in revenue	52%

Top 5 fastest-growing job roles: Big Data Specialists, FinTech Engineers, AI/ML Specialists, Software & Application Developers, Security Management Specialists.

Top 5 fastest-growing skills: AI and big data, networks and cybersecurity, technology literacy, creative thinking, resilience/flexibility/agility.

Top 5 fastest-declining job roles: Data Entry Clerks, Bank Tellers, Administrative Assistants, Printing Workers, Postal Service Clerks.

Source: WEF's Future of Jobs Report 2025

Why this time is different: generative AI and the end of gradual disruption

Previous waves of technological change tended to expand digital labour demand without fundamentally altering the structure of work. Generative AI is different because it lowers the barrier to performing tasks that once required trained specialists, especially at the routine and entry-level end of the skill spectrum.

For WB6, this is not an abstract projection. Across the region's ICT industry, the impact is already visible. Industry leaders interviewed for this study described a market where the rules of engagement have shifted rapidly.

> *A Serbia's ICT cluster:* "Juniors, nobody wants to hire them – ChatGPT does what juniors used to do. But at the same time, seniors who can think architecturally, who understand business, who can lead – those people are impossible to find."

Similar concerns emerged across interviews conducted in other WB6.

> *An enterprise software company (Bosnia and Herzegovina):* "What local engineers were doing five or ten years ago is no longer in demand. Simple front-end dashboards or API integrations are easily auto-generated by modern tools or AI models. The real value is in understanding the client's business problem, designing a system architecture, and implementing AI-enabled workflows."

At global level, employers are responding to AI not only by adopting new tools, but by rethinking workforce structure, hiring profiles, and training needs. For the WB6, the implication is direct: the tasks that once supported growth under the outsourcing model are increasingly those most vulnerable to automation, while the complementary value created by AI depends on higher-order technical, business, and organisational capability.

At the same time, the WEF also documents a significant opportunity. Employers who expect AI to transform their business are more likely to upskill workers (85%), to transition employees into growing roles (50%), and to invest in workforce augmentation rather than simple replacement. The question is no longer whether AI will reshape the region's ICT sector, but whether firms and institutions can adapt fast enough to capture the higher-value opportunities it creates.

2.3 The demand side: What clients and markets now require

The shift described above is not only technological; it is also commercial. What global clients now expect from ICT providers is changing, and that change is reshaping the business model on which much of the WB6 sector was built. For much of the previous decade, the dominant outsourcing model was based on executing clearly specified development tasks at competitive rates. That model has not disappeared, but it is increasingly being supplemented by a different kind of demand: clients now arrive less often with a finished specification and more often with a business problem they expect their technology partner to help define and solve.

> *The ICT industry association (Bosnia and Herzegovina):* "The IT sector is moving decisively towards business understanding and client-centricity. Developers increasingly need to grasp the business models and industries they serve. The market is shifting towards sector specialisation: IT in logistics, agriculture, and manufacturing is increasingly in demand, requiring multidisciplinary and domain expertise."

At sector level, the outsourcing model is now under pressure from both directions. From above, clients increasingly demand higher-value, AI-enabled, consultative services that require broader skill sets and deeper expertise. From below, routine coding tasks are being eroded by AI tools that can perform parts of entry-level work faster and more cheaply.

> *The ICT industry association (Bosnia and Herzegovina):* "Domestic firms must remember that they are small players at the end of the global value chain. The upside is that crises reach them with delay. The downside is that when the wave arrives, there is no cushion."

Competition is also intensifying from new directions. A regional ICT media outlet reports that even where quality and English proficiency are strong in WB6, cost-driven decisions increasingly push clients towards lower-cost locations in South-East Asia and Africa. A leading regional engineering services company, one of the region's most capable engineering service providers, described a global talent market where a single specialised role attracted only 116 indexed profiles worldwide – illustrating both the scarcity of advanced skills and the intensity of global competition for them.

Interview evidence and the employer survey conducted for this study – presented in detail in Chapter 3 – confirm that this shift is already visible across the WB6: the skills employers most struggle to find, and the reasons candidates are most often rejected, point consistently towards a gap in business understanding and consultative capability rather than in narrow technical knowledge.

2.4 The supply side: Regional readiness and the digital skills gap

If the demand side is asking for more, the supply side is struggling to keep up. The region faces a set of interlocking constraints – in digital literacy, in education systems, in demographic trends – that together define the scale of the readiness challenge.

The digital literacy deficit

WB DESI 2025 Report provides the clearest benchmark of the region's digital readiness gap relative to the EU. As Box 5 shows, the WB6 trails the EU across most core indicators of digital capability, with particularly large gaps in basic and above-basic digital skills.

Box 5: The Digital Readiness Gap – WB6 versus the EU

WB DESI 2024 Report and WB DESI 2025 Report, calculated using the EU's own methodology, enables direct comparison between WB6 and the EU across key digital indicators.

Indicator (2023)	WB6 Average	EU Average	Gap
Internet use	88%	92%	-4 pp
At least basic digital skills	33%	56%	-23 pp
Above basic digital skills	9%	27%	-18 pp
ICT specialists in employment	3%	5%	-2 pp
ICT graduates (% of all graduates)	7%	4.5%	+2.5 pp
SMEs with basic digital intensity	59%	73%	-14 pp
Cloud computing use (enterprises)	23%	38%	-15 pp
Data analytics (enterprises)	29%	32%	-3 pp
AI use (enterprises)	6%	13%	-7 pp

Source: WB DESI 2024 Report and WB DESI 2025 Report; EU DESI 2024 and EU DESI 2025 visualisation tool

The DESI data also reveal a structural imbalance in business digitalisation. The region has adopted some individual digital tools relatively quickly, but deeper technology integration into business models and processes remains limited – especially in areas such as AI and broader SME digital intensity.

The education pipeline: quantity without quality

On paper, the region appears to have a relatively strong ICT graduate pipeline. Yet interviews and employer evidence suggest that this apparent strength masks a more difficult reality: graduate output is not translating into the depth and quality of capability that firms increasingly require.

The World Bank's analysis of PISA 2022 results paints a sobering picture of foundational learning. Students in WB6 trail EU peers by an average of 16 months in mathematics, and learning losses have widened since 2018 in most WB6. Kosovo*'s learning gap is equivalent to 4.6 years of schooling. Almost no students in the region reach high levels of proficiency (PISA levels 5 and 6), compared to approximately 8% in the OECD. These foundational weaknesses compound as students progress through higher education and into the labour market.

At the university level, the disconnect between what education delivers and what employers need emerged as one of the most consistent themes across interviews. The criticism was not abstract; it was concrete and practical:

> *A leading engineering services company (Serbia):* "The diploma is like passing a driving test. It signals basic fitness to enter a profession, but it does not guarantee readiness for real engineering work, especially in specialised domains."

> *A long-established ICT company (Kosovo*):* "Training someone to become a software engineer with foundational algorithmic thinking takes three to four years. The education system cannot keep up – accreditation cycles are lengthy, and the system does not adapt fast enough to emerging fields."

A Kosovo* economic research institute's analysis of domestic higher education system adds a further dimension. Digital competencies are weakly integrated or entirely absent outside dedicated ICT study programmes. Even within universities, applied research, innovation, and practical digital applications remain marginal. Key constraints include outdated infrastructure and laboratories, digitally unskilled academic staff, and insufficient funding for modern tools. As a result, graduates often possess theoretical familiarity with programming languages but lack the applied problem-solving skills that employers require.

The demographic squeeze

Compounding the skills challenge is a demographic reality that cannot be solved by education reform alone. World Bank projections indicate a substantial decline in the region's working-age population over the coming decades, while labour shortages are expected to emerge much earlier in several WB6. The labour market presents what the World Bank calls a 'paradox': labour shortages coexist with unemployment rates that remain above 10% and labour force participation rates below 55%, particularly among women and youth.

For the ICT sector specifically, these demographic pressures interact with brain-drain dynamics.

> *Montenegro ICT cluster:* "A growing challenge is competition for senior talent. The entry of foreign companies – particularly those linked to Russian and US markets – has led to experienced senior engineers being recruited away, creating a talent drain within the domestic ecosystem."

2.5 Beyond ICT: Digital skills as an economy-wide imperative

Until this point, the analysis has focused primarily on the ICT sector itself. But the most consequential implication of the trends described above extends well beyond the boundaries of any single industry. The digitisation of work is not a sectoral phenomenon; it is an economy-wide transformation. And it is this transformation

that elevates ICT skills from a narrowly sectoral concern to a determinant of competitiveness.

Every sector needs digital workers

The World Bank's analysis of online job postings suggests that the demand for digital and higher-order skills is broadening well beyond the ICT sector itself. The issue is no longer only how to produce more software professionals, but how to equip workers across the wider economy with the digital, technical, and socio-emotional capabilities increasingly required in modern jobs.

Interview evidence consistently points to growing demand for digital skills combined with sector-specific domain knowledge, particularly in areas such as logistics, agriculture, manufacturing, and public services.

A long-established Kosovo* ICT company described the frontier of this convergence:

> "The next wave of demand will come from sectors outside IT – health, agriculture, energy, logistics. These industries need people who understand both the technology and the domain. A developer building a patient data platform needs to think about security, compliance, and clinical workflows – not just the code."

A Serbia's digital economy framed the same dynamic from a policy perspective:

> "Future skills efforts should not be limited to IT people. We are piloting a programme that equips social science and humanities graduates with digital work practices – because their employability increasingly depends on understanding data analysis and digital tools."

WB DESI findings reinforce this broader picture: digital skills and business digitalisation remain too concentrated in a relatively narrow ICT core, rather than diffused across the wider economy where the next phase of demand is emerging. The challenge extends further still. The digital transition is not the only structural force reshaping the region's labour markets.

The twin transition: digital and green pressures converge

The digital transition is also interacting with the green transition, creating what the World Bank describes as a dual challenge for policymakers. Around 20% of the WB6 workforce – roughly 2.8 million workers – is estimated to be at risk or in need of substantial reskilling. AI-driven technological change primarily threatens medium and high-skilled occupations – the World Bank notes a 'middle-skill squeeze' where clerical and sales positions are highly exposed to automation yet offer little scope for AI complementarity. The green transition, by contrast, disproportionately affects low-skilled workers: nearly one-third of workers with low education levels in Kosovo*, and similarly high shares elsewhere, are estimated to be employed in at-risk occupations.

For WB6, this means that the skills challenge is not one-dimensional. The ICT sector needs deeper, more sophisticated talent. But the broader economy simultaneously

needs basic digital literacy, green skills, and the capacity to reskill workers whose current occupations may not survive the twin transition. Addressing one dimension without the other is a recipe for widening inequalities.

2.6 The convergence: Why the window for action is narrowing

The argument of this chapter is that several pressures are now reinforcing one another rather than operating separately. AI is changing the structure of labour demand, employer expectations are shifting towards deeper and more adaptive capability, and the region's wider skills base remains too shallow to support that transition at scale. At the same time, digital skills are becoming relevant far beyond the ICT sector itself, while demographic pressures are tightening the supply of labour across the region. Together, these trends mark a structural turning point for the WB6.

In this context, skill gaps cease to be a secondary labour-market issue and become a direct constraint on competitiveness. Across the evidence reviewed in this chapter – global assessments, regional indicators, and firm-level findings – the same message recurs: the problem is not simply the quantity of labour available, but the depth, relevance, and adaptability of skills. The challenge is therefore not only to produce more graduates, but to build a workforce that can operate across changing technologies, shifting business models, and increasingly complex client demands.

These pressures also create an opportunity. The global expansion of demand in software, AI, cybersecurity, data-related roles, and digitally enabled business transformation still aligns with areas where the WB6 has already built important foundations. The region retains meaningful assets: a relatively strong ICT graduate pipeline, proven export capability, growing innovation ecosystems, and proximity to the EU. The question is whether those strengths can now be converted into deeper capability rather than simply more volume.

Encouragingly, parts of the region are already moving in this direction. Interviews point to emerging efforts in teacher training, cross-disciplinary digital education, startup infrastructure, AI-related capacity building, and support for more specialised and product-oriented firms. But these initiatives remain fragmented and limited in scale relative to the pressures now reshaping the market.

3. GROUND TRUTH – WHAT EMPLOYERS NEED, WHAT THE MARKET DELIVERS

Chapter Summary

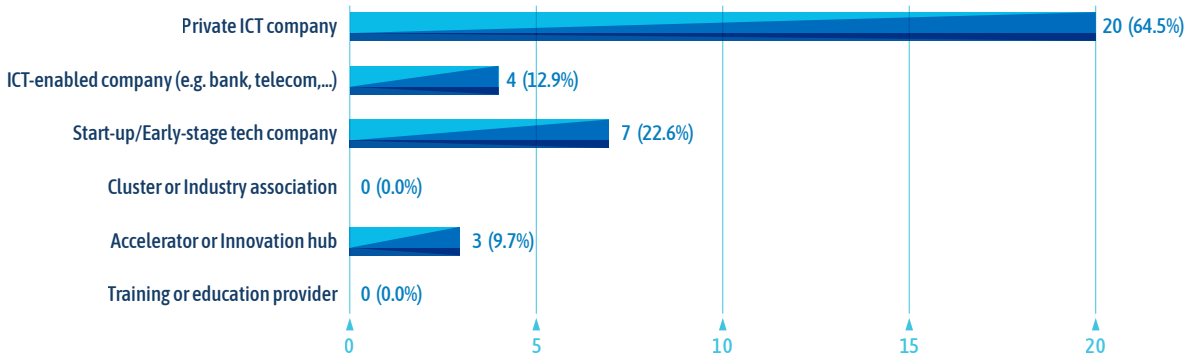
This chapter brings the macro trends identified in the previous chapters down to firm level. Drawing on the employer survey and structured interviews, it shows that WB6 ICT firms are still trying to grow, but are increasingly constrained by a mismatch between what the market now requires and what the labour pipeline supplies. Demand is shifting towards more senior, multidisciplinary, and client-facing profiles; the largest gaps are in problem-solving, teamwork, business understanding, and practical readiness rather than in core programming languages alone. Firms are responding through internal training, internships, and rapid AI adoption, but the evidence suggests that employer-led adaptation is compensating for, rather than being supported by, the education and skills system.

3.1 Introduction: From global trends to hiring desks

Global analyses describe what is changing in the world of work. Export statistics measure the aggregate result. But between the macro trend and the macro number sits a hiring desk, where a recruiter evaluates a candidate and decides whether the region's ICT sector moves forward or stalls. This chapter presents the ground-level evidence of that decision-making process: what WB6 ICT companies actually need, what they find in the labour market, and where the gap between the two is widest.

The chapter draws on two complementary sources: a structured employer survey generating 38 market-specific observations across all WB6, and 18 interviews with ICT companies, associations, investors, hubs, and other ecosystem actors. Survey respondents range from micro-firms to large companies and span product businesses, mixed models, and service-oriented firms. Figure 1 summarises the composition of respondents by type.

Figure 1. Structure of respondents by type



What emerges is a portrait of an industry that is simultaneously expanding and constrained. Companies are hiring, but they cannot find the people they need. Candidates exist, but they lack the depth, breadth, or business awareness that modern ICT delivery requires. Universities produce graduates, but the graduates require extensive further investment before they become productive.

