

DIGITRANS – ADRION REGIONAL POLICIES FOR FOSTERING OF DIGITAL TRANSFORMATION OF SME

TRANSREGIONAL STATE OF THE ART REPORT

DELIVERABLE: D.1.2.3

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DIGITRANS

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Abstract

The DIGITRANS project addresses a shared challenge across the Adriatic–Ionian region: accelerating and deepening the digital transformation of small and medium-sized enterprises (SMEs). SMEs form the backbone of regional economies in all participating territories, particularly in manufacturing, agri-food, tourism, and related service sectors. Their capacity to adopt and effectively use digital technologies is therefore a decisive factor for productivity growth, integration into European and global value chains, and long-term territorial competitiveness.

This Transnational State of the Art Report synthesizes and compares the findings of nine regional State of the Art reports prepared by DIGITRANS project partners, covering regions in Italy, Slovenia, Croatia, Greece, North Macedonia, Serbia, Albania, Bosnia and Herzegovina, and Montenegro. It provides a strategic, policy-oriented overview of the current situation regarding SME digitalisation, policy frameworks, and support mechanisms across the partnership. Rather than replicating national analyses, the report benchmarks regional ecosystems, identifies converging trends and structural challenges, and highlights transferable good practices relevant across diverse institutional and economic contexts.

Across all regions, SMEs have largely completed an initial phase of digitalisation. Internet access, basic ICT infrastructure, and the use of standard digital tools such as email, accounting software, and basic websites are widespread. However, the transition towards advanced digital transformation remains uneven. Technologies such as ERP and CRM systems, data analytics, automation, artificial intelligence, Internet of Things (IoT), and Industry 4.0 solutions are adopted by only a limited share of SMEs, typically medium-sized firms or those embedded in stronger innovation ecosystems.

National reports from IPA regions (North Macedonia, Serbia, Albania, Bosnia and Herzegovina, Montenegro) underline persistent constraints related to limited access to finance, shortages of digital skills, and low absorptive capacity among SMEs. Reports from EU Member States (Italy, Slovenia, Croatia, Greece) indicate higher overall digital maturity, but also reveal fragmentation of policy instruments, administrative complexity, and persistent gaps between strategic ambition and implementation.

Despite these challenges, the national State of the Art reports document a rich landscape of policy initiatives and support mechanisms, including innovation voucher schemes, Digital Innovation Hubs, integrated financial and advisory instruments, and structured quadruple helix platforms. This Transnational Report identifies those practices with the highest potential for transfer and adaptation and translates analytical findings into concrete inputs for DIGITRANS Regional Action Plans, jointly developed action plans, and transregional cooperation activities.

1. Introduction

1.1 Purpose and Scope of the Report

The Transnational State of the Art Report represents a core analytical deliverable of the DIGITRANS project. Its primary purpose is to provide a structured, comparative overview of the current state of SME digitalisation across partner regions and to identify common challenges, development patterns, and policy-relevant insights at transnational level.

The report builds on the national and regional State of the Art analyses carried out by DIGITRANS partners within Work Package 1, and presented in Annex A in this report. These analyses provide detailed descriptions of socio-economic contexts, SME structures, digitalisation levels, policy frameworks, and support instruments in each participating territory. On this basis, the present report adopts a higher-level analytical perspective, focusing on synthesis, comparison, and interpretation rather than on detailed country-by-country reporting.

The scope of the report is explicitly transregional. It does not aim to replicate or summarise individual national or regional analyses in a descriptive manner. Instead, it extracts and compares evidence across regions in order to identify shared structural characteristics, recurring bottlenecks, and converging policy challenges relevant to SME digitalisation in the Adriatic–Ionian area.

The analysis focuses on three interlinked dimensions. First, it examines the level and characteristics of SME digitalisation, moving beyond basic ICT usage to consider the depth, strategic orientation, and transformative potential of digital adoption. Second, it analyses policy and strategic frameworks shaping SME digitalisation, including governance arrangements and alignment with broader development objectives. Third, it assesses support ecosystems and policy instruments, with particular attention to their accessibility, coherence, and effectiveness.

By addressing these dimensions in a comparative manner, the report provides an evidence-based foundation for policy learning, mutual exchange, and the development of improved policy approaches within the DIGITRANS project.

1.2 DIGITRANS Project Context

DIGITRANS aims to enhance the digital transformation of SMEs and to strengthen policies supporting research, technological development, and innovation across the Adriatic–Ionian region. The project is implemented within the framework of the Interreg Programme and brings together regions from both EU Member States and IPA countries. This composition reflects a wide diversity of economic structures, institutional capacities, and policy maturity

levels, while underlining the shared strategic importance of SME digitalisation for regional development and competitiveness.

A defining feature of DIGITRANS is its strong policy orientation. Rather than focusing on direct support to enterprises, the project seeks to improve policy instruments, governance arrangements, and support ecosystems that shape the conditions under which SMEs operate. In this sense, the project addresses systemic barriers to digitalisation, such as fragmented policies, insufficient coordination among stakeholders, and misalignment between support instruments and SME needs.

Within the project architecture, Work Package 1 (WP1) is dedicated to building this analytical foundation. WP1 includes the preparation of national and regional State of the Art reports (Annex A). Together, these documents provide a comprehensive and comparable evidence base for understanding SME digitalisation across partner regions.

The present Transnational State of the Art Report consolidates and interprets this evidence at transnational level. It serves as a common reference document for the partnership and directly informs subsequent project activities, including peer learning, exchange of good practices, and the development of improved policy instruments within the DIGITRANS framework.

2. Methodological Approach

2.1 Purpose of the Transnational Methodology

The methodological approach adopted for this Transnational State of the Art Report is designed to ensure coherence, comparability, and analytical depth across a highly diverse partnership. The DIGITRANS consortium includes regions from both EU Member States and IPA countries, characterised by different levels of economic development, institutional capacity, data availability, and policy maturity. As a result, the methodology does not aim to produce a rigid, purely quantitative benchmarking exercise, but rather a structured qualitative and semi-quantitative synthesis that enables meaningful comparison and policy learning.

The primary purpose of the transnational methodology is threefold. First, it aims to consolidate the evidence generated at national and regional level into a coherent transregional narrative. Second, it seeks to benchmark regional ecosystems for SME digitalisation by identifying relative strengths, weaknesses, and development patterns across territories. Third, it provides an analytical bridge between descriptive State of the Art analyses and the forward-looking policy design activities that follow in the project, particularly the preparation of Regional Action Plans.

2.2 Sources and Evidence Base

This Report is based exclusively on the nine regional State of the Art reports (Annex A) prepared by DIGITRANS project partners within Work Package 1. These reports constitute

the core empirical foundation of the analysis and reflect a substantial investment in data collection, document review, and stakeholder consultation at regional and national level.

Across the partnership, the reports draw on a broad set of sources, including: - Official national and regional statistical data on SMEs, employment, productivity, ICT usage, and sectoral structures; - Policy and strategic documents, such as national development strategies, smart specialisation strategies, digital transformation strategies, SME strategies, and innovation frameworks; - Descriptions and assessments of policy instruments, including grants, vouchers, loan schemes, advisory services, and innovation infrastructure; - Programme evaluations, monitoring reports, and implementation data where available; - Qualitative inputs from interviews, surveys, workshops, and expert consultations involving public authorities, business support organisations, SMEs, research institutions, and other ecosystem actors.

While the scope and depth of evidence vary across regions, the use of national reports as a common source ensures that the transnational synthesis remains grounded in officially recognised data and partner-validated analyses.

2.3 Common Analytical Structure of National Reports

To enable comparability, the DIGITRANS partnership agreed on a common analytical framework for the preparation of national and regional State of the Art reports. Although adapted to local contexts, all reports address a core set of thematic areas, including: - Socio-economic and structural characteristics of the region; - Role and structure of SMEs, with particular attention to manufacturing and smart specialisation sectors; - Level of SME digitalisation and use of ICT tools; - Human capital, education, and digital skills; - Policy and strategic frameworks relevant to SME digitalisation; - Mapping and assessment of policy instruments and support mechanisms; - Identification of challenges, gaps, and preliminary good practices.

This shared structure provides the backbone for the transnational synthesis. It allows the present report to systematically extract comparable information from national analyses while respecting contextual differences.

2.4 Analytical Framework for Transnational Synthesis

Building on the regional reports, the transnational analysis applies a multi-dimensional analytical framework structured around six core dimensions:

1. **SME Digitalisation Levels and Patterns** – examining not only access to digital infrastructure, but also the depth and strategic orientation of digital adoption, including the use of advanced technologies.
2. **Sectoral and Structural Characteristics** – analysing how enterprise size, sectoral composition, and smart specialisation priorities influence digitalisation trajectories.
3. **Human Capital and Digital Skills** – assessing the availability of digital skills, education and training systems, and labour market dynamics affecting SMEs.

4. **Policy and Strategic Frameworks** – reviewing national and regional strategies, policy coherence, and alignment with EU priorities.
5. **Support Instruments and Innovation Ecosystems** – mapping financial and non-financial instruments, innovation infrastructure, and intermediary organisations.
6. **Governance and Stakeholder Involvement** – examining institutional responsibilities, coordination mechanisms, and the role of quadruple helix collaboration.

This framework supports a holistic understanding of SME digitalisation as a systemic process shaped by multiple interacting factors rather than isolated technological choices.

2.5 Qualitative Comparative Approach

Given the diversity of contexts and limitations of directly comparable quantitative indicators, the transnational synthesis relies primarily on a qualitative comparative approach. This approach focuses on identifying patterns, convergences, and divergences across regions, rather than ranking territories based on numerical scores.

For example, instead of comparing absolute levels of ICT investment, the analysis examines how SMEs in different regions perceive and use digital technologies, how policies are designed and implemented, and how support ecosystems function in practice. This allows for more nuanced insights into why certain approaches work in specific contexts and how they might be adapted elsewhere.

Where quantitative data are available and comparable, they are used illustratively to support qualitative interpretation, rather than as standalone benchmarks.

2.6 Benchmarking Logic and Interpretation

Benchmarking in this report is understood as a learning-oriented process rather than a competitive ranking exercise. The objective is to understand relative positions and trajectories of regional ecosystems, identify reference points, and highlight practices that demonstrate higher effectiveness or maturity.

In practical terms, benchmarking is applied by: - Comparing EU Member State regions and IPA regions to identify structural differences linked to institutional maturity and access to EU funding; - Examining differences between regions with more advanced innovation ecosystems (e.g. Slovenia, parts of Italy) and those at earlier stages of digital transformation; - Identifying intra-regional disparities, such as urban–rural divides and differences between micro, small, and medium-sized enterprises.

This interpretative benchmarking approach supports the identification of realistic and context-sensitive policy improvements.

2.7 ERDF and IPA Contexts: Methodological Implications

The inclusion of both ERDF and IPA partner regions has important methodological implications. ERDF regions typically operate within more stable policy environments, with longer experience in implementing EU-funded programmes and more established monitoring systems. IPA regions, by contrast, often face greater institutional volatility, limited administrative capacity, and stronger dependence on donor-funded initiatives.

The methodology explicitly accounts for these differences by interpreting findings in context and avoiding normative judgments based solely on formal policy alignment or instrument availability. Instead, attention is paid to implementation capacity, sustainability of measures, and actual uptake by SMEs.

2.8 Role of Stakeholder Perspectives

Many State of the Art reports include qualitative inputs from stakeholders such as SMEs, business associations, innovation agencies, and research institutions. These perspectives are an important methodological component of the transnational synthesis, as they provide insights into how policies and instruments function in practice.

Where stakeholder feedback converges across regions – for example regarding administrative burden, lack of tailored support, or skills shortages – these issues are treated as transregional challenges rather than isolated national problems.

2.9 Limitations of the Analysis

Despite efforts to ensure comparability, several limitations must be acknowledged. Differences in statistical systems, reference periods, and data granularity limit the scope for direct quantitative comparison. Some regions have more comprehensive data on SME digitalisation than others, and qualitative assessments may reflect subjective perceptions.

These limitations are mitigated by triangulating sources within national reports and by focusing on robust patterns that appear consistently across multiple regions.

2.10 Methodological Contribution to DIGITRANS Implementation

Finally, the methodology is explicitly designed to support DIGITRANS implementation. By linking descriptive analysis with comparative interpretation and benchmarking, this Transnational Report provides a structured evidence base for policy experimentation and improvement.

The methodological framework ensures that findings can be directly translated into Regional Action Plans. It also establishes a common analytical language for transregional dialogue, facilitating mutual understanding and sustained cooperation beyond the lifetime of the project.

3. Socio-Economic and Structural Context of SME Digitalisation

3.1 SMEs as the Backbone of Regional Economies

Across all project partner regions, small and medium-sized enterprises constitute the structural backbone of the economy. Regional State of the Art reports consistently indicate that SMEs account for more than 95% of all registered enterprises, provide most of the private-sector employment, and play a decisive role in regional value creation. This structural dominance makes SME digitalization a central determinant of overall economic competitiveness, resilience, and cohesion in the Adriatic–Ionian area.

In IPA partner regions such as North Macedonia, Albania, Bosnia and Herzegovina, Montenegro, and Serbia, SMEs are particularly important as drivers of employment and social stability. National reports from these countries highlight that SMEs often compensate for the limited presence of large enterprises and foreign investors, especially outside capital cities. At the same time, these SMEs frequently operate with low productivity levels, limited access to capital, and narrow profit margins. These structural characteristics significantly constrain their ability to invest in advanced digital technologies and long-term innovation strategies.

In EU Member State regions (Italy, Slovenia, Croatia, Greece), SMEs are similarly dominant in numerical terms, but they operate within more mature and diversified economic systems. Reports from Slovenia and Italy underline that SMEs are often embedded in industrial districts, clusters, and value chains that facilitate knowledge spillovers, access to specialised suppliers, and diffusion of new technologies. Nevertheless, even in these contexts, the predominance of micro and small enterprises shapes digitalisation trajectories and limits the pace of transformation for large parts of the SME population.

3.2 Enterprise Size Structure and Implications for Digitalisation

A key structural feature common to all DIGITTRANS regions is the overwhelming prevalence of micro enterprises. In most partner regions, micro firms (with fewer than 10 employees) account for between 85% and 95% of all SMEs. Small enterprises represent a much smaller share, while medium-sized enterprises constitute only a marginal segment of the business population.

This size structure has profound implications for SME digitalisation. National reports consistently show that medium-sized enterprises are far more likely to adopt advanced digital technologies, such as integrated ERP systems, automation solutions, data analytics, and Industry 4.0 applications. These firms typically have greater financial capacity, more formalised organisational structures, and higher managerial capabilities, enabling them to absorb and implement complex digital solutions.

By contrast, micro enterprises often limit digitalisation to basic tools such as email, accounting software, and simple websites. The national report from Italy highlights that

micro enterprises frequently perceive digitalisation primarily as a compliance or administrative requirement rather than a strategic opportunity. Similar observations are reported in North Macedonia and Bosnia and Herzegovina, where micro firms face difficulties meeting co-financing requirements and navigating administrative procedures associated with digital support schemes.

As a result, digitalisation policies that are formally open to all SMEs tend in practice to benefit a relatively narrow segment of medium-sized and more advanced firms. This structural bias is a recurring theme across national reports and represents a major challenge for inclusive digital transformation.

3.3 Sectoral Composition of Regional Economies

The sectoral structure of regional economies strongly shapes SME digitalisation patterns across the DIGITRANS partnership. Manufacturing plays a central role in most regions, often forming the core of smart specialisation strategies and regional development agendas. National reports from Slovenia, Italy, Serbia, and North Macedonia emphasise the strategic importance of manufacturing SMEs in sectors such as metal processing, machinery, automotive components, food processing, wood and furniture, and textiles.

In Slovenia and Italy, parts of the manufacturing sector have already entered more advanced stages of digitalisation, particularly within export-oriented clusters and industrial districts. These SMEs are more likely to adopt automation, robotics, digital production planning, and data-driven quality control systems. However, national reports also stress that such advanced adoption remains concentrated among a limited group of firms, while a large share of manufacturing SMEs continues to rely on labour-intensive processes and legacy equipment.

In IPA regions, manufacturing SMEs are often concentrated in traditional, low- to medium-technology sectors. National reports from Bosnia and Herzegovina and Albania note that while awareness of Industry 4.0 concepts is increasing, practical implementation remains limited due to high investment costs, insufficient technical skills, and uncertainty regarding return on investment. As a result, digitalisation in manufacturing often takes incremental forms, such as the introduction of basic production software or standalone machines, rather than integrated digital systems.

3.4 Role of Services, Tourism, and Trade

Service sectors play a major economic role across DIGITRANS regions, particularly tourism, trade, logistics, and business services. National reports from Greece and Croatia highlight the importance of tourism SMEs as drivers of regional employment and income, especially in coastal and island regions.

These sectors have demonstrated relatively rapid uptake of customer-facing digital tools, particularly following the COVID-19 pandemic. Online booking platforms, digital marketing, social media, and electronic payment systems are now widely used by tourism and trade

SMEs. However, national reports consistently note that digitalisation in these sectors is often limited to front-end functions. Back-end processes, such as data analytics, dynamic pricing, supply chain integration, and customer relationship management, remain underdeveloped.

In IPA regions, similar patterns are observed. The national report from Montenegro, for example, highlights the widespread use of online platforms among tourism SMEs, but also notes limited capacity to leverage digital data for strategic decision-making. This points to a broader structural challenge: digitalisation is frequently reactive and market-driven, rather than strategically planned and integrated.

3.5 Productivity, Value Added, and Digitalisation Gaps

Productivity levels among SMEs vary significantly across the project regions and are closely linked to digitalisation capacity. National reports from EU Member States indicate higher average labour productivity and value added per employee compared to IPA regions. However, even within EU regions, productivity gaps between digitally advanced SMEs and the broader SME population remain substantial.

In North Macedonia, Albania, and Bosnia and Herzegovina, national reports underline that low productivity remains a structural constraint for many SMEs, limiting their ability to finance digital investments. At the same time, digitalisation is increasingly recognised as a potential lever to increase productivity and compensate for labour shortages, particularly in contexts characterised by emigration and demographic decline.

This creates a circular challenge: SMEs need digitalisation to improve productivity, but low productivity constrains their capacity to invest in digitalisation. Breaking this cycle requires targeted policy interventions that lower entry barriers and reduce perceived risks for SMEs.

3.6 Territorial Disparities and Urban–Rural Divides

Territorial disparities within regions further shape SME digitalisation trajectories. National reports from Greece, Italy, and Montenegro highlight pronounced differences between capital cities and major urban centres on the one hand, and rural or peripheral areas on the other. SMEs located in urban centres benefit from better access to digital infrastructure, skilled labour, advisory services, and innovation ecosystems.

In rural and peripheral areas, SMEs face additional challenges related to workforce availability, distance from support institutions, and limited exposure to innovation networks. In IPA regions, these territorial disparities are often compounded by weaker infrastructure and limited public support capacity at local level.

These patterns underline the importance of place-based digitalisation policies that explicitly address territorial inequalities and ensure that digital transformation does not reinforce existing regional disparities.

3.7 Demographic Trends and Labour Market Dynamics

Demographic trends play an increasingly important role in shaping SME digitalisation across the Adriatic–Ionian region. National reports from IPA regions consistently highlight the impact of emigration, population ageing, and shrinking labour forces. These trends reduce the availability of skilled workers and increase competition for talent, particularly in ICT-related occupations.

In this context, digitalisation is often framed as both a necessity and an opportunity. Automation, digital process optimisation, and remote working tools can help SMEs maintain competitiveness despite labour shortages. However, national reports also note that demographic pressures exacerbate skills gaps and increase the urgency of investing in human capital.

In EU Member State regions, similar demographic challenges are present, albeit to a lesser degree. National reports from Italy and Greece highlight ageing workforces and difficulties attracting young professionals to SMEs, particularly in peripheral regions.

3.8 Structural Implications for SME Digitalisation Policies

The socio-economic and structural characteristics outlined above have important implications for the design and implementation of SME digitalisation policies. First, the predominance of micro enterprises requires policies that are simple, accessible, and tailored to limited administrative and financial capacities. Second, sectoral diversity calls for differentiated approaches that reflect the specific needs of manufacturing, tourism, and service SMEs.

Third, territorial disparities highlight the need for decentralised and place-based support mechanisms, including local innovation hubs and outreach activities. Finally, demographic trends and labour market constraints underscore the importance of integrating digitalisation policies with skills development, education, and labour market strategies.

Taken together, these structural factors provide essential context for understanding the patterns of SME digitalisation analysed in subsequent sections and for designing effective, inclusive policy interventions within DIGITRANS.

4. State of SME Digitalisation Across Regions

4.1 Understanding SME Digital Transformation

The regional State of the Art reports consistently demonstrate that SME digitalisation across the Adriatic–Ionian region is best understood as a multi-stage process rather than a binary condition. Most SMEs have already completed an initial phase of digital adoption, characterised by access to digital infrastructure and the use of basic ICT tools. However, far fewer enterprises have progressed towards deeper forms of digital transformation that fundamentally reshape business models, production processes, and value creation.

For the purposes of this transnational analysis, SME digitalisation can be conceptually divided into three broad stages. The first stage concerns **basic digital readiness**, including access to broadband internet, availability of computers, and routine use of email, accounting software, and basic websites. The second stage involves **process digitalisation**, such as the introduction of enterprise resource planning (ERP) systems, customer relationship management (CRM) tools, e-invoicing, and basic automation of administrative or production processes. The third stage corresponds to **advanced digital transformation**, encompassing data-driven decision-making, integration of digital technologies across the value chain, Industry 4.0 solutions, artificial intelligence, IoT, robotics, and digital servitisation.

The transnational evidence shows that while the first stage has largely been achieved across regions, progression to the second and especially the third stage remains uneven and fragile. This pattern is observed across both EU Member State regions and IPA partner regions, albeit with significant differences in scale, speed, and scope.

4.2 Basic Digital Readiness and ICT Access

All national reports confirm that basic digital readiness among SMEs is now widespread. Internet access rates among enterprises are high across all partner regions, reflecting years of investment in digital infrastructure and market-driven diffusion of ICT tools. SMEs routinely use email, digital accounting systems, and online banking services, and many maintain at least a basic online presence.

In EU Member State regions such as Italy, Slovenia, Croatia, and Greece, basic ICT usage among SMEs is close to saturation. National reports indicate that lack of access to digital infrastructure is no longer a binding constraint for most firms. Similarly, in IPA regions including North Macedonia, Serbia, Albania, Bosnia and Herzegovina, and Montenegro, significant progress has been made in expanding broadband coverage and basic ICT usage among enterprises, particularly in urban areas.

However, national reports also underline persistent qualitative differences. In several IPA regions, connectivity quality, reliability, and speed remain uneven, particularly outside capital cities. Moreover, basic ICT usage is often limited to administrative compliance rather than strategic business functions. This distinction between access and effective use is a recurring theme across regions.

4.3 Digitalisation of Business Processes

The second stage of SME digitalisation concerns the digitalisation of internal business processes. National reports reveal significant variation across regions and enterprise sizes in this respect. Adoption of ERP and CRM systems, digital inventory management, and integrated accounting and logistics software is markedly higher among medium-sized enterprises than among micro and small firms.

In Slovenia, the national report highlights relatively widespread adoption of ERP systems among manufacturing SMEs, supported by strong links with technology providers and innovation support organisations. In Italy, process digitalisation is more uneven: medium-sized firms embedded in industrial districts are more likely to implement integrated systems, while micro enterprises often rely on fragmented or manual solutions.

In Croatia and Greece, process digitalisation among SMEs is more advanced in service-oriented sectors such as tourism, logistics, and trade. However, national reports note that digital tools are often implemented in isolation, without full integration across organisational functions. This limits their impact on efficiency and productivity.

In IPA regions, process digitalisation remains at an earlier stage. National reports from North Macedonia and Serbia indicate that while some SMEs have adopted basic ERP or accounting software, comprehensive integration of digital systems is rare. SMEs often depend on external consultants for system implementation, resulting in limited internal capacity and sustainability.

4.4 E-Commerce and Customer-Facing Digitalisation

Customer-facing digitalisation represents one of the most visible and rapidly adopted aspects of SME digitalisation across the DIGITRANS partnership. Regional reports consistently show that SMEs in tourism, trade, and certain service sectors have embraced digital marketing, online booking platforms, and electronic payment systems.

In Greece and Croatia, tourism SMEs have made extensive use of online platforms and social media to reach international markets, particularly following the COVID-19 pandemic. This has increased visibility and market access but has not always translated into higher profitability or resilience. National reports emphasise that reliance on third-party platforms can expose SMEs to pricing pressures and reduce control over customer data.

In Italy and Slovenia, e-commerce adoption is more balanced across sectors but remains limited among micro enterprises. In IPA regions, e-commerce uptake is growing, particularly among younger entrepreneurs and start-ups, but logistical constraints, trust issues, and regulatory barriers continue to limit scale.

4.5 Advanced Digital Transformation and Industry 4.0

The transition to advanced digital transformation remains the most challenging stage for SMEs across all DIGITRANS regions. Adoption of Industry 4.0 technologies, such as automation, robotics, IoT, and data analytics, is concentrated among a relatively small group of SMEs, typically medium-sized firms operating in manufacturing or technology-intensive sectors.

In Italy and Slovenia, national reports document a growing number of manufacturing SMEs implementing automation and digital production systems, often supported by national or

regional incentives. However, these firms represent a minority, and diffusion beyond early adopters remains slow.

In IPA regions, advanced digital transformation is still at an early stage. National reports from Bosnia and Herzegovina, Albania, and North Macedonia highlight that Industry 4.0 concepts are widely discussed in policy documents, but practical implementation is limited. High investment costs, lack of specialised skills, and uncertainty regarding returns discourage SMEs from adopting advanced technologies.

4.6 Differences Between EU Member State and IPA Regions

A clear digitalisation gap exists between EU Member State regions and IPA partner regions, although this gap should not be overstated. EU regions generally exhibit higher levels of process digitalisation and more frequent adoption of advanced technologies, supported by stronger innovation ecosystems and access to EU funding.

However, national reports from Italy and Greece demonstrate that even in EU regions, a large share of SMEs remains stuck at intermediate levels of digitalisation. Conversely, IPA regions show pockets of advanced digital adoption, particularly among export-oriented SMEs and technology-driven start-ups.

This suggests that the digital divide is not solely determined by country status, but also by firm characteristics, sectoral context, and ecosystem maturity.

4.7 Intra-Regional Disparities and Firm-Level Heterogeneity

Significant disparities exist not only between regions but also within them. National reports highlight differences between urban and rural areas, capital cities and peripheral regions, and firms integrated into value chains versus locally oriented SMEs.

In Italy and Greece, SMEs located in metropolitan areas benefit from better access to skills, advisory services, and innovation infrastructure. In IPA regions, urban–rural divides are often more pronounced, exacerbating inequalities in digitalisation capacity.

Firm-level heterogeneity is also evident. Even within the same sector and region, SMEs differ widely in digital maturity, reflecting differences in management attitudes, ownership structures, and strategic orientation.

4.8 Perceived Benefits and Barriers to Digitalisation

National reports provide valuable insights into how SMEs perceive digitalisation. Benefits commonly cited include improved efficiency, better customer reach, and enhanced competitiveness. At the same time, SMEs across regions report similar barriers: high investment costs, lack of skills, uncertainty about returns, and fear of operational disruption.

In IPA regions, concerns about affordability and sustainability of digital investments are particularly pronounced. In EU regions, administrative complexity and difficulty accessing support instruments are more frequently cited.

4.9 Impact of External Shocks on Digitalisation Trajectories

External shocks, particularly the COVID-19 pandemic, have acted as catalysts for SME digitalisation across all regions. National reports from Greece, Croatia, and Italy highlight accelerated adoption of digital tools during the pandemic, especially in services and trade.

However, the reports also note that many digital solutions adopted under crisis conditions were reactive and short-term, rather than part of long-term digital strategies. This underscores the need for policies that consolidate crisis-driven digital adoption into sustainable transformation pathways.

4.10 Key Patterns in SME Digitalisation Across Regions

The transnational synthesis of national reports reveals several consistent patterns. First, basic digital adoption is widespread and no longer the primary constraint. Second, progression towards deeper digital transformation remains uneven and highly differentiated by firm size, sector, and ecosystem context. Third, advanced digitalisation is concentrated among a small subset of SMEs, while the majority remain at intermediate stages.

These patterns highlight the need for policy approaches that explicitly target the transition from basic digitalisation to transformative digital use. Without such targeted support, existing digital divides are likely to persist or even widen.