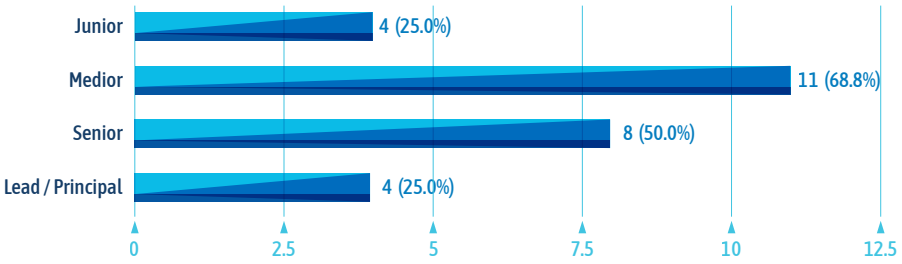
This chapter synthesises the survey data and interview evidence into a coherent account of what WB6 ICT employers actually face, structured around hiring intent, role demand, skills gaps, rejection dynamics, training responses, and technology trajectories. The analysis validates several findings from the World Economic Forum and the World Bank reports with ground-level regional data, but it also surfaces dimensions that macro-level analyses miss – dimensions that policymakers need to understand if interventions are to match the scale and specificity of the challenge.

3.2 Hiring intent: Cautious expansion amid structural constraints

Despite the export deceleration documented in Chapter 1 and the global tech labour market cooling described in Chapter 2, WB6 ICT companies remain in expansion mode. Fully 52% of surveyed firms plan to expand employment over the next twelve months, while 48% expect to maintain current headcount. Not a single respondent reported plans to downsize – a pattern consistent with the quarterly data from Serbia showing positive but slowing net job creation.

Yet, the nature of this expansion carries a paradox. When asked which seniority levels they plan to hire, the overwhelming preference is for mid-career and senior professionals. Only 13% of firms plan to hire at the junior level. This 'seniority paradox' – expanding workforces while narrowing the entry point – echoes the observation from Chapter 2 that AI tools are compressing demand for entry-level roles. Figure 2 shows the seniority levels firms expect to hire over the next twelve months.

Figure 2. Seniority level planned to hire

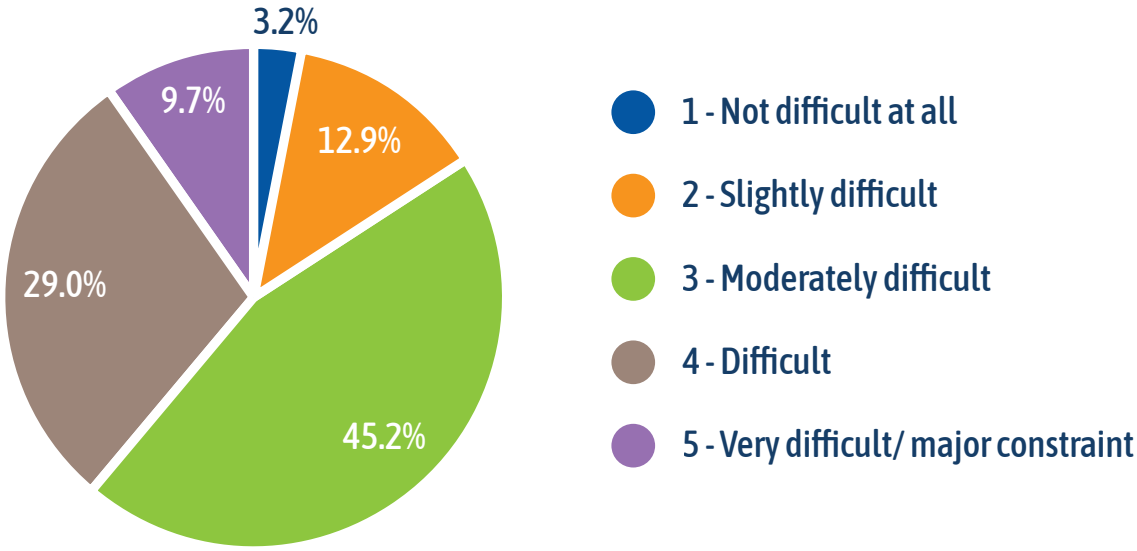


Interview evidence helps explain this pattern. Across the region, employers described a clear shift away from junior hiring and towards proven medior and senior profiles, especially after the 2022–2023 tech downturn and the spread of AI-assisted coding tools. This creates a systemic risk: if firms continue to narrow entry pathways, the future pool of experienced professionals will also begin to thin, turning today's efficiency gains into tomorrow's capability deficit.

How difficult is it to hire?

The survey leaves little ambiguity about the severity of the hiring challenge. Fully 84% of firms report moderate-to-severe difficulty finding suitable candidates for key technical roles, with nearly 39% rating the challenge as 'difficult' or 'very difficult'. Only a single respondent described hiring as 'not difficult at all'. This figure is consistent across the region: Kosovo*'s IT Barometer finds that roughly 80% of ICT companies describe hiring skilled staff as moderate or difficult, and Albania's labour market study shows 36% of firms reporting major difficulty attracting the right talent. Figure 3 summarises how employers rate the difficulty of finding suitable candidates on a five-point scale.

Figure 3. Difficulty finding suitable candidates (1–5 scale, bar chart)



Time-to-hire provides another indicator. The median time to fill a key technical role is 45 days; the mean is 53 days. At the extremes, some firms fill positions in as few as 10 days, while others report cycles of up to 120 days – four full months of an unfilled seat that directly affects project delivery and revenue.

> *A recruiter at a major engineering firm from Serbia:* "Clients don't want to pay two or three separate specialists; they want one person who can handle the entire environment. Finding that person takes time."

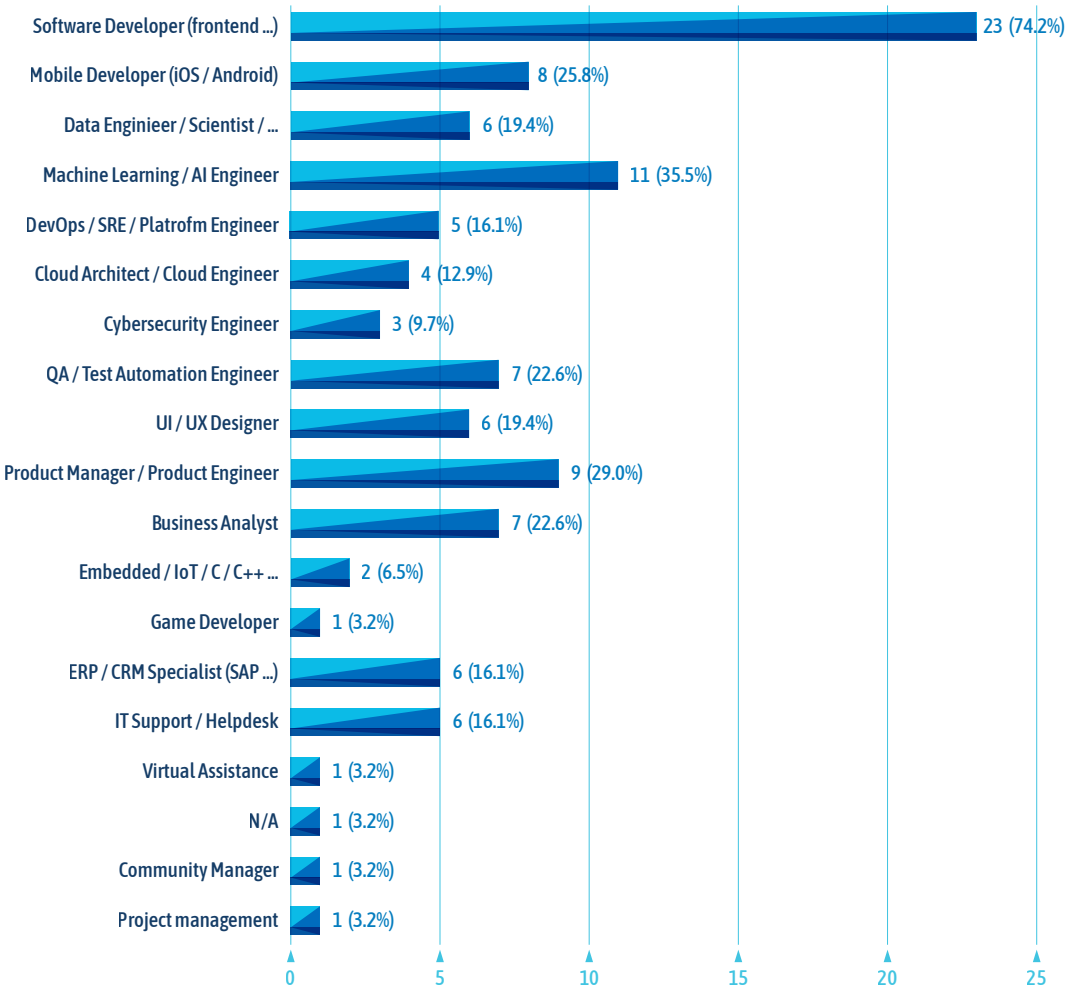
More than three-quarters of respondents say that the lack of qualified talent moderately, significantly, or severely limits their company's growth. The combination of expansion intent, seniority bias, and hiring difficulty creates a structural tension: companies want to grow, but they want to grow with experienced professionals who are already scarce. The resulting competition for senior talent drives up compensation – North Macedonia's ICT industry association has reported annual wage increases of 12 to 13% – which in turn reinforces the wage-skill disconnect examined in Section 3.5.

3.3 Role demand: Software development dominance with rising business functions

The survey confirms what export data already suggests: software development is the backbone of WB6 ICT sector. Fully 74% of companies identify Software Developer as their most in-demand role – a figure that aligns with the finding from Chapter 1 that custom software development constitutes the dominant service category in ICT

exports. Figure 4 maps the technical and functional roles firms expect to hire over the next twelve months.

Figure 4. Technical and functional roles planned to hire in next 12 months



But the composition of demand is evolving. Machine Learning and AI roles are sought by 36% of respondents, validating the WEF's identification of AI and ML Specialists among the fastest-growing occupations globally. Product Managers appear at 29% and Business Analysts at 23% – roles that bridge technology and commercial strategy. Mobile developers (26%), QA and test automation engineers (23%), and data professionals (19%) round out the upper tier.

Interviews reveal a critical distinction between two categories of demand. For mature technologies – Java, .NET, Angular, standard frontend and backend stacks – companies generally report adequate supply. A recruiter at a large firm from Serbia stated that these profiles can be hired within two to three months and are available internally as well. For emerging and specialised technologies, however, the picture is markedly different. The same recruiter described a search for a Databricks engineer – a profile so scarce externally that the company chose to train its own cohort through

an internal academy. The distinction extends beyond technology stacks to the nature of the work itself.

> *An enterprise software company (Bosnia and Herzegovina):* "You can't control a vacuum cleaner inside a nuclear reactor with a graduate from an IT academy. You need someone who came out of the Faculty of Electrical Engineering. The real demand is for people who can combine deep technical knowledge with the ability to solve problems no one has solved before."

The rise of Product Manager and Business Analyst roles deserves particular attention. A North Macedonia's angel investor and technology-park veteran observed that the binding constraint on growth in the region is not technical skill but commercial and managerial capability. The outsourcing model, he argued, does not build those muscles: sales, financial modelling, and business development skills were all singled out as critically absent. Interview evidence across the region points in the same direction: demand is increasingly moving towards sector-specific, client-facing, and commercially aware roles, not just narrow software execution.

When employers were asked in open-ended format which single role and skill combination was the hardest to fill in the past twelve months, the responses overwhelmingly pointed to senior profiles combining deep technical expertise with business or leadership capabilities. Typical answers included 'Senior Data Engineer for Microsoft platform', 'Enterprise architect', 'Tech skills + business skills', and 'Lead engineers with experience in data science'. The pattern is consistent: companies are not primarily struggling to find people who can code; they are looking for people who can code and think strategically, communicate with clients, and lead teams.

3.4 The skills gap: When problem-solving matters more than programming

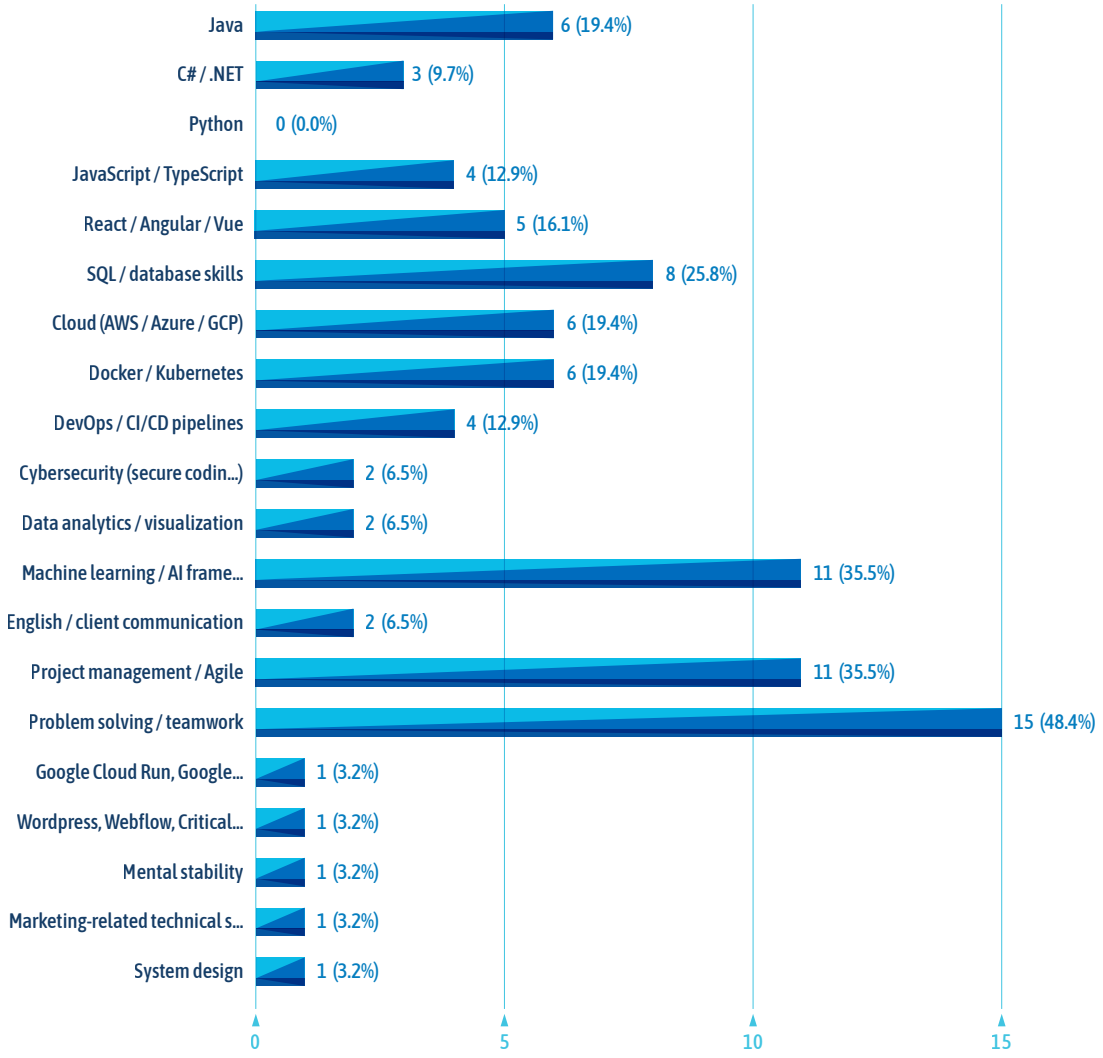
If the survey contained one finding that should reshape the skills policy conversation across WB6, it is this: the single largest skills gap reported by ICT employers is not in any programming language, framework, or technical domain. It is in problem-solving and teamwork.

When asked to select up to five skills where they most frequently observe gaps among candidates, 48% of firms cited problem-solving and teamwork – the highest response in the entire survey. This was followed by project management and agile methodologies (35%) and machine learning and AI frameworks (35%). SQL and database skills (26%), cloud platforms (19%), and Docker/Kubernetes (19%) formed a second tier. Traditional programming languages – Java (19%), C#/.NET (10%), and Python (0%) – ranked far lower.

The Python result merits particular reflection. In a global labour market where Python has become the lingua franca of data science, AI, and automation, not a single employer identified Python skills as a gap. This does not mean Python competence is universal; it means that, relative to the other deficits companies face, Python proficiency is

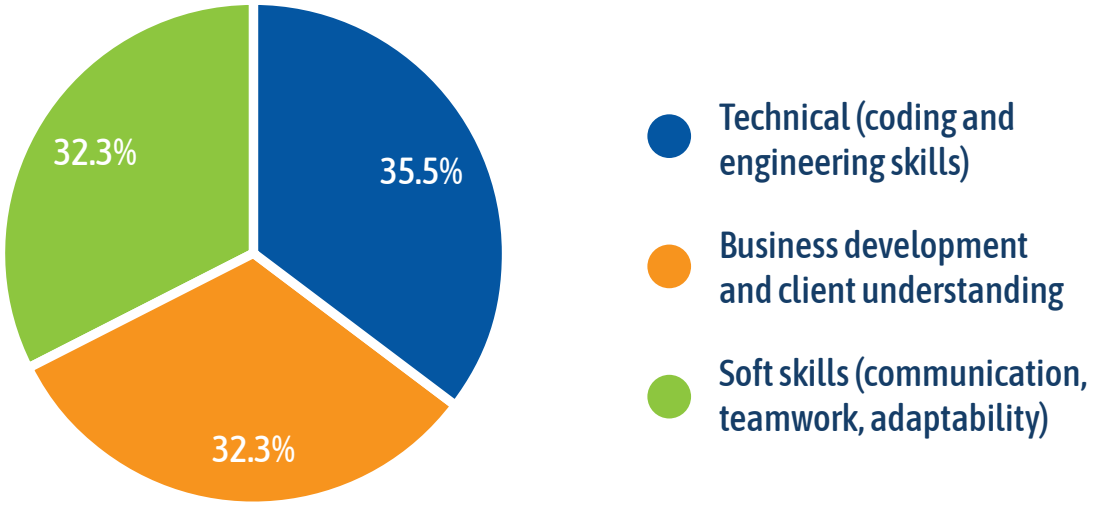
no longer the binding constraint. The binding constraints are upstream: the ability to define problems clearly, to work effectively in teams, to manage projects using structured methodologies, and to apply AI tools to real business contexts. Figure 5 summarises the skills areas where employers most frequently observe gaps among candidates.

Figure 5. Skills most frequently identified as gaps among candidates



A complementary question asked firms to identify the single biggest skill area lacking among today's candidates, forcing a choice among three broad domains. The results produced a near-perfect three-way split: technical skills (36%), business development and client understanding (32%), and soft skills including communication, teamwork, and adaptability (32%). Two-thirds of ICT employers thus consider non-technical capabilities to be the most critical gap – a finding that challenges the widespread assumption that the ICT skills agenda is primarily about producing more programmers. Figure 6 forces a single-choice ranking of the skill domain employers see as the biggest current deficit.

Figure 6. Single biggest skill area lacking



The human-skills deficit

A digital economy initiative from Serbia, drawing on research with over fifty companies across IT, banking, and marketing, identified what it termed a 'two-way mismatch': technical candidates often lack non-technical competencies, while non-technical profiles lack core digital capabilities. The initiative emphasised that flexibility, adaptability, continuous learning, and analytical and creative thinking are now expected alongside technical expertise – not as optional supplements but as core requirements.

In Kosovo*, a leading economic research institute found that the barriers extend beyond technical skills into professional communication, client engagement, English language proficiency, and business understanding. Their curriculum review revealed that these competencies are weakly integrated or entirely absent outside dedicated ICT study programmes. Several interviewees described the same shift in behavioural terms: the market now rewards initiative, interpretation, and solution design much more than passive execution of predefined tasks.

This shift – from passive task execution to proactive problem-solving – was a dominant theme across interviews. An enterprise software executive from Bosnia and Herzegovina described years of outsourcing as having reinforced a certain passivity:

> "For years, developers were used to having everything drawn out for them so they could just code. They never ask the client anything – they only point out problems instead of proposing solutions."

As clients now arrive with business problems rather than technical specifications, that model no longer functions.

The education-industry disconnect

The gap between what universities teach and what employers need emerged as one of the most consistent findings across all eighteen interviews. In Bosnia and Herzegovina, the ICT industry association identified the lack of practical, hands-on training as the core systemic challenge: the economy's IT education remains mostly theoretical, and a dual-study model combining academic and practical work is practically non-existent. Of 800 to 900 students who enrol in IT-related programmes each year, only 200 to 250 ultimately graduate domestically – a conversion rate below 30%. The causes are multiple: some students drop out due to the gap between theoretical curricula and practical expectations, while others leave to continue their studies abroad, further thinning the domestic talent pipeline.

An ICT cluster leader from Serbia offered a broader historical observation: as enrolment expanded significantly, the number of graduates increased, but the average depth of practical competence did not keep pace. In this view, the system now produces more credentials than consistently work-ready capability.

Interview evidence across all WB6 points to the same underlying problem: formal education still signals basic entry into the profession, but not consistent readiness for real project work, specialised domains, or client-facing delivery. Employers repeatedly emphasised weak practical exposure, limited project-based learning, and insufficient emphasis on experimentation, teamwork, and applied problem-solving.

Specific technical gaps: AI in theory, not in practice

The 35% skills gap in machine learning and AI frameworks deserves specific attention. Companies want to hire AI talent, but the available pool is shallow. An ICT cluster representative from Montenegro described AI and machine learning as 'taking off' in terms of demand, but noted that advanced specialisations remain scarce. In Albania, a major development foundation's ICT labour market study identified continued and rising demand for AI and machine-learning roles, with emphasis on depth of capability, adaptability, and the ability to integrate AI into existing business processes rather than isolated research.

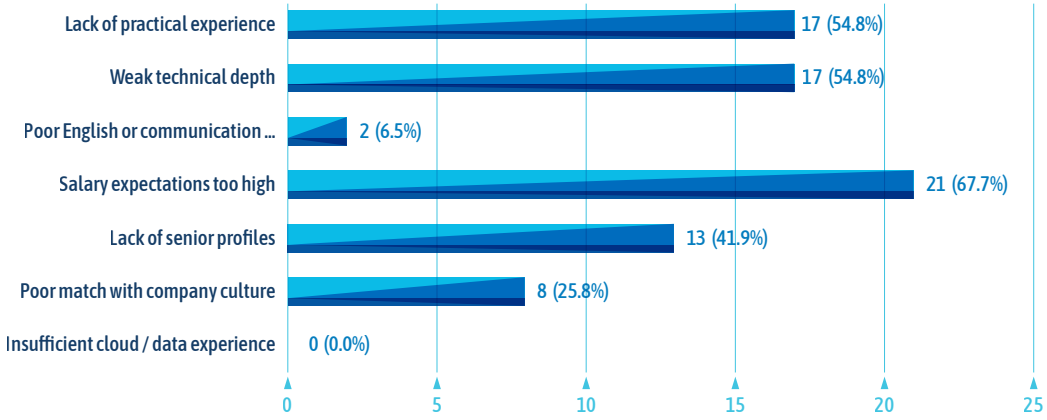
The SQL and database skills gap at 26% points to a more prosaic but equally important deficit. As companies shift towards data-driven decision-making, even traditional software developers need database competencies. Yet, universities continue to treat database skills as secondary to programming languages, creating a gap that widens as data-intensive workflows become standard.

3.5 Why candidates are rejected: The wage-skill disconnect

Understanding what skills are missing is only half the picture. The other half is understanding why hiring processes fail. The survey asked firms to identify up to three reasons why candidates are not hired, and the results expose a dynamic that

goes to the heart of the region's competitiveness challenge. Figure 7 summarises the main reasons candidates are not hired.

Figure 7. Main reasons candidates are not hired



The single most common rejection reason, cited by 68% of firms, is that candidates' salary expectations exceed their demonstrated capabilities. This is not a finding about salaries being too high in absolute terms; it is a finding about a structural misalignment between what candidates believe they are worth and what they can demonstrably deliver. It is followed by lack of practical experience (55%) and weak technical depth (55%) – together painting a picture of a talent pool where expectations have outpaced capabilities.

The absence of available senior profiles (42%) and poor cultural fit (26%) complete the top five. Poor English or communication skills, often assumed to be a significant barrier, was cited by only 7% – a finding that confirms the region's strong English language proficiency in global outsourcing markets.

Interview evidence illuminates the mechanism. A recruiter at a major engineering firm in Serbia described a US-market posting for a junior role with a dollar-denominated salary range – and senior-level candidates applied, expecting senior pay. The anecdote illustrates how global remote-work competition and social media amplification of headline ICT salaries have inflated expectations beyond what the local market's value-add can sustain.

This wage-skill disconnect has direct implications for the export deceleration documented in Chapter 1. For years, regional firms operated in what an ICT cluster leader from Serbia called a 'seller's market': global demand for digital talent meant that anyone with basic coding skills could secure employment. But as clients began rationalising their contractor portfolios following the post-pandemic correction, firms that had built relationships purely on cost-based delivery – without investing in client retention, domain expertise, or product-level thinking – were among the first to lose contracts. Interview evidence suggests that firms relying only on delivery, without stronger client ownership, domain expertise, or relationship-building capacity, proved more exposed once international demand softened.

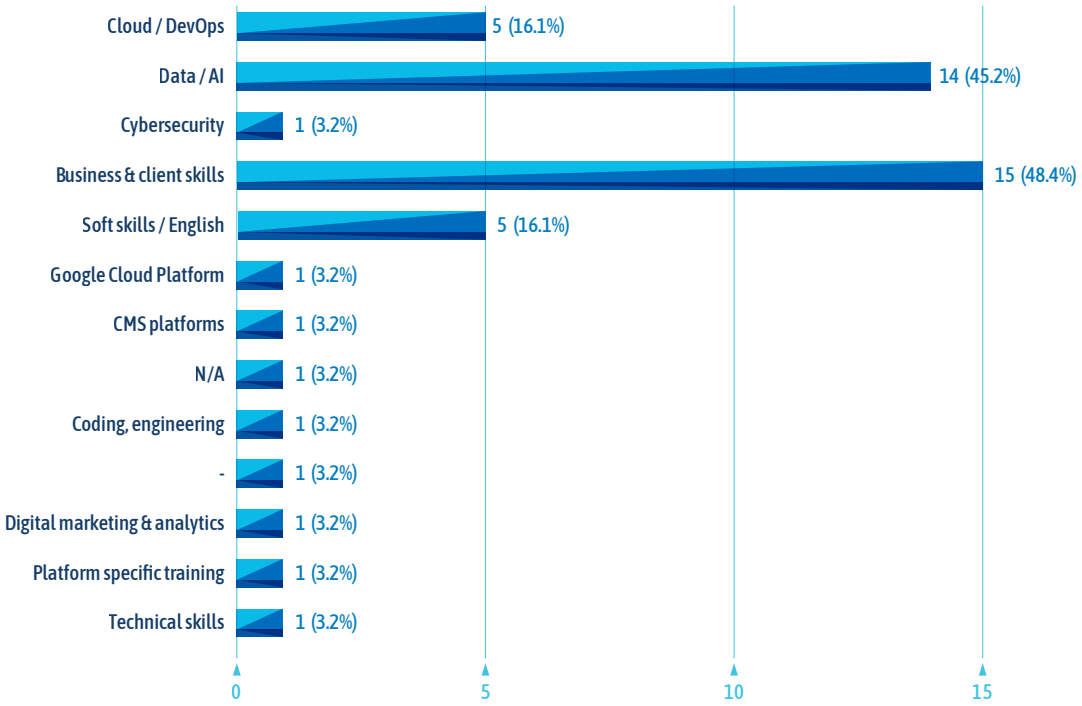
The rejection pattern thus forms a coherent narrative. Universities produce credentials faster than they produce competence. Graduates enter the market with salary expectations calibrated to headlines about ICT prosperity rather than to their actual skill level. Companies, facing global price pressure from lower-cost competitors and rising quality demands from clients, cannot afford to pay for potential – they need to pay for proven capability. The result is a market where demand and supply coexist in the same geography but fail to meet.

3.6 Training priorities: Companies invest in business, not code

If the skills gap reveals what companies lack, training investment reveals what they have decided to build themselves. The survey shows that the vast majority of firms take workforce development seriously: 87% offer some form of internal training, with 68% providing ad-hoc or project-based upskilling and 19% operating structured training programmes. Only 13% – typically the smallest micro-enterprises – offer no training at all.

The composition of that training investment sends a powerful signal. When asked to identify their top training priorities, 48% of firms selected business and client skills – the highest response, followed closely by data and AI (45%). Soft skills and English (16%) and cloud/DevOps (16%) formed a second tier. Coding and core engineering skills were identified as a priority by only a handful of respondents. Figure 8 shows the areas where firms are directing their training investment.

Figure 8. Top training priorities



This inverts the expected hierarchy. In a sector defined by software development, one might assume that technical training dominates. Instead, employers have concluded that they can teach code – or that employees arrive with adequate coding skills – but that the business, communication, and consultative capabilities required by today's market are not being developed elsewhere. Enterprise software executive from Bosnia and Herzegovina captured the training imperative:

> "We need people who can research an industry, understand its pain points, and design a solution – not just code a feature. That's what we spend our training budget on."

A digital economy initiative in Serbia identified a planned pilot programme to equip social science and humanities graduates with project management, product management, and administrative skills – capabilities increasingly required across organisations, not only in IT firms. The initiative described these non-technical competencies as the 'missing middle' between university education and professional practice.

Company-led training initiatives have proliferated as a response to education system gaps. In Montenegro, a cluster-affiliated academy delivers annual training cycles combining key technologies with practical work placements in member companies, training approximately 30 to 40 junior candidates per year over cycles of six to twelve months. In Bosnia and Herzegovina, a major software firm runs annual internships for top students from across the region, placing them in competitive teams to build real products. In Serbia, at least two large engineering firms have established internal academies that function as parallel education tracks.

> *An ICT cluster from Serbia:* "IT companies historically grew from strong engineering roots, but sales, finance, and management were always weak points. Nobody systematically educates for IT-adjacent roles."

An innovation hub from Montenegro takes this further, explicitly training programmers in basic business concepts such as invoicing, business operations, and client management – knowledge described as particularly absent among graduates of technical faculties. In Kosovo*, a leading economic research institute found that 51% of ICT firms report no spending on employee training at all, citing high costs and outdated content as primary barriers. When training does occur, firms overwhelmingly prefer short, intensive formats of up to five days.

A startup accelerator from Bosnia and Herzegovina reinforced the depth of the business-skills deficit, observing that years of execution-based outsourcing work left the ecosystem with technically competent graduates but few innovators: only one in twenty startups in their programmes, they noted, truly understands basic financial terminology.

The training data thus confirms a fundamental reorientation. Companies have accepted that the education system will not deliver business-ready graduates and have begun building internal pipelines to compensate. The cost is substantial: every hour spent teaching an engineer how to communicate with a client is an hour not spent on billable delivery. But companies have concluded that this investment is more productive than waiting for universities to change.