5. Human Capital and Digital Skills

5.1 Human Capital as a Core Enabler of SME Digitalisation

Across all DIGITRANS partner regions, human capital and digital skills emerge as one of the most decisive factors shaping the pace, depth, and sustainability of SME digitalisation. The State of the Art reports consistently underline that digital transformation is not primarily constrained by the availability of technologies, but by the capacity of enterprises to understand, implement, and effectively use them. This capacity depends heavily on the skills, competencies, and learning culture of SME owners, managers, and employees.

SMEs in the Adriatic–Ionian region typically operate with lean organisational structures and limited human resources. In such contexts, digitalisation decisions are often concentrated in the hands of owners or senior managers, whose digital awareness and strategic vision strongly influence adoption trajectories. Where leadership demonstrates openness to innovation and continuous learning, SMEs are more likely to engage in structured digital transformation. Conversely, limited digital literacy at management level frequently results in risk aversion, fragmented adoption, or complete avoidance of digital investments.

5.2 Digital Skills Levels Across Regions

The national reports reveal significant disparities in digital skills levels both between and within DIGITRANS regions. In EU Member State regions such as Slovenia, Italy, Croatia, and Greece, the overall level of digital literacy among the workforce is higher than in IPA regions, reflecting stronger education systems, longer exposure to digital technologies, and more developed labour markets. However, even in these regions, advanced digital skills relevant for Industry 4.0, data analytics, cybersecurity, and artificial intelligence remain scarce among SMEs.

In IPA partner regions, including North Macedonia, Albania, Bosnia and Herzegovina, Montenegro, and Serbia, digital skills gaps are more pronounced. National reports highlight that while basic digital literacy has improved significantly over the past decade, intermediate and advanced digital competencies remain limited. SMEs often lack employees capable of managing ERP systems, interpreting digital data, or integrating digital tools into production and service processes.

These disparities are further exacerbated by territorial differences. Urban centres and capital cities typically concentrate higher-skilled labour, while rural and peripheral areas face acute shortages of digitally skilled workers.

5.3 Education Systems and Skills Supply

Education and training systems play a central role in shaping the long-term availability of digital skills. National reports from EU Member States indicate that higher education institutions increasingly incorporate digital competencies into curricula, particularly in engineering, ICT, and business programmes. However, SMEs often struggle to attract graduates due to wage constraints, limited career prospects, and competition from larger firms.

In IPA regions, structural challenges within education systems are more evident. National reports from North Macedonia and Albania point to mismatches between education outputs and labour market needs, particularly in ICT-related fields. While universities produce graduates with theoretical knowledge, practical digital skills aligned with SME needs are often insufficient.

Vocational education and training (VET) systems play a particularly important role in bridging this gap. Positive examples are highlighted in Slovenia and North Macedonia, where dual education and apprenticeship models have strengthened links between training institutions and SMEs. National reports indicate that graduates from such programmes demonstrate better readiness for digital work environments, although coverage remains limited relative to demand.

5.4 Lifelong Learning and Upskilling of the SME Workforce

Given the rapid pace of technological change, lifelong learning and continuous upskilling are essential for SME digitalisation. However, national reports consistently show that participation in adult learning remains low across many DIGITRANS regions, particularly among micro and small enterprises.

In EU Member States, structured training programmes are more widely available, often supported by public funding or delivered through Digital Innovation Hubs. National reports from Italy and Slovenia highlight the role of targeted training linked to digitalisation projects, which combines technical instruction with practical application. Nevertheless, time constraints and opportunity costs limit SME participation, especially for micro enterprises.

In IPA regions, lifelong learning opportunities are more fragmented and frequently project-based. National reports from Bosnia and Herzegovina and Montenegro underline that training initiatives are often short-term, donor-driven, and insufficiently aligned with SME needs. This limits their impact on sustained digital capability building.

5.5 Skills Shortages and Labour Market Dynamics

Labour market dynamics strongly influence SME access to digital skills. Across all DIGITRANS regions, SMEs face increasing difficulties attracting and retaining digitally skilled workers. This challenge is particularly acute in IPA regions, where emigration and brain drain reduce the available talent pool. National reports from North Macedonia and Serbia highlight that skilled ICT professionals frequently seek employment abroad or in large domestic or foreign companies, leaving SMEs with limited options.

In EU Member State regions, competition for digital talent is equally intense. National reports from Italy and Greece note that SMEs struggle to match the wages and career opportunities offered by multinational companies and larger enterprises. Peripheral regions are disproportionately affected, reinforcing territorial disparities in digitalisation capacity.

These labour market pressures create a vicious circle: SMEs with limited digital capabilities struggle to attract talent, while lack of talent further constrains digitalisation.

5.6 Managerial Skills and Digital Leadership

Beyond technical competencies, managerial and leadership skills are critical enablers of SME digitalisation. National reports consistently stress that digital transformation requires strategic planning, change management, and the ability to align technology adoption with business objectives.

In many SMEs, particularly micro enterprises, owners and managers lack formal training in digital strategy and innovation management. This often results in ad-hoc technology adoption, driven by external pressures or short-term incentives rather than long-term vision. National reports from Italy and Croatia highlight that SMEs frequently invest in digital tools without adapting organisational processes, which is limiting their impact.

Strengthening digital leadership and managerial competencies is therefore a key priority for effective SME digitalisation across all regions.

5.7 Role of Advisory Services and Intermediaries in Skills Development

Advisory services, innovation intermediaries, and Digital Innovation Hubs play an increasingly important role in addressing skills gaps. National reports from Slovenia, Italy, and North Macedonia highlight examples where advisory services provide not only technical guidance, but also support strategic decision-making and organisational change.

Such intermediaries help SMEs translate abstract digital concepts into concrete actions, assess skills needs, and identify appropriate training pathways. However, access to these services remains uneven, particularly in IPA regions and peripheral areas.

5.8 Gender, Age, and Inclusiveness Dimensions

Several national reports highlight gender and age-related dimensions of digital skills. Younger entrepreneurs and employees tend to demonstrate higher digital literacy and openness to new technologies, while older SME owners may be more reluctant to engage in digital transformation. Gender gaps in ICT-related occupations persist across regions, limiting the available talent pool.

Addressing these inclusiveness dimensions is important not only for equity reasons, but also for expanding the supply of digital skills available to SMEs.

5.9 Implications of Skills Gaps for SME Digitalisation

The combined evidence from national reports clearly shows that skills gaps represent one of the most binding constraints on SME digitalisation across the Adriatic–Ionian region. Without adequate human capital, financial incentives and technological infrastructure alone are insufficient to drive meaningful transformation.

Skills shortages slow down adoption, increase reliance on external consultants, and reduce the sustainability of digital investments. They also exacerbate inequalities between SMEs, regions, and sectors.

5.10 Summary Assessment of Human Capital and Digital Skills

The analysis across the project partner regions confirms that human capital and digital skills are structural determinants of SME digitalisation in the Adriatic–Ionian area. Differences in digital uptake are less driven by access to technology than by SMEs' capacity to use it strategically, which depends on the skills, attitudes, and learning capacity of owners, managers, and employees.

Persistent and multi-layered skills gaps remain evident across all regions. These extend beyond technical competencies to include managerial skills, digital leadership, and the

ability to integrate digital tools into business processes. While EU regions generally show higher baseline digital literacy, shortages of advanced and strategic skills persist. IPA regions face broader deficits, further intensified by labour market challenges such as emigration and brain drain.

Territorial, demographic, and inclusiveness factors compound these gaps. Digital skills and training opportunities are concentrated in urban areas, while rural and peripheral regions face limited access. Age and gender disparities further constrain the available skills base and influence engagement with digital transformation.

Overall, the findings confirm that human capital constraints are among the most significant bottlenecks to SME digitalisation. Digital transformation emerges not merely as a technological issue, but as a socio-economic process shaped by education systems, labour markets, organisational culture, and access to knowledge intermediaries, with important implications for long-term resilience and balanced regional development.

6. Policy and Strategic Frameworks for SME Digitalisation

6.1 Strategic Recognition of SME Digitalisation as a Policy Priority

Across all project regions, SME digitalisation is formally recognised as a strategic priority within national and regional development agendas. The State of the Art reports consistently demonstrate that digital transformation is embedded in a wide range of policy documents, including national development strategies, smart specialisation strategies, innovation and industrial policies, digital transformation strategies, and SME development frameworks.

In EU Member State regions (Italy, Slovenia, Croatia, Greece), SME digitalisation is closely linked to broader policy agendas addressing Industry 4.0, the twin digital and green transition, resilience of regional economies, and competitiveness within the EU single market. National reports from Italy and Slovenia highlight that digitalisation has been a recurring strategic objective for more than a decade, supported by successive policy cycles and sustained public investment.

In IPA partner regions (North Macedonia, Serbia, Albania, Bosnia and Herzegovina, Montenegro), digitalisation is increasingly framed as both an economic development imperative and a core component of EU accession and alignment with the *acquis communautaire*. National reports underline that digital transformation strategies often serve a dual purpose: modernising domestic economies while demonstrating progress towards EU standards in areas such as digital markets, innovation systems, and public administration.

Despite differences in context, the strategic narrative across all regions converges on the idea that SME digitalisation is essential for productivity growth, export competitiveness, and long-term economic resilience.

6.2 Integration of Digitalisation into National Development Strategies

National development strategies represent the highest level of policy commitment and provide an important reference framework for SME digitalisation. In Slovenia and Italy, national reports indicate that digital transformation is embedded as a horizontal priority cutting across multiple sectors, including manufacturing, services, public administration, and education.

In North Macedonia, the national report highlights that digitalisation is identified as a central pillar within the National Development Strategy, explicitly linked to competitiveness, innovation, and EU integration. Similar patterns are observed in Serbia and Montenegro, where digital transformation is framed as a key driver of economic modernisation.

However, national reports also reveal that the translation of high-level strategic priorities into operational measures remains uneven. While strategic documents articulate ambitious objectives, implementation often depends on sector-specific programmes and funding instruments that may lack coordination.

6.3 Smart Specialisation Strategies and SME Digitalisation

Smart Specialisation Strategies (S3) play a particularly important role in shaping SME digitalisation policies across the DIGITTRANS partnership. In EU Member States, S3 frameworks provide a structured mechanism for aligning digitalisation, innovation, and industrial development priorities with regional strengths.

The national report from Slovenia highlights the strong integration of digital technologies within S3 priority domains such as advanced manufacturing, mobility, and ICT. In Italy, regional S3 strategies similarly emphasise Industry 4.0 and digital innovation within manufacturing clusters.

In IPA regions, S3 strategies are more recent but increasingly influential. National reports from North Macedonia and Serbia underline that S3 frameworks explicitly recognise ICT and digital technologies as transversal enablers across priority sectors. However, limited institutional capacity and experience with S3 implementation constrain their impact on SME digitalisation.

6.4 SME Strategies and Digital Transformation

Dedicated SME strategies constitute another key policy layer influencing digitalisation. National reports from EU regions indicate that SME strategies increasingly incorporate digital transformation objectives, though often as part of broader competitiveness and innovation agendas.

In IPA regions, SME strategies are frequently in transition. For example, the national report from North Macedonia notes that while previous SME strategies addressed innovation

indirectly, newer draft strategies place stronger emphasis on digital transformation, advanced technologies, and digital business models. Similar developments are observed in Serbia and Albania.

Despite these advances, national reports consistently point to gaps between SME strategies and digital strategies, with limited alignment and coordination between responsible institutions.

6.5 Digital Transformation and ICT Strategies

Dedicated digital transformation or ICT strategies provide a more focused policy framework for SME digitalisation. EU Member State regions typically operate within comprehensive national digital strategies aligned with EU Digital Agenda priorities. These strategies address infrastructure, digital skills, innovation, cybersecurity, and digital services.

In IPA regions, digital strategies have gained prominence in recent years. National reports from North Macedonia and Montenegro highlight the establishment of dedicated ministries or agencies for digital transformation, signalling stronger institutional commitment. These strategies often include specific measures targeting SMEs, such as digital vouchers, training programmes, and support for digital innovation hubs.

Nevertheless, fragmentation remains a challenge, as digital strategies are not always effectively coordinated with SME, innovation, and industrial policies.

6.6 Governance Structures and Institutional Responsibilities

Governance arrangements for SME digitalisation vary significantly across DIGITRANS regions. In EU Member States such as Italy and Greece, responsibilities are distributed across multiple levels of government and institutions, including national ministries, regional authorities, development agencies, and innovation bodies.

While multi-level governance allows for policy tailoring to regional contexts, national reports highlight risks of fragmentation, overlapping instruments, and administrative complexity. SMEs, particularly micro enterprises, often struggle to navigate complex institutional landscapes.

In Slovenia, governance structures are comparatively more streamlined, with clearer coordination between national policy design and regional implementation. The national report highlights the role of specialised agencies and innovation intermediaries in translating strategic priorities into operational support.

In IPA regions, governance challenges are more structural. National reports from Bosnia and Herzegovina and Albania point to limited administrative capacity, frequent institutional changes, and weak inter-ministerial coordination. These factors hinder consistent implementation of digitalisation policies.

6.7 Policy Coordination and Coherence

A recurring theme across all national reports is the challenge of policy coordination. SME digitalisation intersects with multiple policy domains, including innovation, education, labour markets, industrial development, and regional policy. However, coordination mechanisms between these domains are often weak.

In Italy and Greece, coordination challenges arise from the complexity of governance systems and overlapping responsibilities. In IPA regions, coordination is constrained by capacity limitations and project-based approaches driven by donor funding.

As a result, SMEs often face fragmented support, with multiple instruments addressing similar objectives without clear integration.

6.8 Strategy–Implementation Gap

Perhaps the most consistent finding across national reports is the existence of a strategy–implementation gap. While policy documents articulate ambitious goals for SME digitalisation, implementation often falls short due to limited funding, administrative burden, insufficient monitoring, and lack of continuity.

In EU Member States, this gap is frequently linked to administrative complexity and procedural barriers that discourage SME participation. In IPA regions, limited financial resources and reliance on short-term projects exacerbate the problem.

6.9 Monitoring, Evaluation, and Learning

Effective monitoring and evaluation are essential for adaptive policy learning. National reports indicate that monitoring systems for SME digitalisation policies are often underdeveloped. Data on outcomes and impacts are limited, reducing the ability of policymakers to refine instruments based on evidence.

Where evaluation mechanisms exist, they tend to focus on financial absorption rather than qualitative outcomes such as capability building or organisational change.

6.10 Key Findings on Policy and Strategic Frameworks

The analysis shows that SME digitalisation is widely recognised as a strategic priority across DIGITRANS partner regions and is embedded in national and regional development strategies, S3 frameworks, SME policies, and digital and ICT strategies. This reflects a shared understanding of digitalisation as a key driver of competitiveness, productivity, and economic resilience.

However, the policy landscape remains fragmented, with digitalisation objectives spread across multiple strategies and limited alignment between SME, innovation, industrial,

education, and digital policies. While Smart Specialisation Strategies offer an important integrative framework, their practical impact on SME digitalisation varies across regions.

A recurring finding is the strategy–implementation gap. Ambitious objectives are often undermined by administrative complexity, limited resources, fragmented governance, and weak monitoring systems, which tend to focus on financial absorption rather than qualitative outcomes.

Overall, the effectiveness of SME digitalisation policies depends not only on strategic ambition, but also on policy coherence, governance capacity, and the translation of high-level strategies into accessible and well-coordinated support measures across the Adriatic–Ionian region.

7. Mapping and Comparative Assessment of Policy Instruments

7.1 Overview of Business Support Ecosystems

Across the DIGITRANS partner regions, business support ecosystems consist of a diverse set of public and semi-public actors, including ministries, agencies, business support organisations (BSOs), chambers of commerce, clusters, and sectoral associations. These actors play a critical intermediary role in connecting SMEs with policy instruments, financial resources, advisory services, and innovation infrastructure.

While national policy frameworks define strategic priorities and allocate resources, the effectiveness of SME digitalisation support often depends on the capacity and performance of these intermediary organisations. Their proximity to SMEs, sectoral knowledge, and ability to translate policy objectives into practical support measures make them central to successful digital transformation.

7.2 Financial Instruments: Grants, Vouchers, Loans, and Incentives

Financial instruments represent the most visible form of public support for SME digitalisation. In EU Member State regions, ERDF-funded grant schemes are the dominant tool. National reports from Italy and Slovenia highlight extensive programmes supporting investments in software, automation, robotics, data analytics, and digital innovation projects. These schemes are often complemented by national-level incentives, such as Industry 4.0 tax credits in Italy, which significantly reduce the cost of digital investments for eligible firms.

In Croatia and Greece, financial support is similarly channelled through ERDF operational programmes. National reports underline strong demand for digitalisation grants, frequently exceeding available budgets. However, complex application procedures and co-financing

requirements limit access for micro enterprises, reinforcing a bias towards more advanced SMEs.

In IPA regions, financial instruments are generally smaller in scale and more fragmented. North Macedonia provides a relatively coherent set of instruments, including innovation vouchers, digital transformation grants, and loan schemes such as the EBRD-supported Go Digital facility. Nevertheless, national reports note uneven awareness among SMEs and limited uptake outside urban centres.

In Albania, Bosnia and Herzegovina, Montenegro, and Serbia, financial support for digitalisation relies heavily on donor-funded projects and short-term calls. Limited national budgets and underdeveloped financial markets constrain the availability of long-term financing for digital investments, particularly for intangible assets.

7.3 Non-Financial Support and Advisory Services

Non-financial instruments, such as advisory services, mentoring, digital audits, and training programmes, are increasingly recognised as essential complements to financial support. These services help SMEs identify appropriate technologies, manage organisational change, and maximise the impact of digital investments.

National reports from Italy, Slovenia, and Croatia highlight the positive role of advisory services linked to innovation agencies and Digital Innovation Hubs. In contrast, reports from Serbia and North Macedonia point to fragmented and project-based advisory support that lacks continuity.

7.4 Business Support Organisations and Clusters

Business support organisations, chambers of commerce, clusters, and sectoral associations play a crucial intermediary role in translating policy instruments into tangible support for SMEs. Acting as a bridge between public authorities, support programmes, and enterprises, these organisations are often the first point of contact for SMEs seeking information, guidance, and assistance related to digitalisation.

In EU Member State regions, such as Italy, Slovenia, and Croatia, clusters and sectoral associations are well-established actors within regional innovation ecosystems. National reports highlight that clusters in manufacturing, agri-food, and ICT sectors facilitate peer learning, knowledge exchange, and joint digital projects among SMEs. In Italy, industrial clusters and district-based organisations support collective adoption of Industry 4.0 solutions by pooling resources, sharing expertise, and engaging jointly with technology providers. Similarly, in Slovenia, clusters linked to smart specialisation priorities play an active role in connecting SMEs with research institutions and Digital Innovation Hubs, thereby lowering entry barriers to advanced digital technologies.

In Croatia, sectoral associations and regional development agencies contribute to SME digitalisation by organising training activities, awareness-raising events, and matchmaking initiatives. These organisations often complement formal policy instruments by providing practical, hands-on support and by tailoring services to sector-specific needs. National reports indicate that SMEs involved in cluster-based initiatives tend to demonstrate higher levels of digital awareness and readiness compared to non-affiliated firms.

In IPA partner regions, chambers of commerce and business associations play an even more prominent role, often acting as the primary intermediaries between SMEs and public support systems. National reports from North Macedonia, Serbia, Albania, and Bosnia and Herzegovina underline that chambers of commerce are key information points for SMEs regarding available grants, training opportunities, and donor-funded programmes. However, their capacity to provide advanced digital advisory services varies significantly. While some chambers have developed specialised units or partnerships with ICT providers, many remain focused on basic information dissemination and administrative support.

Overall, the analysis suggests that strengthening the capacity of BSOs and clusters to provide higher-value digital advisory services represents an important leverage point for improving the effectiveness of SME digitalisation policies across the DIGITRANS regions.

7.5 Accessibility and Effectiveness of Instruments

A recurring and strongly convergent finding across all national State of the Art reports is that accessibility remains a major challenge for SME digitalisation instruments. Despite the availability of a wide range of financial and non-financial support measures, many SMEs – particularly micro and small enterprises – face significant barriers in accessing and benefiting from these instruments.

Administrative complexity is frequently cited as a key obstacle. National reports from Italy, Greece, and Croatia note that application procedures for digitalisation grants and incentives are often perceived as burdensome, requiring detailed documentation, technical expertise, and substantial administrative effort. These requirements disproportionately affect smaller firms with limited internal resources.

Co-financing requirements represent an additional barrier, particularly in IPA regions. Reports from North Macedonia, Albania and Montenegro highlight that SMEs often struggle to mobilise the upfront investment needed to access support, even when grants or subsidised loans are available. This limits participation and reinforces existing inequalities between larger and smaller firms.

Limited awareness and information gaps further reduce uptake. In several regions, SMEs are not fully aware of available instruments or do not perceive them as relevant to their specific needs. In this context, instruments that combine financial support with advisory services, digital audits, and mentoring demonstrate higher effectiveness. National reports

consistently show that such integrated approaches not only increase participation but also lead to more sustainable digital transformation outcomes.

7.6 EU-Funded and Transnational Instruments

EU-funded and transnational programmes play an important complementary role in supporting SME digitalisation across the DIGITRANS partnership. Programmes such as Interreg, Horizon Europe, and Digital Europe provide opportunities for experimentation, cross-border cooperation, and capacity building that are not always available through national instruments.

In EU Member State regions, these programmes often serve as testing grounds for innovative approaches, pilot actions, and new forms of collaboration between SMEs, research institutions, and public authorities. National reports from Italy and Slovenia highlight the value of EU-funded projects in strengthening innovation ecosystems and fostering long-term partnerships.

For IPA partner regions, EU and donor-funded programmes are frequently a primary source of support for SME digitalisation. Reports from North Macedonia, Albania and Bosnia and Herzegovina underline that international programmes provide not only financial resources but also access to expertise, networks, and best practices. However, heavy reliance on external funding raises concerns about sustainability, policy alignment, and long-term institutional ownership.

7.7 Gaps and Challenges in Support Ecosystems

Despite the diversity and growing sophistication of policy instruments supporting SME digitalisation, national reports consistently identify a set of persistent gaps and challenges within regional support ecosystems. These challenges limit the overall effectiveness and impact of policy interventions.

Limited coordination among institutions and instruments remains a major issue across both EU and IPA regions. Overlapping responsibilities, fragmented delivery systems, and weak information flows reduce policy coherence and create confusion for SMEs. National reports from Italy, Greece and Serbia emphasise that better coordination among ministries, agencies, and intermediaries is essential to improve outcomes.

Insufficient targeting of micro enterprises is another widely reported gap. Many instruments are implicitly designed for larger SMEs, leaving micro firms underserved. This is particularly problematic in regions where micro enterprises dominate the business structure.

Weak monitoring and evaluation of outcomes further constrain learning and policy improvement. Several national reports note that while input and output indicators are

collected, systematic assessment of long-term impacts on SME performance and digital maturity is rare.

Finally, territorial disparities persist, with SMEs in peripheral and rural areas facing reduced access to support services and innovation infrastructure. Addressing these gaps will require more integrated, place-based, and inclusive policy approaches in future actions.

8. Transferable Good Practices

8.1 Identifying Transferable Practices

One of the objectives of this Transnational State of the Art Report is to identify good practices that demonstrate tangible results in fostering SME digitalisation and that can be adapted and transferred across the project partnership. Transferability in this context does not imply direct replication of instruments or governance models, but rather the adaptation of underlying principles, design features, and implementation approaches to different regional and institutional contexts.

The regional State of the Art reports provide numerous examples of practices that have proven effective in addressing specific barriers to SME digitalisation, including low awareness, limited skills, fragmented support, and risk aversion. This section synthesises those examples and highlights practices with high relevance for transregional learning within the project.

Across the DIGITRANS partnership, several categories of practices emerge as particularly relevant for transregional transfer. These include innovation voucher schemes, integrated digital support packages, Digital Innovation Hubs, cluster-based digitalisation initiatives, and structured quadruple helix platforms.

8.2 Innovation Voucher Schemes as Low-Threshold Entry Points

Innovation voucher schemes emerge as one of the most consistently transferable practices across regions. National reports from Slovenia and North Macedonia highlight the effectiveness of vouchers in engaging micro and small enterprises that would otherwise not participate in innovation or digitalisation programmes. By reducing financial risk and administrative complexity, vouchers encourage SMEs to experiment with digital solutions, conduct digital audits, or collaborate with external experts.

The transferability of innovation vouchers lies in their flexibility, scalability, and low administrative burden. For DIGITRANS regions, vouchers represent an effective first step in digitalisation pathways, particularly when combined with follow-up instruments that support implementation.

8.3 Integrated Digital Support Packages

National reports from Italy and Croatia highlight the effectiveness of integrated support packages that combine financial incentives with advisory services, training, and mentoring. These approaches address not only the cost of digital investments, but also skills gaps and organisational challenges that often undermine effectiveness.

Such integrated packages are particularly relevant for regions seeking to move SMEs from intermediate levels of digitalisation towards more advanced transformation. Their transferability depends on coordination between managing authorities, innovation agencies, and advisory service providers.

8.4 Digital Innovation Hubs and One-Stop-Shop Models

Digital Innovation Hubs (DIHs) and European Digital Innovation Hubs (EDIHs) represent another highly transferable practice. Examples from Italy, Slovenia, and North Macedonia demonstrate the value of one-stop-shop models that provide SMEs with access to testing facilities, expertise, training, and networking opportunities.

While resource-intensive, DIHs can be adapted to different scales and institutional contexts. In regions with limited capacity, virtual hubs or network-based models can replicate core functions without extensive infrastructure investment.

8.5 Quadruple Helix Platforms for Policy Co-Creation

Several national reports, particularly from Slovenia, emphasise the effectiveness of structured quadruple helix platforms in aligning policy design with SME needs. By involving public authorities, SMEs, research institutions, and civil society, these platforms facilitate dialogue, trust-building, and co-creation of solutions.

The DIGITRANS project itself builds on this practice, making quadruple helix cooperation both a good practice and a core project mechanism.

8.6 Sector-Specific Digitalisation Initiatives

Sector-specific approaches represent another transferable practice. National reports from Greece and North Macedonia highlight targeted digitalisation programmes for tourism and manufacturing SMEs, respectively. These initiatives tailor support to sector-specific processes, technologies, and market dynamics, increasing relevance and uptake.

8.7 Key Conditions for Transferability

The comparative analysis of transferable good practices across the DIGITRANS partner regions shows that successful policy transfer does not depend solely on the technical design of individual instruments. Instead, transferability is strongly conditioned by a set of enabling contextual and institutional factors that determine whether a practice can be effectively adapted and sustained in a different regional or national environment. The State of the Art reports provide consistent evidence that the following conditions are particularly critical.

Political and institutional commitment emerges as a fundamental prerequisite for transferability. In regions where political leadership and senior public administration actively support SME digitalisation, good practices are more likely to be adopted, scaled up, and embedded within long-term policy frameworks. National reports from Italy and Slovenia illustrate that sustained political backing enables continuity across programming periods and reduces the risk that transferred practices remain isolated pilot initiatives. Conversely, in contexts where political priorities shift frequently even well-designed practices struggle to achieve lasting impact.

Adequate administrative capacity is a second decisive factor. Transferable practices often require skilled public servants, effective intermediary organisations, and streamlined administrative procedures. National reports from North Macedonia and Serbia highlight that limited staffing, high turnover, and insufficient technical expertise can constrain the implementation of otherwise relevant practices. In contrast, regions with dedicated innovation agencies or experienced managing authorities are better positioned to adapt complex instruments such as integrated digital support packages or innovation voucher schemes.

Active engagement of SMEs and intermediary organisations is essential to ensure that transferred practices respond to real needs and achieve uptake. Chambers of commerce, clusters, Digital Innovation Hubs, and sectoral associations play a critical role in mediating between policy design and SME realities. Evidence from Croatia and Slovenia shows that practices embedded within strong intermediary networks benefit from higher SME participation and stronger feedback loops, which allow continuous refinement of support measures.

Flexibility and adaptability to local contexts are repeatedly identified as key success factors. Transferable practices must be adapted to differences in economic structure, enterprise size distribution, sectoral specialisation, and institutional maturity. National reports from Albania and Bosnia and Herzegovina emphasise that direct replication of instruments developed in more advanced regions is rarely effective. Instead, successful transfer requires modular design, phased implementation, and the possibility to adjust eligibility criteria, support intensity, and delivery mechanisms.

Finally, integration with broader policy frameworks significantly enhances transferability and sustainability. Practices that are aligned with smart specialisation strategies, SME support policies, digital skills initiatives, and regional development objectives are more likely to generate systemic impact. National reports from Italy and Greece demonstrate that when digitalisation instruments are embedded within coherent policy mixes, they reinforce

each other and reduce fragmentation. In contrast, stand-alone or project-based initiatives risk remaining marginal and dependent on temporary funding.