3.7 The multidisciplinary T-shaped engineer

Both survey and interview evidence point to the same emerging professional profile: firms increasingly value engineers with depth in one technical domain and enough breadth to work across adjacent technical, organisational, and client-facing functions. The combination of demand for software, AI, and business-facing roles – together with the corresponding gaps in problem-solving, teamwork, and practical judgment – points towards a T-shaped rather than narrowly specialised profile.

A recruiter at a major engineering firm in Serbia described the evolution:

> "What was once Java developer five years ago is today full-stack plus DevOps plus testing plus reliability. One person, the whole environment."

Enterprise software executive from Bosnia and Herzegovina framed the shift as a paradigm change from coding to consulting. Simple front-end dashboards or API integrations, he argued, can already be auto-generated by modern tools or AI models. What matters now is the ability to explain to the AI what to generate, understand the client's business process, identify where automation adds value, and manage the integration of AI-generated components into a coherent system. These are consulting skills, not coding skills.

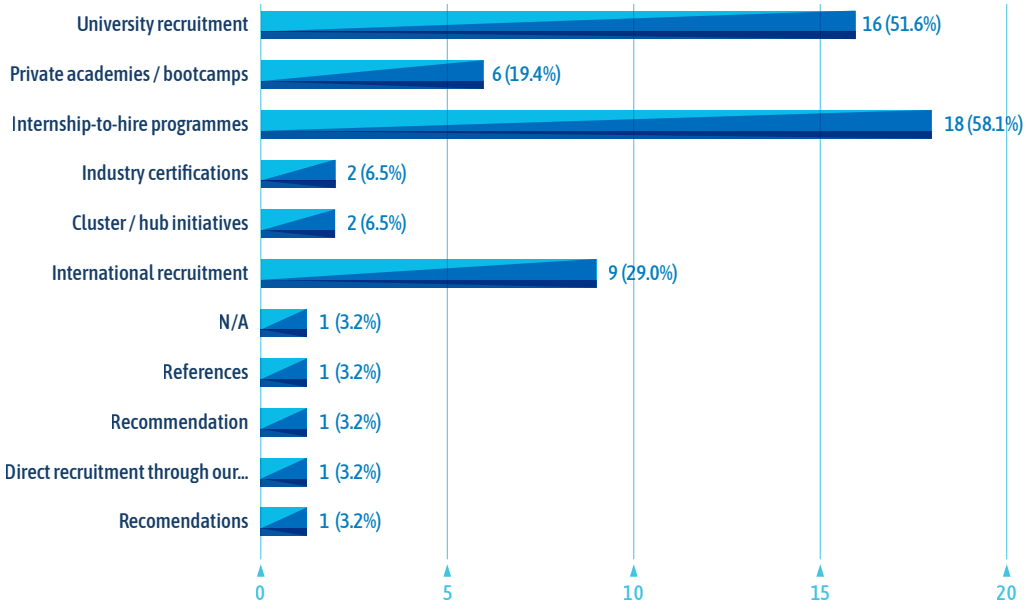
An angel investor and technology-park veteran from North Macedonia reinforced the commercial dimension. In his view, the outsourcing era produced strong coders, but the transition to product development requires entirely different muscles: market discovery, distribution, pricing, and scaling. The classic technical career ladder – junior developer to senior developer to tech lead – does not produce these capabilities. What the market now requires are professionals who can move laterally between technology and business with equal confidence.

This convergence towards T-shaped profiles has significant implications for education policy. Universities that organise curricula around single technologies – a Java track, a Python track, a web-development track – are producing graduates whose skill profile is already narrow on arrival. The market demands an educational model that combines deep technical foundations (algorithms, system design, data structures) with broad exposure to business processes, project management, communication, and applied problem-solving. The gap between these two models – what education produces and what the market demands – is the space in which most of this chapter's findings live.

3.8 Recruitment pathways: Internships outperform credentials

The survey asked firms to identify the talent channels that produce the best results. Internship-to-hire programmes dominate at 58%, followed by university recruitment (52%), international recruitment (29%), and private academies or bootcamps (19%). Figure 9 identifies the talent channels firms consider most effective.

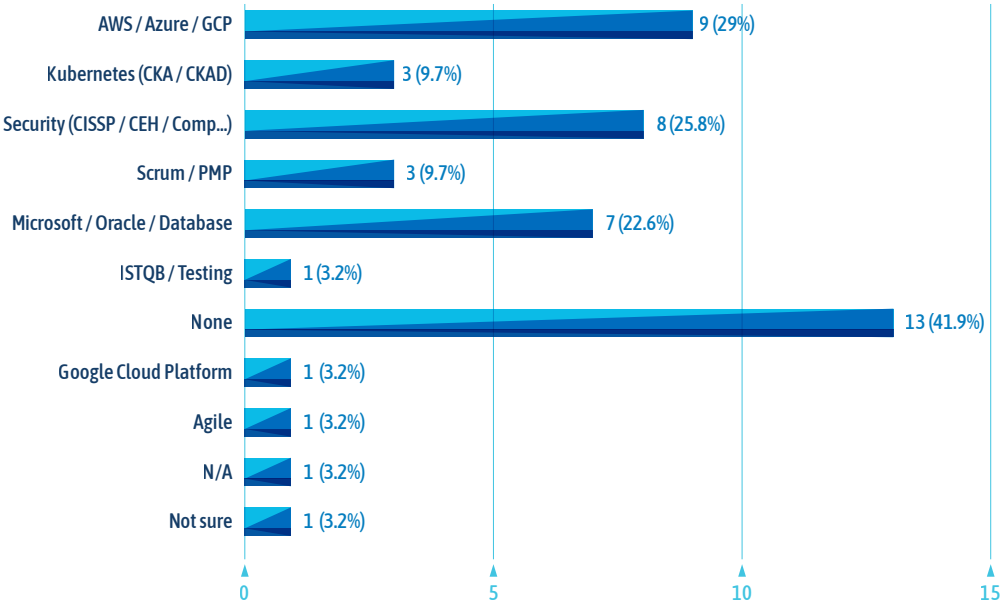
Figure 9. Most effective talent channels



The logic behind this hierarchy is consistent across interviews: companies want to see candidates work before they commit to hiring them. An innovation hub director from Albania emphasised that young people should start with internships "no matter what their degree is", because internships develop communication skills, workplace understanding, and professional habits that academic settings do not replicate. In Bosnia and Herzegovina, structured twelve-to-sixteen-week training pipelines covering full-stack development, cloud tools, and workplace integration have become a standard feature of the larger firms' talent strategies.

The survey's findings on formal certifications reinforce the same pattern. When asked which certifications matter most for hiring or promotion, employers most often selected 'none', suggesting that demonstrated capability matters more than formal badges. Figure 10 shows which certifications, if any, employers consider relevant for hiring or promotion.

Figure 10. Certifications that matter for hiring or promotion



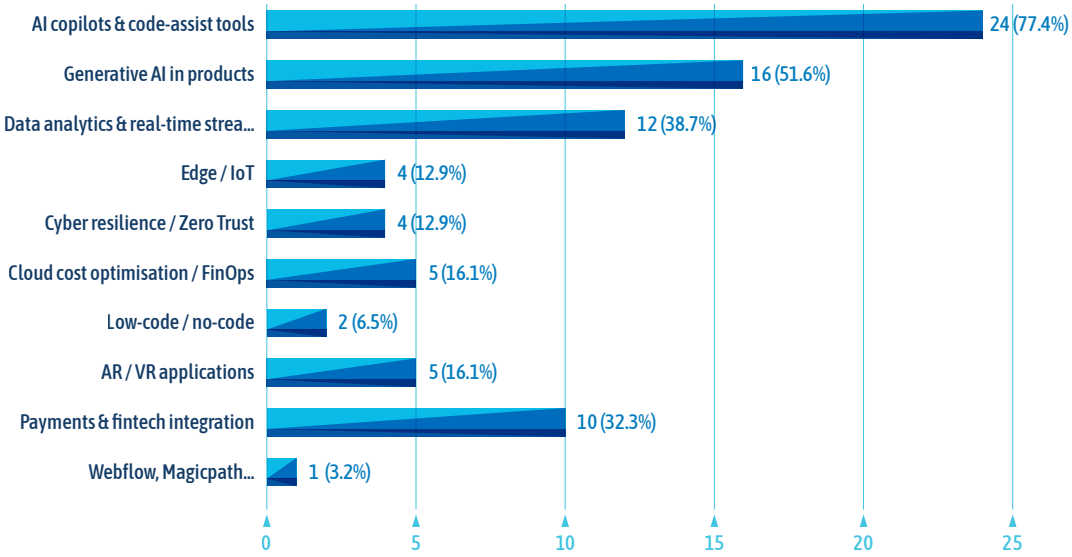
This finding has implications for the bootcamp and private academy ecosystem. Short-cycle training providers that award certificates rather than building internship pipelines may be producing graduates with credentials that employers do not prioritise. The effective recruitment channel is not the piece of paper but the structured workplace exposure that allows companies to evaluate a candidate's actual capabilities. Policy investments in workforce development should accordingly prioritise demonstrated capability through project work and structured internships over credential accumulation.

The 29% figure for international recruitment reflects both the sector's global orientation and the growing practice of sourcing talent also from abroad. Several interviewees linked this to the difficulty of finding specialised senior profiles domestically. A ride-hailing startup from Albania demonstrated one adaptive strategy: scouting junior talent from both public and private universities, offering part-time positions during studies, and signing early retention agreements – a model that trades guaranteed employment for early loyalty.

3.9 Technology roadmap: AI everywhere, readiness still catching up

The survey's technology roadmap question produced the chapter's most forward-looking data. When asked which technologies are most relevant to their company's roadmap over the next three to five years, the results are dominated by AI. Figure 11 maps the technologies firms consider most relevant to their roadmap over the next three to five years.

Figure 11. Emerging technologies on company roadmap, next 3–5 years



AI copilots and code-assist tools lead the field at 77% – more than three-quarters of ICT firms in the region are either already using or actively planning to deploy AI-assisted development tools. Generative AI integrated into products follows at 52%, indicating that firms are not merely using AI internally but building AI-enabled offerings for clients. Data analytics and real-time streaming (39%) and fintech integration (32%) complete the top tier.

> *A recruiter at a major engineering firm in Serbia:* "There isn't a meeting where AI isn't mentioned in the first five minutes."

Yet, the interviews reveal a notable gap between adoption ambition and current readiness. A digital economy initiative from Serbia self-assessed the regional knowledge of AI as between 2 and 3 on a scale of 0 to 5 – general awareness but limited practical competence. In Kosovo*, the ICT association's Barometer documented that AI usage has moved from experimental adoption in 2021–2022 to an embedded productivity layer across development, testing, documentation, and analytics by 2023–2024. Nearly all surveyed companies report using tools such as ChatGPT and GitHub Copilot, with the majority reporting tangible productivity gains. But adoption is shallow: advanced AI domains – proprietary model development, computer vision, large-scale data platforms – remain limited.

Enterprise software company from Bosnia and Herzegovina described the real value of AI not in building models but in mapping client processes, identifying insertion points for automation, and orchestrating AI-generated outputs into coherent business solutions. This framing – AI as a consulting tool rather than a coding tool – aligns with the chapter's broader finding that business understanding is becoming as important as technical execution.

An ICT cluster leader from Serbia framed the AI impact on labour in terms of role displacement: AI reduces demand for what he called 'tailor-style labour' – repetitive, boilerplate coding – while increasing demand for senior integrators who understand

systems end-to-end. The same executive estimated that generative AI tools save approximately 30% of time in standardised tasks, but warned that the freed capacity only creates value if it is redirected towards higher-order work that the current workforce is not yet trained to deliver.

3.10 Structural patterns across the region

While the survey and interview findings describe a broadly shared regional reality, important structural differences shape how these challenges manifest in each WB6. The interviews reveal patterns of geographic concentration, market maturity, and institutional capacity that condition the skills challenge differently across the WB6.

Geographic concentration is acute everywhere. In Albania, 82% of ICT professionals are based in Tirana. In Bosnia and Herzegovina, 65 to 70% of IT capacity is concentrated in Sarajevo. In Montenegro, the ecosystem centres on Podgorica with a smaller cluster in Budva. In Serbia, Belgrade and Novi Sad dominate, with smaller but growing nodes in Niš, Kragujevac, and Subotica. This concentration means that ICT skills strategies risk becoming de facto capital-city strategies unless deliberate efforts are made to distribute both demand and training infrastructure more broadly.

Labour market maturity varies significantly. Albania's ICT sector employs approximately 23,000 professionals, with 80% at mid or senior level, suggesting accumulated human capital over a decade. The sector's growth has moderated to around 5% annually, indicating a transition from rapid expansion to a steadier state that requires different policy instruments. Kosovo*'s market is more nascent and dynamic: firms are smaller and less differentiated, with a local human capital base used primarily to support foreign countries through outsourced services rather than building domestic capacity. North Macedonia has developed a strong export orientation that acts as a skills amplifier, with serving international markets raising expectations for quality, reliability, security, and communication. In Montenegro, the ICT cluster confirmed that most companies operate as delivery vendors for foreign clients, with very few developing proprietary products or platforms – a pattern that, combined with the ecosystem's small scale, makes it particularly dependent on cluster-level coordination and shared training infrastructure.

Price competition shapes regional hiring flows. Interview evidence also points to clear intra-regional price differentials, which shape company location decisions and create arbitrage dynamics within the WB6 market.

Migration dynamics differ but universally constrain advanced skill formation. In Kosovo*, 56% of ICT firms report employee departures due to emigration. In Albania, a major development foundation frames talent retention rather than acquisition as the emerging critical constraint. In Montenegro, competition from foreign companies paying premium salaries draws experienced senior engineers out of the domestic ecosystem. In Serbia, global remote-work opportunities create retention pressure that does not require physical emigration but has similar effects on the availability of senior talent for local firms.

These structural patterns mean that while the skills gap agenda is regionally convergent, the policy instruments must be locally calibrated. Albania needs retention strategies for experienced professionals. Kosovo* needs mechanisms to deepen firm capabilities and reduce dependence on pure outsourcing. Bosnia and Herzegovina – where a leading industry association estimates that outsourcing still accounts for roughly 70% of total IT activity – needs to address business-skills development alongside its engineering strengths. Montenegro needs to scale its ecosystem beyond the current cluster core. North Macedonia needs to sustain its export quality advantage as competition intensifies. Serbia needs to manage the transition from volume growth to value growth.

3.11 Synthesis: Findings that should reshape the policy conversation

The combined survey and interview evidence presented in this chapter accomplishes three analytical tasks. First, it validates the global trends identified by the World Economic Forum and the World Bank reports with ground-level regional data. Second, it surfaces dimensions that macro-level analyses do not capture. Third, it provides the empirical foundation for the policy recommendations developed in the final chapter.

Validation of global findings

The WEF's identification of AI, creative thinking, and problem-solving as the fastest-growing competencies finds direct confirmation in the survey data presented above. The World Bank's 'labour market paradox' – simultaneous shortages and unemployment – manifests regionally as the wage-skill disconnect documented in Section 3.5.