Taken together, these conditions underline that transferability is not a purely technical exercise but a strategic policy process. DIGITRANS provides a structured environment in which these enabling conditions can be strengthened through transregional learning, capacity building, and coordinated action, thereby increasing the likelihood that good practices identified within the partnership lead to meaningful and lasting policy improvements.

10. Conclusions

This Transnational State of the Art Report demonstrates that SME digitalisation across the Adriatic–Ionian region has reached a decisive and critical transition point. Over the past decade, substantial progress has been made in expanding access to digital infrastructure and basic digital tools. Internet connectivity, standard ICT equipment, and elementary digital applications are now widely adopted across most sectors and territories. As a result, the fundamental challenge facing SMEs is no longer whether digital technologies are accessible, but whether they are used strategically, systematically, and transformatively to enhance productivity, competitiveness, and long-term resilience.

The analysis clearly shows that the current phase of digitalisation requires a qualitative shift. Moving from basic adoption towards deeper digital transformation entails changes not only in technologies, but also in organisational structures, management practices, skills profiles, and business models. For many SMEs, particularly micro and small enterprises, this transition represents a substantial challenge that cannot be addressed through isolated investments or short-term support measures alone.

Across both EU Member State regions and IPA partner regions, SMEs face a set of structurally similar constraints that limit their ability to progress along the digital transformation pathway. These include persistent shortages of digital and transversal skills, limited managerial and strategic capacity, fragmented and complex support ecosystems, uneven access to finance, and significant administrative burdens associated with public support instruments. While the intensity and specific manifestations of these constraints differ across institutional and socio-economic contexts, their cumulative effects on SME digitalisation outcomes are remarkably convergent across the Adriatic–Ionian area.

In EU Member State regions, SMEs operate within more mature innovation and policy ecosystems, yet they continue to struggle with administrative complexity, overlapping instruments, and difficulties in scaling up digital solutions beyond pilot phases. In IPA partner regions, structural constraints are often more pronounced, including lower availability of long-term finance, limited administrative capacity, and stronger reliance on donor-funded or project-based initiatives. Nevertheless, the analysis shows that these differences do not translate into fundamentally different challenges, but rather into variations in intensity, sequencing, and institutional readiness.

A central conclusion of this report is the persistence of a gap between policy ambition and effective implementation. Strategic frameworks at national and regional levels increasingly recognise digital transformation as a priority for SME competitiveness, innovation, and economic resilience. However, the operational delivery of these strategies frequently falls short. Limited coordination among institutions, fragmented governance structures, insufficient monitoring of outcomes, and lack of continuity across programming periods reduce the overall effectiveness of policy interventions. As a consequence, many support instruments tend to benefit a relatively narrow segment of SMEs—often medium-sized, well-connected, and administratively capable firms—while micro enterprises, traditional sectors, and peripheral territories remain underserved.

At the same time, the report identifies a robust set of good practices that demonstrate how these challenges can be addressed through more integrated and strategic policy approaches. Innovation voucher schemes, integrated digital support packages combining finance and advisory services, Digital Innovation Hubs offering test-before-invest solutions, and structured quadruple helix governance models all show strong potential to lower entry barriers, build absorptive capacity, and stimulate sustainable digital transformation among SMEs. Crucially, these practices share common success factors: strong stakeholder engagement, alignment with SME needs, flexibility in design, and integration within broader policy frameworks.

The transnational perspective of DIGITRANS adds significant value in this context. By bringing together regions with differing levels of development, institutional capacity, and policy experience, the project creates opportunities for meaningful policy learning and adaptation rather than simple replication. More advanced regions contribute tested instruments and governance models, while less advanced regions offer insights into structural bottlenecks and opportunities for leapfrogging. This mutual learning dynamic is one of the key strengths of the project and a critical driver of its potential long-term impact.

DIGITRANS is particularly well positioned to address the challenges identified in this report by linking robust analysis and benchmarking with targeted policy experimentation, learning, and implementation. Through the combination of analytical work (WP1), policy learning and stakeholder engagement, and action-oriented policy improvement (WP2), the project can contribute to more coherent, inclusive, and effective SME digitalisation policies across the Adriatic–Ionian region. The establishment and strengthening of quadruple helix platforms in each partner region provide an important governance mechanism for ensuring that policy improvements are grounded in real SME needs and supported by relevant stakeholders.

Looking beyond the project’s lifetime, sustained impact will depend on several critical factors. These include continued political and institutional commitment to SME digitalisation, reinforcement of administrative and intermediary capacities, systematic integration of digitalisation instruments within broader policy mixes, and ongoing transregional cooperation and knowledge exchange. Digital transformation is not a one-off process but a continuous journey that requires adaptive policies, learning-oriented governance, and long-term engagement.

In conclusion, SME digitalisation in the Adriatic–Ionian region represents both a shared challenge and a shared opportunity. By addressing structural barriers, strengthening policy coherence, and leveraging transnational cooperation, DIGITRANS can contribute to more

resilient, innovative, and competitive regional economies. This Transnational State of the Art Report provides a solid analytical foundation for that effort, offering evidence-based insights and strategic guidance to support the next phases of policy development and implementation.

Annex A – National State of the Art Reports

Regional State of the Art Report, Veneto Region, Italy

General Overview of Veneto Region

Veneto is a highly developed region in north-eastern Italy, known for its rich cultural heritage and robust economy. With about 4.85 million inhabitants (approximately 8.2% of Italy’s population)[1], it is the fourth most populous Italian region[2]. The region’s capital is Venice, a global tourist destination, while other major cities include Verona, Padua, and Vicenza. Veneto spans from the Dolomite Alps to the Adriatic Sea, giving it strategic advantages in both manufacturing and maritime trade. It borders fellow industrial regions Lombardy and Emilia-Romagna, and connects to Friuli-Venezia Giulia and Austria via alpine passes, positioning Veneto as a gateway between Western Europe and the Adriatic-Balkan area.

Historically part of the Venetian Republic, the region today is firmly integrated into Italy and the EU. It benefits from European cohesion policy as a “more developed region”, leveraging EU funds (e.g. European Regional Development Fund – ERDF) to support innovation and infrastructure. The region actively aligns with national and EU digital strategies – for example, contributing to Italy’s “Italia Digitale 2026” plan under the National Recovery and Resilience Plan (NRRP) and pursuing the EU’s Digital Decade targets. Veneto’s commitment to digital transformation and sustainable growth echoes broader European objectives, underscoring its role in the country’s drive toward digital innovation and competitiveness.

1.2. Economic Profile of the Region

General Economic Overview

Veneto is one of Italy’s economic powerhouses, with a diversified production base and strong export orientation. In 2023 its GDP per capita (in purchasing power standards) was about 105% of the EU27 average, well above the national average (93%)[3]. The region’s total GDP reached an estimated €168 billion in 2023[4], making Veneto the third-largest regional economy in Italy. The economic structure is broad-based: traditional industries (textiles, apparel, goldsmithing), manufacturing (machinery, appliances, automotive parts), fashion and design (home to brands like Luxottica and Calzedonia), and a dynamic agrifood sector (renowned wines and agri-food products) all contribute significantly. In recent years the services sector has expanded rapidly – over 171,000 service businesses are active, especially in tourism, commerce, and logistics[5]. Venice’s tourism alone makes a sizable impact, with millions of international visitors annually, driving growth in hospitality and related services. Agriculture plays a smaller role by employment, but remains strategic through high-quality, export-oriented products (e.g. Prosecco wine), often organized in geographically focused districts[5].

Entrepreneurial Environment and SMEs: Veneto's economy is characterized by a dense network of small and medium-sized enterprises (SMEs), which form the backbone of its industrial districts. The region had 468,000 registered businesses (about 422,000 active) as of 2023, one of the highest counts in Italy[6]. Over 99% of firms are SMEs, reflecting the national pattern of family-owned and medium enterprises dominating the landscape. These firms are highly flexible and innovative, enabling local companies to excel nationally and internationally[7]. Many world-known brands have roots in Veneto's SME clusters – for instance, Luxottica (eyewear), Geox (footwear), De'Longhi (appliances), and Calzedonia (fashion apparel) all started as local businesses and grew into industry leaders[8]. The prevalence of SMEs means they account for a large share of regional employment and exports. Notably, Veneto's companies are strongly export-oriented, collectively making the region one of Italy's top exporters. This outward focus, coupled with a culture of industrial specialization by territory (industrial districts), has driven Veneto's prosperity over decades.

Key economic indicators include a **GDP per capita around €34,000** (well above the EU average) and steady growth in output. The region rebounded from the COVID-19 downturn with solid performance: by late 2023 Veneto's output and employment had surpassed pre-pandemic levels (manufacturing revenues in Italy hit record highs in 2023[9]). Business surveys indicate widespread adoption of efficiency-enhancing technologies – e.g. **36% of Italian manufacturing firms use industrial IoT systems and 19% have introduced robotics into production**[10], trends mirrored in Veneto's modern factories (especially in sectors like machinery and automotive components). This ongoing **Industry 4.0** transition is supported by national incentives and is crucial for maintaining the region's competitiveness given rising global cost pressures.

Role of SMEs in the Economy

SMEs are the engine of Veneto's economy and employment. They **constitute over 99%** of all enterprises and contribute an estimated two-thirds of private sector employment and value added. In 2023, Veneto's **SME sector remained vibrant**, with even micro-firms (<10 employees) playing a vital role in niche manufacturing and artisan goods. Recent trends show mixed signals: while SME employment grew modestly in 2022–2023, productivity challenges persist in some traditional segments. There is a gradual structural shift as many SMEs invest in **digitalisation and automation** to boost efficiency. Veneto's SMEs are known for agile supply chains and high-quality craftsmanship, but they also face pressure to scale up and innovate. The region encourages aggregation (e.g. enterprise networks and consortia) to help small firms achieve economies of scale in innovation and export marketing.

ICT Sector and Digital Economy

Veneto's **ICT sector** is a growing component of the economy, albeit smaller than in Italy's largest metro areas. The region hosts a **burgeoning startup scene** (e.g. Padua's "Galileo Visionary District" incubator and H-Farm innovation hub in Treviso) and several mid-sized tech companies focusing on software, IT services, and electronics. The presence of strong universities (University of Padua, Ca' Foscari University of Venice, University of Verona)

contributes to a steady flow of ICT graduates and research spinoffs. Overall, the **digital economy** in Veneto is developing in tandem with its industrial strengths: for instance, many manufacturing firms are adopting digital solutions (CAD/CAM design, industrial automation software), and local tech startups often cater to industrial and smart manufacturing needs. The region also benefits from national initiatives like **Competence Center SMACT** in Padua (one of 8 Industry 4.0 centers in Italy) which provides test laboratories and consulting for advanced technologies to SMEs. These efforts aim to nurture an innovation ecosystem where digital and traditional industries converge.

Digitalisation Maturity Among SMEs

Despite Veneto's economic success, there is recognition of a **digital gap** that needs to be closed for SMEs to remain competitive. At the national level, Italy has made progress on basic business digitalisation, but still lags in advanced technology uptake. As of 2024, approximately **70.2% of Italian SMEs** have achieved at least a basic level of digital intensity (using a set of minimum digital tools), reflecting significant improvements with support from recent programs[11]. However, adoption of **advanced digital technologies** remains limited – for example, only **8.2% of Italian enterprises use Artificial Intelligence** applications, well below the EU average (~8% EU, i.e. Italy among the lower performers)[11][12]. Similarly, use of **big data analytics, cloud computing** and other emerging technologies by SMEs is growing slowly. Within Veneto, high-tech manufacturing exporters tend to be more digitally advanced (many have implemented ERP systems, cloud services, or automation), whereas **micro-enterprises** and traditional small firms (e.g. in construction, craft trades) often **lag in digital adoption**. A significant share of SMEs still have only rudimentary online presence or digital capabilities. The government's "**Transizione 4.0**" incentives and regional digital vouchers have spurred many firms to invest in new machinery, e-commerce platforms, or cybersecurity, but the **challenge is greatest for the smallest firms**. In sum, Veneto's economy is robust and diverse, and while its SMEs are benefiting from digital transformation in areas like e-commerce and process automation, a concerted effort is needed to accelerate **broader digitalisation** to sustain the region's long-term competitiveness[13][14].

1.3. HR Profile of the Region

Educational Attainment and Higher Education

Veneto's workforce is comparatively well-educated by Italian standards, though tertiary attainment remains below some European benchmarks. As of 2023, about **22.1%** of people active in the regional labor market held a **tertiary degree** (university or equivalent)[15]. Over half (51.2%) had completed upper secondary education (high school or vocational), while roughly a quarter had only primary or lower-secondary education[15]. These figures indicate **widespread upper-secondary attainment**, reflecting Italy's strong tradition of technical high schools (Veneto has many vocational institutes producing skilled technicians). However, the tertiary rate (22%) is modest compared to the EU average (~32-40% for ages 25–64), pointing to an area for improvement – Italy historically has one of the lowest university graduation rates in Western Europe.

Veneto is home to **several prestigious universities** which bolster its human capital. The University of Padua (founded 1222) is one of Europe's oldest and renowned for engineering, medicine, and science programs. Ca' Foscari University of Venice specializes in economics, management, and languages, while the University of Verona and smaller institutions like IUAV (Venice) offer expertise in fields from ICT to design. These universities collectively produce thousands of graduates each year, including **engineers, IT specialists, and business professionals**, many of whom enter the regional job market. Moreover, Veneto's higher education system is complemented by **research centers** (CNR institutes, etc.) and a strong network of vocational training centers (e.g. ITS academies) that provide practical skills in areas like mechatronics, logistics, and digital marketing. This educational infrastructure has helped create a talent pool that supports the region's manufacturing and service economy.

Lifelong Learning and Skills Development

Like much of Italy, Veneto faces challenges in adult upskilling and lifelong learning participation. Traditional employment often did not emphasize continuous training, but this is changing as digital skills become essential. The region (with national co-funding) promotes initiatives such as worker upskilling programs, training vouchers, and events akin to a "Digital Skills Week" to encourage adults to acquire new competencies. Still, **participation in adult education remains relatively low**, especially among older and lower-skilled workers. SMEs report difficulty freeing up staff time for training, and many micro-entrepreneurs lack awareness of training opportunities. To address this, projects under the **European Social Fund (ESF)** in Veneto focus on digital and entrepreneurial skill workshops targeting SMEs, and the region's chambers of commerce (through **PID – "Punti Impresa Digitale"** one-stop shops) offer free assessment of digital competencies and training courses. These efforts are beginning to bear fruit, but scaling them up is necessary to reach a broader base of the workforce.

Digital Skills and ICT Specialists

A critical aspect of the HR profile is the level of digital skills in the population and the availability of ICT professionals. Italy as a whole has notable gaps here, and Veneto is no exception, though it likely performs a bit better than the national average. As of 2024, only **45.8% of people in Italy have at least basic digital skills**, markedly below the EU average of 55.6%[\[16\]](#). In Veneto's more advanced economy, the share with basic digital skills is expected to be slightly higher than the national figure, but still far from universal. This "digital skills gap" is reflected in employer surveys: over **50% of firms in Veneto reported difficulty finding staff with the right digital/technical profiles in 2023**[\[17\]](#). In particular, the region – like the rest of the country – suffers from a shortage of **ICT specialists**. Only about **4% of total employment in Italy consists of ICT specialists**, which is below the EU average (~4.8%)[\[18\]](#). Veneto's share is similar; many ICT graduates tend to relocate to major cities like Milan or go abroad for higher salaries, causing local firms to compete for a limited pool of tech talent. In 2021, around **69% of Italian companies reported difficulty hiring ICT specialists**[\[19\]](#), indicating a serious skills mismatch.

To mitigate this, regional actors are investing in ICT education and training. Universities in Veneto produce **thousands of STEM graduates** annually (ICT graduates are ~4-5% of all grads nationally[20]), and specialized programs (like **coding bootcamps** and ICT apprenticeships co-funded by EU programs) are being expanded. The EDIH “**NEURAL**” in Veneto (described later) also allocates part of its budget to digital skill training for SMEs’ employees[21]. Furthermore, the **National Recovery Plan (PNRR)** funds include significant components for digital education – such as improving schools’ digital curriculum and setting up “digital hubs” in each province for citizen training. Despite these efforts, **older workers and small entrepreneurs** remain a hard-to-reach group for digital skill upgrading, and many businesses cite this as a barrier to their digital transformation.

Entrepreneurship and Innovation Culture

Veneto’s workforce is known for its entrepreneurial spirit and hands-on skills. The region historically had a high rate of self-employment and family-run firms, which cultivated a culture of problem-solving and practical innovation. Universities and business associations are now building on this by **integrating entrepreneurship and innovation in education**. For example, the University of Padua and other institutions have introduced courses on startup creation, collaboration with incubators, and hackathons to encourage student entrepreneurship[22][23]. Regional innovation contests and SME-oriented innovation grants also incentivize employees to propose and develop new ideas. The human capital of Veneto thus combines solid traditional skills (craftsmanship, engineering, design) with a gradually improving foundation of digital competencies. The key going forward will be **scaling up digital literacy** across all ages and ensuring a pipeline of ICT specialists and data professionals to meet the growing demands of Industry 4.0 and the digital economy. The region’s commitment to education and training – evidenced by high upper-secondary attainment and initiatives like “Digital Veneto” skill programs – provides a basis for optimism, even as gaps in advanced skills and workforce aging pose ongoing challenges[16][18]. Overall, Veneto’s human capital is a strong asset, but continuous investment in **reskilling and upskilling** is needed for the workforce to fully support the digital transformation of SMEs.

1.4. Socioeconomic Conditions and Employment Opportunities

Veneto enjoys generally **favourable socioeconomic conditions**, with high employment, low poverty rates, and a strong industrial base contributing to social stability. The region’s labor market is one of the most robust in Italy. In **2023, the employment rate in Veneto was 52.9%** (population age 15+), significantly above the national average of 46.1%[24]. This represents a post-pandemic high and an increase of ~1.9 percentage points over 2022[15]. By the internationally comparable 20–64 age employment metric, Veneto would be around 70%+, reflecting the region’s high workforce participation. Unemployment is **very low**: Veneto’s unemployment rate stood at just **4.2% in 2023**, compared to 7.6% nationally[25]. This rate has remained stable (4.2% also in 2022) and is among the lowest in Europe, indicating near full-employment conditions. Youth unemployment, while higher than overall, is also far better than Italy’s average – the youth employment rate in Veneto is 29%

(vs ~20% nationally)[26], and many young people find opportunities in the region's diverse economy.

Labor Force Structure and Inclusion

Veneto's labor force of ~2.32 million (2023) is split by gender and age in telling ways. Female employment has historically lagged male, but the **female employment rate reached 45.3%** in 2023, over 7 points higher than the Italy-wide female rate[27]. This indicates that while a gender gap persists (male employment 60.9% in Veneto)[28], the region provides relatively more opportunities for women, likely due to its manufacturing and services sectors that have absorbed female workers. Policies such as regional funds for women entrepreneurship and better childcare services (co-funded by ESF) aim to further raise women's participation. Meanwhile, Veneto's aging population means the workforce is gradually graying – the average age of workers has risen, and a wave of retirements is expected soon. Indeed, **analysts estimate about 302,000 workers will need to be replaced between 2024–2028** due to retirements alone[29]. This looming turnover could exacerbate skill shortages, but also opens opportunities for younger workers if they are equipped with the right skills.

Employment Opportunities and Sectoral Demand

Employers in Veneto have been optimistic in their hiring outlook. In 2023, companies projected a **5% increase in hiring** over the previous year, expecting over **526,000 new hires** (gross) during the year[30]. The majority of these opportunities (around 65%) are in the **tertiary (service) sector**, especially in **accommodation, food services, tourism, and commerce**[31]. Tourism and hospitality rebounded strongly post-COVID, driving demand for service workers. At the same time, the **industry sector** (manufacturing and construction) accounts for about 35–38% of planned hires, notably in **construction and metal/mechanical industries** as these sectors face booming demand and workforce replacement needs[32]. By firm size, it's noteworthy that even **micro-enterprises (<10 employees)** plan to hire (27% of expected hires), indicating broad-based labor demand across company sizes[33]. The tight labor market has, however, led to **labor shortages in certain occupations**. As of 2023, employers report difficulties filling about **50% of vacancies** – a share that has climbed from under 20% a few years ago[17].

Skills Shortages (“Mismatches”): The most **in-demand profiles** in Veneto, and correspondingly those in shortage, include: **Skilled trades in construction and manufacturing:** e.g. bricklayers, carpenters, electricians, mechanics, welders – reflecting a construction boom and strong manufacturing orders[17]. **Specialized technicians:** industrial machinery technicians, automation specialists, and similar roles requiring advanced vocational training are hard to find[17]. **IT professionals:** software developers, data analysts, and IT technicians are among the top hard-to-fill positions as digital transformation accelerates[34]. **Tourism and hospitality staff:** chefs, cooks, and experienced waiters are in short supply, particularly for the peak tourist season, as the sector expands and competition for skilled staff increases[34]. **Healthcare professionals:** (While not explicitly highlighted in the regional text above, Italy generally has shortages of

nurses and care workers; Veneto likely shares this trend, especially given its aging population. Health sector demand remains high in the wake of the pandemic.)

These shortages are **structural and cyclical**. Structural, because there is a **mismatch between workforce skills and industry needs** – for example, vocational schools are not graduating enough welders or IT specialists to meet demand. The issue is aggravated by an aging skilled-trades workforce entering retirement (the share of vacancies unfillable due to “lack of candidates” rose to 33% in 2023 from 17% in 2019)[\[35\]](#). Cyclical, because sectors like tourism and agriculture face seasonal peaks and struggle to attract workers for short stints. The **aging population** in Veneto further tightens the labor supply: the region has one of Italy’s highest life expectancies and low birth rates, so new labor market entrants are fewer than those exiting.

Labor Surpluses

On the flip side, there are certain labor segments in **surplus**, often involving workers whose skills have become outdated. According to regional analyses, **older workers with limited digital/technical skills and those in declining occupations** (some clerical roles, traditional artisans) face difficulties finding jobs[\[36\]](#). These individuals may not be geographically mobile or able to retrain easily, leading to pockets of unemployment or underemployment despite the overall labor shortage. Many such workers are reluctant or unable to move (within Italy or abroad) due to family ties, language barriers, or simply the lack of modern skills that are in demand[\[37\]](#). This underscores a **digital divide within the workforce**: those without digital competencies are at growing risk of exclusion, as companies increasingly seek tech-savvy employees.

Wages and Living Standards

High employment has translated into rising incomes in Veneto, though wage levels remain moderate compared to richer EU regions. The average gross monthly salary in Italy is around €2,500 (c. €1,600 net). Veneto’s wages are slightly above the Italian average, and the region’s cost of living (outside of tourist hotspots like Venice) is reasonable. As a result, **quality of life in Veneto is high**. The region scored **0.903 on the HDI (Human Development Index) in 2021**, placing it 8th out of 21 Italian regions[\[38\]](#) – a “very high” development level comparable to many Western European countries. Residents benefit from a mix of urban amenities and excellent public services and infrastructure.

Veneto’s socioeconomic conditions are characterized by **strong labor market performance** and a generally prosperous society, albeit with challenges in ensuring the **right skills match** for its evolving economy. Employment opportunities are plentiful across sectors, but the region must confront the twin issues of **skill shortages and population aging**. Policies to train workers in needed skills, attract talent (including from other regions/countries), and retain older workers longer will be crucial. Additionally, addressing the small pockets of labor surplus (via retraining programs for older and low-skilled workers) will improve social inclusion. By continuing to invest in its human capital and leveraging its

high employment to further innovation, Veneto is well-positioned to maintain its status as an economic leader, while improving opportunities for all its residents in the digital age.

2. Analysis and Assessment of Policy Instruments

Over the past several years, numerous **policy instruments and initiatives** have been implemented to drive the digitalisation of SMEs in Veneto and more broadly in Italy. These instruments span **regional, national, and EU levels**, and range from strategic frameworks to concrete funding programs. This section provides an overview and assessment of key policy instruments, evaluates their effectiveness, identifies challenges, and discusses the region's competitiveness and best practices in SME digital transformation.

2.1. Policy Instruments

Strategic Frameworks

Veneto's efforts sit within Italy's national digital strategy and EU policy context. The Italian government has established ambitious goals through *Italia Digitale 2026*, aligned with the EU's **Digital Decade 2030** targets, focusing on gigabit connectivity, digital public services, and SME digitalisation. At the regional level, Veneto's **Smart Specialisation Strategy (S3) 2021–2027** emphasizes digital innovation across priority domains (e.g. "Smart Manufacturing" and "Smart Agrifood")^[39], ensuring that digital investments align with areas of regional competitive advantage. These strategies provide direction and ensure coherence between different programs.

Major Funding Instruments and Programs

Several major instruments underpin SME digitalisation in Veneto:

- **Regional ERDF Programme (PR Veneto FESR 2021–2027):** As a **more developed region**, Veneto receives substantial funding from the **European Regional Development Fund (ERDF)** to support innovation and competitiveness. Under the current program, the region launched initiatives like the *Fondo Veneto Ricerca, Sviluppo e Innovazione*. This fund (with ~€46 million allocation) offers a combination of **grants and soft loans** to SMEs investing in R&D and technological innovation^[40]. It specifically supports projects in areas such as advanced manufacturing, sustainability, and digital transformation. SMEs (and even individual professionals) in Veneto can obtain co-financing for expenses like hiring innovation experts, developing prototypes, acquiring new digital tools, etc., provided their projects align with S3 priorities^[39]. The fund essentially acts as a regional innovation engine, lowering financial barriers for SMEs to experiment with new technologies. ERDF also co-finances other measures: e.g., **digitalization vouchers at regional level**, innovation advisory services, and the build-out of broadband infrastructure in less-served areas. By targeting **SME innovation capacity**, the ERDF programs directly contribute to increasing digital maturity among Veneto's businesses.
- **National Recovery and Resilience Plan (PNRR) – Digitalisation Mission:** Italy's **NRRP** (funded by the EU NextGenerationEU facility) dedicates an unprecedented budget to digital transformation – roughly **€50 billion** under Mission 1 "Digitalization, Innovation, Competitiveness, Culture"^[41]. Veneto, like other regions, benefits from

a share of these investments. Through the PNRR, various **calls for projects and incentives** have been rolled out. Examples include: **Transition 4.0 tax credits** (described below), funding for ultra-broadband and 5G infrastructure deployment in underserved industrial areas, support for public digital services (indirectly helping SMEs via easier e-government), and specific programs for sectors (e.g., digital tourism platforms). The PNRR’s impact in Veneto is significant – local firms are accessing grants for advanced technology adoption, and the region has seen upgrades in digital connectivity (FTTP broadband coverage has climbed to ~70.7%, matching the EU average)[\[42\]\[11\]](#). Importantly, the PNRR also funded the establishment of the **European Digital Innovation Hub (EDIH) in Veneto** and provides resources for training SMEs in digital skills. In summary, the NRRP acts as a **catalyst fund**, accelerating ongoing digital initiatives with a substantial influx of EU recovery funds.

- **Piano Nazionale Transizione 4.0:** This is Italy’s flagship enterprise digitalisation program, introduced in 2017 as “Industria 4.0” and enhanced as **Transizione 4.0** from 2020 onwards. Rather than direct grants, it offers **tax credits** to companies investing in advanced technologies, innovation and training. About **€13.4 billion** in tax credits have been allocated through Transizione 4.0 to support investments in **tangible and intangible Industry 4.0 assets, R&D projects, and workforce training**[\[43\]](#). SMEs in Veneto have extensively utilized these incentives to acquire digital machinery (e.g. CNC machines, robots), adopt software (ERP, CRM, IoT platforms), and upskill employees. For instance, firms get a tax credit of 40-50% for investing in approved Industry 4.0 equipment and 20-25% for software and IT systems, up to certain limits. There are also credits for R&D expenditures (typically 10-15%) and for conducting training on new technologies (up to 70% of training costs for SMEs). This program, funded initially by national budget and reinforced by PNRR, has **reached thousands of companies nationwide** – including many in Veneto’s manufacturing districts – and stimulated private investment in digitalisation. It is widely credited with raising awareness of Industry 4.0; by 2022, surveys showed **87% of Italian SMEs were aware of IoT benefits and a majority had initiated IoT or automation projects**, partly thanks to Transizione 4.0’s incentives[\[44\]\[43\]](#). The plan runs through 2025 (with some credits extended to 2026) and is evolving (a proposed “Transizione 5.0” will integrate green objectives). For Veneto, this instrument addresses the *technology upgrade* aspect by making digital tools more affordable for SMEs.
- **Fondo per la Crescita Digitale (Digital Growth Fund):** The national **Digital Growth Fund** was established to finance projects under Italy’s Digital Agenda (Strategia per la Crescita Digitale 2014–2020) and beyond. It has been used to fund strategic digital initiatives, including support for SME digitalisation. For example, this fund (managed by the Ministry of Economic Development, now MIMIT) co-financed the “**Voucher Digitalizzazione PMI**” scheme in 2018, which provided small vouchers to tens of thousands of micro enterprises to buy software, hardware, or e-commerce solutions. In the current period, the fund’s resources are channeled into measures like broadband expansion and innovation support for enterprises. While not a direct grant program that SMEs apply to, the Digital Growth Fund underpins many digital policies – effectively acting as a **national budget line** ensuring continuity of financing for digital initiatives (including some regional ones). In Veneto, elements of this fund have contributed to expanding connectivity (e.g. voucher for ultrabroadband

connectivity for SMEs, offering up to €2,500 to offset the cost of gigabit fiber subscriptions[45][46] and supporting the digital innovation hubs network.

- **SME Digitalisation Vouchers (Voucher Digitali I4.0):** A **targeted, low-barrier funding** instrument has been the digital voucher programs run by chambers of commerce and regional authorities. For instance, Unioncamere Veneto (the regional chamber union), with support from the national Ministry and ERDF, issues annual calls for “**voucher digitali**” to SMEs. These provide co-financing (often **50% of expenses up to €10,000**) for small projects such as adopting e-commerce systems, building a company website, digital marketing, Industry 4.0 consultancy, or cybersecurity improvements[47]. The application process is simplified, and vouchers are accessible even to very small businesses that might not have capacity to engage with larger grants. This instrument has been quite popular – in Italy over **5,000 vouchers** were awarded between 2020–2023 under various schemes[48][49], and Veneto has been one of the most active regions in voucher uptake. During the COVID-19 pandemic, these vouchers were crucial in helping micro and small enterprises quickly set up online sales channels and remote working tools. The **impact** is significant in breadth if not in individual project size: thousands of Veneto’s micro-firms (craft workshops, small retailers, local tourism operators) have benefitted, making initial steps in digitalisation that they might not otherwise have taken. The voucher approach is considered a **good practice** (see Section 2.5) due to its simplicity and reach.
- **European Digital Innovation Hub – NEURAL (Veneto):** Launched in 2023, **NEURAL EDIH** is one of the 228 EDIHs co-funded by the EU’s Digital Europe Programme and Italy’s PNRR. It serves as a **one-stop shop** to support Veneto’s SMEs (and public entities) in their digital transformation journey[50]. The EDIH provides services such as “*test before invest*” facilities (allowing companies to experiment with AI, IoT, etc. before making investments), digital maturity assessments, training and upskilling programs, and assistance in finding investment or financing for digital projects[51][52]. NEURAL EDIH is delivered by a consortium of regional players – including **t2i**, Digital Innovation Hub Vicenza, Confartigianato Vicenza, University of Padua (through SMACT), and even private partners like Intesa Sanpaolo bank[53]. With an available budget of nearly **€6 million** (via NextGenerationEU)[21], it subsidizes the cost of services to SMEs, often providing initial consultations and trainings either free or at a heavy discount (typically 50-100% subsidy for eligible services). The hub specifically targets SMEs that need guidance to start or accelerate digitalisation, offering them tailored roadmaps and connecting them to technology providers or finance. It also focuses on the regional smart specialisation areas – e.g. advanced manufacturing, health, tourism – so that digital solutions are relevant to local industry needs. NEURAL became operational in late 2022 and by 2025 aims to **serve 300+ SMEs** in the region with its services. This instrument is crucial for addressing *knowledge and advisory gaps*: many SMEs struggle not just with funding but with understanding what technologies to adopt and how. By filling that role, the EDIH complements the financial incentives and is expected to raise the effectiveness of other programs (firms that go through the EDIH can then better utilize vouchers, tax credits, etc., with a clearer digital strategy).
- **Competence Center “SMACT” and Digital Innovation Hubs Network:** In addition to the EDIH, Veneto benefits from the **national Industry 4.0 network** established a few

years prior. The **SMACT Competence Center** (based in Padua) is a public-private partnership co-funded by the Ministry of Economic Development. It focuses on **Social, Mobile, Analytics, Cloud, IoT** (hence the acronym SMACT) and provides advanced labs and expertise to help companies develop Industry 4.0 projects^[54]. SMACT runs innovation projects, training, and **technology audits** for SMEs, often acting as a bridge between university research and industry. It has also launched its own calls co-funding innovative SME projects (with grants up to €100k for pilot projects). Meanwhile, the region has local **Digital Innovation Hubs (DIHs)**, typically hosted by business associations (Confindustria Veneto's DIH, Confartigianato's DIH, etc.), which perform outreach and first-line digital consultancy for SMEs. These DIHs now coordinate closely with NEURAL EDIH and the Competence Center, forming a multi-layer support ecosystem. The **integration of competence centers and DIHs** is an instrument in itself – creating an *innovation ecosystem* where an SME can get support ranging from awareness (local DIH events) to deep expertise (competence center) depending on its needs. This structured network is supported by both national and EU funds and ensures that policy instruments are not only about financing, but also about **knowledge transfer**.

Table 1 below summarizes the **key policy instruments** relevant to SME digitalisation in Veneto, along with their scope and status:

Instrument / Program	Description & Goals	Status/Reach
PR Veneto FESR 2021–27 (Fondo RSI)	ERDF-funded regional program; grants & loans for SME innovation and digital projects in S3 priority areas[40][39]. Aims to increase R&D and tech adoption in regional SMEs.	Launched 2024; supporting dozens of SME projects (ongoing). €46M fund allocation; high demand first call.
PNRR – Digitalisation (Mission 1)	National recovery plan investments in broadband, e-government, and SME digital readiness (including EDIHs)[41]. Enables infrastructure and capacity-building to meet EU Digital Decade targets.	2021–2026; multi-billion € projects underway. Veneto receiving funds for 5G corridors, digital hub, etc.
Transizione 4.0 Plan (2020–2025)	Tax credit scheme incentivizing private investment in Industry 4.0 tech, R&D, and worker training[43]. Goal: modernize production and boost innovation in firms of all sizes.	Active (tax credits through 2025). Widely used in Veneto; hundreds of firms claim credits yearly. Allocated €13.4B nationally.
SME Digital Vouchers (Voucher I4.0)	Small-scale grants (often €5k–€10k) via chambers or region for SMEs to acquire digital services (software, e-commerce, training)[47]. Low-barrier funding to engage micro and small enterprises in digitalisation.	Annual calls since 2018; high uptake. Thousands of Veneto SMEs reached (e.g. ~800 in latest call), covering 50% of project costs.
Fondo Crescita Digitale (Nat. Digital Growth Fund)	National fund supporting Digital Agenda initiatives – financed broadband vouchers, digitalization projects, etc. for SMEs and public sector. Provides strategic funding underpinning many specific measures.	Ongoing (2015–present). Financed measures like SME connectivity vouchers 2020–2023[45], and co-funds current digital programmes.
NEURAL EDIH (Veneto)	EU–Italy funded European Digital Innovation Hub for Veneto[50]. Offers “test before invest”, assessments, training, and innovation ecosystem networking for SMEs, focusing on digital transformation.	Operational 2023–2025 (initial). Target to assist 300+ SMEs by 2025. Already providing subsidized services with €6M PNRR support[21].
SMACT Competence Center & DIHs	Industry 4.0 Competence Center (Padua) with labs and expert support for advanced projects; plus a network of regional Digital Innovation Hubs for outreach and guidance. Aim to build innovation capacity and link SMEs with technology providers/research.	Established 2018; ongoing. SMACT has engaged dozens of SMEs in pilot projects and training. DIHs conduct awareness workshops (>1000 SMEs reached across Veneto).

Funding Sources

The above instruments are financed through multiple channels, reflecting a mix of EU and national contributions. Key funding sources include the **European Regional Development Fund (ERDF)** for regional programs, the **Recovery and Resilience Facility (NRRP)** for one-time transformative investments, **national funds** such as the Digital Growth Fund and budget allocations for Transizione 4.0, and the **EU Digital Europe Programme** for EDIH support[55]. Coordination of these funds is crucial to avoid overlap and ensure comprehensive coverage of needs.

Overall, Veneto and Italy have put in place a **multi-tiered policy ecosystem** to advance SME digitalisation – from direct financial incentives and advisory support to broader strategies setting the direction. The next sections will assess how effective these instruments have been, what gaps remain, and how they contribute to the region’s competitive position.

2.2. General Assessment

Progress and Uptake

Veneto (and Italy generally) has made **steady progress** in fostering SME digitalisation, thanks in part to the targeted policy instruments described. There is clear evidence of improvement in basic digital adoption: approximately **70% of Italian SMEs now have a basic level of digital intensity**, a significant rise compared to a few years ago[11] (and well above the EU27 average of ~58% in 2023). Many Veneto firms took advantage of the extraordinary stimulus (NRRP, vouchers, etc.), resulting in tangible outcomes – for example, thousands of micro-businesses launched their first e-commerce sites or implemented digital marketing during 2020–22 with voucher support. **However, progress remains uneven across company sizes and sectors.**

Key observations include:

- **Basic vs Advanced Technologies:** While more SMEs are online and using basic digital tools (e.g. having a website, social media, basic software), the **use of advanced technologies is still limited**. Only a minority of SMEs utilize cutting-edge solutions like AI, big data analytics, or IoT in operations. In Italy, only **5% of firms use AI (vs 8% EU average)**[12], and similarly low figures apply to big data and cloud uptake for small businesses. This suggests that many SMEs stop at the first step of digitalisation and have not yet integrated more transformative technologies into their processes. **Micro-enterprises** in particular struggle to go beyond basic ICT adoption due to cost and skill constraints.
- **Digital Skills Gap: Digital skills among owners and employees of SMEs are below desired levels.** As noted, only ~46% of Italian adults have basic digital skills[16], and Veneto’s workforce mirrors this challenge. This shortfall directly impacts SMEs: for instance, a significant share of small manufacturers report that lack of skilled staff is a barrier to adopting new digital tools[56][57]. Many SMEs depend on external IT

providers or consultants for their digital needs, which can be costly and limit the in-house assimilation of digital culture. The policy focus on training (Transizione 4.0's training credits, and EDIH's courses) is addressing this gradually, but results will take time. In the interim, digital skill deficits continue to slow the effective use of available technologies in the SME sector.

- **Regional and Sectoral Disparities:** Within Italy, **regional disparities** in SME digitalisation are prominent – northern regions like Veneto are ahead of southern ones. Within Veneto itself, disparities exist **by sector and firm size** rather than geography (the region is relatively homogeneous economically). **More advanced sectors** include:
 - *Manufacturing (medium-high tech)* – e.g. machinery and automotive SMEs integrating automation, IoT and robotics to remain competitive;
 - *Fashion and design brands* – often quick to adopt e-commerce, PLM software, etc.;
 - *Tourism and hospitality* – many have embraced digital marketing, online booking platforms, and data-driven customer service to enhance their offerings[58].

On the other hand, **lagging sectors** are: - *Construction* – many small contractors still rely on traditional methods, low uptake of BIM (Building Information Modeling) or project management software; - *Agriculture and small agro-food producers* – digital tools (smart farming, e-commerce) are not yet widespread outside a few innovative cases; - *Craft-based micro enterprises* – artisans, small retailers who may not see immediate value in digital or lack capacity to implement it[59][60].

There is also a gap by **firm size**: larger SMEs (100-249 employees) tend to have dedicated IT staff and higher adoption of ERP systems, advanced analytics, etc., whereas **micro and small firms** often have very patchy digital implementation. This “*digital divide by size*” is significant – smaller firms also find it harder to access some of the support schemes due to limited administrative capacity.

- **Impact of Policy Instruments:** The policy instruments introduced have been **numerous**, which is positive in terms of resources available, but can be **fragmented from the SME perspective**. Companies often need help navigating the “jungle” of support. For example, an SME could potentially tap a regional ERDF call, a chamber voucher, a national tax credit, and an EDIH service – but knowing about all these and understanding how they complement each other is challenging, especially for micro-enterprises[61][62]. Some firms report that while funding is available, **application processes can be complex or bureaucratic**, acting as a deterrent for the smallest businesses without external help. That said, many programs have simplified procedures (vouchers, for instance), and intermediaries like business associations often assist SMEs in applying. Overall, **absorption of funds in Veneto has been high** – the region usually fully utilizes its allocations for innovation programs. The **general assessment** is that policy instruments are making a dent in the problem, but there remain **key gaps and issues** to address (outlined in the next section).

To summarise the state of play: **SME digitalisation is now firmly on the political and business agenda in Veneto.** Over half of SMEs have taken at least basic steps, and success stories exist of small firms significantly improving efficiency or expanding markets through digital tools (e.g. artisans finding global customers via online platforms). However, the transformation is far from complete. Many SMEs still operate in traditional ways and risk falling behind as digital technology and data-drive competition advance. The existing policy support, while beneficial, has to be continually refined to ensure it reaches the **most vulnerable segments (micro-enterprises, rural businesses) and encourages adoption of more advanced digital innovations**, not just basic IT.

Key Issues and Gaps

Building on the above, several **persistent issues** can be identified:

- **Digital Divide by Size:** Micro and small enterprises have **lower digital maturity** compared to larger SMEs. They often lack not only finances but also awareness and strategic capacity for digital projects[60][63]. Many national schemes (e.g. sizable innovation grants) end up skewed towards medium firms that can prepare complex proposals, leaving a gap for the smallest companies.
- **Low Adoption of Advanced Tech:** Technologies like AI, advanced analytics, and blockchain are **adopted only by a minority** of SMEs[64][65]. Even among manufacturing SMEs, Industry 4.0 tends to start with simpler automation; few have moved to data-driven decision making or AI-based processes. There is a need for deeper penetration of these technologies, possibly via targeted pilots and demonstrations relevant to SME use-cases.
- **Skills Shortages and Mismatch:** A **mismatch between workforce skills and digital transformation needs** is evident[66]. Older workers and many unemployed have skills that don't meet current SME needs, while companies struggle to hire programmers, technicians, and digital marketers. Without bridging the skills gap (through education reform, re-training programs, and attracting talent), digitalisation efforts might stall – e.g., SMEs might buy new software but fail to fully utilize it due to lacking skill internally.
- **Fragmented Support Landscape:** Many support schemes exist, but **SMEs often find them complex to navigate or under-publicized**[61]. A common complaint is that information on available instruments is scattered. There is no single “portal” or advisory service that streamlines all options (though the EDIH might evolve into that role). This fragmentation can lead to unequal access – well-networked firms tap multiple aids, while others remain unaware.
- **Insufficient Long-Term Impact Tracking:** There is limited **longitudinal data** on how digital investments are paying off in terms of productivity, profitability, or growth for SMEs[67][68]. Most KPIs tracked are immediate (number of firms funded, number of websites created, etc.), but to fine-tune policies, it would help to understand the longer-term outcomes and which interventions yield the best ROI.

Despite these gaps, the **policy agenda remains strongly committed** to SME digitalisation. Digital transformation is recognized as a top priority in Italy’s economic policy (it features in national strategies and high-profile programs, as described). Veneto’s regional authorities likewise emphasize digital innovation as key to regional development. The alignment with EU initiatives gives additional impetus – for instance, meeting the Digital Decade target that **75% of SMEs achieve basic digital intensity by 2030** is a clear goal against which progress is measured.

In conclusion, the general assessment is mixed-positive: **significant strides have been made**, but there is still a lot of work to ensure *breadth and depth* of SME digitalisation. The next subsections delve into specific challenges and how they affect policy effectiveness, followed by an examination of how these efforts translate into regional competitiveness outcomes.

2.3. Identification of Policy Challenges

A structured analysis of the current policy instruments in Veneto/Italy reveals several **challenges and weaknesses** that need to be addressed to improve SME digital transformation outcomes. These policy challenges often mirror the gaps identified above. Table 2 summarizes the key challenges:

Table 2: Policy challenges in SME Digitalisation

Challenge (ID)	Description of the Challenge
C1: Low adoption of advanced technologies	Despite available incentives, uptake of AI, cloud, IoT, and data analytics is low across most SMEs. Many firms focus on basic IT and are hesitant or unsure how to implement more complex digital tools[64][69]. This limits productivity gains and innovation potential.
C2: Micro-enterprise gap	Micro-SMEs struggle to access or benefit from larger digital transformation schemes[63]. They often lack the human and financial capacity to apply for grants or invest in new technologies, risking exclusion from the digital transition.
C3: Skills gap	The workforce skills gap persists: only ~46% of the population has basic digital skills (Italy)[16], and internal ICT capabilities in SMEs are weak [66]. A shortage of ICT specialists and low digital literacy among many workers hinder SMEs in adopting and effectively using new technologies.
C4: Administrative barriers	Some SMEs find the bureaucracy and complexity of programs to be a barrier[70]. Lengthy application forms, strict documentation, or co-financing requirements can overwhelm small firms. The administrative burden means certain companies do not even attempt to access available funds.
C5: Geographic and infrastructure disparity	Although Veneto is well-developed, rural areas and smaller towns can lag in digital infrastructure and adoption. Gaps in high-speed broadband (though narrowing) and lower awareness outside urban centres contribute to a regional digital divide (nationally, Italy’s south vs north; within Veneto, perhaps mountain communities vs plains)[71]. This challenge echoes broader cohesion goals to ensure balanced digital development.
C6: Sectoral imbalance	Traditional sectors (e.g., agriculture, simple manufacturing, crafts) lag significantly behind services and high-tech sectors in digital uptake[72]. Policies may not be sufficiently tailored to these lagging sectors’ needs – e.g., lack of sector-specific digital solutions or demonstration projects that speak to, say, a small farm or a construction firm.

These challenges highlight where policy refinements are needed. For instance, **C1 (advanced tech adoption)** suggests the need for initiatives specifically promoting emerging tech usage (perhaps technology demo centers or higher incentives for AI projects). **C2 (micro-enterprises)** points to implementing more **inclusive measures**, like micro-grants, outreach and hands-on assistance so that the “long tail” of smallest businesses is not left behind. **C3 (skills gap)** requires educational and training policy alignment – collaborating with education institutions, expanding digital apprenticeships, and facilitating hiring of digital talent (possibly through incentives or easing immigration of skilled workers). **C4 (bureaucracy)** indicates a need to **simplify procedures** further – Italy has been trying one-stop digital portals for grants, but continued streamlining and perhaps capacity-building for SMEs to handle admin is needed. **C5 (geographic)** is partly being tackled by broadband roll-out (PNRR aims for full ultra-broadband by 2026) and by leveraging local networks (like chambers in every province doing digital awareness events). **C6 (sectoral)** suggests that one-size-fits-all policies may miss the mark; more targeted support (e.g. a digital scheme for agriculture, or specific digital toolkits for artisans) could ensure no sector is left untouched.

In evaluating the current instruments against these challenges: some, like the voucher scheme, directly address **C2** and **C4** by being micro-friendly and low-bureaucracy (hence their success). The competence centers and EDIH address **C1** and **C3** by raising know-how and skills, but they will need scaling up to reach enough companies. The national strategies are cognizant of **C5** and **C6** (for example, “digital in agriculture” initiatives exist under separate programs, and cohesion funds target rural broadband). However, **coordination and integration of efforts** remain a challenge in itself, which could be considered another meta-challenge: ensuring all these initiatives form a coherent pipeline for an SME (from initial awareness to advanced tech adoption and scaling).

The subsequent sections on competitiveness, good practices, and recommendations will further explore how to overcome these challenges and strengthen the policy response.

2.4. Regional Competitiveness

Digitalisation of SMEs is not an end in itself – its ultimate rationale is to bolster the **competitiveness** of the region’s economy and improve socioeconomic outcomes. In Veneto’s case, SME digitalisation is a critical lever for maintaining its high productivity, export success, and ability to generate quality jobs. This section examines the **economic and social impact** of SME digitalisation in Veneto, and how the region stacks up in innovation and competitiveness indices.

Economic Impact – GDP and Productivity

As SMEs adopt digital technologies, improvements in efficiency and innovation can contribute to economic growth. Italy has long experienced a productivity stagnation, especially in traditional SME-dominated sectors, so digital tools are seen as a means to revitalize productivity. Veneto’s recent GDP growth has been modest but steady; for

example, **GDP per capita in 2024 reached around €34,000**, up about 1.5–2% from the previous year (keeping pace with national growth)[73]. While it is difficult to isolate the effect of digitalisation, **firms that implemented advanced technologies have shown resilience and even gains**. National data suggests digitalised SMEs were better able to weather the COVID-19 shock (by shifting to online sales or remote work) and rebound faster. Veneto's overall GDP per capita is about **€40,800 in PPS, which is 111.6% of the EU average**[74], indicating above-average productivity and wealth generation[75]. Sustaining this advantage will depend on broadening digital adoption – studies correlate higher digital intensity with higher productivity growth at firm level. The *value-added per employee* in digitally mature SMEs tends to be higher than in non-digital peers. Some early signs in Veneto: companies that invested in Industry 4.0 have reported productivity increases and cost savings (e.g., a 3–5% gain in output or reduced downtime), contributing incrementally to regional GDP growth. Going forward, as more SMEs move from basic IT to data-driven and automated operations, the expectation is a lift in the region's productivity growth, helping Veneto remain one of Italy's most prosperous regions.

Employment and Job Creation

Digitalisation's impact on employment is twofold – it can **create jobs** by enabling growth and new services, but also **change the job structure** (automation can reduce certain routine roles while increasing demand for tech-savvy roles). So far in Veneto, the effect appears net positive. The region's employment rate (72.9% for 20–64 age group, equivalent to 52.9% for 15+ as earlier noted) is among the highest in Italy[15]. Unemployment at 4.2% is so low that the main concern is labor shortages, not lack of jobs[25]. **Digitalisation has facilitated job creation** in some sectors: for example, the ICT sector in Veneto is growing and hiring more people (the region now counts tens of thousands of ICT sector employees – nationwide Italy has ~33,700 ICT enterprises employing ~100k+ people[76], and Veneto as an industrial hub hosts a share of those). New roles like digital marketing specialists, data analysts, and e-commerce managers are emerging even in traditional companies, adding jobs that did not exist a decade ago. A concrete indicator: the **ICT sector salaries and employment** have been rising. In Italy, ICT specialists' employment share rose from 3.5% to 4% (2019–2024)[18]. Veneto likely mirrors this, although still below EU average. The **job vacancy rate** in ICT in Italy remains high – implying strong demand. Interestingly, in Slovenia (as a comparator), the ICT sector job vacancy rate fell slightly from 3.4% to 2.2% in 2023 as more positions were filled[77]. In Veneto, anecdotal evidence suggests companies that embraced digitalisation (like those pivoting to e-commerce during the pandemic) retained or even grew employment, whereas those that did not were more likely to downsize.

On the other hand, **automation has begun to displace some manual jobs** – e.g., automated warehouses reduce the need for laborers, digital accounting software reduces need for clerks. However, given the current labor shortages, these efficiencies are often welcome and free up workers for other roles. Many SMEs report that automation is used to cope with unfilled vacancies rather than to cut existing staff. Thus, in the short to medium term, SME digitalisation in Veneto contributes to **qualitative improvements in jobs** (more

skilled positions, less drudgery) and supports overall employment by making firms more competitive (and thus more likely to expand).

Income and Wages

Increased digital competitiveness can lead to higher wages, especially for in-demand skills. In Veneto, wages in tech-related occupations have been on the rise due to high demand. For instance, **software developers** in the region can earn from €30k up to €60-70k annually for experienced roles, significantly above average local wages (Italy's average gross salary ~€30k/year)[78]. This has created a wage premium for digital skills. The **ICT sector in Italy saw a ~7-8% salary increase from 2023 to 2024**, reflecting robust demand[79]. Veneto's competitive companies, especially exporters, can afford higher pay, which contributes to the region's standard of living. However, it's also noted that **Italy's average wages are still below the EU average** (average gross ~€2,220 per month in 2023 vs €3,417 EU average)[80]. Veneto's cost of living adjusted wages are decent, but further digital-driven productivity gains could help justify higher salaries and attract/retain talent locally (reducing brain drain to places like Milan or abroad).

Social Impact – Quality of Life

Digital transformation also has social implications in the region. A more digital economy often means more flexible work arrangements (remote work, gig economy), better access to services (e.g., telemedicine in rural areas), and improved work-life balance if managed well. Veneto is generally a high performer on quality of life metrics. Italy's **BES (Benessere Equo e Sostenibile)** indicators and Eurostat's regional quality of life surveys rank Veneto near the top in Italy for factors like health, social connections, and safety. For example, on a Quality of Life Index Europe-wide, Veneto's components (if measured) would likely be high given low crime and good healthcare. As a country comparison, **Italy ranks 13th in Europe on the Quality of Life Index** and Veneto, being wealthier and well-governed, likely exceeds the national average[81]. Digitalisation contributes to this by, for instance, **enhancing access to services** (digital public services mean less bureaucracy for citizens), **promoting remote work** (which many Veneto companies enabled during COVID, reducing commute stress for employees), and offering digital public utilities (e.g., e-health records – Italy performs above EU average in e-health access at 82.7/100[82], with Veneto fully rolling out electronic health records). The pandemic accelerated some of these, and they remain in use, improving convenience.

However, there are also **challenges**: not everyone is digitally included. Elderly populations and some rural communities risk isolation if they lack digital skills. The region has initiatives via social services to train older people for basic IT use and ensure that traditional channels remain for those not online. On balance, **digitalisation is seen as a positive force for social inclusion** when coupled with training – e.g., telemedicine can bring specialist healthcare to remote mountain villages, and e-governance saves time for citizens interacting with government.

Innovation Capacity

From a competitiveness standpoint, innovation is key. Veneto's status in the **Regional Innovation Scoreboard (RIS) 2023** is “**Moderate Innovator +**”, meaning it performs above the EU average of the moderate innovator group^[75]. Its **Regional Innovation Index (RII)** is **0.552**, which is about **100.8% of the EU average** (slightly above) and 111.6% of the Italian average^{[83][74]}. This indicates that Veneto has a solid innovation performance – stronger than most Italian regions except perhaps Lombardy, and comparable to regions like Catalonia or Baden-Württemberg's mid-tier. Innovation indicators show Veneto's strengths in areas like **SMEs innovating** (many introduce product or process innovations), and weaknesses in things like R&D spending (as in Italy generally) and venture capital availability. Over 2016–2023, Veneto's innovation performance improved by about **+14.7%**, showing positive momentum^[75].

Specifically related to digital, some relevant innovation metrics: the share of **SMEs with in-house product or business process innovations** is quite good, and **employment in innovative enterprises** is high^{[84][85]}. Conversely, the share of **ICT specialists** in employment and **venture capital investment** are relative weaknesses (as we've noted – lack of funding for startups and tech talent scarcity)^[86]. The policy instruments like Startup funds, incubators, and now the EDIH aim to tackle these.

Regional Competitiveness Index (RCI)

The EU's Regional Competitiveness Index measures factors like institutions, infrastructure, macro stability, health, education, labor market, market size, technological readiness, and innovation. Veneto typically scores well on infrastructure and market efficiency, moderately on innovation, and less on higher education (because of Italy's low tertiary education). It consistently ranks in the top tier of Italian regions on such composite indices.

In terms of **international competitiveness**, Veneto's high export numbers (machinery, fashion, agro-food, etc.) showcase its companies' ability to compete globally. Digitalisation helps maintain that edge – for instance, Veneto's manufacturing exporters adopting Industry 4.0 are better positioned against lower-cost competitors because they compete on quality and efficiency, not just cost. **Export success** is a direct competitiveness indicator: Veneto exports tens of billions of euros in goods annually (machinery, metals, fashion, furniture, wines, etc.). As global trade shifts to requiring digital compliance (e.g., digital supply chain integration, e-certifications), Veneto's SMEs must keep up digitally to remain preferred suppliers in German automotive chains or global fashion retail networks.

Key Challenges for Competitiveness

Despite many strengths, there are challenges hindering full realisation of digital dividends:
- A **persistent digital divide** within Italy means the country as a whole still lags top EU performers in many digital metrics, potentially dragging on overall competitiveness. Veneto

pulls above its weight but still operates within that context. - The **skills shortage** is a glaring issue (as detailed, only 4% ICT specialists vs 4.8% EU[18], and only ~46% basic digital skills[16]). Without sufficient talent, competitive gains from technology might stall. - **Access to finance for innovation** remains moderate – Italy has relatively fewer high-growth startups and less venture capital (only 7–9 unicorns in Italy by 2023, <3% of EU total[87], and Veneto has some startups but not yet a unicorn hub). This can limit how far digital innovation translates into new high-value firms in the region.