Table 5. Validation of global findings through regional survey data and interview evidence

Global / Macro Finding	Survey Evidence	Interview Confirmation
AI/ML as fastest-growing skills (WEF)	ML/AI roles: 36%; AI copilots on roadmap: 77%	AI has become a routine strategic concern across firms
Creative thinking and resilience as top skills (WEF)	Problem-solving/teamwork: 48% gap (highest)	"Change from sitting in a chair, waiting for tasks, to taking initiative"
Education-industry gap (World Bank)	55% rejected for lack of practical experience	Formal education signals entry, but not consistent job readiness
Senior talent scarcity and retention pressure	Medior/Senior dominate; only 13% Junior	Senior talent is scarce and increasingly expensive
Shift towards hybrid/T-shaped profiles	SW Dev 74% + AI 36% + Cloud 19% + Business 23%	Employers increasingly seek hybrid, cross-functional profiles

Global / Macro Finding	Survey Evidence	Interview Confirmation
Wage inflation vs. productivity	68% reject for salary too high (top reason)	Competition from Philippines, Africa; outsourcing firms losing contracts on price

Six findings beyond global frameworks

Beyond validation, the chapter surfaces findings that global analyses do not capture:

Finding 1: The seniority paradox documented in Section 3.2 is real, and AI is accelerating it. AI tools are compressing the tasks that once defined entry-level positions, narrowing the pipeline from which future senior professionals emerge. Without deliberate intervention to preserve mentorship and structured entry pathways, today's productivity gains risk becoming tomorrow's capability deficit.

Finding 2: The skills gap is not primarily technical. Problem-solving, teamwork, project management, and business understanding collectively outrank programming languages in the gap hierarchy. Two-thirds of employers identify non-technical capabilities as the single most critical deficit. This suggests that the return on investment in applied problem-solving, business-oriented education, and soft-skills development may be significantly underestimated in current policy frameworks.

Finding 3: The wage-skill disconnect is the mechanism that links micro-level hiring failures to macro-level export deceleration. The implication is direct: the region is becoming less cost-competitive without having yet become fully capability-competitive. Closing this gap requires not just more graduates, but graduates with deeper, more immediately productive skills.

Finding 4: Education systems deliver theory; the market demands practice. With the vast majority of firms investing in internal training, internship programmes outperforming every other talent channel, and consistent employer demand for practical experience, the data indicate that companies have largely accepted the role of finishing what education starts. But this is an expensive and inefficient equilibrium that penalises smaller firms unable to afford extensive onboarding.

Finding 5: Certifications matter less than capability demonstration. The finding that a large share of employers consider no formal certification relevant to hiring challenges the value proposition of certification-heavy training programmes. Policy investments in workforce development should prioritise demonstrated capability through project work, portfolios, and structured work experience over credential accumulation.

Finding 6: AI adoption is universal, but AI capability is scarce. The technology roadmap data in Section 3.9 show that AI adoption is near-universal, but capability remains shallow. The region is not lagging in AI adoption. But the ability to develop, fine-tune, and deploy AI – as opposed to merely consuming AI-generated outputs – remains a critical scarcity. The distinction between AI users and AI builders is likely to define which firms and economies thrive in the next five years.

The next chapter turns from the demand side to the supply response, examining whether the education and training system can adapt quickly enough to the changing profile of labour-market demand.

4. FORCES SHAPING TOMORROW – EMERGING SKILLS REQUIREMENTS AND POLICY CHALLENGES

Chapter Summary

This chapter identifies the main forces that will reshape ICT skills requirements in the WB6 through 2030. Some are technological – especially AI, cloud, cybersecurity, and data – while others are structural, including demographic pressure, intensifying competition, and the wider digital and green transitions. Across all of them, the same problem recurs: skills requirements are evolving faster than education and training systems can respond. The central implication is that future competitiveness will depend not only on the region's ability to build specialised technical capability, but also on whether it can adapt its human capital systems quickly enough to match a much faster-moving market.

4.1 Introduction: Understanding what is changing and why it matters

Chapter 3 showed that WB6 ICT firms are already facing a mismatch between what they need and what the labour pipeline delivers. Those firm-level difficulties are not isolated problems. They are the visible expression of deeper forces that are changing both the content of ICT work and the pace at which required skills evolve.

This chapter examines seven interconnected pressures that will shape ICT skills requirements across the WB6 through 2030. Four are technological: AI, cloud, cybersecurity, and data analytics. Three are structural: demographic contraction, intensifying competition, and the digital and green transitions that extend the skills challenge well beyond the ICT sector.

For each pressure, the analysis asks four questions: What is changing? How does it reshape skills requirements? What evidence exists from the survey, interviews, and global data? And what gap remains between current capabilities and future needs? The answers to these questions – particularly the gap assessments – provide the analytical foundation for the policy recommendations developed in Chapter 5.

4.2 The human skills imperative: Problem-solving over programming

As Chapter 3 demonstrated, the most binding skills gap across the WB6 is not technical – it lies in problem-solving, business understanding, and communication. Firms can still find people who can code, but too few who can frame a problem, understand a client context, coordinate delivery, and make sound decisions under uncertainty. The question for this section is why this gap exists and what is driving it deeper.

Why this is happening: From execution to co-creation

The driver behind this shift is structural. The outsourcing model that powered the region's growth for a decade rewarded execution against predefined specifications – it did not systematically build initiative, solution design, or client-facing judgment. As that model gives way to more consultative, AI-enabled delivery, the skills it never developed are precisely the ones the market now demands.

AI accelerates this transition. As routine coding tasks become automatable, the distinctly human contribution shifts towards ambiguity resolution, creative problem-framing, stakeholder communication, and judgment. Enterprise software executive from Bosnia and Herzegovina estimated that around 60% of traditional coding and testing tasks can already be handled by AI tools, but emphasised that the remaining 40% – understanding context, making design trade-offs, managing integration complexity – requires precisely the skills that current graduates lack.

The emerging profile: The T-shaped professional

The T-shaped professional profile documented in Chapter 3 – deep in one technical domain, broad enough to work across business, communication, and delivery functions – is the direct response to this shift. A digital economy initiative from Serbia reinforced this with research across IT, banking, and marketing firms: the most important competencies are flexibility, adaptability, continuous learning, analytical and creative thinking, communication, empathy, and teamwork. These are not supplementary attributes. They are core requirements without which technical proficiency alone does not produce employable professionals.

The gap: Education systems that produce I-shaped graduates

Against this demand, the region's education systems continue to produce graduates with narrow technical depth but limited exposure to business context, collaboration, or applied problem-solving. The gap between the T-shaped profile the market demands and the I-shaped profile that education produces is where most of the workforce challenge now sits.

The employer survey's open-ended responses on education reform reinforce this diagnosis with unusual consistency. When asked what single change in education

would most improve hiring, responses included: "Prepare students for real-life experience – they lack soft skills and business skills"; "Solve real problems; learn business"; "More hands-on experience across domains and cross-technology projects"; "Understanding business context in addition to technical education"; and "Strengthen applied math and coding early, add mandatory hands-on projects, teach problem-solving and adaptability as core skills." The message from employers is consistent: produce graduates who can think, communicate, and solve problems – not just graduates who can code.

> **Policy implication**
>
> Curriculum reform should go beyond adding elective courses. Business skills, project-based learning with real clients, cross-functional teamwork, and communication training need to be embedded as mandatory components of ICT degree programmes. Universities that continue producing I-shaped graduates in a market that demands T-shaped professionals will see their graduates' employability decline further.

4.3 Artificial intelligence: From optional skill to essential infrastructure

Artificial intelligence is the most transformative technological force now acting on the WB6 ICT sector. Earlier chapters have already shown both the scale of global AI-driven change and the speed with which firms in the region are adopting AI tools. The key issue here is not whether AI matters, but how it is changing the structure of skills demand.

What is changing

The AI transition has two dimensions. One is tool-level adoption, where AI copilots and code assistants are becoming standard across day-to-day workflows. The other is capability-level integration, where firms begin embedding AI into the products and services they sell. Interviews and regional evidence suggest that the first is spreading quickly, while the second remains much more limited and capability-intensive.

How it reshapes skills requirements

AI creates a three-tier demand structure. At the base, every ICT professional must become fluent in AI-assisted workflows: using copilots effectively, prompting with precision, validating AI-generated code, and understanding the limitations of generated output. At the intermediate level, firms need engineers who can integrate AI components into existing systems – connecting models to databases, building

retrieval-augmented generation pipelines, orchestrating multi-agent workflows. At the top, a smaller number of specialists are required to develop, train, and fine-tune models for domain-specific applications.

> *An enterprise software company (Bosnia and Herzegovina):* "Anyone can build an LLM and feed it with data. The real value lies in mapping a client's processes, identifying the right insertion points for automation, and integrating AI agents to optimise workflows."

The displacement effect is not a net reduction in employment, but a recomposition: fewer people doing routine implementation, more people doing design, integration, and client-facing problem-solving. The value is no longer in writing code that AI can generate, but in understanding where AI fits within client processes and managing the resulting trade-offs.

The gap: Universities teaching as if AI does not exist

Against the near-universal AI adoption documented in Chapter 3, the region's education systems are largely unprepared. A digital innovation hub representative from North Macedonia noted that university programmes operate on five-year reaccreditation cycles, meaning that formal curricula cannot track the pace of change in AI tooling, modern data practice, and rapidly evolving technology stacks. Interview evidence suggests that AI awareness is broad, but practical capability remains shallow: firms are learning to use AI tools faster than institutions are learning to teach AI-enabled engineering, integration, and deployment.

In Montenegro, a cluster representative described AI and machine learning as 'taking off' in terms of demand, but noted that advanced specialisations remain scarce domestically. Highly advanced domains such as computer vision and cutting-edge AI research are largely absent from the ecosystem, and students interested in these fields must look beyond the region for training.

In Albania, a major development foundation's ICT labour market study identified continued and rising demand for AI and machine-learning roles, but with emphasis on depth of capability and the ability to integrate AI into existing business processes – not on AI as an isolated technical specialty. The gap is not in awareness but in the engineering depth required to move from consuming AI tools to building AI-enabled products.

Policy implication

AI fluency should become a standard component of all ICT curricula, not an elective or specialisation. This means teaching students to use AI-assisted development tools from the first year, integrating prompt engineering and output validation into programming courses, and developing intermediate-level modules on AI system integration, data pipeline construction, and model deployment. Universities that graduate developers who have never used a copilot are graduating professionals for a market that no longer exists.

4.4 Cloud computing: Infrastructure as baseline competency

Cloud computing has transitioned from a specialised domain to foundational infrastructure. The employer survey identifies meaningful skills gaps in cloud platforms and container orchestration technologies – gaps that, while less prominent than the human-skills deficit, represent baseline competencies without which developers cannot participate in modern software delivery.

What is changing and why

Interviews and regional evidence suggest that cloud-based delivery is no longer a specialist option, but a baseline expectation among export-oriented firms. International clients increasingly expect deployment on standard cloud platforms, alongside DevOps and CI/CD practices as part of normal delivery.

The drivers are straightforward. Remote work requires cloud-hosted environments. International clients expect deployment on major cloud platforms for compliance, scalability, and integration. The shift to DevOps and site reliability engineering practices has made containerisation, infrastructure-as-code, and continuous integration and continuous deployment (CI/CD) pipelines standard expectations rather than specialist skills.

The gap: Graduates who develop only on local machines

University curricula across the region continue to teach server-based computing models. Students still often develop applications on local machines and submit assignments in isolation from the cloud environments, CI/CD pipelines, and containerised deployment workflows that define professional practice. An innovation hub from Montenegro explicitly trains students in DevOps fundamentals and cloud deployment – skills described as entirely absent from formal university curricula.

In Bosnia and Herzegovina, a major engineering firm took the training gap into its own hands, building a Databricks engineering capability through an internal academy after finding that external supply was effectively non-existent. The company reached slight excess capacity in this specialisation – demonstrating that internal reskilling can work, but at a cost that is sustainable only for larger firms. A recruiter at the same firm noted that while standard profiles such as Java and .NET developers can be hired within two to three months, specialised cloud and data-platform roles require either international recruitment or internal development programmes lasting six months or more.

Policy implication

Cloud exposure should begin in undergraduate education. Programmes such as AWS Educate and Microsoft Azure for Students provide free or subsidised cloud credits that eliminate cost as a barrier. Integrating cloud deployment, containerisation, and infrastructure-as-code into standard coursework would close a gap that currently forces every employer to retrain every graduate.

4.5 Cybersecurity: From specialist niche to shared responsibility

The WEF Future of Jobs Report identifies cybersecurity as a priority skill for 70% of employers globally. Within the region, the survey shows relatively low direct hiring for cybersecurity roles – approximately 13% of firms – but this figure understates actual demand. Interviews consistently indicate that cybersecurity is shifting from a specialist function to a shared professional responsibility integrated into every development, deployment, and data-handling role.

What is changing

Across the region, cybersecurity is becoming more salient as firms serve more international clients, handle more sensitive data, and operate in a less forgiving digital environment. In several WB6, interviewees linked this shift to both practical incidents and rising client expectations around compliance, resilience, and trust. In Montenegro, cybersecurity awareness surged after a serious cyberattack on government systems several years ago. A cluster representative described the attack as a catalyst for institutional and business-level awareness, shifting security from an abstract concern to a concrete operational priority. In Kosovo*, the ICT association's Barometer identifies cybersecurity as an increasing concern especially among higher-revenue and export-oriented firms, where exposure to international clients raises compliance and security requirements. In Albania, an innovation hub director explicitly framed cybersecurity as an area of growing need, and survey responses from firms from Albania identified network engineering combined with cybersecurity expertise as a critical future role.

How it reshapes skills requirements

The shift from specialist-only to shared-responsibility cybersecurity has practical implications for training. Every developer must understand secure coding practices, OWASP principles, encryption standards, and secure deployment. Architects must design for resilience. System administrators must manage identity, access, and audit trails. Product managers must understand the regulatory landscape, including GDPR compliance for firms serving EU clients – the majority of the region's ICT exporters.

A digital economy initiative from Serbia noted that cybersecurity is among the future-oriented technical skills of growing importance, but also highlighted that AI adoption itself creates new security concerns – ethical risks, adversarial attacks on AI systems, and data privacy challenges – that add complexity to an already demanding compliance environment.

Policy implication

Cybersecurity should be integrated across all ICT curricula as a foundational competency, not confined to elective courses or specialist tracks. Every programming course should teach secure coding. Every systems course should cover threat modelling. Every data course should address privacy and compliance. The region's cybersecurity posture will be only as strong as its weakest developer.

4.6 Data analytics: Value extraction as core capability

Data capabilities are moving from specialist niche to standard expectation. The survey shows gaps in SQL and related database competencies, while the technology roadmap points to deeper investment in analytics and business intelligence over the next three to five years. Interview evidence reinforces the same message: data-related skills are spreading across engineering, product, and commercial roles rather than remaining confined to a narrow analytics function.

What is changing and why

Data-driven decision-making is transitioning from an aspiration to an operational requirement. In Bosnia and Herzegovina, a startup accelerator director noted that while earlier years of the IT sector were dominated by front-end developers, demand is now rising for Python, data science, and AI-related roles – aligning the domestic market with global trends. In Kosovo*, the ICT association reports that salaries are highest in technical engineering, data and AI, and leadership roles – confirming that advanced data skills command a clear wage premium. An independent economic research institute found growing demand for digital marketing specialists alongside traditional technical roles, reflecting data analytics spreading beyond engineering into commercial functions.

When employers were asked about the most critical future roles, survey responses consistently pointed to data-intensive profiles: "Data Engineer / Data Scientist (Python, SQL, ML/AI, data-pipelines)"; "Data Analyst with strong SQL, BI, and data visualisation skills, and AI Engineer with expertise in machine learning and MLOps"; "Senior Data Engineer with AI skills". The pattern is clear: data competencies are becoming a prerequisite across roles, not a standalone specialisation.

The gap: Theory without practice

Universities teach database theory and SQL syntax, but students rarely work with real business data, messy datasets, or analytical workflows that connect data extraction to business decision-making. In Kosovo*, an independent economic research institute explicitly recommended that curricula should include modern programming languages, applied data analysis, and real-world digital projects – competencies that current programmes do not systematically develop.