In conclusion, **SME digitalisation has positively influenced Veneto’s economic growth, employment, and innovation capacity**, reinforcing the region’s competitive position. Veneto’s GDP per capita and employment rates are among the best in Italy, and digital adoption contributes to these outcomes by enabling higher productivity and new business models. However, to **sustain and enhance these benefits**, the region must address the identified challenges: bridging remaining digital divides (firm size, skill level, sector), ensuring the workforce is prepared, and providing a supportive ecosystem (financing, networking) for advanced digital innovation. Continued commitment to strategic policies – like expanding training, incentivising advanced tech adoption, and improving data infrastructure – will be crucial for Veneto to maintain its competitive edge in Europe’s digital economy.

2.5. Good Practices and Recommendations

In implementing SME digitalisation policies, certain **good practices** have emerged in Veneto (and Italy at large) that could be models for other regions. Additionally, drawing from the analysis of challenges, we outline **recommendations** to strengthen the policy approach moving forward.

Good Practices

GP1: SME Digitalisation Vouchers (Chamber of Commerce model) – Low-barrier co-funding reaching micro and small businesses. This scheme, implemented by chambers of commerce in Veneto (as part of the national Impresa 4.0 program), has proven effective in engaging SMEs that might otherwise not participate in digital projects. **Why it works:** It provides **small grants with minimal bureaucracy**, lowering the threshold for action. The vouchers are **tailored to SME needs** – e.g. a bakery can get funding for a simple e-commerce site, a craftsman for digital marketing, a small manufacturer for a cybersecurity audit – exactly the kind of specific, immediate needs SMEs have[88][89]. The application is typically online with a short form, and calls are frequent (some chambers have **monthly or rolling calls**, so businesses can apply when ready)[90]. **Impact:** Over **5,000 SMEs were supported in Italy between 2019 and 2023** through digital vouchers[91][92], with a significant uptake in Veneto. These vouchers helped micro-firms implement tangible improvements (e.g., many during COVID pivoted to online sales thanks to voucher-funded e-commerce). The widespread use among micro and small enterprises (including artisans and shops that had never received public aid before) shows this practice succeeded in **democratizing access to digital innovation**[93].

- **GP2: Integrated Digital Innovation Hubs Network (EDIH + local DIHs + Competence Center)** – *Collaborative support ecosystem for SMEs.* Veneto’s approach of linking the European Digital Innovation Hub (NEURAL), existing local Digital Innovation Hubs, and the SMACT Competence Center creates a continuum of services for companies. **Why it’s a good practice:** It leverages multiple strengths – the **EDIH provides funding and a structured framework**, the **DIHs bring local outreach and understanding of SMEs’ needs**, and the **competence center contributes deep technical know-how and facilities**. Partners such as universities, chambers, and industry associations are working in concert rather than siloed. For example, an SME might attend an introductory digital awareness seminar by a local DIH, then get referred to NEURAL EDIH for a detailed **digital maturity assessment and expert consultation**, and if needed, connected to **SMACT’s labs for prototyping or testing** a solution. This creates a pipeline from initial awareness to actual implementation. **Impact:** Although relatively new, this integrated approach is already showing results – SMEs that engage with the hub network are able to identify appropriate technologies and often then apply for financial support (like vouchers or tax credits) with a clearer plan. The *coordinated, partnership-based model* avoids duplication of efforts and has been recognized at the national level as a model to emulate (tying together national competence centers and EU EDIHs). It aligns with the EU’s vision of one-stop-shops for digital transformation support. This practice particularly helps address the **knowledge and coordination gap (Challenge C4)** by simplifying the SME’s journey through various support instruments.
- **GP3: Targeted Training and Mentorship Programs (Digital Coaches)** – *Focus on human capital alongside technology.* Veneto, through initiatives like PID “**digital promoters**” and projects under ESF, has piloted programs where experts (sometimes called digital tutors or coaches) work directly with SMEs to craft digital strategies. **Why it’s effective:** Many small businesses need not just money, but guidance on **how to digitalise**. Having a **skilled mentor/consultant visit the company**, assess its processes, and suggest a step-by-step digital roadmap is immensely valuable. Some chambers employed “digital promoters” who performed free assessments and advice for SMEs as part of PID – a service that was well-received. In a similar vein, certain cluster associations in Veneto offered mentorship where successful entrepreneurs (“digital champions”) coached peer SMEs on technology adoption. **Impact:** These programs, though smaller in scale, have shown that participating SMEs make better use of technology and are more likely to complete their digital projects successfully (since they had guidance). By coupling mentorship with financial incentives, SMEs can use funds more effectively. This addresses **Challenge C3 (skills gap)** and **C2 (micro gap)** by building internal understanding within the SME, not just throwing equipment or software at them. The recommendation is to expand such coaching initiatives, possibly via EDIH (which has budget for advisory) or new ESF-funded projects.

Recommendations

Building on the above practices and the identified challenges, the following recommendations are offered for policymakers and stakeholders in Veneto's SME digitalisation journey:

- **Simplify and Integrate Access to Support (“No Wrong Door” approach):** Create a **unified digital portal or helpdesk** for SME digital transformation support in Veneto. SMEs should have a clear starting point to learn about all available programs (regional, national, EU). This could be an expansion of the **Infocamere/PID portal** to encompass regional specifics, or a dedicated section on the regione.veneto.it site that aggregates information on Transizione 4.0, vouchers, ERDF calls, EDIH services, etc. The **NEURAL EDIH** could be positioned as this gateway: as part of its mandate, it can ensure that any SME approaching it is guided to all relevant opportunities (effectively acting as a concierge). This addresses **fragmentation (C4)**. Additionally, continue simplifying application procedures where possible – e.g., extend the voucher model of short applications to some ERDF measures for micro-firms, and allow **more user-friendly reporting** (perhaps template-driven) so that administrative burden is minimized.
- **Tailor Support to Micro and Under-served SMEs:** To tackle **C2 (micro-enterprise gap)**, introduce **micro-grant bundles with coaching**. For example, a program that offers a small grant (say €5k) *plus* 20 hours of a consultant's time to a micro-business could ensure money is well-used. This could be delivered through EDIH or DIHs, effectively subsidizing consultancy alongside the hardware/software purchase. Also, consider **special outreach** for sectors like artisans, small retailers, farmers – perhaps through their trade associations – to promote digital tools relevant to them (point-of-sale digital systems, farm management apps, etc.). The key is ensuring the smallest firms are not intimidated by digitalisation. Continued funding of **Chamber vouchers** and perhaps increasing their budget (since demand often exceeds supply) is another concrete step.
- **Focus on Advanced Technologies & Innovation Capacity:** To overcome **C1 (low advanced tech adoption)**, Veneto should launch **targeted initiatives for AI, advanced manufacturing, and data analytics** in SMEs. For instance, a regional call (using ERDF or national funds) specifically for **SME AI adoption projects** – providing grants or innovation vouchers to those willing to implement AI or big data solutions. Partnering with universities and startups can help provide solutions. Also, expanding test facilities: SMOACT and other labs could host “*open house*” events where SMEs can see AI/robotics in action relevant to their industry. In addition, stimulate **sector-specific digital innovation hubs** – e.g., a digital agriculture hub in collaboration with agri-tech companies for the agro-food sector; or PropTech initiatives in construction. Strengthening **innovation financing** is related: encourage more venture capital and startup incubation in the region (perhaps through a regional co-investment fund) to boost the creation of digital startups that can both become new employers and offer innovative solutions to traditional SMEs.

- **Intensify Digital Skills Development:** Addressing **C3 (skills gap)** is crucial and requires a multi-pronged approach:
- **Education:** Work with educational institutions to update curricula – more coding, data science, and digital entrepreneurship content in universities and technical institutes. Veneto’s universities could expand ICT seats and programs in AI, cybersecurity, etc., possibly with scholarships to retain talent locally. Support vocational schools (ITS) that provide Industry 4.0 technician training; ensure their courses align with what local SMEs need (automation specialists, digital maintenance, etc.).
- **Upskilling current workforce:** Scale up programs like **Digital Skill vouchers for employees**, where SMEs get funding or tax breaks to train their staff (using certified training bodies or online courses in digital topics). The Transizione 4.0 tax credit for training is underutilized – promote it more aggressively in Veneto and simplify its use.
- **Attracting Talent:** The region might explore incentives to attract ICT professionals from elsewhere – for instance, housing support or tax incentives (like Italy’s “Brain Gain” tax break for repatriates) targeted to tech workers to choose Veneto’s cities as home. Encouraging **women in tech** and other underrepresented groups is also important (aligning with EU and national inclusion goals).

Furthermore, continue funding **awareness campaigns** highlighting the importance of digital skills at all levels (for SMEs owners – so they invest in their people, and for workers – so they pursue training). Ultimately, without more digitally skilled people, investment in tools will not fully translate to value.

- **Ensure Sustainable Digitalisation and Post-Project Support**
Many programs assist an SME up to the point of acquiring technology, but **follow-up support** is often lacking. It is recommended to implement a mechanism where, say **12-18 months after a grant**, the SME is revisited (by a chamber or EDIH advisor) to assess if the digital tool is implemented effectively, and offer additional help or peer-learning opportunities. This could be informal, but a structured “**post-adoption audit**” program could be considered. It would help address issues of under-utilization of purchased technology and provide data on impact (tackling **lack of impact tracking** issue). Also, promote **networking and peer learning**: create forums (physical or online) where SMEs that have digitalised share experiences. The EDIH can host periodic meetups for companies who went through digital projects to exchange lessons and possibly mentor those just starting.
- **Strengthen Data Infrastructure and Monitoring**
For **policy evaluation** and to refine future actions, improve the data collection on SME digitalisation at the regional level. Work with ISTAT/Eurostat to get more **granular data** (e.g., include enterprises with <10 employees in some surveys or do dedicated regional surveys)[94][95]. Also, integrate datasets – perhaps link the results of voucher programs, EDIH assessments, etc., to see correlations and outcomes. This will identify which types of support yield the best results. Strengthening data infrastructure also refers to continuing the expansion of digital

infrastructure: by 2025, aim for near 100% ultrabroadband coverage in Veneto (leveraging PNRR funds) and promote the adoption of advanced connectivity (5G, edge computing) in industrial zones. Connectivity is the foundation upon which digital tools rely.

By implementing these recommendations, Veneto can build upon its successes and address its weaknesses. The overarching theme is to move from a somewhat fragmented support landscape to a **more integrated, user-centric ecosystem** for SME digital transformation – one that not only provides funding but also knowledge, skills, and long-term partnership to SMEs on their digital journey. This will help ensure that digitalisation truly translates into sustained competitive gains, inclusive growth, and resilience for the region in the face of future challenges.

2.6. Data Infrastructure

To effectively steer and evaluate the digital transformation of SMEs, **data infrastructure and measurement tools** are essential. Veneto (and Italy) have put in place several mechanisms to monitor progress, but certain **data gaps remain** that hinder a fully informed policy cycle. This section outlines the available data tools and strategic frameworks, and identifies where improvements in data infrastructure are needed.

Digital Intensity Index (DII)

At the EU level, one key measure is the **Digital Intensity Index**, which assesses the use of 12 digital technologies by businesses (ranging from basic like internet and email to advanced like ERP, CRM, cloud) on a scale of 0-12. According to Eurostat, as of 2023 about **59% of all EU enterprises** (with ≥ 10 employees) had at least a basic level of digital intensity, while for SMEs it was $\sim 58\%$ [96]. Italy's performance on this index has improved: **around 52% of Italian enterprises with ≥ 10 employees** reached a basic level of digital intensity in 2023[97][98]. Among SMEs specifically, roughly **half of Italian SMEs** achieved that level (the earlier mentioned 50.4% for Slovenia, by comparison, shows Italy was likely a bit higher in the latest data)[97][98]. The DII provides a broad indication of digital uptake. It also highlights challenges: for instance, a survey found **66% of enterprises in Slovenia (a similar context) faced obstacles in digital transformation**, mainly lack of skills (41%) and financial constraints (37%)[99][56]. It's reasonable to assume Italian firms voice similar barriers. Veneto can leverage such findings to target those issues with policy (as it has tried with training and vouchers).

Strategic Monitoring Frameworks

Italy has established strategic frameworks that include monitoring of key indicators:

The **Strategy for Digital Italy / “Digital Agenda”** (now embodied in Italia Digitale 2026) sets targets (e.g. broadband coverage, digital public service usage, SME digitalisation) and

monitors them annually in collaboration with the EU's Digital Economy and Society Index (DESI) and Digital Decade Country Reports. Italy's 2024 Digital Decade Report, for instance, highlighted strengths (like e-health records adoption) and weaknesses (AI adoption, digital skills) with quantitative scores[82][12]. These reports provide a country-level assessment which regions can interpret at their level. - Veneto's **Smart Specialisation Strategy (S3)** has its own evaluation plan, tracking innovation projects and outcomes in its focus areas. However, S3 indicators are more broad innovation metrics (patents, R&D, etc.) and may not isolate digitalisation impact on SMEs.

Digital Maturity Assessment Tools: Through the EDIH and industry associations, Veneto has started to use **Digital Maturity Assessment (DMA) tools** for individual firms. For example, NEURAL EDIH offers a diagnostic where SMEs are evaluated across dimensions such as digital strategy, readiness, data management, automation & AI, etc.[100][101]. This yields firm-specific data and also helps aggregate region-level gaps. While these assessments are invaluable for one-on-one consulting, aggregated results (anonymised) could inform policy by showing common weaknesses (e.g., perhaps many SMEs score low in data analytics dimension – indicating a policy need for that area). Ensuring these tools are widely used (the target is to evaluate hundreds of SMEs via EDIH by 2025) will create a **rich dataset of SME digital maturity** in Veneto.

Surveys and Reports

Various bodies have conducted surveys that shed light on SME digitalisation: - **Digital Innovation Hub surveys:** e.g., Confindustria's DIH in Veneto regularly surveys member companies on Industry 4.0 adoption, identifying how many have implemented IoT, what barriers they cite, etc. - **ISTAT/Eurostat surveys:** The annual ICT usage survey by ISTAT gives data on Italian enterprises (≥10 employees) for things like social media use, e-commerce uptake, cloud computing usage (Italy in 2023: ~60% use social media for business, ~40% use cloud services, but only ~8% use AI as noted). Breaking this down to the **NUTS2 level (Veneto)** is sometimes possible if sample sizes allow, but often not publicly reported. Lobbying for more regional detail or commissioning a regional oversample could help. - **OECD and academic studies:** Occasionally, studies (like OECD reports or university research) focus on Italian SMEs' digital challenges and policy impact, providing qualitative and quantitative insights[102]. For instance, the OECD might study how Italian SME productivity links to ICT investment, etc.

Despite these data sources, several **gaps hinder full understanding:**

Micro-enterprises data

Most official stats (Eurostat, ISTAT) exclude enterprises with **fewer than 10 employees** from their ICT surveys[94]. Yet micro-firms are a huge part of Veneto's economy. This leaves a knowledge gap – we don't systematically know how, say, a 5-person artisan workshop is doing in digital adoption. Some clues come from chamber surveys or specific studies, but

not with the regularity and breadth of official surveys. Bridging this requires either adjusting survey frameworks or doing dedicated micro-enterprise digital surveys.

Longitudinal impact studies

There is a **lack of long-term studies** tracking the same SMEs over time to measure how digitalisation affects their performance[103][68]. For example, if an SME got a voucher in 2019, did we see its revenue or productivity climb by 2021? Did it hire more people? Such panel data would be extremely informative. Currently, evaluation tends to be immediate (number of grants, self-reported satisfaction, etc.) rather than over years. Implementing a panel study or linking program participant data with later performance (from financial statements) would improve understanding of efficacy.

Sector-specific analyses

More detailed data by **sector** is needed[104]. How does digital uptake vary in, say, textiles vs. machinery vs. food processing? And what specific digital tools are used in each? Understanding this can allow tailoring of policy by sector. There have been some efforts (the national Innovation Hub network often splits adoption data by broad sector), but finer granularity and region-specific sector insights would help Veneto prioritize (e.g., if we find tourism SMEs are digitalising fast but agriculture is lagging, that influences where to focus resources).

Integration of digital skills data with firm data

We have data on population digital skills and separate data on firm digital adoption, but linking the two is tricky[105][106]. For instance, if a firm trains its workers, do we see measurable improvement in its digital maturity next year? Or regions with higher digital skills – do their SMEs adopt tech faster? Such integrated analysis would need combined datasets or special surveys. Italy’s “BES” (Wellbeing) measures include some digital skill metrics and could possibly be correlated with enterprise outcomes regionally.

Evaluation of support mechanisms

There is limited systematic evaluation of the **effectiveness of each support program** beyond output metrics[95]. We lack, for example, rigorous studies on whether firms that received vouchers or tax credits performed better subsequently than similar firms that did not (controlling for other factors). Without such impact evaluation, it’s hard to fine-tune policy (though qualitatively, we believe they help). A recommendation is to engage independent evaluators (perhaps local universities or research centres) to assess major programs. One could use methods like comparing beneficiaries with a control group to estimate actual impact on growth or productivity.

By addressing these data gaps, policymakers would gain a **fuller picture** of SME digitalisation, enabling more targeted and effective measures.

In summary, **Veneto has a strategic framework and some tools for monitoring SME digitalisation (DII, surveys, EDIH assessments)**, but it should enhance its data infrastructure by including micro-firms, conducting longitudinal tracking, drilling down into sectors, and evaluating policy outcomes rigorously. This will ensure that the digital transformation drive is evidence-based and adaptive. With better data and feedback loops, Veneto can refine its approach – focusing resources where the biggest digital gaps and potential gains are – thereby achieving the dual goals of boosting SME competitiveness and ensuring no business is left behind in the digital era.

3. Summary

Nature and Significance of SME Digitalisation in Veneto: Digitalisation is a **critical driver of competitiveness and innovation** for Veneto's SME-dominated economy. SMEs make up over 99% of businesses and account for a large majority of employment and GDP in the region, so their performance significantly shapes Veneto's overall economic health^{[6][15]}. The adoption of digital tools – from basic IT to advanced Industry 4.0 technologies – has proven benefits: it improves productivity, expands market access (e.g., via e-commerce), enhances customer engagement, and can drive product or process innovation. In a region known for manufacturing excellence and export-oriented districts, integrating digital technologies helps firms maintain quality while increasing efficiency. Furthermore, Veneto's digitalisation efforts align with broader goals of **economic resilience and EU strategic frameworks**. Italy's national plans (PNRR, Digital Italy 2026) and EU initiatives (Digital Decade 2030 targets, Smart Specialisation strategy) emphasize SME digital uptake as a means to foster growth, cohesion, and green transition. By advancing digitalisation, Veneto supports these higher-level objectives and secures its place in an increasingly digital European single market.

However, the analysis also shows that **significant gaps remain**. Veneto's SMEs, on average, still **lag behind European frontrunners** in both basic and advanced digital technology adoption. While roughly 70% of Italian SMEs have basic digital intensity, that implies 30% still do not use even simple digital tools^[11]. The adoption of advanced digital tech (AI, big data, etc.) is even more limited – only ~8% of enterprises use AI^[11] – indicating that the **digital transformation is far from complete**. There are also disparities **between different SME segments**: micro vs. medium-sized, traditional sectors vs. tech-intensive ones, and even urban vs. more remote areas. For example, a medium manufacturer in Padova might be implementing IoT on the shop floor, while a 3-person workshop in a small town may still be entirely paper-based in its operations. These disparities highlight that benefits of digitalisation are not yet evenly distributed.

Moreover, **persistent structural issues** such as skill shortages, limited access to risk capital, and bureaucratic hurdles continue to inhibit the full potential of SME digitalisation. Veneto's unemployment is low, but as noted, the **shortage of ICT specialists and digitally skilled workers** is a bottleneck for many firms (with only ~4% ICT specialists in the workforce, below EU average[18]). Similarly, SMEs often struggle with complexity in accessing support or in rethinking their business models to integrate digital innovations deeply.

Main Policy Instruments Addressing SME Digital Transformation: To tackle these challenges, Veneto and Italy have developed a **multi-tiered, well-funded ecosystem of policy tools**. The most impactful include:

- **ERDF co-funded programs (Regional Operational Programme)** – providing **grants and financial support** for SME innovation and digital projects. For instance, the *Fondo Veneto Ricerca, Sviluppo e Innovazione* offers a combination of grants/loans up to €500k+ to stimulate R&D and digital adoption in SMEs[40]. This leverages EU funds to encourage strategic, larger-scale transformation efforts in companies, often leading to new digital processes or products.
- **National “Transizione 4.0” Incentives** – a broad scheme of **tax credits (worth €30k–€100k+ per firm)** to promote investment in advanced machinery, software, R&D and worker training[43]. This has driven many SMEs to undertake **comprehensive digital transformation projects**, from upgrading production lines with IoT-enabled equipment to implementing enterprise software and automation. It effectively reduces the cost of these investments by 40-50%, making projects viable that otherwise might be postponed or scaled down.
- **SME Digitalisation Vouchers** – *micro-financing tools* (small grants up to ~€10k) aimed at specific needs like building a website, acquiring e-commerce solutions, improving cybersecurity, or training staff[47]. These vouchers have a **high uptake among micro and small businesses**, reaching thousands of firms that would not engage with larger, complex programs[48][49]. They fill the gap for low-budget, immediate digital improvements and have been especially useful for retail, artisan and service SMEs adapting to digital marketing and online sales (notably during COVID).
- **European Digital Innovation Hub (EDIH – “NEURAL”) and Competence Centers** – providing **free or subsidized assessments, “test-before-invest” opportunities, and advanced tech training** for SMEs[50][51]. Veneto's EDIH, in partnership with the SMOACT Competence Center, has begun to **scale up SME digital capability** by offering expert consulting, linking companies to solution providers, and even facilitating partnerships (e.g., between SMEs and tech startups or research centers). These hubs ensure that even SMEs with limited know-how can embark on digital projects with guidance, thereby improving the effectiveness of any funding they receive.

Collectively, these instruments address different layers: funding (both large and small scale), advice and know-how, and strategic alignment with national/EU priorities. They are backed by substantial resources: **ERDF and PNRR funds, national budget allocations, and EU Digital Europe Programme funding**[107]. This multi-faceted support structure is a strength of the current policy approach – few SMEs in Veneto are completely without support options if they seek to digitalise.

Policy Challenges and Areas for Improvement: Notwithstanding the comprehensive policy toolkit, the analysis identified key **weaknesses and gaps** in the current approach:

- **Access & Awareness**

The multitude of programs can be confusing, especially for the smallest firms. Awareness of available support is uneven – some micro-enterprises remain unaware of vouchers or training credits. And even when aware, **low-capacity firms may struggle with application requirements**, leading to an access gap (Challenge C4)[70]. Essentially, those who might benefit most (e.g., a tiny family business with no IT staff) are the ones least likely to navigate the system successfully without help.

- **Advanced Digitalisation not yet Mainstream**

While basic digital tools have spread, **embedding advanced digitalisation into SME innovation models is still work in progress**. Many SMEs treat digital upgrades as one-off projects (e.g., buy a machine, set up a website) rather than an ongoing strategic transformation. Integrating technologies like AI, data analytics, or IoT into their core business remains rare – indicating cultural and knowledge barriers in addition to cost (Challenge C1).

- **Skills and Human Capital Gaps**

The **shortage of digital skills** both at the leadership level (SME owners/managers) and workforce level stands out. Without significantly boosting digital skills training, the risk is that even if technology is adopted, it may be underutilized or implemented sub-optimally. This is coupled with demographic issues (aging workforce, difficulty attracting young tech talent to some traditional industries). Challenge C3 highlights that only ~46% of Italians have basic digital skills and companies report weak internal capabilities[66]. This is a fundamental constraint on the speed and depth of digital uptake.

- **Sustainability of Change**

There is a tendency to focus on the initial implementation (getting hardware/software in place) but less on **sustained integration and evolution of digital business models** (as flagged in Table 11 weaknesses)[108][109]. Some SMEs may lapse in usage or fail to update technologies over time. Policies currently have limited mechanisms for follow-up support after the funding or project period ends. Ensuring digital transformation is not just a one-time checkbox, but an ongoing journey, is a challenge.

- **Coordination**

Coordination is needed both **horizontally (between programs)** and **vertically (national-regional-local)**. Instances of fragmentation or overlap have been

observed (e.g., multiple actors offering similar assessments). Challenge C5/C6 also indicate the need for better tailoring to geographic or sector needs – a one-size approach might leave some niches unserved[72]. The governance of the whole ecosystem could be improved by clear roles (e.g., EDIH as main entry point, chambers focusing on micro outreach, etc.) and information sharing.

Future Policy Priorities

To address these challenges, a number of priorities emerge for the next phase of the digital transformation effort:

- **Develop a Consolidated SME Digital Pathway**
As recommended earlier, create a more structured **“SME Digital Journey” framework**, guiding firms from initial awareness -> basic adoption -> advanced integration -> scale-up[110][111]. This could involve certification or milestone recognition (e.g., an SME goes from “digitally beginner” to “digitally competent” to “digitally innovative” with specific criteria). Align all support instruments along this pathway to ensure continuity. For instance, an SME might start with a free EDIH assessment (awareness), then use a voucher for a first step (basic adoption), then get a larger grant or tax credit for bigger investments (advanced integration), and finally connect to R&D or VC networks for innovative projects (scale-up).
- **Target Micro-SMEs with Integrated Support**
Launch initiatives specifically for **micro-enterprises combining diagnostic, mentoring, and micro-grants**[112][113]. Lower the barriers as much as possible – perhaps an “ease-of-access” track where application is via a simplified questionnaire and a digital facilitator helps the firm through it. Also, possibly consider **group applications** or cluster approaches (several micro firms in a local network apply together for a shared digital solution or training program).
- **Enhance Skills and Talent Pipeline**
Work closely with educational institutions and industry to **expand digital skill programs** – from coding in schools to ICT specialist university seats to re-skilling programs for mid-career workers. The recommendations included boosting ICT in higher education, incentivising women in tech, and using EDIHs as hubs for training and apprenticeship matchmaking[114][118]. Also, consider policies to **retain and attract talent** (like promoting Veneto’s high living standards and offering incentives to tech graduates to work in regional SMEs rather than moving abroad or to big corporations).
- **Post-funding Support and Networking:** Institute mechanisms for **post-project follow-up** (mentorship, peer learning, second-phase grants if needed)[115][116]. Encourage formation of SME peer networks or digital forums where those that have implemented solutions can guide others (perhaps supported by chambers or EDIH). This community approach can sustain momentum and drive home the message that digitalisation is continuous.
- **Data-Driven Policy Making**

Invest in improving the **data infrastructure** to better monitor progress and outcomes (as detailed in Section 2.6). For instance, track how many SMEs cross certain digital thresholds each year, use surveys to identify new barriers, and measure the ROI of support programs. This will allow fine-tuning of policies (e.g., if vouchers are seen to greatly boost e-commerce adoption but not AI, maybe introduce an “AI voucher” variant or additional AI-focused support).

In conclusion, Veneto has built a strong foundation for SME digital transformation through a range of policies and initiatives. The **impact so far is evident** in rising digital adoption rates, numerous success stories of SMEs innovating, and the region maintaining its economic dynamism even in challenging times. To fully realise the vision of a digitally empowered SME sector, Veneto must now focus on **bridging the remaining gaps** – ensuring that even the smallest or most traditional businesses can join the digital economy, that advanced technologies become more commonplace, and that the human element (skills, mindset, culture) keeps pace with technological advancements. By doing so, Veneto will not only secure its own future competitiveness and social well-being but also serve as a leading example in Europe of how a region steeped in tradition and craft can successfully transform itself for the digital age.

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methodology and example report[127][128] to ensure consistency with the expected structure and depth.)

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1. Regional Background Information

1.1. Introduction

Slovenia is a small Central European country, located at the crossroads of Western Europe, the Balkans, and the Alpine region. It shares borders with Italy, Austria, Hungary and Croatia, and has a small coastline along the Adriatic Sea. Slovenia's location makes it a key transit and logistics corridor between Western Europe and the Balkans, often referred to as a "gateway" country. With a population of approximately 2.1 million, it boasts a diverse economy encompassing manufacturing, services, and a burgeoning information and communication technology (ICT) sector. The nation's strategic location and well-developed infrastructure facilitate its role as a significant transit and trade hub in the region. In the European context, Slovenia actively participates in various EU initiatives, particularly those focusing on digital transformation and sustainable development. Its commitment to aligning with EU standards underscores its integration into the broader European framework.

The capital and largest city is Ljubljana, a political, cultural, and economic centre. On the NUTS2 level, Slovenia is divided in two cohesion regions:

- Eastern Slovenia (population: 1,105,046, area km²: 12,433, number of development regions: 8, number of municipalities 148, population density / number of inhabitants per km²: 88.9) and
- Western Slovenia (population: 1,003,931, area km²: 7,840, number of development regions: 4, number of municipalities 64, population density / number of inhabitants per km²: 128.1).

Economic Significance

Slovenia has a high-income, export-oriented economy, with a strong emphasis on manufacturing, automotive, pharmaceuticals, ICT, logistics, and increasingly green technologies. It was one of the most successful post-socialist economies in transitioning to a market-based system and was the first former Yugoslav republic to join the European Union (2004) and adopt the euro (2007).

Key economic indicators:

- GDP (2024): €67 billion
- GDP per capita: €31,490 (higher than the EU average in purchasing power terms)
- Yearly GDP growth volume: 1,6%
- Main exports: motor vehicles, machinery, pharmaceuticals and electronics.
- Strong SME sector: SMEs account for over 99% of businesses, contributing over 65% to employment.

Slovenia also ranks well in terms of macroeconomic stability, innovation capacity, and quality of infrastructure, including digital connectivity.

Socio-Demographic Characteristics

Slovenia has a population of approximately 2.1 million people (2024), making it one of the smallest EU countries by population. Key demographic characteristics include:

- Aging population: The median age is rising, currently around 44 years.
- Urbanization: About 55% of the population lives in urban areas, with Ljubljana being the largest urban centre.
- Education: High literacy rate (99.8%), with a strong tradition in science, technology, and engineering fields.
- Life expectancy: 82 years (among the highest in Central and Eastern Europe).

Slovenia consistently ranks high on social cohesion, quality of life, and environmental sustainability, with a well-developed welfare state and healthcare system.

Role in National and European Contexts

Slovenia plays a critical bridging role in:

- Regional economic development, especially through advanced sectors like ICT, green technology, and logistics.
- Promoting decentralization, innovation, and cross-border cooperation at the local/regional level (e.g., Podravje, Gorenjska, Goriška regions).
- Supporting digitalisation and green transformation through national strategic frameworks such as “Digital Slovenia 2030” and the “Smart Specialisation Strategy (S5)”.

Slovenia is an active and constructive member of the European Union, committed to upholding European values of democracy, rule of law, and sustainable development. Its role includes:

- Participation in the Schengen Area, Eurozone, and various EU agencies and missions.
- Leadership in EU cohesion policy, with experience in implementing EU-funded projects for regional development, digitalisation, and green transition.
- A voice in environmental policy, advocating for climate neutrality, biodiversity, and circular economy.
- Host of EU Presidency (last in 2021), promoting resilience, recovery, and rule of law in Europe.

Slovenia also contributes to international peacekeeping, diplomatic efforts, and is a member of NATO, OECD, and other multilateral organizations.

Regional Innovation Capacity

Slovenia is a Moderate Innovator with performance at 91% of the EU average in 2024. Performance is above the average of the Moderate Innovators (84.8%).

Transregional State of the Art Report

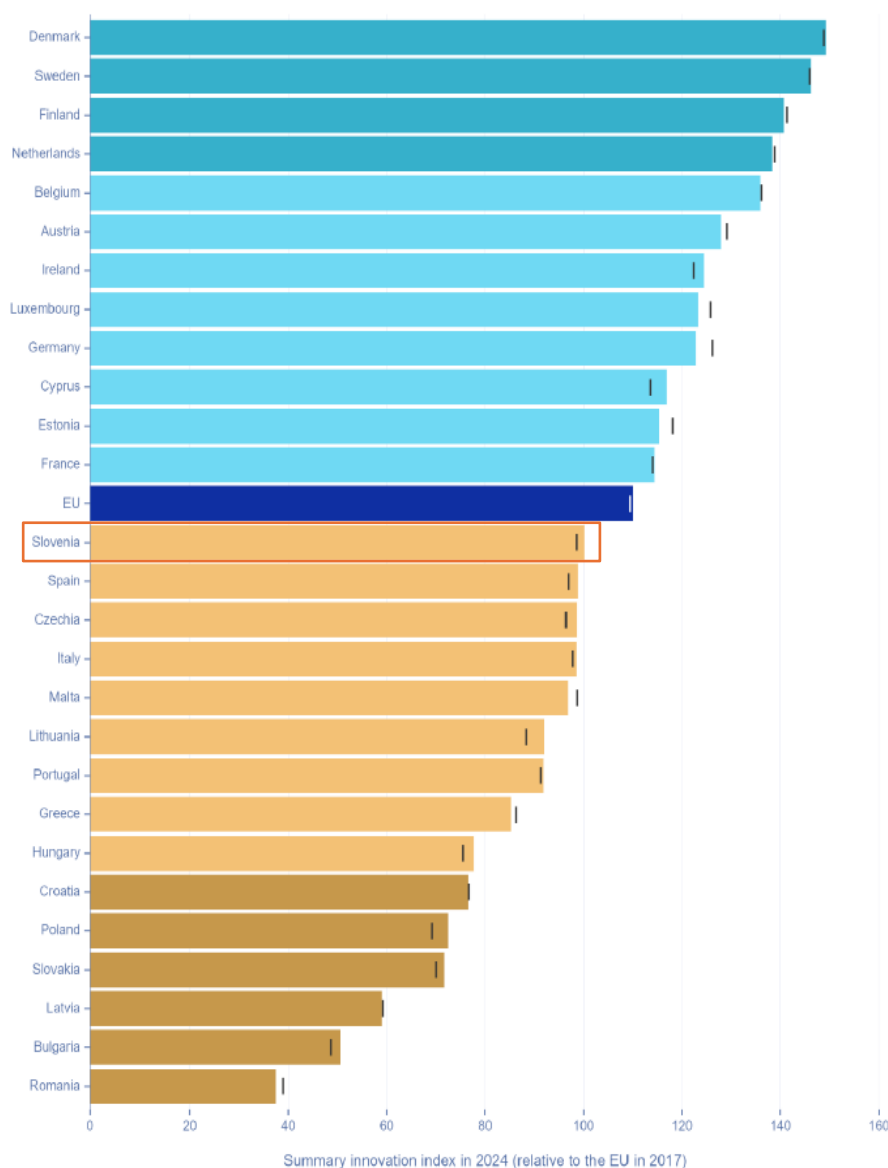
January 2026

SMEs and digitalisation:

- Strong increases are in the areas of SMEs introducing product innovations, employment in innovative enterprises and enterprises providing ICT training.
- Strong decreases are in areas of direct and indirect government support of business RCD and employed ICT specialists.
- Relative weakness affecting fostering of innovative SMEs (startups and scaleups) is also in venture capital expenditures.

Slovenia is committed to fostering innovation through digital transformation, particularly within SMEs.

Table 1: Innovation performance of the EU27, relative to the EU 2017 and compared to national performance in 2023.



1.2. Economic Profile of the Region

General Economic Overview

- **GDP:** Slovenia's gross domestic product (GDP) reached approximately €67 billion in 2024, up from €49 billion in 2014, indicating steady economic growth over the past decade. [exposlovenia.eu](https://www.exposlovenia.eu)
- **Economic Structure:** The economy is diversified, with significant contributions from manufacturing, services, and a growing information and communication technology (ICT) sector.
- **Trade:** Slovenia maintains strong trade ties within the European Union, with exports playing a crucial role in economic performance.

Role of SMEs in the Economy

- **Prevalence:** SMEs constitute 99.8% of all companies in Slovenia, underscoring their dominance in the business landscape.
- **Employment and Revenue:** These enterprises employ nearly 70% of the workforce and generate 65% of the total revenue among companies, highlighting their central role in economic activity.
- **Recent Trends:** In 2024, SMEs experienced a 0.7% increase in employment. However, real value added declined by 2.0%, following a 3.9% downturn in 2023. Micro firms saw decreases in both employment (-0.1%) and value added (-0.9%), while small businesses (10–49 employees) grew by 1.6% in employment and 1.7% in real value added.

ICT Sector Overview

- **Industry Significance:** Slovenia's ICT sector is a vital component of its economy, providing software and hardware solutions across various industries, including telecommunications, transport, public safety, and energy.
- **Innovation and Start-ups:** The country boasts a vibrant start-up ecosystem, with notable achievements such as the emergence of its first “unicorn” in the digital entertainment sector.
- **Talent Pool:** Slovenia's universities, particularly University of Ljubljana, University of Maribor, University of Primorska and University of Nova Gorica, produce a steady stream of well-educated, multilingual engineers, contributing to the sector's growth.

Digitalisation Maturity Among SMEs

- **Digital Intensity:** As of 2023, 59% of all EU businesses achieved a basic level of digital intensity. For SMEs, the figure was ca. 58%, indicating that a significant portion still lags in digital adoption. As of 2023, 50.4% of Slovenian SMEs achieved at least a basic level of digital intensity, below the EU average of 57.7%.

- **Advanced Technologies:** The adoption of advanced digital technologies such as cloud computing, big data analysis, and artificial intelligence among Slovenian SMEs remains below the EU average. 44.7% of enterprises adopted AI, cloud, or data analytics, compared to the EU average of 54.6%. Notably, only 19.1% adopted data analytics tools.
- **Government Initiatives:** Slovenia has implemented the "Digital Slovenia 2030" strategy, aiming to position the country among the top five most digitalised in Europe. This includes enhancing digital skills, infrastructure, and the integration of advanced technologies in businesses.

Slovenia's economy demonstrates resilience and diversification, with SMEs playing a pivotal role. While the ICT sector shows promising growth and innovation, there is a clear need for accelerated digital transformation among SMEs to enhance competitiveness and align with broader EU digitalisation goals. Due to the 2024 Digital Decade Country Report, Slovenian enterprises, especially SMEs, lag behind in the adoption of advanced technologies like data analytics. Besides that, the second weakness is significant shortage of ICT specialists. On the other hand, two main strengths are digital public services and e-health (e-health maturity scoring 87.6 out of 100), as well as connectivity infrastructure (78,5% FTTP coverage). However, respecting the results of the IMD World competitiveness ranking and World digital competitiveness ranking, in 2024 Slovenia lost four (4) positions in both compared to the 2023. Decrease in competitiveness is on the other hand closely related to the EU's market changes and decrease in economic growth.

1.3. HR Profile of the Region

Educational Attainment and Higher Education:

- **Tertiary Education:** As of 2022, 40% of Slovenians aged 25–64 have completed tertiary education, aligning with the EU average. This includes 8% with short-cycle tertiary education, 12% with a bachelor's degree, 16% with a master's, and 4% with a doctorate.
- **Upper Secondary Education:** Approximately 83% of adults aged 25–64 have attained at least an upper secondary education, surpassing the OECD average of 74%.
- **Basic Education:** Among individuals aged 25–34, 93% have completed upper secondary education, indicating a strong educational foundation among younger cohorts.

Lifelong Learning:

- **Adult Participation:** Slovenia actively promotes adult learning through initiatives like the Lifelong Learning Week and the Learning Parade. Despite these efforts, participation in adult learning remains below national targets, particularly among low-skilled, unemployed, and older adults.

- **EU Funding:** The Ministry of Cohesion and Regional Development has approved EU funding for projects aimed at raising awareness and encouraging greater involvement in lifelong learning, with a focus on digital and entrepreneurial skills.

Digital Skills and ICT Sector:

- **Basic Digital Skills:** In 2024, 46.7% of Slovenians possess at least basic digital skills, which is below the EU average of 55.6%.
- **ICT Specialists:** The proportion of ICT specialists in employment decreased from 4.5% in 2023 to 3.8% in 2024, compared to the EU average of 4.8%.
- **ICT Graduates:** ICT graduates constitute 4.1% of all graduates in Slovenia, slightly above the EU average of 3.9%. However, the country faces challenges in meeting the demand for highly qualified ICT professionals, with 69.3% of companies reporting difficulties in recruiting ICT specialists in 2021.

Entrepreneurship and ICT Education:

- **Entrepreneurship Education:** Slovenian higher education institutions are increasingly integrating entrepreneurship into their curricula. Initiatives include courses, extracurricular activities, and strategic frameworks aimed at fostering innovation and supporting graduates in launching their ventures.
- **Digital Slovenia 2030:** This strategic plan aims to position Slovenia among the top five most digitalized countries in Europe by 2030. It focuses on enhancing digital skills, infrastructure, and the integration of advanced technologies across various sectors.

Slovenia demonstrates a strong commitment to education, with high levels of upper secondary and tertiary attainment. While digital skills among the population are improving, there is a need for continued investment in digital literacy and ICT education to meet labour market demands. Lifelong learning initiatives and entrepreneurship education are key components of the country's strategy to foster a resilient and innovative workforce.

1.4. Socioeconomic Conditions and Employment Opportunities

Slovenia's labour market remains robust, with an employment rate of 72.9% in late 2024, reflecting a historically high level of workforce participation.

However, the country faces notable labor shortages in several sectors:

- **Construction and Skilled Trades:** High demand persists for building and related trades workers, excluding electricians.
- **Metal and Machinery Industries:** There is a significant need for metal, machinery, and related trades workers.
- **Healthcare:** Health professionals are among the most sought-after, indicating a pressing need in the healthcare sector.

Conversely, surplus labour is evident in fields such as legal, social, and cultural professions, as well as in business and administrative associate roles.

The job vacancy rate in Slovenia stood at 2.7% in mid-2024, with the construction sector experiencing particularly high vacancy rates, underscoring ongoing labour shortages.

Salary Levels and ICT Sector Insights

General Salary Overview:

- Average Gross Monthly Salary: €2,496.61 as of March 2025, marking a 5.9% year-over-year increase in real terms.
- Average Net Monthly Salary: Approximately €1,569.12 after mandatory deductions.
- Minimum Wage: €1,253.90 per month in 2024, translating to an annual minimum of €15,333.

ICT Sector Salaries:

The ICT sector in Slovenia offers competitive salaries, reflecting the high demand for skilled professionals:

- Software Engineers: Annual salaries range from €30,781 to €78,000.
- DevOps Engineers: Earnings between €45,000 and €70,000 annually.
- Software Engineering Managers: Up to €102,100 per year.
- IT Directors: Approximately €85,000 annually.

Overall, the average annual salary for tech professionals in Slovenia is around €44,423, slightly below the EU average of €46,800.

Comparative Perspective with Other European Countries:

When compared to other European nations, Slovenia's average gross salary positions it in the mid-range:

- Slovenia: €2,496.61/month.
- Germany: Approximately €3,975/month.
- Austria: Around €3,700/month.
- Croatia: Approximately €1,500/month.

In the ICT sector, Slovenia's salaries are competitive within the region but remain lower than those in Western European countries. However, the country's lower cost of living can offset this discrepancy, making it an attractive destination for tech professionals.

Slovenia's labour market is characterized by high employment rates and sector-specific labour shortages, particularly in construction, manufacturing, and healthcare. The ICT sector continues to grow, offering lucrative opportunities for skilled professionals. While salaries are moderate compared to Western Europe, the balance between earnings and living costs positions Slovenia as a compelling option for both domestic and foreign workers.

2. Analysis and Assessment of Policy Instruments

Slovenia has implemented several policy instruments over the past 5 years, to enhance the digitalisation of small and medium-sized enterprises (SMEs), as well as their competitiveness and integration into the digital economy. These initiatives aim to foster digital transformation and align with broader European Union (EU) digital objectives. Below is an overview of key policy instruments, their goals, measures, and available data on outcomes.

2.1. Policy Instruments

Digital Transformation Strategy of the Slovenian Economy (2021–2030)

Table 2: Digital Transformation Strategy of the Slovenian Economy (2021–2030)

Instrument name	Digital Transformation Strategy of the Slovenian Economy (2021– 2030)
Duration	2021 – 2030 Managed by the Ministry of the Economy, Tourism and Sport
Description of goals	<ul style="list-style-type: none"> • Position Slovenia among the top five EU countries in digital adoption by 2025. • Accelerate the integration of advanced technologies such as AI, IoT, and blockchain into SMEs' business models.
Relevance to national and regional strategies	Digital Slovenia 2030
Enhancing digitalisation of SMEs	<p>Measures:</p> <ul style="list-style-type: none"> • Support for investment in hybrid cloud infrastructure. • Incentives for RCD and adoption of digital platforms. • Funding for digital skills training and cyber-security. <p>Funding s Support:</p> <ul style="list-style-type: none"> • Total allocation: €56.5 million from the Recovery and Resilience Plan. • Implementing bodies: Ministry of the Economy, SPIRIT Slovenia, Slovene Enterprise Fund (SEF), and SID Bank. <p>Results:</p>

	<ul style="list-style-type: none"> • Supported hundreds of SMEs in initiating digital transformation projects. • Contributed to the development of national platforms for e-business and B2B systems.
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Incentives for the Digital Transformation of SMEs (P4D 2025)

Table 3: Incentives for the Digital Transformation of SMEs (P4D 2025)

Instrument name	Incentives for the Digital Transformation of SMEs (P4D 2025)
Duration	2024 – 2026 Managed by the Slovenian Enterprise Fund (SEF)
Description of goals	<ul style="list-style-type: none"> • Comprehensive Digital Transformation: Encourage SMEs to adopt digital operating models and adjust to digital markets. • Competence Development: Provide training to improve staff digital competencies within supported SMEs. • Process Optimization: Foster material and energy-efficient processes in supported SMEs. • Value Addition: Increase the added value per employee by at least 3% in participating companies.
Relevance to national and regional strategies	Strategy of Digital Transformation of the Slovenian Economy (2021–2030) Slovenia 2024 Digital Decade Country Report
Enhancing digitalisation of SMEs	<p>Financial Support: Non-repayable grants of up to €100,000, covering 50% of eligible costs.</p> <p>Project Focus Areas:</p> <ul style="list-style-type: none"> • Improving customer experience through digital means. • Efficient data collection, processing, and visualization. • Developing digital solutions to support business and production processes. • Rolling out digital business models.

	<ul style="list-style-type: none"> • Cultivating digital culture and upskilling the workforce. • Investing in cybersecurity infrastructure and building cyber resilience. • Implementing Industry 4.0 projects. <p>Total Budget: €17.8 million.</p> <ul style="list-style-type: none"> • €9.4 million allocated for the Cohesion Region of Eastern Slovenia. • €8.4 million allocated for the Cohesion Region of Western Slovenia. <p>Funding Source: €15 million contributed by the European Regional Development Fund.</p> <p>Expected Outcomes and Impact:</p> <ul style="list-style-type: none"> • Number of Supported SMEs: The program anticipates supporting approximately 175 to 178 SMEs in implementing digital transformation initiatives. • Employee Competency Enhancement: A significant focus is placed on improving the digital skills of employees within the supported enterprises. • Economic Impact: Targeted increase in added value per employee by a minimum of 3% in participating companies.
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Incentives for the Digital Transformation of SMEs (P4D ReactEU 2022)

Table 4: Incentives for the Digital Transformation of SMEs (P4D ReactEU 2022)

Instrument name	Incentives for the Digital Transformation of SMEs (P4D ReactEU 2022)
Duration	2020 – 2023 Managed by the Slovenian Enterprise Fund (SEF)

Description of goals	<ul style="list-style-type: none"> • To facilitate the digital transformation of key production and business processes within SMEs. • To enhance the digital competencies of employees in supported enterprises. • To increase the added value per employee by at least 3% in the participating companies. • To promote the adoption of advanced digital technologies, including Industry 4.0 solutions and cybersecurity measures.
Relevance to national and regional strategies	Strategy of Digital Transformation of the Slovenian Economy (2021–2030)
Enhancing digitalisation of SMEs	<p>Financial Support: Non-repayable grants ranging from €30,000 to €100,000, covering up to 60% of eligible costs.</p> <p>Project Focus - investments aimed at:</p> <ul style="list-style-type: none"> • Enhancing customer experience through digital means. • Implementing data collection, processing, and visualization tools. • Developing digital solutions to support business and production processes. • Introducing digital business models and processes. • Developing digital skills and fostering a digital culture within the organization. • Ensuring cybersecurity and integrating Industry 4.0 technologies. <p>Funding and Financial Allocation</p> <ul style="list-style-type: none"> • Total Budget: €30 million allocated for the entire program duration. • Funding Source: Entirely financed by the European Regional Development Fund under the React-EU initiative. • Expected Reach: The program aimed to support at least 300 projects over its lifespan. <p>Outcomes and Impact</p> <ul style="list-style-type: none"> • Number of Supported SMEs: The program anticipated supporting at least 300 SMEs in implementing digital transformation initiatives. • Employee Competency Enhancement: A significant focus was

	<p>placed on improving the digital skills of employees within the supported enterprises.</p> <p>Economic Impact: Targeted an increase in added value per employee by a minimum of 3% in participating companies.</p>
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European Digital Innovation Hubs 2022–2025, DIH Slovenia (DIGI-SI)

Table 5: European Digital Innovation Hubs 2022–2025, DIH Slovenia (DIGI-SI)

Instrument name	European Digital Innovation Hubs 2022–2025, DIH Slovenia (DIGI-SI)
Duration	2022 - 2025
Description of goals	<p>Offer a one-stop shop for digital innovation services to SMEs, including testing, training, and financing support.</p> <ul style="list-style-type: none"> • Support 700 companies in digital transformation efforts • Increase digital maturity of service users by 10% to 20% • Provide services such as pre-investment testing, skills development, investor matchmaking, and innovation ecosystem scaling
Relevance to national and regional strategies	Strategy of Digital Transformation of the Slovenian Economy (2021–2030) Slovenia 2024 Digital Decade Country Report
Enhancing digitalisation of SMEs	<p>Budget: €3.3 million</p> <p>Focus Areas:</p> <ul style="list-style-type: none"> • Artificial Intelligence (AI) • High-Performance Computing (HPC) • Cybersecurity • Advanced Digital Skills <p>Target Sectors: Agri-food, Healthcare, Manufacturing, Tourism</p> <p>Services offered:</p> <ul style="list-style-type: none"> • Digital Maturity Assessments: Evaluating the current digital capabilities of organizations to identify areas for improvement. • Pre-Investment Testing: Allowing companies to test digital

	<p>solutions before full-scale implementation.</p> <ul style="list-style-type: none"> • Training and Skills Development: Offering courses and workshops to enhance digital competencies among employees. • Access to Funding: Assisting organizations in identifying and applying for financial support for digital projects. <p>Innovation Ecosystem Integration: Connecting organizations with research institutions, technology providers, and other stakeholders to foster innovation.</p>
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European Digital Innovation Hubs 2022–2025, SRC-EDIH (Smart Rural Communities EDIH)

Table c: European Digital Innovation Hubs 2022–2025, SRC-EDIH (Smart Rural Communities EDIH)

Instrument name	European Digital Innovation Hubs 2022–2025, SRC-EDIH (Smart Rural Communities EDIH)
Duration	2022 - 2025
Description of goals	<p>Offer a one-stop shop for digital innovation services to SMEs, including testing, training, and financing support.</p> <ul style="list-style-type: none"> • Support over 100 organizations and more than 1,000 employees in acquiring digital skills • Provide access to 100 training courses and 11 test environments • Offer services that are 80–100% subsidized
Relevance to national and regional strategies	Strategy of Digital Transformation of the Slovenian Economy (2021–2030) Slovenia 2024 Digital Decade Country Report
Enhancing digitalisation of SMEs	<p>Budget: €3 million</p> <p>Focus Areas:</p> <ul style="list-style-type: none"> • Artificial Intelligence (AI) • High-Performance Computing (HPC) • Cybersecurity • Blockchain • Robotics <p>Target Sectors: Manufacturing companies and public sector</p>

	<p>organizations</p> <p>Services offered:</p> <ul style="list-style-type: none"> • Digital Maturity Assessments: Evaluating the current digital capabilities of organizations to identify areas for improvement. • Pre-Investment Testing: Allowing companies to test digital solutions before full-scale implementation. • Training and Skills Development: Offering courses and workshops to enhance digital competencies among employees. • Access to Funding: Assisting organizations in identifying and applying for financial support for digital projects. <p>Innovation Ecosystem Integration: Connecting organizations with research institutions, technology providers, and other stakeholders to foster innovation.</p>
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SME Vouchers for Digitalisation

Table 7: SME Vouchers for Digitalisation

Instrument name	SME Vouchers for Digitalisation
Duration	<p>2019 – 2023</p> <p>Managed by the Slovenian Enterprise Fund (SEF)</p>
Description of goals	<ul style="list-style-type: none"> • Enhance Digital Competencies: Empower SMEs to improve their digital skills and knowledge. • Promote Digital Marketing: Support the adoption of digital marketing strategies to increase competitiveness. • Develop Digital Strategies: Assist in formulating comprehensive digital transformation plans. • Strengthen Cybersecurity: Encourage the implementation of robust cybersecurity measures.
Relevance to national and regional strategies	<p>Strategy of Digital Transformation of the Slovenian Economy (2021–2030)</p>

Funding details:

- Co-financing Rate: Up to 60% of eligible costs.
- Maximum Grant per Voucher: €9,999.99.
- Annual Cap per Enterprise: €30,000.
- Application Process: Simplified and fast-tracked, with e-voucher submissions available through the SEF portal.

Types of Vouchers

1. Digital Competencies Voucher

- Purpose: Enhance employee and management digital skills.
- Eligible Activities: Training programs (group or individual) to raise digital competencies.
- Funding Range: €600 – €9,999.99.

2. Digital Strategy Voucher

- Purpose: Develop a comprehensive digital transformation strategy.
- Components:
 - Assessment of current digital status.
 - Plan for developing digital capabilities.
 - Strategy covering areas like customer experience, data strategy, business processes, digital business models, digital culture, cybersecurity, and Industry 4.0.
- Funding Range: €1,000 – €9,999.99.

3. Digital Marketing Voucher

- Purpose: Implement digital marketing tools to boost competitiveness and revenue.
- Eligible Activities:
 - Website development and testing (€500 – €1,500).
 - Mobile application development and testing (€500 – €2,000).
 - Online store creation (€500 – €2,500).
 - Reservation platform development (€500 – €2,500).

	<ul style="list-style-type: none"> • Maximum Co-financing: €8,500 per enterprise. <p>4. Cybersecurity Voucher</p> <ul style="list-style-type: none"> • Purpose: Improve cybersecurity measures within SMEs. • Eligible Activities: <ul style="list-style-type: none"> ○ System security inspections, including safety and technical reports (€1,000–€5,000). ○ Penetration testing with comprehensive reporting (€1,000 –€9,999.99). <p>Program Impact</p> <ul style="list-style-type: none"> • Total Funding Allocated (201G–2023): €23.7 million. • Vouchers Awarded: Over 5,000 approved from more than 10,000 applications. • Most Popular Voucher: Digital Marketing Voucher, especially during the COVID-19 pandemic. • Processing Efficiency: Rapid evaluation and fund disbursement, often within one month of final request submission.
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E-Business 201G–2022 program

Table 8: E-Business 201S–2022 program

Instrument name	Public Tender for the Establishment or Upgrade of Electronic Commerce in SMEs (E-Business 201G-2022)
Duration	2019 – 2022 Managed by SPIRIT Slovenia Business Development Agency
Description of goals	<ul style="list-style-type: none"> • Enhance International Competitiveness: Support SMEs in adopting electronic business practices to facilitate easier entry into global value chains and new markets. • Improve Business Interactions: Accelerate and streamline interactions with foreign business partners through digital means. • Optimize Information Exchange: Enable more efficient sending and receiving of information, thereby improving relationships throughout the supply chain.

Relevance to national and regional strategies	Strategy of Digital Transformation of the Slovenian Economy (2021–2030)
Enhancing digitalisation of SMEs	<p>Eligible Activities</p> <ol style="list-style-type: none"> 1. Electronic Exchange Between Partners: Developing or upgrading systems for electronic data interchange with suppliers, customers, and distributors. 2. Digitization of Appearances at Trade Fairs: Creating digital content for virtual presentations at international trade events. 3. Websites for Foreign Markets: Designing and launching multilingual websites tailored to international audiences. 4. Online Stores: Establishing e-commerce platforms to sell products or services online. 5. Product-Sales Videos: Producing promotional videos to showcase products or services to potential foreign clients. 6. Strengthening Competences – Training: Conducting training sessions to enhance employees' digital skills and competencies <p>Funding:</p> <ul style="list-style-type: none"> • Co-financing Rate: Up to 70% of eligible costs. • Grant Amount: Between €5,000 and €30,000 per enterprise. • Funding Sources: European Regional Development Fund (ERDF) and the Republic of Slovenia. • Total amount of allocated funding: €12,364,818.01 • Total amount of SMEs supported: 461

2.2. General Assessment

Slovenia has made steady progress in fostering digitalisation among its SMEs, driven by targeted policy instruments and EU funding. However, progress remains uneven across regions and sectors:

- Around 50.4% of Slovenian SMEs achieved a basic level of digital intensity (2023), which is below the EU average (57.7%).
- Use of advanced technologies (e.g. AI, big data analytics, cloud computing) is still limited, particularly among micro-enterprises.
- Digital skills among SME employees are also below EU benchmarks, with only 46.7% of adults having at least basic digital skills, compared to 55.6% EU-wide.