The SQL gap is particularly telling. It suggests that even long-established technical competencies are still being taught too abstractly.

> **Policy implication**
>
> Cybersecurity should be integrated across all ICT curricula as a foundational competency, not confined to elective courses or specialist tracks. Every programming course should teach secure coding. Every systems course should cover threat modelling. Every data course should address privacy and compliance. The region's cybersecurity posture will be only as strong as its weakest developer.

4.7 Demographic pressure: A shrinking talent pool

The skills challenges examined in this chapter unfold against a shrinking labour base. World Bank projections point to sustained demographic contraction and growing labour shortages across the region, with the implications already visible in firm-level hiring pressure, retention difficulty, and rising competition for experienced talent.

The labour market presents what the World Bank describes as a 'paradox': labour shortages coexist with unemployment rates above 10% and labour force participation rates below 55%, particularly among women and youth. For the ICT sector, this means that the pool from which skilled workers can be drawn is shrinking at the same time that the skills demanded from each worker are expanding.

Migration as a compounding factor

Demographic decline is compounded by emigration. As documented in Chapter 3, more than half of Kosovo*'s ICT firms report employee departures due to emigration – a figure that directly undermines returns on training investments and exacerbates shortages in higher-value roles. In Albania, a major development foundation frames talent retention rather than acquisition as the emerging critical constraint: while demand continues to rise for programmers and IT specialists, the binding challenge is keeping experienced professionals who are most productive.

In Bosnia and Herzegovina, a different dynamic has emerged. An industry association executive observed that outward physical migration slowed after the pandemic, but remote work for foreign clients has partially replaced it. Professionals remain physically present but economically disengaged from the domestic ecosystem. One interviewee captured this dynamic:

> *The ICT industry association (Bosnia and Herzegovina):* "One company owner told me: I'll be damned if I know how much of their time my people actually spend working for me and how much for someone else."

In Montenegro, the entry of foreign companies – particularly those linked to international markets – has intensified competition for experienced senior engineers, drawing them away from domestic employers. A cluster representative described this as a growing challenge: the domestic labour market is competing not just with emigration but with global salaries delivered through remote-work arrangements to professionals who never leave Montenegro.

In Serbia, global remote-work opportunities create retention pressure that does not require physical emigration but has similar effects on the availability of senior talent for local firms. Across the region, the resulting wage inflation – documented in Chapter 3 as the single most common reason candidates are rejected – is driven in significant part by this competitive dynamic.

Implications for skills policy

Demographic decline cannot be reversed through skills policy alone, but its impact can be mitigated through three strategies. First, activating underutilised talent pools – particularly women, whose ICT participation remains significantly below male rates despite evidence that the gender gap in digital skills is narrower in younger cohorts. Second, accelerating reskilling for career changers from adjacent sectors, enabling workers displaced by automation or the green transition to enter the ICT workforce. Third, and perhaps most consequentially, increasing the productivity of each worker through better education, more effective training, and faster deployment of AI tools that multiply individual output.

Policy implication

If the workforce is shrinking, every worker should become more productive, more skilled, and more effectively deployed. Reskilling programmes, gender-inclusive recruitment, and retention-oriented workplace policies are not equity measures alone – they are economic imperatives in a region facing demographic contraction.

4.8 Global competition: Beyond wage arbitrage

WB6 ICT sector was built on cost competitiveness. For a decade, the region offered skilled engineers at lower rates than Western Europe or North America, making it an attractive outsourcing destination. That advantage is eroding from two directions: wage expectations are rising domestically while lower-cost competitors in South-East Asia, Africa, and other emerging markets are entering the same segments.

The wage-skill disconnect documented in Chapter 3 – where salary expectations consistently outpace demonstrated capability – is the demand-side manifestation of this pressure. On the supply side, cost-driven client decisions increasingly push work towards lower-cost locations in South-East Asia and Africa, even where quality and English proficiency in the WB6 remain strong. Firms competing on generic, undifferentiated outsourcing are under the greatest pressure.

The strategic implication is that the region's ICT sector must increasingly compete on capability rather than cost. This transition is already visible in firms that have invested in domain specialisation, consultative delivery, and AI-enabled services – and in the difficulties faced by those that have not. As Chapter 3 documented, firms relying primarily on cost-based delivery proved most exposed when international demand softened after the pandemic.

Serbia's ICT export deceleration – from double-digit growth to approximately 7% – can be read as an early indicator of this transition. Growth is not collapsing, but the period of easy expansion driven by global demand and cost arbitrage is giving way to a more competitive environment that rewards specialisation, domain expertise, and higher-value services.

Interview evidence also points to niche specialisation as one of the clearest survival strategies: more specialised firms appear better positioned to grow than generalist outsourcing providers.

Policy implication

Supporting the transition from outsourcing to higher-value services requires investment in the skills that differentiate: domain expertise, product management, consultative delivery, and AI integration. Innovation funds, startup support, and industry-academia partnerships that encourage specialisation would accelerate this transition more effectively than general-purpose training programmes.

4.9 Green transition and horizontal digitalisation: Parallel reskilling challenges

Two broader transitions shape the environment in which ICT skills needs are evolving: decarbonisation and the spread of digitalisation across the wider economy.

For the ICT sector, these twin forces create both opportunity and competition. The opportunity is that workers displaced or transitioning from carbon-intensive industries represent a potential reskilling pipeline: adults with professional discipline, domain expertise in energy, manufacturing, or logistics, and motivation to retrain. The challenge is that horizontal digitalisation competes for the same training resources and institutional attention. These twin transitions do not affect all workers in the same way, which means that reskilling needs are uneven across occupations and sectors.

A digital economy initiative from Serbia captured the cross-sectoral dimension: the initiative described a pilot programme to equip social science and humanities graduates with digital work practices – project management, product management, data analysis – because their employability increasingly depends on capabilities that overlap with the ICT sector's own human-skills deficit. In Kosovo*, a leading technology company described the frontier of this convergence: hybrid education combining technology with domain knowledge in agronomy, health, and engineering will be essential, especially where AI can add value.

Policy implication

Reskilling programmes should be designed to serve both ICT workforce deepening and cross-sectoral digital upgrading. The same training infrastructure that teaches data analytics to aspiring data engineers can, with adaptation, teach data literacy to logistics managers, energy auditors, or public administrators. Modular, stackable curricula would maximise the reach of limited training infrastructure.

4.10 Education system readiness: The central challenge

Every trend analysed in this chapter – AI adoption, cloud normalisation, cybersecurity integration, data-driven practice, human skills demand, demographic pressure, competitive upgrading – converges on a single institutional question: can the region's education and training systems adapt fast enough?

The speed mismatch

University curriculum cycles across the region typically run on five-to-seven-year accreditation timelines, while technology cycles – particularly in AI and cloud – operate on eighteen-month horizons. By the time a new curriculum is designed, approved, and delivered, the technologies it teaches may already be superseded. This structural speed mismatch emerged as one of the most consistent concerns across interviews.

The quality dilution problem

Expanding enrolment has not proportionally expanded quality. The dropout rates documented in Chapter 3 – exceeding 70% in some WB6 IT programmes – reflect a system where intake has grown faster than teaching capacity, practical training infrastructure, and quality assurance. A startup accelerator director in Bosnia and Herzegovina observed that public universities may have stronger engineering infrastructure built over decades, but these facilities are often underutilised, while smaller private institutions make more active use of their limited resources. The paradox of large, well-equipped institutions producing less practical output than smaller, more agile ones recurred across interviews.

> *A technology company and academy (Kosovo*):* "The formal system does not respond quickly enough to technological change. Professors and curricula are not always aligned with industry demands, and the overemphasis on lengthy academic credentials without corresponding practical depth creates a structural barrier."

Company-led training as a compensatory mechanism

In the absence of sufficiently responsive formal education, companies have built their own training infrastructure. As Chapter 3 documented, the vast majority of firms now invest in internal training – with business and client skills, not coding, as the top priority. This compensatory mechanism works, but it is costly and far less accessible to smaller firms that cannot afford structured onboarding programmes.

Across the region, larger firms have increasingly built their own training infrastructure – including internal academies, structured internships, and company-led onboarding tracks – in order to compensate for weak labour-market readiness.

Policy implication

Education system reform is the enabling finding for every other recommendation in this study. Three structural changes would accelerate adaptation: first, establishing mandatory industry advisory boards for all ICT programmes, with authority to recommend curriculum updates outside the standard accreditation cycle. Second, creating fast-track accreditation mechanisms for technology-intensive modules, allowing new content to be introduced within one academic year rather than five. Third, linking a portion of public funding for higher education to graduate employment outcomes, creating direct incentives for labour-market alignment.

4.11 Synthesis: Seven trends, seven skill imperatives

Table 6 summarises the seven forces examined in this chapter, the skills they require, the evidence of pressure identified in the survey, interviews, and external sources, and the education gaps that remain unresolved.

Table 6. Seven key trends overview

Trend	Skills Required	Evidence of Pressure	Education Gap
Human skills imperative	Problem-solving, teamwork, business understanding, communication	48% skills gap (survey); 48% training priority; WEF: analytical thinking #1 skill; 18/18 interviews consistent	Universities teach technical skills in isolation; no business, communication, or project-based learning with real clients
AI mainstreaming	AI-assisted development, prompt engineering, model integration, AI ethics	77% adopting copilots; 52% GenAI in products; 36% hiring AI/ML; AI knowledge at 2–3/5	Curricula teach manual coding; no AI tool exposure; advanced ML/AI tracks scarce or absent
Cloud normalisation	Cloud deployment, containers, DevOps, infrastructure-as-code	19% gap in cloud platforms; 19% gap in Docker/Kubernetes; DevOps as standard expectation	Students develop on local machines; no cloud credits, CI/CD, or deployment training in standard curricula
Cybersecurity integration	Secure coding, threat modelling, compliance, privacy-by-design	70% WEF global priority; Montenegro catalysed by government cyberattack; rising EU compliance demands	Security taught as elective at best; not integrated into programming or systems courses

Trend	Skills Required	Evidence of Pressure	Education Gap
Data analytics expansion	SQL, data pipelines, visualisation, applied statistics, business intelligence	26% SQL gap; 39% firms deepening analytics; data roles command wage premiums	Database theory taught abstractly; no real-data projects; statistics disconnected from applications
Demographic contraction	Productivity per worker, reskilling capacity, inclusion of underutilised groups	190K workers missing by 2030; 56% Kosovo* firms lose staff to emigration; 12–13% annual wage growth (North Macedonia)	Reskilling infrastructure minimal; women's ICT participation below potential; no systematic career-changer pathways
Competitive upgrading	Product development, consultative delivery, domain expertise, sales capability	68% reject for salary vs capability; export growth decelerating; outsourcing model under pressure	No product/ business courses in CS programmes; innovation ecosystems underfunded; industry-academia linkages weak

Source: Synthesis of employer survey (38 market-specific observations), 18 structured interviews (November 2025–January 2026), WEF's Future of Jobs Report 2025, World Bank Western Balkans Regular Economic Report No. 28.

4.12 Identifiable challenges, actionable solutions

The seven forces examined in this chapter do not point to a single disruptive shock, but to a cumulative change in the environment in which the WB6 ICT sector will compete through 2030. AI adoption, cloud-based delivery, cybersecurity requirements, data-driven practice, demographic pressure, stronger international competition, and the wider digital and green transitions all increase the premium on faster adaptation.

The central finding is not that any one of these forces is unmanageable, but that their convergence exposes the limits of current education and training systems. Institutions operating on slow curriculum cycles cannot prepare graduates for a market that is changing in much shorter intervals. Firms have responded by building their own academies, internships, and training programmes, but this compensatory model is expensive, uneven, and harder for smaller firms to sustain.

The encouraging point is that the gaps are identifiable and the responses are not abstract. The evidence reviewed in this chapter points clearly towards a set of practical priorities: stronger human skills formation, earlier and deeper AI exposure, cloud and data capability as baseline competencies, integrated cybersecurity, more agile curriculum management, and reskilling mechanisms that respond both to ICT sector needs and to the wider economy. Chapter 5 translates these findings into a structured policy agenda for governments, industry, and education institutions across the WB6.

5. FROM EVIDENCE TO ACTION – GUIDANCE FOR POLICY AND PRACTICE

Chapter Summary

This chapter translates the study's findings into five priority areas for action. The emphasis is not on prescribing identical measures across all WB6, but on identifying the directions where the evidence is strongest and the need for action clearest. Across all five areas, the same conclusion applies: future competitiveness will depend less on expanding the supply of technical graduates alone and more on improving the quality, adaptability, and market relevance of skills. The chapter also highlights the regional dimension – areas where intra-regional cooperation can reinforce efforts at the level of each WB6 and generate outcomes that would be difficult to achieve separately.

5.1 Introduction: From diagnosis to direction

The preceding chapters identified the main constraints shaping the future of ICT skills in the WB6: a persistent human-skills gap, shallow AI capability, weak alignment between education and labour-market demand, a tightening talent pipeline, and growing pressure to move beyond cost-based competition. This chapter turns that diagnosis into guidance for action.

The aim is not to prescribe identical measures across all WB6, but to identify the priority areas where the evidence is clearest and where action is likely to have the highest leverage. For each area, the chapter sets out the strategic direction supported by the evidence, highlights where challenges appear more acute in specific WB6, and points to the kinds of interventions that seem most promising.

A regional dimension runs through all five priority areas. Many of the challenges documented in this study are shared across the WB6, even where they vary in intensity. That creates scope for cooperation in areas where coordinated approaches, shared infrastructure, or common frameworks can strengthen responses in each WB6.

5.2 Priority area 1: Closing the human-skills gap

Chapters 3 and 4 converged on a central finding: the most consequential skills deficit across the WB6 is not technical but human – problem-solving, business understanding, communication, and the ability to work across functions. As the market moves towards

more consultative and client-facing delivery, these capabilities become central rather than supplementary.

Strategic direction

Human and business skills need to become mandatory components of ICT education at all levels, rather than remaining supplementary or optional. The goal is not to reduce technical rigour, but to broaden it in line with what the market now demands.

Guidance: Integrating human skills into ICT education

Project-based learning with real industry partners – Several companies across the region already run structured internship programmes that function as the most effective recruitment channel (58% of firms). Formalising these partnerships within university curricula, so that students work on authentic business problems under joint academic-industry supervision, would bring the practical exposure employers demand into the education system itself.

Cross-disciplinary coursework – Business fundamentals, client communication, project management, and presentation skills integrated as assessed components of technical programmes, not electives. A Montenegro's innovation hub's experience of training programmers in basic business operations demonstrates the demand for this content; embedding it in formal curricula would make it systematic rather than ad hoc.

Assessment reform – Moving beyond individual examinations towards team-based project assessments that evaluate communication, collaboration, and problem-solving alongside technical execution. The survey's emphasis on 'real-world problems' and 'practical experience' suggests that evaluation methods should mirror professional practice.

Specific considerations per WB6

In **Bosnia and Herzegovina**, the challenge is compounded by the dropout rates documented earlier in this study, suggesting that the education experience itself needs reform to retain students. The industry association's call for a dual-study model combining academic and practical work addresses both the skills gap and the retention problem. In North Macedonia, the angel investor community has identified sales, financial modelling, and business development as the binding constraint on the transition from outsourcing to product development – suggesting that business-skills integration may have the highest marginal return here. In Kosovo*, where the market is more nascent and firms are smaller, the independent economic research institute's finding that digital competencies are weakly integrated even within university programmes suggests that foundational curriculum reform is a prerequisite for more advanced integration.