Sectoral and Regional Differences

More advanced sectors are:

- ICT and software development – naturally lead due to internal capacities.
- Manufacturing – especially larger SMEs integrating automation and Industry 4.0 technologies.
- Tourism and services – with strong uptake of e-marketing and digital booking platforms. On the other hand, less advanced sectors:
- Construction, agriculture, and some craft-based industries lag in adopting digital tools.
- Micro-enterprises and businesses in Eastern Slovenia face additional barriers, such as limited access to digital talent and advisory services.

Key Issues and Gaps

- **Digital Divide by Size and Region:**
- Micro and rural SMEs have lower digital maturity compared to larger urban-based companies.
- **Low Adoption of Advanced Technologies:**
- Technologies like artificial intelligence, data analytics, and blockchain are adopted by only a minority of SMEs.
- **Digital Skills Shortages:**
- A mismatch between available workforce skills and digital transformation needs, particularly in older demographics and low-skilled sectors.
- **Fragmented Support Landscape:**
- While many support schemes exist, SMEs often find them complex, under- publicised, or administratively demanding.
- **Insufficient Long-Term Impact Data:**
- Limited tracking of how digital investments affect productivity, competitiveness, and innovation over time.

Digitalisation policy agenda and instruments

Digitalisation of SMEs is a high political and economic priority in Slovenia, reflected in multiple national strategies aligned with EU goals:

- Digital Slovenia 2030: National roadmap targeting 80% digital skill attainment by 2030 and top 5 EU ranking in digitalisation.
- Strategy for Digital Transformation of the Economy (2021–2030): Focuses on Industry 4.0, AI, IoT, cybersecurity, and green transition.
- Slovenian Sustainable Smart Specialisation Strategy – S5: one of 10 identified strategic priority areas in which Slovenia demonstrates comparative advantages, is Horizontal network of information and communication technologies (ICT).

Key support programs and measures

Table S: Key support programs and measures

Program	Description	Status
P4D Programs (201G–2025)	Incentives for SMEs to adopt digital tools, processes, and business models	Hundreds of SMEs supported with grants up to €100,000
SME Digital Vouchers	Targeted, low-barrier funding for digital skills, marketing, cybersecurity, and strategy	Over 5,000 vouchers awarded
E-BUSINESS 201G–2022	Support for e-commerce, trade fair digitisation, and B2B tools	€5,000–€30,000 grants to dozens of SMEs
EDIH Slovenia (DIGI-SI, SRC-EDIH)	Free/discounted support for digital maturity assessments, testing, and training	Target to serve 800+ organisations by 2025

Sources of funding

- European Regional Development Fund (ERDF)
- Recovery and Resilience Plan (RRP Slovenia)
- National and SPIRIT Slovenia funds
- Digital Europe Programme (EDIH)

2.3. Identification of Policy Challenges

Proceeding with the structured analysis of the digitalisation policy instruments for SMEs in Slovenia, including an evaluation of their effectiveness, identified challenges, weaknesses, and alignment with national and regional policies, results are presented below.

Policy challenges

Table 10: Policy challenges

Title of the Challenge	Description of the challenge
C1: Low adoption of advanced technologies	AI, cloud, IoT, and data analytics remain underused across most SME sectors
C2: Micro-enterprise gap	Micro-SMEs struggle to access or qualify for larger digital transformation schemes

C3: Skills gap	46.7% of population has basic digital skills (below EU average); weak internal ICT capabilities in SMEs
C4: Administrative barriers	Some SMEs find application processes complex or capacity-draining
C5: Geographic disparity	Eastern Slovenia lags in SME digital intensity and tech uptake
C6: Sectoral imbalance	Traditional sectors (e.g., agriculture, crafts, construction) lag significantly behind services, ICT, and manufacturing

Weaknesses and areas to be improved

Table 11: Weaknesses and areas to be improved

Title of the area	Description of the weakness
Evaluation	Limited monitoring and impact tracking of funded projects (lack of KPIs for competitiveness gains, innovation output)
Sustainability	Focus mostly on implementation (e.g. acquiring tools), less on sustained integration and digital business models
Access for under-resourced SMEs	Low awareness or internal capacity to prepare digital strategy/action plans inhibits access
Scalability	Programs are not always adapted for scalable digital business models or rapid innovation needs
Synergy	Fragmentation between national, regional, and EU-level support programs without unified digital navigation support

Impact assessment of policy instruments

Table 12: Impact assessment of policy instruments

Positive Impacts	Barriers and Missed Needs
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<ul style="list-style-type: none"> • P4D Programs supported hundreds of SMEs in comprehensive transformation efforts with >3% productivity targets. • Vouchers reached 5,000+ SMEs across Slovenia, especially in digital marketing, a critical area during COVID-19. • E-BUSINESS enabled modernization of customer-facing and B2B platforms. • EDIHs began offering high-quality diagnostics and test-before-invest tools in priority sectors (agri-food, tourism, public sector). 	<ul style="list-style-type: none"> • SMEs lacking internal digital strategy capabilities are excluded from some programs (P4D, EDIH). • Need for custom sector-based programs with built-in coaching/consulting components. • Persistent lack of qualified ICT professionals affects implementation post-funding. • No formal digital transformation pathway for SMEs – no bundled progression from readiness to scale-up.
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Linking to National s Regional Policy

Table 13: Linking to National & Regional Policy

Title of the challenge	Description of the link to policy
Skills C workforce gaps	Aligned with Digital Slovenia 2030 and RRP goals to upskill 80% of population by 2030
Micro-enterprise exclusion	Conflicts with S5 priority to foster inclusive, smart growth; requires targeted inclusion tools
Regional digital divide	Echoed in Cohesion policy 2021–2027, calling for balanced regional digital development
Fragmented support access	Digital Slovenia 2030 envisions integrated digital support ecosystems (not yet realized)
Advanced tech adoption	Core objective in Strategy for Digital Transformation of the Economy, needing deeper sector-specific focus

Summary s Recommendations

Key Challenges

- Access C Awareness: Especially for small, rural, low-capacity firms.

- Advanced Digitalisation: Still not mainstreamed into SME innovation models.
- Sustainability of Change: Need follow-up mechanisms post-grant.
- Coordination: Between national, EU, regional instruments.

Future Policy Priorities

- Develop a National SME Digital Pathway Framework: from readiness to transformation to innovation.
- Target micro-enterprises with low-barrier diagnostic+ mentoring + microgrants bundles.
- Invest in sector-specific advisors and digital coaches within EDIHs or regional SPOT centres.
- Scale up post-grant support: digital maturity re-assessment, peer learning, tech benchmarking.
- Strengthen data collection and longitudinal monitoring of digital impacts.

2.4. Regional Competitiveness

Economic Impact of SME Digitalisation

GDP per Capita

In 2024, Slovenia's GDP per capita reached €31,490, marking a 1.6% increase from the previous year. This growth reflects the positive contributions of innovation initiatives, particularly among SMEs adopting advanced technologies and digital business models.

Employment Rates

The employment rate in Slovenia in 2023 was at 72.5%, surpassing the EU average of 70.4%. Unemployment rate is historically low at 4%. 86.3% of the active workforce were from Slovenia, 2% from other EU Member States and 11.7 from third countries. Digitalisation has facilitated job creation within SMEs, especially in sectors embracing digital tools and platforms (11,822 enterprises and 33,722 employees in ICT sector). Still, the job vacancy rate in ICT sector lowered in 2023 compared with 2022 (from 3.4 to 2.2).

Salary Levels in ICT and High-Tech Sectors

The ICT sector in Slovenia experienced a 7.7% increase in salaries from 2023 to 2024, indicating robust growth and demand for digital skills. However, the average gross earnings in Slovenia were €2,222 in 2023, below the EU27 average of €3,417, highlighting a wage gap that digitalisation efforts aim to bridge.

The ICT sector in Slovenia offers competitive salaries, reflecting the high demand for skilled professionals:

- Software Engineers: Annual salaries range from €30,781 to €78,000.

- DevOps Engineers: Earnings between €45,000 and €70,000 annually.
- Software Engineering Managers: Up to €102,100 per year.
- IT Directors: Approximately €85,000 annually.

Overall, the average annual salary for tech professionals in Slovenia is around €44,423, slightly below the EU average of €46,800.

Social Impact: Quality of Life

Slovenia ranks 13th in Europe on the Quality of Life Index, with a score of 169.3, surpassing neighbouring countries like Croatia and Hungary. Digitalisation contributes to this standing by enhancing access to services, promoting remote work, and improving overall life satisfaction.

Due to the OECD Better Life Index, Slovenia performs well across a number of well-being dimensions relative to other countries in the Better Life Index. Slovenia outperforms the average in education, safety and social connections. It underperforms average in income and life satisfaction.

Innovation Capacity: Regional Innovation Index

Considering the European Innovation Scoreboard, Slovenia is a Moderate Innovator with performance at 91% of the EU average in 2024. Performance is above the average of the Moderate Innovators (84.8%). Unfortunately, performance is increasing less than the EU (+10%). Related to the SMEs and digitalisation, strong increases since 2017 are in the areas of SMEs introducing product innovations, employment in innovative enterprises and enterprises providing ICT training. Strong decreases in the same period are in areas of direct and indirect government support of business RCD and employed ICT specialists. Relative weakness affecting fostering of innovative SMEs (startups and scaleups) is also in venture capital expenditures. This classification underscores the country's commitment to fostering innovation through digital transformation, particularly within SMEs.

Key Challenges and Areas for Improvement

Despite these advancements, several challenges hinder the full potential of SME digitalisation in Slovenia:

- **Digital Divide:** Disparities exist between urban and rural areas, with Eastern Slovenia lagging in digital adoption.
- **Skills Shortage:** The percentage of ICT specialists in employment decreased from 4.5% in 2023 to 3.8% in 2024, below the EU average of 4.8%.
- **Access to Finance:** Limited venture capital and funding opportunities constrain SME growth and innovation.
- **Sectoral Imbalances:** Traditional sectors like agriculture and construction are slower in adopting digital technologies compared to ICT and manufacturing.

Digitalisation of SMEs in Slovenia has positively influenced economic growth, employment, and innovation. However, to sustain and enhance these benefits, targeted efforts are needed to bridge regional disparities, address skill shortages, and improve access to finance. Continued commitment to strategic policies and investment in digital infrastructure will be crucial in maintaining Slovenia's competitive edge in the European landscape.

2.5. Good Practices and Recommendations

Presented good practices and recommendations are based on successful Slovenian policy instruments that support SME digitalisation. These instruments have shown tangible results and hold strong potential for transregional transfer and adaptation in other European contexts.

Table 14: Good practices

Title of the Good Practice	GP Description
<p>GP1: SME Digitalisation Vouchers</p>	<p>Why it works:</p> <ul style="list-style-type: none"> • Low-barrier access to co-financing for specific digitalisation services. • Tailored to SME needs (e.g. digital marketing, digital strategy, cybersecurity, upskilling). • Fast, simple application and processing (monthly open calls, minimal bureaucracy). <p>Impact:</p> <ul style="list-style-type: none"> • Over 5,000 SMEs supported between 2019 and 2023. • Widespread use among micro- and small enterprises. • Strong uptake during the COVID-19 period for e-commerce and digital promotion. <p>Transferability Potential:</p> <ul style="list-style-type: none"> • Modular and easily replicable model. • Suitable for local/regional adaptation in countries with large numbers of micro SMEs.

<p>GP2: Incentives for Digital Transformation of SMEs - P4D</p>	<p>Why it works:</p> <ul style="list-style-type: none"> • Offers larger-scale grants (€30,000–€100,000) for integrated digital transformation. • Requires SMEs to develop a digital transformation action plan (strategic orientation). • Encourages restructuring of business models and internal processes. <p>Impact:</p> <ul style="list-style-type: none"> • Hundreds of SMEs supported in comprehensive digital upgrades. • Focus on added value per employee, process efficiency, and digital skills training. <p>Transferability Potential:</p> <ul style="list-style-type: none"> • Excellent model for national innovation funds targeting high- potential or growth-oriented SMEs. <p>Combines funding with strategic thinking and encourages uptake of Industry 4.0 tools.</p>
<p>GP 3: E-Business (2019–2022)</p>	<p>Why it works:</p> <ul style="list-style-type: none"> • Targeted digitalisation of customer-facing and B2B e-commerce infrastructure. • Financed websites for foreign markets, online stores, digital trade fair participation, and promotional video creation. <p>Impact:</p> <ul style="list-style-type: none"> • Enhanced international competitiveness of Slovenian SMEs. • Particularly useful for export-oriented SMEs in traditional sectors. <p>Transferability Potential:</p> <ul style="list-style-type: none"> • High potential for adoption in export-intensive regions or where traditional SMEs need entry points into digital trade.

<p>GP4: European Digital Innovation Hubs (DIGI-SI C SRC-EDIH)</p>	<p>Why it works:</p> <ul style="list-style-type: none"> • Free or heavily subsidised digital maturity assessments, training, and test-before-invest services. • Strong alignment with the Digital Europe Programme and national strategies. • Supports SMEs and public organisations in AI, HPC, cybersecurity, and robotics. <p>Impact:</p> <ul style="list-style-type: none"> • Reached hundreds of organisations across multiple sectors (agri-food, manufacturing, public sector). • Created regional innovation ecosystems and bridges to research C tech providers. <p>Transferability Potential:</p> <ul style="list-style-type: none"> • Highly transferable EU-wide as a hub-and-spoke model for digital transformation. <p>Can be adapted to focus on different sectors (e.g. health, green tech, tourism).</p>
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Key elements of success

Across all programs, the following factors contributed to their effectiveness:

Table 15: Key elements of success

Title of the success factor	Description
Strategic focus	All programs are linked to national strategies (Digital Slovenia 2030, S5).
Simplicity and Accessibility	Vouchers and online applications reduce administrative burdens.
Skill integration	Focus on digital competences and human capital, not just tech investment.
Regional Balance	Allocation by cohesion region (East/West Slovenia) improves territorial equity.
Feedback and Adaptation	Programs have evolved based on SME feedback and digital maturity trends.

Recommendations for the policy transfer

1. **Modular Funding:** Combine micro-incentives (e.g., vouchers) with large-scale strategic investments (e.g., P4D).
2. **Integrate Advisory Support:** Offer digital consultants/certified providers in public calls.
3. **Lower Entry Barriers:** Simplify eligibility, especially for micro-enterprises and low-digital sectors.
4. **Strengthen Follow-up:** Introduce post-grant mentoring and maturity reassessments.
5. **Create Regional Synergies:** Align national instruments with regional innovation hubs and Smart Specialisation priorities.
6. **Emphasise Impact Metrics:** Track added value, innovation output, and job quality post-digitalisation.

2.6. Data Infrastructure

Slovenia has implemented several strategies and tools to assess and enhance the digitalisation and competitiveness of its small and medium-sized enterprises (SMEs). However, certain data gaps remain that hinder a comprehensive evaluation. Available data and

Strategic framework are as follows:

Digital Intensity Index (DII)

The Statistical Office of the Republic of Slovenia (SURS) reports that in 2023, 52% of enterprises with at least 10 employees reached at least a basic level of digital intensity. Among SMEs, half achieved this level. The DII assesses the use of 12 digital technologies, including cloud computing, ERP systems, CRM software, and social media presence. Notably, 66% of enterprises faced challenges in digital transformation, primarily due to a lack of relevant staff or knowledge (41%) and financial constraints (37%).

Strategy of Digital Transformation of the Economy (2021–2030)

Adopted in January 2022, this strategy aims to position Slovenia as a leading hub for advanced digital technologies by 2030. It emphasizes the integration of technologies like AI, IoT, big data, and blockchain into business processes. The strategy outlines objectives such as enhancing digital infrastructure, fostering digital competencies, and promoting sustainable digital transformation.

Digital Slovenia 2030 Strategy

This overarching national strategy focuses on improving Slovenia's digital performance across various sectors. Key targets include ensuring that 60% of the population possesses basic digital skills by 2025 and reaching 80% by 2030. The strategy also addresses digital inclusion, digital public services, and the development of gigabit connectivity.

Digital Maturity Assessment (DMA) Tool

Implemented through European Digital Innovation Hubs (EDIHs), the DMA tool evaluates an SME's digital maturity across six dimensions: digital business strategy, digital readiness, human-centric digitalisation, data management, automation C AI, and green digitalisation. It serves as both a diagnostic and benchmarking instrument to guide SMEs in their digital transformation journeys.

Surveys and Reports

Various organizations, including the Digital Innovation Hub Slovenia and the OECD, have conducted surveys to assess the state of digitalisation among Slovenian SMEs. These studies provide insights into the adoption of digital technologies, challenges faced, and the effectiveness of support mechanisms.

Despite the available data and strategic initiatives, certain gaps hinder a full understanding of SMEs' digitalisation and competitiveness:

- **Granular Data on Micro-Enterprises:** Most statistics focus on SMEs with 10 or more employees, leaving a knowledge gap regarding micro-enterprises, which constitute a significant portion of the business landscape.
- **Longitudinal Impact Studies:** There is a lack of long-term studies assessing the impact of digital transformation initiatives on SMEs' productivity, profitability, and market expansion.
- **Sector-Specific Analyses:** More detailed data is needed to understand digital adoption and challenges across different industries, such as manufacturing, services, and agriculture.
- **Integration of Digital Skills Data:** While general digital skills statistics exist, there is a need for more integrated data linking employee digital competencies with SME performance metrics.
- **Evaluation of Support Mechanisms:** Assessments of the effectiveness of government-funded programs, vouchers, and training initiatives in facilitating SME digitalisation are limited.

By addressing these data gaps and implementing the recommended measures, Slovenia can enhance its understanding of SME digitalisation, leading to more targeted and effective policies that bolster competitiveness and economic growth.

3. Summary

Nature and Significance of SME Digitalisation in Slovenia

- Digitalisation is a critical driver of competitiveness and innovation in Slovenia's SME sector, which makes up over 99% of all enterprises and employs more than 70% of the workforce.
- The adoption of digital tools improves productivity, market access, customer interaction, and sustainability.

- Slovenia’s digitalisation efforts support broader goals of economic resilience, regional cohesion, and alignment with EU strategic frameworks (e.g., Digital Decade 2030, Smart Specialisation S5).
- However:
 - Slovenia’s SMEs still lag behind the EU average in basic and advanced digital technology adoption.
 - There are significant disparities between micro vs. medium SMEs, urban vs. rural, and sector-specific digital maturity.

Main Policy Instruments Addressing SME Digital Transformation

Slovenia has developed a multi-tiered and well-funded ecosystem of policy tools. The most impactful include:

Table 1c: Policy instruments

Instrument	Description	Relevance
P4D Programs (2019–2025)	Grants (€30k–€100k) for comprehensive digital transformation	Strategic change in operations and business models
SME Digital Vouchers	Micro-financing (up to €9,999) for digital skills, marketing, cybersecurity, etc.	High uptake among micro and small businesses
E-BUSINESS 2019–2022	Support for digital trade, B2B integration, websites, online stores	Boosted international visibility and e-commerce readiness
EDIH Slovenia (DIGI-SI, SRC- EDIH)	Free maturity assessments, test-before-invest, advanced tech training	Scaled SME digital capability and partnerships

These instruments are supported by:

- Digital Slovenia 2030
- Strategy for Digital Transformation of the Economy (2021–2030)
- Slovenian Sustainable Smart Specialisation Strategy – S5
- Recovery and Resilience Plan
- Cohesion Policy 2021–2027

Main Challenges and Gaps

Despite the progress, Slovenia faces several persistent challenges. Structural and Strategic Gaps:

- Micro-enterprises and rural SMEs are underrepresented in strategic programs.
- Limited sector-specific tailoring, especially in low-digital industries like agriculture or construction.
- Insufficient post-grant follow-up to track digital maturity progression or economic impact.

Skills and Capacity

- Only 46.7% of adults have basic digital skills (EU average: 55.6%).
- ICT professionals in the workforce dropped to 3.8% in 2024, below the EU average.
- Digital transformation strategies required by grants are too complex for some SMEs to develop alone.

Access and Coordination

- Overlapping instruments sometimes lead to fragmentation and inefficiencies.
- Low awareness among SMEs, especially in disadvantaged regions.
- No centralised one-stop-shop or national digital portal for SMEs.

Data Infrastructure for Regional Analysis and Assessment

Existing Assets:

- Digital Intensity Index (DII): Reported annually by SURS and Eurostat.
- EDIH maturity assessments: In-depth diagnostics provided regionally.
- Ministry/SEF/DIH databases: Administrative records on funding uptake and SME profiles.
- EU datasets: Eurostat's RIS, DESI, and Innovation Scoreboard.

Gaps and Limitations:

- Lack of SME-level longitudinal data tracking performance post-digitalisation.
- No unified national dashboard consolidating data from different instruments.
- Insufficient granularity by sector and NUTS3 region (especially in Eastern Slovenia).
- Data sharing across agencies is limited, hindering integrated analysis.

Recommended measures to bridge the gaps

Table 17: Measures to bridge the gaps

Title of the area	Description of needed measures
Inclusivity	Tailor micro-grants and advisory services to micro-enterprises and low-digital regions
Support Services	Embed certified digital advisors or innovation brokers in voucher and grant schemes

Monitoring C Impact	Build a national digital transformation dashboard with regional KPIs
Skills C Literacy	Expand subsidised digital training under vouchers and link to employment services
Data Infrastructure	Integrate SEF, DIH, and SURS data streams; standardise reporting across regions and instruments

Slovenia has created a strong foundation of digitalisation support policies for SMEs. However, to maximise impact, the country must address the systemic gaps in inclusiveness, continuity, and data integration. A future-focused, regionally balanced, and data-driven approach will be key to ensuring all SMEs can contribute to and benefit from digital transformation.

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1. Regional Background Information

1.1. Introduction

Croatia is a small, open economy strategically positioned at the crossroads of Central and Southeast Europe, serving as a vital connector between Western Europe and the Western Balkans. With a population of approximately 3.8 million and a GDP per capita of around €17,000 (2022, in purchasing power standards), Croatia plays an important role in regional economic cohesion and digital integration within the European Union.

The Croatian economy is service-oriented, with tourism accounting for nearly 20% of GDP, but small and medium-sized enterprises (SMEs) remain the backbone of the national economy, generating more than 60% of total employment. In recent years, Croatia has seen improvements in its business environment and public investment capacity, driven by EU structural and investment funds, particularly through its Recovery and Resilience Plan (RRP), which prioritizes green and digital transitions.

Socio-demographically, Croatia faces significant challenges due to demographic ageing, population decline, and youth emigration—factors that directly impact the availability of skilled labour and long-term productivity. Nevertheless, the country has invested heavily in education reform, innovation infrastructure, and administrative digitalisation, which are beginning to yield results.

On the European stage, Croatia is classified as an "emerging innovator" in the European Innovation Scoreboard. Through active participation in the EU's cohesion policy, digital agenda, and cross-border initiatives such as the Danube Strategy, Croatia contributes to narrowing the innovation gap between Eastern and Western Europe. The national digital strategy and smart specialization framework aim to enhance regional competitiveness and support the growth of high-value-added sectors, particularly ICT, energy, mobility, and health technologies.

This State of the Art Report supports the key objectives of the DIGITRANS project by providing an evidence-based overview of the digitalisation level of Croatian SMEs, identifying policy gaps, and mapping existing support instruments. The findings will directly inform the preparation of Regional Action Plans (WP2) and contribute to the improvement of regional policy frameworks (WP3).

Methodology

The report is based on a desk analysis of national and European data sources, including Eurostat, the Digital Decade Monitoring Framework (formerly DESI), national statistics (DZS), and strategic documents such as the Digital Croatia Strategy 2032 and the National Recovery and Resilience Plan (NPOO). Policy instruments were assessed using publicly available programme documentation, government reports, and SME support datasets,

complemented by qualitative insights gathered through consultations with the DIGITRANS Regional Stakeholder Group.

1.2. Economic Profile of the Region

The Croatian economy is characterized as a **small, open, and service-based economy**, with services accounting for over 70% of GDP. Key sectors include tourism, trade, transport, and increasingly, information and communication technologies (ICT). Despite Croatia's relative success in macroeconomic stabilization, structural weaknesses persist, including low productivity, regional development disparities, and a high dependence on seasonal industries such as tourism.

Croatia is administratively divided into two NUTS 2 regions: **Continental Croatia** and **Adriatic Croatia**, each with distinct structural characteristics, development trajectories, and economic profiles:

- **Continental Croatia.** This region includes Zagreb, the capital and economic centre of the country, and is characterized by a more urbanized, industrialized, and diversified economy. It accounts for the majority of national GDP and hosts the largest share of educational institutions, research centers, government agencies, and technology hubs. As such, digitalisation maturity and innovation intensity are highest in this region, particularly in Zagreb and surrounding counties (e.g., Varaždin, Karlovac, and Međimurje). Key features include: (1) a strong presence of manufacturing and ICT services, (2) higher concentration of SMEs with export potential and RCD engagement, (3) better developed digital infrastructure (broadband, 5G pilots), (4) greater access to startup ecosystems, incubators, and EU-funded innovation programs.
- **Adriatic Croatia.** Comprising coastal counties such as Split-Dalmatia, Šibenik-Knin, Zadar, and Istria, this region's economy is heavily dependent on tourism and seasonal services. The region experiences significant population fluctuations, driven by tourism demand, and is more vulnerable to external shocks such as pandemics or geopolitical disruptions affecting travel. While Adriatic Croatia boasts natural and cultural capital, it faces challenges in: (1) diversifying beyond tourism, (2) retaining a skilled workforce, particularly in ICT and engineering, (3) deploying advanced digital solutions across traditional industries such as hospitality, agriculture, and fisheries, (4) ensuring year-round economic activity and productivity in less urbanized zones.

Regional Disparities. The divergence in development between the two regions is reflected in:

- **GDP per capita:** significantly higher in Continental Croatia, especially in the City of Zagreb, compared to eastern counties and remote coastal areas.
- **Unemployment rates:** historically higher in parts of Adriatic Croatia outside of tourist peaks, and in rural Continental counties like Vukovar-Srijemska.
- **Digital readiness and investment:** concentrated around urban cores, with many rural and coastal areas still lacking reliable infrastructure and digital services.

To address these disparities, national strategies, including the Smart Specialisation Strategy (S3) and Cohesion Policy 2021–2027, emphasize balanced territorial development, supporting green and digital transition projects, SME capacity building, and decentralized access to innovation infrastructure.

SMEs and Competitiveness - Overall, micro, small, and medium-sized enterprises (SMEs) dominate the Croatian business landscape. SMEs account for over **66% of all businesses** and employ **more than two-thirds of the workforce**, they contribute to **56% of total value added**, slightly below the EU average and sectors with the highest concentration of SMEs include trade, construction, tourism, and manufacturing.

Despite their prevalence, Croatian SMEs face considerable **productivity and innovation challenges**, particularly in peripheral and rural regions. Access to finance, bureaucratic complexity, and insufficient digital skills are among the most cited barriers to competitiveness.

ICT Sector as a Strategic Growth Driver - Zooming into the **ICT sector**, that sector has grown significantly in the last decade and is increasingly recognized as a **strategic growth driver**. Key characteristics include that it counts over **6,500 ICT companies**, generating around **€3.5 billion in annual revenue**. A strong concentration of the registered companies is within **software development**, IT services, and telecommunications and the sector employs around **50,000 workers** but faces a chronic **shortage** of skilled ICT professionals.

Government policies have supported the growth of the sector through initiatives such as tax relief for IT professionals, startup support programs, and investment in broadband infrastructure. However, the lack of STEM graduates and brain drain continue to constrain expansion.

Digitalisation Maturity Among SMEs assessment indicate that Croatian SMEs show moderate levels of digitalisation, though still below the EU average in several areas:

- According to the European Commission's DESI (Digital Economy and Society Index), **only 58% of SMEs** have at least a **basic level of digital intensity**, compared to the EU average of 69%.
- Use of advanced technologies such as **cloud computing (22%)**, **big data (11%)**, and **AI (8%)** is comparable to the EU average, but concentrated in more developed urban areas.
- A 2023 national survey revealed that **many SMEs do not perceive digitalisation as a priority**, particularly in traditional sectors like agriculture and small-scale manufacturing.

Barriers to digital transformation include (1) lack of awareness about available tools and benefits, (2) high implementation costs, (3) insufficient internal digital skills and (4) limited strategic support for digitalisation at the regional level. In response, the Croatian government has implemented several national and EU-funded programs such as:

- **Vouchers for Digitalisation** (co-funded by the EU) offering grants for CRM systems,

e-commerce, and cyber security tools.

- The **e-Impulse** and **Digital Transformation of SMEs** calls under the National Recovery and Resilience Plan (RRP), aiming to reach over 10,000 SMEs by 2026.

In summary, while Croatia has made progress in building its digital economy and modernising key sectors, SMEs—especially those outside urban centers—still lag behind in digital maturity.