5.3 Priority area 2: Building AI readiness across the workforce

AI adoption is already widespread across the sector, but capability remains uneven and often shallow. The evidence suggests a clear gap between using AI tools for productivity and building the engineering depth needed to integrate, deploy, and develop AI-enabled products and services. The strategic priority is therefore not AI awareness, but AI readiness at different levels of sophistication.

Strategic direction

The evidence supports a differentiated approach to AI skills development, reflecting the three tiers of demand. At the base level, AI tool fluency should become a standard expectation for all ICT graduates, integrated into existing programming and software engineering courses. At the intermediate level, dedicated modules on AI system integration, data pipeline construction, and model deployment should be available within existing degree programmes. At the advanced level, specialised tracks or graduate programmes in machine learning engineering, computer vision, and natural language processing should be developed, recognising that these will serve a smaller but critically important segment of the market.

Guidance: A three-tier approach to AI skills

Tier 1 – AI fluency for all ICT professionals: Integrating AI-assisted development tools (copilots, code generation, automated testing) into standard programming courses from the first year. This includes prompt engineering, output validation, and understanding the limitations of AI-generated code. The goal is that no ICT graduate enters the labour market without practical experience using the tools that 77% of employers have already deployed.

Tier 2 – AI integration for engineers: Intermediate modules covering the integration of AI components into existing systems – connecting models to databases, building retrieval pipelines, orchestrating workflows, and managing the interface between AI outputs and business processes. This tier addresses the gap identified by enterprise software executive from Bosnia and Herzegovina: the value lies not in building models but in mapping client processes and identifying insertion points for automation.

Tier 3 – AI development for specialists: Advanced tracks for model training, fine-tuning, computer vision, and NLP. Given the region's current baseline (2–3 out of 5), these programmes may benefit from international partnerships and visiting faculty arrangements that bring advanced AI expertise into the region while domestic capacity is being built.

Specific considerations per WB6

In **Montenegro**, a cluster representative described advanced AI domains as largely absent from the domestic ecosystem, with students needing to look beyond the region for training – suggesting that international partnerships or shared regional programmes may be especially valuable here. In **Albania**, the emphasis from a major development foundation's labour market study was on depth of AI capability and the ability to integrate AI into business processes, suggesting that Tier 2 investments may have the highest near-term impact. In **Serbia**, where the ecosystem is larger and more mature, conditions may be more favourable for Tier 3 investments in advanced AI specialisation, potentially serving as a regional resource.

5.4 Priority area 3: Accelerating education-industry alignment

The evidence leaves little doubt that education and training systems are moving too slowly relative to the pace of technological and market change. Employers have increasingly compensated through internal training, internships, and company-led onboarding, but this is uneven, costly, and hardest to sustain for smaller firms. The strategic challenge is therefore not incremental curriculum adjustment, but faster and more institutionalised alignment between education and industry.

Strategic direction

The evidence supports structural changes to how education systems interact with industry, rather than incremental curriculum updates. The successful company-led models documented across the region – internal academies, structured internships, cluster-driven training cycles – demonstrate what effective education-industry alignment looks like in practice. The question is how to systematise these practices and extend their reach beyond the larger firms that can afford them.

Guidance: Accelerating education-industry alignment

Industry advisory mechanisms with curriculum influence – Formalising the role of ICT industry representatives in curriculum design and review, with the mandate to propose updates more frequently than the standard accreditation cycle. Several WB6 already have ICT clusters and industry associations with the expertise to fulfil this role; providing them with a structured channel to influence education content would leverage existing institutional capacity.

Fast-track mechanisms for technology-intensive content – Creating a pathway for introducing new modules (for example, on AI tooling, cloud deployment, or data engineering) within one academic year rather than waiting for the next full accreditation cycle. This could take the form of accredited elective modules developed jointly by universities and industry partners.

Structured workplace learning as a standard component – The survey finding that internships are the most effective recruitment channel (58%) and that companies value demonstrated capability over certifications (42% consider no certification relevant) points strongly towards making structured workplace experience a mandatory part of ICT degree programmes. The industry association from Bosnia and Herzegovina call for a dual-study model combining academic and practical work offers one reference framework.

Outcome-linked funding signals – Where public funding supports ICT education, linking a portion of that funding to graduate employment outcomes would create direct incentives for labour-market alignment. This does not require a prescriptive approach to curricula; it provides a signal that encourages institutions to seek the employer feedback and industry partnerships that produce employable graduates.

Specific considerations per WB6

In **Bosnia and Herzegovina**, the combination of high dropout rates and the industry association's identification of a missing dual-study model suggests that education-industry alignment is both the most needed and the most potentially transformative intervention. In **North Macedonia**, where university programmes operate on five-year reaccreditation cycles, the fast-track mechanism for technology modules would address a bottleneck specifically identified by the digital innovation hub. In **Kosovo***, where 51% of firms spend nothing on training and the market relies more heavily on private academies and bootcamps, quality assurance and linkage between non-formal providers and employer needs may be as important as reforming formal education.

5.5 Priority area 4: Expanding and retaining the talent pipeline

The talent pipeline is under pressure from both sides: the region faces a shrinking labour base, while firms are struggling to attract, retain, and develop the experienced profiles they need. The evidence also shows that the problem is not only quantitative. The narrowing of junior entry pathways, combined with migration and retention

pressures, risks weakening the future supply of senior talent even further. The strategic priority is therefore to expand the pipeline, retain more of the existing workforce, and preserve structured routes from entry-level to advanced roles.

Strategic direction

The evidence points towards three parallel strategies: expanding the pool of people entering ICT careers, improving the retention of experienced professionals, and ensuring that the transition from junior to senior is not disrupted by the displacement of entry-level roles.

Guidance: Expanding and retaining the talent pipeline

Activation of underrepresented groups – Women's participation in the ICT workforce across the region remains well below male rates, despite evidence that the gender gap in digital skills is narrower in younger cohorts. Targeted scholarships, mentorship programmes, and recruitment initiatives – several of which already exist in embryonic form across the region – can expand the talent base without waiting for demographic trends to reverse. Career changers from adjacent sectors represent a further underutilised pool, particularly as the green transition displaces workers from carbon-intensive industries.

Structured junior development pathways – The seniority paradox documented in Chapter 3 is not self-correcting. If AI continues to reduce demand for routine junior tasks, explicit intervention is needed to preserve the apprenticeship pipeline. This could include subsidised junior placement programmes (where public funding offsets the productivity gap while juniors gain experience), redesigned entry-level roles that emphasise AI-augmented work rather than the manual tasks AI is displacing, and structured mentorship requirements within larger companies that receive public support.

Retention-oriented approaches – The evidence suggests that wage competition alone will not solve retention, as domestic firms cannot match the salaries offered by global remote employers. What domestic employment can offer – career progression, equity participation, professional development, community engagement, and participation in product decisions – becomes a differentiating factor. Industry clusters and associations across the region are well positioned to facilitate knowledge-sharing on retention practices that go beyond compensation.

Reskilling infrastructure for career transitions – The approximately 2.8 million workers at risk from the twin digital and green transitions represent a potential reskilling pipeline. Modular, stackable training programmes that allow mid-career professionals to acquire ICT competencies – without requiring them to complete full degree programmes – would expand the talent base while addressing the broader digital literacy deficit.

Specific considerations per WB6

In **Kosovo***, where emigration rates are the highest in the region (56% of firms affected), retention-oriented strategies and diaspora engagement are especially urgent. In Albania, where the ICT sector is more geographically concentrated (82% of activity in Tirana) and the workforce is predominantly mid-career and senior (80%), the priority may be expanding the base – attracting new entrants and developing professionals outside the capital. In Bosnia and Herzegovina, the dual-employment phenomenon raises questions about how to structure incentives that keep professionals engaged in the domestic ecosystem even when they have access to foreign remote opportunities. In Serbia, as the largest market, the seniority paradox is most pronounced; the very low junior hiring rate documented in Chapter 3, combined with the quality dilution in the education system, makes structured junior development pathways especially critical.

5.6 Priority area 5: Supporting the transition to higher-value services

The evidence suggests that the region's earlier outsourcing model is approaching its limits. Firms that remain in generic, cost-based delivery face growing pressure from AI, from more demanding clients, and from lower-cost competitors. Firms that move towards product development, domain specialisation, and higher-value services appear better positioned. The strategic priority is therefore to support upgrading towards activities where differentiation depends on capability rather than price alone.

Strategic direction

The transition from cost-based to capability-based competition is ultimately a firm-level decision, but the environment in which firms make that decision can be shaped by policy. The evidence suggests that the most effective interventions are those that reduce the risk and cost of upgrading: supporting the development of specialised skills, facilitating connections between firms and potential product markets, and building ecosystem infrastructure that enables smaller firms to access the resources that larger firms create internally.

Guidance: Supporting value-chain upgrading

Domain specialisation support – The interview evidence consistently identifies sector-specific expertise – IT applied to logistics, agriculture, manufacturing, healthcare, fintech – as the differentiating capability that enables firms to move beyond generic outsourcing. Training programmes, industry-academia partnerships, and innovation support that are organised around specific vertical domains, rather than generic ICT skills, would align public investment with the direction the market is already moving.

Product development and business-building skills – The North Macedonia angel investor's observation that sales, financial modelling, and business development are the binding constraint on product development was echoed across multiple interviews. This is the applied dimension of the human-skills gap: the region produces engineers but not product managers, market analysts, or commercial strategists who can turn technology into commercially viable offerings. Programmes that develop these skills – whether within universities, through accelerator and incubator programmes, or through cluster-level initiatives – address a specific bottleneck in the sector's evolution.

Ecosystem infrastructure for smaller firms – Large firms build internal academies, recruitment pipelines, and technology capabilities that smaller firms cannot afford. ICT clusters, shared training facilities, and joint programmes (such as the Montenegro cluster's annual academy for 30–40 junior candidates) extend these capabilities beyond the firms that created them. Strengthening and scaling these cluster-level initiatives would reduce the barriers to upgrading for the micro and small enterprises that constitute the majority of the sector.

Specific considerations per WB6

In **North Macedonia**, where the angel investor community has explicitly identified the outsourcing-to-product transition as the central strategic challenge, support for business-building skills and product-market development may have the highest leverage. In Bosnia and Herzegovina, where the sector has developed a price competitiveness advantage (approximately 20% cheaper than Serbia for comparable services), the risk is that this advantage reinforces dependence on cost-based competition rather than encouraging capability upgrading. In Montenegro, where the market is smaller and the ICT cluster plays an outsized coordination role, cluster-level ecosystem support is especially important. In Serbia, the deceleration of export growth from double digits to approximately 7% may serve as the clearest signal that the outsourcing model's growth ceiling is approaching.

5.7 The regional dimension: Where intra-regional cooperation matters most

The regional dimension matters not because all WB6 face identical conditions, but because many of the underlying challenges – small market size, thin specialist

demand, migration pressure, fragmented training capacity, and weak comparability of credentials – are difficult to address effectively in isolation. Even where the constraints differ in intensity, they are shared widely enough to create a clear case for cooperation in areas where efforts at the level of each WB6 alone may remain too fragmented, too small in scale, or too costly to sustain independently. The study's evidence identifies several areas where that regional dimension is especially relevant:

Shared skills standards and mutual recognition

The finding documented in Chapter 3 – that a large share of employers consider no formal certification relevant to hiring – reflects, in part, the absence of regionally recognised, industry-endorsed credentials. Developing shared competency frameworks – built on the skill demands documented in this study – would provide a common reference point for education institutions, employers, and training providers across the region. This is not a call for standardised curricula, but for shared definitions of what constitutes competence in areas such as cloud deployment, AI integration, cybersecurity, and project management, enabling comparability without imposing uniformity.

Regional talent mobility and retention

The demographic and migration pressures documented across the region create a paradox: each WB6 needs more ICT talent, yet emigration and remote work for foreign employers drain the collective pool. A regional framework creates an opportunity to address this through mutual recognition of qualifications that facilitates intra-regional mobility (keeping talent within the WB6 rather than losing it to destinations beyond the region) through joint initiatives to engage diaspora professionals, and through shared platforms that connect talent with opportunities across the region.

Shared training infrastructure and centres of excellence

The advanced skills most needed by the region – AI model development, cybersecurity operations, cloud architecture at scale – require training infrastructure and faculty that may not be economically viable for each WB6 to build independently. Regional centres of excellence, jointly supported and accessible to students and professionals from the region, would create critical mass in areas where individual markets are too small to sustain advanced programmes. The evidence that Montenegro and Albania face the most acute gaps in advanced AI and cybersecurity training suggests that these WB6 would benefit disproportionately from shared regional infrastructure.

Coordinated employer engagement

The ICT industry clusters and associations that were interviewed for this study represent a unique regional asset. They exist in each WB6, they understand local market dynamics, and they already coordinate significant training and workforce

development activities. Strengthening the linkages between these clusters – enabling them to share best practices, coordinate training curricula, and jointly engage with international partners – would multiply the impact of their existing efforts. Better coordination across regional industry and education actors could significantly strengthen these efforts.

5.8 Synthesis: From evidence to direction

Table 7 summarises the five priority areas, the evidence supporting them, the strategic direction implied by that evidence, and the WB6 where the challenge appears most acute.

Table 7. Five priority areas overview

Priority Area	Key Evidence	Strategic Direction	Most Acute In
1. Human-skills gap	48% skills gap in problem-solving; 2/3 of employers cite non-technical gaps as most binding; 48% train for business skills; 18/18 interviews consistent	Integrate business understanding, communication, project-based learning as mandatory components of ICT education at all levels	Bosnia and Herzegovina (70% dropout, dual-study absent); North Macedonia (business skills as binding constraint); Kosovo* (weak curriculum integration)
2. AI readiness	77% copilots deployed; 52% GenAI in products; AI knowledge at 2–3/5; 35% ML/AI skills gap; AI Engineer as top future role	Three-tier approach: AI fluency for all graduates, integration skills for engineers, advanced specialisation for researchers	Montenegro (advanced AI absent); Albania (integration depth needed); Serbia (conditions for Tier 3 most favourable)
3. Education-industry alignment	5–7yr vs 18-month cycles; 87% firms train internally; 58% internships as top channel; 42% no certification matters; 200→1000 quality dilution	Industry advisory mechanisms, fast-track content updates, structured workplace learning, outcome-linked funding signals	Bosnia and Herzegovina (70% dropout, no dual-study); North Macedonia (5-year accreditation bottleneck); Kosovo* (51% no training spend)
4. Talent pipeline	190K missing by 2030; 56% Kosovo* emigration; 13% junior hiring; 84% difficulty finding talent; Bosnia and Herzegovina dual employment	Activate underrepresented groups, structured junior pathways, retention beyond wages, reskilling for career changers	Kosovo* (highest emigration); Albania (geographic concentration); Serbia (seniority paradox most pronounced)

Priority Area	Key Evidence	Strategic Direction	Most Acute In
5. Value-chain upgrading	68% salary-capability disconnect; export deceleration to ~7%; outsourcing model under pressure from AI and low-cost competitors	Support domain specialisation, product/business skills, ecosystem infrastructure for smaller firms	North Macedonia (outsourcing-to-product transition); Bosnia and Herzegovina (cost advantage may reinforce dependency); Serbia (growth ceiling emerging)

Source: Synthesis of the employer survey (38 market-specific observations), 18 structured interviews (November 2025–January 2026), the WEF Future of Jobs Report 2025, the World Bank's Western Balkans Regular Economic Report No. 28.

5.9 Concluding observations

The evidence assembled in this study points in a clear direction. The next phase of ICT sector competitiveness in the WB6 will depend less on expanding the volume of technical graduates alone and more on improving the quality, breadth, and adaptability of skills. Human skills, AI readiness, faster education-industry alignment, a stronger talent pipeline, and support for higher-value upgrading emerge as the five areas where the need for action is most immediate and the evidence most consistent.

None of these challenges is unique to the WB6, but the region's mix of strengths and vulnerabilities gives them particular urgency. The sector has a proven export base, a comparatively strong ICT graduate pipeline, and growing industry capacity. At the same time, it faces slow-moving education systems, demographic pressure, uneven digital readiness, and a competitive model that can no longer rely on cost alone.

What the study provides is not a single blueprint, but a shared diagnostic and a set of directions supported by evidence. Translating these directions into action will require choices that differ across WB6. But the central message is common across the region: future competitiveness will depend on how quickly institutions can adapt to the same market shifts that firms are already confronting.

ANNEX: METHODOLOGICAL NOTE

This annex provides a detailed account of the research methodology underpinning this study. It describes the design, implementation, and limitations of the two primary data-collection instruments – the employer survey and the structured interviews – as well as the broader analytical approach through which findings were generated. The full survey instrument is reproduced at the end of this annex.

Research design and analytical approach

The study employs a triangulation methodology, combining three complementary levels of evidence to produce findings that are robust despite the inherent limitations of any single source. These three levels are: (1) a comprehensive review of global, regional, and literature and data sources from each WB6; (2) a structured employer survey designed specifically for this study; and (3) qualitative interviews with ICT industry stakeholders across the region.

No single instrument was designed to stand alone. The employer survey provides structured, quantifiable data on hiring patterns, skills gaps, training practices, and technology adoption. The interviews supply explanatory context – the 'why' behind the numbers – and surface dynamics that structured questionnaires cannot capture. The literature review provides macro-level framing, validates survey and interview findings against independently published data, and fills evidentiary gaps in WB6 where primary data collection was more limited. The findings presented throughout this report are grounded in the convergence of evidence across sources, not in the statistical properties of any single instrument.

Employer survey

Design and purpose

The employer survey was developed specifically for this study to capture structured, quantifiable evidence on ICT skills demand, recruitment challenges, training practices, and technology adoption across the region. The instrument comprised 22 substantive questions organised in three sections: company profile and market orientation (5 questions); hiring, roles, and skills (7 questions); and training, technology, and growth constraints (10 questions). Question formats included multiple-choice, Likert-scale, and open-ended items.

The survey was conceived as an analytical support instrument – one component within the broader triangulation framework described above – not as a standalone measurement tool. Its purpose was to generate structured, comparable data points across thematic dimensions that could be cross-validated against interview evidence, published literature, and statistical data. It was not designed to produce statistically

representative estimates of the ICT workforce in any individual WB6 or across the region as a whole, and it should not be interpreted as such.

The survey was administered online via Google Forms between November and December 2025. Distribution was facilitated through ICT industry clusters, associations, and direct outreach to companies identified through stakeholder mapping during the inception phase.

Response and coverage

A total of 31 companies completed the survey. Because a number of respondent companies operate across multiple WB6, each company provided responses relevant to all WB6 in which it is active. This yields a total of 38 market-specific observations – the unit of analysis used throughout the report when presenting patterns between different WB6.

Response rates varied across the region. Serbia, Montenegro, and North Macedonia provided the strongest coverage, while Kosovo*, Albania, and Bosnia and Herzegovina had lower response rates. This unevenness reflects both differences in the density of ICT industry networks through which the survey was distributed and differences in the maturity of industry association infrastructure that facilitated outreach.

Analytical status and limitations

Three limitations should be noted. First, the sample size of 31 companies (38 market-specific observations) does not support population-level statistical inference. The percentages reported throughout this study describe the surveyed sample and are used to identify patterns and directions, not to estimate population parameters. Second, the uneven distribution of responses across WB6 means that each WB6 level survey findings carry different levels of confidence depending on the number of observations in each market. Third, the sample is self-selected: companies that responded may differ systematically from those that did not, for example in their engagement with industry associations or their awareness of skills challenges.

These limitations are real but bounded. The survey was never intended to be the sole or primary source of evidence for the study's findings. Its analytical value lies in the structured, comparable evidence it provides across seven thematic areas – evidence whose patterns can be tested against independent sources.

Cross-validation and convergence

In practice, this cross-validation proved remarkably consistent. Where the survey identified a finding – for example, that problem-solving and teamwork constitute the largest skills gap, that salary expectations are the most common rejection reason, or that internship-to-hire programmes outperform other recruitment channels – the interview data and published literature independently confirmed the same pattern. The WEF's Future of Jobs Report 2025 corroborated the prioritisation of analytical thinking and creative problem-solving. The World Bank's Regular Economic Report confirmed the demographic and wage dynamics. Individual WB6 ICT barometers and

labour market surveys published by economic research institutes across the region echoed the same structural constraints.

The convergence of findings across these independent sources provides confidence in the analytical conclusions even where the survey sample alone would not support such confidence. Where survey findings diverged from other sources or where the evidence was ambiguous, the report notes the divergence explicitly.

Compensating for uneven coverage of all WB6

In those WB6 where survey response rates were lower – notably Kosovo*, Albania, and Bosnia and Herzegovina – the research team adopted a deliberate compensatory strategy with two components.

First, the literature review for these WB6 was conducted with considerably greater depth and breadth. In these markets, the review encompassed substantially all publicly available sector analyses, ICT labour market studies, industry association publications, development organisation assessments, and relevant statistical office data on ICT employment, trade, and education outputs. This included ICT barometers, labour force surveys, sector-specific studies published by economic research institutes and think tanks, and policy evaluations from international organisations active in the region.

Second, the structured interviews in these WB6 were designed to be more extensive in scope. Where the survey provided fewer data points, the interviews were relied upon to supply both quantitative estimates (for example, dropout rates, emigration figures, training participation rates, wage dynamics) and qualitative assessments that, in WB6 with stronger survey coverage, were primarily used for explanatory depth. In these markets, interviews also included ICT company executives and technical leads alongside the associations and ecosystem actors interviewed in all WB6, broadening the base of direct employer evidence.

The practical effect of this approach is that the study's findings for each WB6 reflect a composite of survey data, interview evidence, and published literature – with the relative weight of each source varying by WB6 based on data availability. Market-specific observations throughout the report should be understood as triangulated assessments rather than survey-derived statistics. Drawing conclusions per each WB6 from the survey data alone would not be methodologically appropriate; the report does not do so.

At the regional level, the convergence of all three evidence streams supports robust analytical conclusions. The structural patterns documented in this study – the primacy of the human-skills gap, the breadth but shallowness of AI adoption, the education-industry misalignment, the seniority paradox, the wage-skill disconnect – are confirmed across sources and across WB6, giving the regional findings a level of confidence that exceeds what any single instrument could provide.

Structured interviews

Design and implementation

Eighteen structured interviews were conducted between November 2025 and January 2026. All interviews were conducted online via video-conferencing platforms and lasted approximately one hour each. The interview protocol followed a semi-structured format: a standardised set of thematic questions was used across all interviews to ensure comparability, while allowing interviewees the flexibility to elaborate on topics of particular relevance to their WB6, organisation, or area of expertise.

The thematic areas covered in the interviews broadly mirrored the survey structure but allowed for deeper exploration: the current state of the ICT labour market in the interviewee's WB6; the nature and severity of skills gaps; hiring and retention challenges; training practices and education system performance; the impact of AI and other emerging technologies on workforce demand; emigration and talent-retention dynamics; and the interviewee's assessment of policy priorities and institutional responses.

Interviewee selection

Interviewees were selected to represent a cross-section of the ICT ecosystem in each WB6. The sample included representatives of ICT industry associations, ICT company executives and technical leads, cluster organisations, angel investors, innovation hubs, startup accelerators, digital economy initiatives, and independent economic research institutes. The selection prioritised organisations with broad sectoral visibility – those whose perspective reflects the dynamics of the ecosystem as a whole rather than the circumstances of a single firm.

All WB6 are represented in the interview sample.

Supplementary desk-based analysis

In a small number of cases, the research team was unable to conduct an interview with an organisation considered significant for the study. In these instances, a detailed desk-based review was undertaken as a substitute. This review covered the organisation's published reports, research outputs, and policy documents; media appearances, public statements, and interviews given to other outlets; presentations and conclusions from industry conferences and events; and any other publicly available material relevant to the study's thematic scope. The purpose was to capture the evidence and perspectives that the planned interview would have produced, ensuring that no significant institutional voice was absent from the analysis.

Anonymisation

All interview sources are anonymised throughout the report. Interviewees and their organisations are referenced by institutional type and WB6 – for example, "an ICT

cluster representative from Serbia" or "an enterprise software company executive (Bosnia and Herzegovina)" – rather than by name. This approach was adopted to encourage candid responses on sensitive topics such as wage levels, emigration, regulatory constraints, and education system shortcomings, and to ensure that the analysis focuses on the substance of observations rather than the identity of the source.

The term 'observations' is used in preference to 'respondents' throughout the report to reflect the analytical rather than statistical nature of the evidence base.

Literature review and secondary data

The literature review was conducted in two phases. The first phase, completed during the inception period, surveyed the global and regional evidence base: the WEF Future of Jobs Report 2025, the World Bank's Western Balkans Regular Economic Report No. 28, WB DESI 2024 Report and WB DESI 2025 Report, OECD SME and digital economy assessments, European Training Foundation reports on workforce development, and the JRC's 2024 assessment of regional ICT collaboration.

The second phase focused on WB6-level sources: ICT industry association reports and barometers (where published), sector analyses from economic research institutes and think tanks, development organisation labour market assessments, statistical office data on ICT employment, trade flows, and educational enrolment and graduation, and relevant media coverage and conference proceedings from ICT industry events across the region. As noted above, this review was conducted with particular depth in those WB6 where survey response rates were lower, ensuring that the evidence base for each WB6 reflects the best available information regardless of primary data-collection constraints.

How findings were generated

The findings presented in this report were generated through systematic cross-validation across all three evidence sources. A finding was considered robust when it was supported by convergent evidence from at least two independent sources – for example, when a survey result was confirmed by interview evidence and corroborated by independently published data. Where sources diverged, the report notes the divergence and presents the evidence transparently rather than privileging one source over another.

This approach means that the study's conclusions do not depend on the statistical properties of the employer survey. They rest on the convergence of structured survey data, qualitative interview evidence, and published research and statistics – a methodological foundation appropriate for a study whose purpose is analytical diagnosis and evidence-based guidance rather than statistical measurement.

Appendix: Survey Instrument

The full text of the employer survey is reproduced below as administered. The survey was distributed online via Google Forms between November and December 2025.

Section 1 of 3: Company Profile

Q1. In which Western Balkans Six does your company currently operate?

Select all that apply.

Albania; Bosnia and Herzegovina; Kosovo*; Montenegro; North Macedonia; Serbia.

Q2. How would you best describe your organisation?

Select all that apply.

Private ICT company; ICT-enabled company (e.g. bank, telecom, manufacturing, logistics); Start-up / Early-stage tech company; Cluster or Industry association; Accelerator or Innovation hub; Training or education provider.

Q3. How many full-time employees does your company currently have?

Select one.

1–9; 10–49; 50–99; 100–249; 250–999; 1,000+.

Q4. Which of the following best describes your company's main business model?

Select one.

Product development; Outsourcing / IT services; Mixed (both product and service); Internal IT / Shared services (e.g. corporate IT department); Other.

Q5. How do you expect your company's total employment to change over the next 12 months?

Select one.

Expanding; Stable; Downsizing.

Section 2 of 3: Hiring and Skills

Q6. At which seniority levels do you plan to hire?

Select all that apply.

Junior; Medior; Senior; Lead / Principal.

Q7. Which technical or functional roles do you plan to hire in the next 12 months?

Select up to 3.

Software Developer (frontend / backend / full-stack); Mobile Developer (iOS / Android / Flutter / React Native); Data Engineer / Scientist / Analyst; Machine Learning / AI Engineer; DevOps / SRE / Platform Engineer; Cloud Architect / Cloud Engineer;

Cybersecurity Engineer; QA / Test Automation Engineer; UI / UX Designer; Product Manager / Product Owner; Business Analyst; Embedded / IoT / C / C++ Engineer; Game Developer; ERP / CRM Specialist (SAP, Dynamics, Salesforce); IT Support / Helpdesk; Other.

Q8. How difficult is it for your company to find suitable candidates for key technical roles?

Likert scale 1–5.

1 – Not difficult at all; 2 – Slightly difficult; 3 – Moderately difficult; 4 – Difficult; 5 – Very difficult / major constraint.

Q9. Approximately how many days does it typically take to fill a key technical role in your company?

Open numeric response.

Approximate average (median) number of days.

Q10. Which skills are most lacking among candidates for your key technical roles?

Select up to 5.

Java; C# / .NET; Python; JavaScript / TypeScript; React / Angular / Vue; SQL / database skills; Cloud (AWS / Azure / GCP); Docker / Kubernetes; DevOps / CI/CD pipelines; Cybersecurity (secure coding, SOC, IAM); Data analytics / visualisation; Machine learning / AI frameworks (TensorFlow, PyTorch); English / client communication; Project management / Agile; Problem-solving / teamwork; Other.

Q11. What are the main reasons why candidates are not hired?

Select up to 3.

Lack of practical experience; Weak technical depth; Poor English or communication skills; Salary expectations too high; Lack of senior profiles; Poor match with company culture; Insufficient cloud / data experience.

Q12. Which skill area is most lacking among candidates today?

Select the single biggest gap.

Technical (coding and engineering skills); Business development and client understanding; Soft skills (communication, teamwork, adaptability).

Section 3 of 3: Training, Technology, and Growth

Q13. Do you offer internal training or upskilling for employees?

Select one.

Yes, structured programme; Yes, ad-hoc or project-based; No.

Q14. What are your top training priorities?

Select up to 2 areas where you invest the most training hours.

Cloud / DevOps; Data / AI; Cybersecurity; Business & client skills; Soft skills / English; Other.

Q15. Which certifications matter most for hiring or promotion?

Select all that apply.

AWS / Azure / GCP; Kubernetes (CKA / CKAD); Security (CISSP / CEH / CompTIA); Scrum / PMP; Microsoft / Oracle / Database; ISTQB / Testing; None; Other.

Q16. How relevant are local universities to your hiring needs?

Likert scale 1–5.

1 (Not relevant) to 5 (Highly relevant).

Q17. Which talent channels work best for you?

Select up to 2 that bring the strongest candidates.

University recruitment; Private academies / bootcamps; Internship-to-hire programmes; Industry certifications; Cluster / hub initiatives; International recruitment; Other.

Q18. If you could change one thing in education to improve hiring, what would it be?

Open-ended (max 150 characters).

Q19. Which emerging technologies are most relevant to your company's roadmap in the next 3–5 years?

Select up to 3.

AI copilots & code-assist tools; Generative AI in products; Data analytics & real-time streaming; Edge / IoT; Cyber resilience / Zero Trust; Cloud cost optimisation / FinOps; Low-code / no-code; AR / VR applications; Payments & fintech integration; Other.

Q20. To what extent does the lack of qualified talent limit your company's growth?

Likert scale 1–5.

1 – Not at all; 2 – Slightly; 3 – Moderately; 4 – Significantly; 5 – Very significantly / critical barrier.

Q21. Which role & skill combination was the hardest for your company to hire in the last 12 months?

Open-ended.

Example: Senior Data Engineer with dbt + Snowflake.

Q22. Which role & skill combination will be most critical for your company in the next 3–5 years?

Open-ended.

Example: AI Engineer with strong MLOps and cloud deployment skills.

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