The ICT sector represents a key opportunity for economic diversification and international competitiveness, but further policy support, talent development, and regional coordination are needed to unlock its full potential.

Digitalisation Snapshot - Croatia 2024

- **56%** of SMEs have basic digital intensity
- **42%** use cloud computing
- **51.7%** use data analytics (among the highest in the EU)
- **Major regional disparities persist (Zagreb vs. rural counties)**

1.3. HR Profile of the Region

Croatia faces a complex set of demographic and human capital challenges, including population decline, negative natural growth, and a persistent mismatch between education outcomes and labour market needs. The population has decreased to approximately 3.8 million in recent years, down from over 4.2 million in 2011. This downward trend is particularly pronounced in eastern and rural regions, while urban centres such as the City of Zagreb continue to attract younger and more educated individuals.

Employment rates and education levels vary significantly across regions. Urban areas, particularly Zagreb, report higher employment, greater shares of tertiary-educated residents, and a stronger concentration of ICT professionals. In 2022, only **35.5%** of young adults aged 25 to 34 had completed tertiary education—well below the EU average of **42%**. Despite this, several reforms have been introduced to modernise vocational education, strengthen digital competencies, and improve alignment between the education system and the labour market through the introduction of dual education models and the Croatian Qualifications Framework.

Digital skills across the population are unevenly distributed. Younger individuals and university graduates in urban settings tend to possess above-basic digital skills, while older citizens and those living in rural or economically weaker regions frequently lack even foundational digital literacy. National programmes such as **e-Schools** and **e-Universities** have aimed to expand digital infrastructure and capabilities in education, but adult participation in formal lifelong learning remains low—only about 3% of adults engage in continuous education, compared to an EU average of around 11%.

Croatia's demographic profile is further strained by high emigration rates, especially following EU accession. It is estimated that over 350,000 citizens—nearly 10% of the population—

left the country between 2013 and 2022, primarily young and educated individuals seeking better opportunities abroad. This emigration has had a profound effect on the working-age population, particularly in regions like Slavonia, contributing to labour shortages and threatening the sustainability of the pension and healthcare systems. Family structures are also evolving: single-person households are becoming more common in urban areas, while traditional multi-generational households remain prevalent in rural areas.

Although Croatia is predominantly ethnically homogeneous, several national minorities play important roles in specific regions, including the Serbian, Roma, Italian, and Hungarian communities. In particular, the Roma population continues to face disproportionately high rates of educational and digital exclusion, underscoring the need for more targeted inclusion policies in education, employment, and digital access.

Taken together, these demographic and educational trends highlight the urgency of adopting a holistic approach to developing human capital in Croatia. This includes strengthening the responsiveness of the education system, encouraging the return of skilled emigrants, improving labour market activation policies, and expanding access to digital and green skills that will be essential for the future economy.

1.4. Socioeconomic Conditions and Employment Opportunities

Croatia's labour market is shaped by persistent structural challenges and emerging opportunities driven by EU integration and digital transformation. Despite a strong post-pandemic recovery, the country continues to face low labour mobility, skill mismatches—especially in ICT and technical professions—and regional disparities in employment outcomes. Labour shortages are particularly acute in the construction, healthcare, tourism, and IT sectors, a trend exacerbated by an ageing population and sustained emigration of young and skilled workers.

The national employment rate stood at approximately **48% in 2022**, significantly below the OECD average of **57.5%**, with a stark gender gap: **54.1%** for men and only **42.1%** for women. Youth unemployment remains high at **21.6%**, nearly double the OECD average, and long-term unemployment also exceeds EU norms. Participation in the labour force has risen slightly but remains constrained by demographic decline, a shrinking working-age population, and insufficient reskilling pathways.

Productivity remains uneven across sectors. SMEs and microenterprises dominate the economic landscape but often operate below EU productivity levels, particularly in lagging regions. Many of these firms rely on low-skill, low-wage labour, while highly skilled professionals—especially in digital industries—can command substantial wage premiums. Croatia's ICT sector, for example, suffers from an undersupply of talent relative to demand, which drives up wages and limits the scalability of digital enterprises.

Wages are rising, with national average earnings growing **7.5%** in 2022, and statutory minimum wages increasing by over 10% in both 2022 and 2023. However, wage levels still lag behind productivity in many sectors. The overall wage-setting mechanism is relatively

decentralised, and sector-specific collective agreements remain limited. At the same time, Croatia faces high structural unemployment in regions like Slavonia, where job creation lags behind national averages.

Croatia's socioeconomic conditions are further affected by demographic pressures. Emigration has significantly reduced the labour pool, with an estimated 350,000 people—mainly young and educated—leaving the country since EU accession. These trends have contributed to a dual pressure on the labour market: increased demand for skilled labour and reduced availability of talent, particularly in STEM and ICT fields.

In response, the Croatian government has launched reforms to improve employment outcomes. Active labour market policies are being reshaped to target youth, the long-term unemployed, and vulnerable populations. Voucher-based adult education for green and digital skills has been introduced and is gaining momentum. However, barriers to participation remain, especially among low-skilled and older adults due to cost, inflexible programme formats, and weak institutional outreach.

Housing affordability and limited rental options also hinder labour mobility, particularly toward economically dynamic urban centres like Zagreb and Split. Overcrowded conditions in cities, rising real estate prices, and earthquake-related housing shortages have further constrained mobility and deepened regional inequalities.

In sum, Croatia's labour market is under pressure from skill shortages, regional disparities, and demographic shifts. Continued investment in education, adult upskilling, digital transition, and labour activation—particularly in rural and economically weaker areas—will be crucial for strengthening employment opportunities and ensuring inclusive growth.

2. Analysis and Assessment of Policy Instruments

2.1. Policy Instrument

In line with the strategic objective “Developed and Innovative Digital Economy,” the **Digital Croatia Strategy until 2032** outlines a comprehensive set of policy instruments that support the digital transformation of small and medium-sized enterprises (SMEs). These instruments span direct financial support, skills development, public-sector digitalisation, innovation ecosystem strengthening, and startup ecosystem activation.

The first priority policy area under this strategic goal is the **support for SME digitalisation**. This area is operationalized through several ongoing and planned instruments. One of the most active tools is the “**Digital Vouchers Scheme**”, funded under the National Recovery and Resilience Plan (NRRP). This instrument provides direct financial support to SMEs for acquiring digital tools, training their staff in digital skills, and implementing complex digital systems such as ERP, CRM, AI, and cybersecurity solutions. The instrument is complemented by **voucher-based adult education programmes** for digital upskilling of employees, aiming to align workforce competencies with digital transition needs.

The second priority focuses on the **digitalisation of public services for enterprises** and aims to create transparent, automated, and user-friendly interfaces for businesses interacting with government. Through the implementation of a national **e-Business Portal** and expansion of digital identity and open data systems, SMEs are gaining improved access to public sector data and digital service delivery tools. These systems lower administrative burdens and facilitate business innovation.

In the third priority area, the instrument **“Support for Digital Innovation Hubs (DIHs)”** enables SMEs to access testing environments, receive expert mentorship, and collaborate with research institutions. DIHs operate as regional nodes of innovation, assisting enterprises in identifying and implementing advanced technologies. The Croatian hubs are co-funded by the Digital Europe Programme and the European Regional Development Fund (ERDF), and are critical for aligning SMEs with emerging trends in AI, cloud services, and cybersecurity.

To support the digital transformation of the **creative and cultural industries**, a specific sub-instrument under the Operational Programme Competitiveness and Cohesion 2021–2027 promotes the development of digital platforms, capacity building for creative entrepreneurs, and support for online content creation. This reflects a broader EU alignment with the Creative Europe programme, but tailored to Croatian SMEs within the sector.

Another key component of the strategic framework includes **planned tax and regulatory reforms to stimulate startup and scaleup development**, including ESOP models, angel investment incentives, and improved access to early-stage funding. These measures, while not yet fully implemented, aim to improve conditions for innovation-driven SMEs and strengthen Croatia’s competitiveness within the European startup landscape.

Collectively, these instruments form a multi-layered support architecture that not only provides direct financial aid but also addresses skills development, public-private digital interface optimization, and ecosystem building through hubs and networking platforms. The strategy’s implementation is closely tied to Croatia’s participation in broader European frameworks such as the **Digital Europe Programme, Horizon Europe**, and the **European Digital Innovation Hub Network**, ensuring policy coherence and funding alignment.

Strategic Objective	Relevant Policy Instruments	Funding / Implementation Framework
1. Developed and Innovative Digital Economy	<ul style="list-style-type: none"> - Digital Vouchers for SMEs (for marketing, cybersecurity, digital skills, complex digital solutions) - Adult Education Vouchers for Green and Digital Skills - Support for SME digital maturity assessments and consultancy 	National Recovery and Resilience Plan (NRRP) Ministry of Economy and Sustainable Development

2. Digitalisation of Public Services for Enterprises	<ul style="list-style-type: none"> - National e-Business Portal - Development of API-based data sharing infrastructure - Expansion of eID and eSignature for SMEs - Automation of admin processes for SME-related public services 	National Budget EU Structural Funds Digital Europe Programme
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Strategic Objective	Relevant Policy Instruments	Funding / Implementation Framework
3. Smart Use of Digital Technologies in Business	<ul style="list-style-type: none"> - Support for Digital Innovation Hubs (DIHs): test-before-invest, mentoring, cloud/AI access - Integration of Croatian DIHs into the European DIH network 	Digital Europe Programme (DEP) European Regional Development Fund (ERDF)
4. Support for Digital and Cultural Industries	<ul style="list-style-type: none"> - Financial support for the digitalisation of creative industries - Grants for digital content creation, platform development, and online distribution - Capacity-building programmes for cultural entrepreneurs 	Operational Programme Competitiveness and Cohesion 2021–2027 Creative Europe (aligned)
5. Stimulating Innovative Startups and Scaleups	<ul style="list-style-type: none"> - Planned reform of startup taxation (e.g., ESOP, angel investor incentives) - Public-private seed fund proposals - National Startup Platform for services, mentoring, and funding access 	To be implemented under National Innovation and Startup Policy (planned for post-2024)
6. Building a Competitive Workforce for the Digital Era	<ul style="list-style-type: none"> - Vouchers for upskilling in digital skills - Public-private reskilling programs for SMEs - e-Schools and e-Universities digital infrastructure and curriculum reform - National Qualification Framework (aligned with digital competency frameworks) 	Ministry of Education National Recovery Plan European Social Fund+ (ESF+)

Besides that high level of overview, concrete policy instruments formed exclusively to support SME digitalisation are formed as it follows:

Policy Instrument 1: Digital Transformation Grants (NPOO Measure C1.1.2 R3)

Description: The Digital Transformation Grants are one of Croatia’s flagship instruments under the National Recovery and Resilience Plan (NPOO), specifically designed to accelerate the digital transition of SMEs. This instrument falls under Component **C1.1 – Strengthening the economy**, subcomponent **C1.1.2 – Supporting Innovation, Research, Development and Digital Technologies**, and more precisely under **Reform C1.1.2 R3: Encouraging the digital transformation of enterprises**.

This support measure is tailored to micro, small, and medium-sized enterprises (SMEs) that intend to invest in digital technologies, tools, processes, and capacity-building to modernise operations and improve productivity. The overarching goal is to enhance the digital intensity of Croatian SMEs, support the integration of digital solutions into their business models, and boost overall competitiveness.

Strategic Goals and Supported Activities

The grants aim to: (1) support Croatian SMEs in achieving a **higher level of digital maturity**, as assessed through structured digital diagnostics, (2) co-finance investments in digital tools such as:

- Enterprise Resource Planning (ERP) systems,
- Customer Relationship Management (CRM) systems,
- Internet of Things (IoT),
- Cloud technologies,
- Artificial Intelligence (AI) applications,
- Cybersecurity solutions.

(3) provide financial incentives for the **training of employees** in the use of these tools to ensure successful integration, (4) foster **business model innovation** and process automation, enabling SMEs to adapt to new market dynamics and digital ecosystems.

Funding Source and Management

The instrument is funded through the **Recovery and Resilience Facility (RRF)**, with a total allocation of €27.3 million. The measure is managed by the **Ministry of Economy and Sustainable Development** in cooperation with the implementing agency **HAMAG-BICRO**. Eligible beneficiaries could receive co-financing for projects ranging **between €20,000 and**

€750,000, depending on the size of the enterprise and the scope of the proposed digital transformation activities. The co-financing intensity ranged **from 45% to 70%**, based on the region and SME category.

Results and Outputs

- **Call Publication:** Opened in **June 2022**, with a deadline in **autumn 2022**.
- **Total Budget:** €27.3 million (100% RRF-funded).
- **SMEs Applying:** Over **1,500 applications** were submitted.
- **SMEs Approved:** Final approval and contracting processes were ongoing as of early 2023, with **over 700 SMEs** expected to receive funding.
- **Sectors involved:** Broad sectoral distribution, with strong participation from

manufacturing, ICT, and business services. Lower participation was noted from traditional sectors such as **agriculture, hospitality, and construction.**

- **Regional Distribution and Reach** (geographical reach): Applications were received from all 20 counties, with the City of Zagreb, Split-Dalmatia, Primorje-Gorski Kotar, and Varaždin counties being most represented. However, regional innovation capacity and SME digital maturity remain uneven, indicating the need for additional support mechanisms in less developed counties (e.g. Slavonia).

KPI Highlights:

- Demand indicator: 1,500+ applications for €27M allocation → **oversubscription ratio of approx. 5:1**
- Expected SME reach: **700+ SMEs (~1% of all Croatian SMEs)**
- High-tech adoption indicator: significant uptake of ERP, CRM, AI and cloud solutions.

Key Observations

→ **Strengths:** (1) high demand indicates strong interest in digital upgrading, (2) good alignment with the Digital Croatia 2032 strategy and EU Digital Decade goals, and (3) incentivised the use of more advanced digital tools (ERP, AI, cloud).

→ **Challenges:** (1) many SMEs lacked the internal capacity to prepare competitive project proposals, (2) the need for digital readiness assessments and pre-application advisory was greater than expected, (3) low visibility of the program in rural and non-tech-dominant regions, (4) complex application and documentation processes were a barrier for microenterprises.

Contribution to Policy Objectives. This instrument directly supports Croatia’s strategic goals under the **Digital Croatia 2032 Strategy**, particularly in building a **developed and innovative digital economy**. It also contributes to **resilience-building**, as outlined in the NPOO, by enabling SMEs to modernise operations and compete more effectively in digital value chains.

It aligns with the EU’s Digital Decade targets, specifically the goal that **G0% of EU SMEs reach at least a basic level of digital intensity by 2030**. In Croatia, this instrument serves as a **critical bridge** between public policy goals and real, measurable progress in the SME sector.

Policy Instrument 2: Grants for the Commercialisation of Innovation (NPOO Measure C1.1.2 R1)

Description: The **Grants for the Commercialisation of Innovation** represent one of Croatia’s **cornerstone policy instruments** under the National Recovery and Resilience Plan (NPOO) aimed at transforming research and development activities into competitive market-ready products and services. Framed within Component C1.1 of the NPOO—“Strengthening the Economy”—and specifically aligned with Reform C1.1.2 R1, this measure focuses on enhancing the ability of small and medium-sized enterprises (SMEs) to scale innovative solutions and bring them to market.

This instrument is a response to a structural gap in the Croatian innovation system, where many research projects and technological prototypes developed by startups and SMEs struggle to move beyond early-stage development due to insufficient funding, low investment readiness, and lack of commercialisation infrastructure. The grants aim to bridge the so-called "valley of death" between research and market entry, thereby increasing the rate of return on public investments in RCD and raising the overall innovation intensity of the economy.

Strategic Goals and Supported Activities

The instrument aims to increase the number of commercially viable innovative products and services developed by Croatian SMEs. Supported activities include

- Advanced prototype development
- Intellectual property protection and patenting
- Product design, certification, and testing
- Pilot production and scaling
- Market validation and early commercialisation activities

Eligible innovations were required to be at **TRL 6** at minimum, progressing toward **TRL 8–G**, ensuring the support is targeted at near-to-market technologies.

Funding Source and Management

The programme is funded through the **Recovery and Resilience Facility (RRF)** with a total budget of **€50.4 million**. It is implemented by the **Ministry of Economy and Sustainable Development** in cooperation with **HAMAG-BICRO**, responsible for evaluation and contracting.

Funding per SME ranged between **€100,000 and €750,000**, with co-financing intensities determined by company size and regional development criteria.

Results and Outputs

- **Call publication:** 2022
- **Total budget:** €50.4 million
- *Applications received:* 800+ SMEs
- **Expected number of funded SMEs:** 300+
- **Most represented sectors:** ICT, green technologies, medical devices, advanced manufacturing, creative industries
- **Geographical distribution:** Applications concentrated in Zagreb and Split-Dalmatia counties, reflecting existing ecosystem strength. Participation from less developed regions was noticeably lower, highlighting the uneven distribution of innovation capacity across Croatia.

KPI Highlights:

- Application demand significantly exceeded available funding: **800+ applications vs. budget for ~300 projects**

- Innovation-stage KPI: all supported projects required **TRL 6+**, targeting TRL 8–9
- Expected contribution: more than **300 new or improved innovative products/services** reaching commercialisation stages
- High-tech sector participation rate: >60% of applications came from knowledge-intensive industries

Key Observations

→ **Strengths:** (1) strong demand demonstrates significant innovation potential among Croatian SMEs, (2) clear alignment with Smart Specialisation Strategy and national innovation priorities, (3) directly addresses the commercialisation gap that has historically hindered innovation growth, and (4) supports development of globally competitive products and technologies.

→ **Challenges:** (1) administrative and technical complexity created barriers for micro and early-stage SMEs, (2) Regional concentration of applicants risks reinforcing existing disparities, (3) limited availability of proposal-development support in weaker regions, and (4) heavy documentation requirements reduced accessibility for businesses without project management experience.

Contribution to Policy Objectives. The instrument is highly aligned with **Digital Croatia 2032**, the **Smart Specialisation Strategy (S3)**, and the EU's **Digital Decade** policy framework. It directly supports: (1) increased private-sector RCD investments, (2) scaling of innovation-driven SMEs, (3) development of high-tech and knowledge-intensive sectors, (4) stronger integration of Croatian SMEs into EU value chains.

The Grants for the Commercialisation of Innovation demonstrate that targeted public investment, paired with structured evaluation criteria, can catalyse the growth of innovation-intensive entrepreneurship. Future iterations of the measure could further enhance impact through mentoring support, post-award monitoring, and improved outreach to underrepresented regions.

Policy Instrument 3: Grants for Startups (NPOO Measure C1.1.2 R2)

Description: The **Grants for Startups** measure under Croatia's **National Recovery and Resilience Plan (NPOO)** represents a critical policy effort to strengthen the country's digital entrepreneurship ecosystem. This instrument is part of **Component C1.1 – Strengthening the Economy**, specifically under **Reform C1.1.2 R2: Strengthening Support for Innovative Entrepreneurship**. It focuses on creating favorable conditions for the emergence, survival, and growth of startup ventures, with particular emphasis on those with strong digital and innovative orientations.

The core objective of this policy measure is to provide **early-stage funding, business development support, and targeted mentorship** to new companies operating in high-growth sectors, especially those developing **digitally based solutions or using digital technologies** as enablers of innovation. By supporting these startups in the critical early

phases—where market entry risk is high and access to private capital is limited—the measure contributes directly to boosting the national rate of startup formation, scalability, and sustainability.

Strategic Goals and Supported Activities

The programme supports startups in the development of innovative and market-ready solutions, particularly those aligned with Croatia’s Smart Specialisation priorities (health, mobility, energy, ICT, creative industries, agri-tech). Funded activities include:

- Development and testing of Minimum Viable Products (MVPs)
- Certification, IP protection, and market validation
- Development of digital services, platforms, and software solutions
- Branding, early-stage marketing, and business model refinement
- Participation in incubation or acceleration programmes (mentorship required in some calls)

Eligible applicants were startups up to five years old, registered in Croatia.

Funding Source and Management

The measure is funded through the **Recovery and Resilience Facility (RRF)** with a total allocation of **€18.7 million**. It is implemented by the **Ministry of Economy and Sustainable Development** in cooperation with **HAMAG-BICRO**, and complements Croatia’s emerging national startup and innovation framework.

Grant amounts ranged from **€30,000 to €150,000**, with funding intensity dependent on business maturity and project scope. The programme emphasises innovation potential, market relevance, and alignment with national strategic objectives.

Results and Outputs

- **Applications received:** more than **600 startups**
- **Expected funded startups:** approximately **220**
- **Budget allocation:** €18.7 million
- **High-interest sectors:** SaaS, health tech, fintech, edtech, green digital technologies
- **Geographical spread:** majority from Zagreb, Rijeka, Split, with emerging hubs in Osijek and Varaždin

The instrument significantly increased early-stage innovation activity in the national startup ecosystem and improved access to structured support through incubation and acceleration programmes.

KPI Highlights:

- **>600 applications** for 220 funded startups → **oversubscription ratio ~3:1**
- Strong digital orientation: **majority of applicants in ICT, SaaS, deep tech and green tech**
- Early-stage support intensity: **up to €150,000 per startup**
- Geographic diversification improving (Osijek, Varaždin emerging)

Key Observations

→ **Strengths:** (1) catalyses early-stage entrepreneurship in digital and knowledge-intensive sectors, (2) addresses a known market failure: limited availability of seed-stage financing, (3) strong alignment with national smart specialisation priorities, and (4) strengthens startup pipelines feeding into accelerators, investors, and DIHs.

→ **Challenges:** (1) limited awareness outside established innovation hubs, (2) the relatively short preparation window for application submission, and (3) gaps in follow-up infrastructure for funded startups after the grant period.

Contribution to Policy Objectives. The Grants for Startups measure is closely aligned with Croatia’s strategic documents, including the **Digital Croatia Strategy 2032**, the **National Development Strategy**, and the forthcoming **National Startup and Innovation Policy**. It also contributes to the EU’s **Digital Decade 2030** targets by supporting the growth of high-tech SMEs, strengthening innovation capacity, and accelerating the digital and green transitions.

This instrument fills a critical gap in Croatia’s entrepreneurial landscape by de-risking early-stage innovation and fostering a pipeline of startups capable of entering EU and global markets. Future iterations may benefit from intensified outreach to peripheral regions, closer engagement with private investors, and enhanced mentoring and post-grant monitoring.

Policy Instrument 4: Support for European Digital Innovation Hubs (EDIHs) Description:

The **Support for European Digital Innovation Hubs (EDIHs)** represents a strategic policy instrument implemented under Croatia’s **National Recovery and Resilience Plan (NPOO)** and the **Digital Europe Programme (DEP)**. It is designed to provide small and medium-sized enterprises (SMEs), as well as public sector bodies, with access to cutting-edge digital expertise, testing facilities, training services, and investment support—all within a regional, one-stop-shop model for digital transformation.

This instrument contributes to **Reform C1.1.2 R3** of the NPOO—“Encouraging the digital transformation of businesses”—and supports the broader national objective of building a **developed and innovative digital economy**, as laid out in the **Digital Croatia Strategy 2032**. It also forms part of the European Commission’s network of EDIHs across all Member States, with the goal of bridging regional innovation gaps and supporting the uptake of digital technologies in strategic sectors.

Launched in 2022, the Croatian EDIH initiative received **co-financing from the Recovery and Resilience Facility (RRF)** and the **Digital Europe Programme (DEP)**, with a **combined allocation of €5.4 million** for an initial period of three years (2022–2025). Four EDIHs were selected through a competitive national and European process and are hosted in different Croatian regions to ensure broad geographic and sectoral coverage.

Strategic Goals and Supported Activities

The primary mission of EDIHs is to help SMEs:

- **“Test before invest”**—access testing environments and pilot digital solutions without the need for large upfront investment;
- Access **training and skills-building programs**, especially in emerging technologies like artificial intelligence (AI), cybersecurity, robotics, and cloud computing;
- Receive tailored **business development support** including digital maturity assessments, technology roadmaps, and assistance in defining digital strategies;
- Gain **access to financing and investment advisory services**, including connections with EU funds and private investors;
- Connect with **innovation ecosystems across Europe**, enabling cross-border collaboration and knowledge transfer.

Each Croatian EDIH specializes in certain technology domains and economic sectors. For example, hubs are aligned with priority areas identified in the **Smart Specialisation Strategy (S3)** such as health technology, advanced manufacturing, smart mobility, and agri-food. Services are provided by consortia consisting of **universities, research institutes, business support organizations, and private tech providers**, ensuring a multidisciplinary approach to digital innovation.

Funding Source and Management

The initiative is jointly funded through:

- *Recovery and Resilience Facility (RRF)*
- **Digital Europe Programme (DEP)**

Total allocation: **€5.4 million (2022–2025)**

Managing bodies include the Ministry of Economy and Sustainable Development, with service delivery executed by four selected EDIH consortia.

Results and Outputs

- **More than 200 SMEs and public organisations** supported by end of 2023
- Strong early demand for advisory and pilot testing services
- SMEs without internal digital expertise benefited most from maturity assessments and roadmapping services
- EDIHs facilitated access to **Horizon Europe, DEP, European Innovation Council (EIC)** opportunities
- Geographical reach improved, though participation is still strongest in Zagreb, Rijeka, and Split regions.

KPI Highlights

- **200+ organisations supported** within first operational year
- Training uptake: high participation in AI and cybersecurity workshops
- Technology adoption readiness increased for SMEs completing full maturity assessments
- EDIHs mapped to **priority S3 sectors** → contributes to regional specialisation focus.

Key Observations

→ **Strengths:** (1) provides high-value digitalisation services at no cost to SMEs, (2) bridges the gap between early diagnostics and advanced technology adoption, (3) connects Croatian SMEs to EU-level innovation ecosystems, and (4) strong alignment with digitalisation and S3 priorities.

→ **Challenges:** (1) awareness remains lower among traditional SMEs and peripheral regions, (2) capacity building needed within hubs to ensure service consistency and quality, (3) SMEs often require hands-on implementation support beyond diagnostics, and (4) long-term sustainability uncertain once DEP/NPOO funding ends.

Contribution to Policy Objectives. The EDIH initiative plays a central role in bridging Croatia’s regional digital divide by extending high-value digitalisation services beyond the country’s established innovation hubs in Zagreb, Rijeka, and Split. By ensuring that SMEs and public organisations in less-developed regions gain access to testing facilities, advisory services, and EU funding pathways, the measure helps reduce long-term disparities in digital maturity and innovation capacity.

The initiative strongly supports the objectives of the Digital Croatia Strategy 2032, particularly in strengthening regional innovation ecosystems and facilitating SME adoption of advanced technologies. It also contributes to the EU’s Digital Decade 2030 targets, including the goal that more than 75% of European enterprises adopt cloud computing, AI, and big data.

Furthermore, EDIHs complement other national digital transformation instruments—such as Digital Vouchers, Startup Grants, and accelerators—by providing upstream services that help SMEs progress from diagnostics to implementation. Their long-term success will depend on sustained public support, better integration with complementary SME programmes, and stronger collaboration with private sector technology providers who can help scale solutions from pilot to market readiness.

Policy Instrument 5: Accelerator Scheme (Jačanje akceleracijske aktivnosti)

Description: The **Accelerator Scheme**, formally known as “**Jačanje akceleracijske aktivnosti**”, is a dedicated policy instrument launched under Croatia’s **National Recovery and Resilience Plan (NPOO)** to foster the structured development of startup acceleration

programs. This measure is aligned with **Reform C1.1.2 R2**—“Strengthening support for innovative entrepreneurship”—and contributes directly to the strategic goal of expanding Croatia’s startup ecosystem with a strong digital and innovation orientation.

The Accelerator Scheme seeks to address a persistent gap in the Croatian innovation landscape: the lack of structured, regionally distributed, and investment-oriented support mechanisms for early-stage technology startups. While many startups emerge with innovative ideas, few have access to the mentorship, technical validation, and investor readiness support needed to scale or survive beyond initial product-market fit.

Strategic Goals and Supported Activities

The Accelerator Scheme co-finances consortia of accelerators that provide services to early-stage startups across Croatia. Supported activities include:

- Intensive business development mentorship
- Technology validation and product development coaching
- Support in accessing early financing (angel investors, VC funds)
- Access to shared infrastructure, prototyping labs, digital toolkits
- Networking, matchmaking, and internationalisation activities

A total of **11 accelerator consortia** were selected through a national call, comprising business support institutions, incubators, technology parks, universities, and experienced industry mentors. This ensures regional coverage and decentralised access to high-quality acceleration services.

Funding Source and Management

The instrument is funded through the **Recovery and Resilience Facility (RRF)** with a total allocation of **€8 million**. Implementation is led by the **Ministry of Economy and Sustainable Development** in cooperation with **HAMAG-BICRO**, ensuring alignment with the **Digital Croatia Strategy 2032** and the forthcoming **National Startup and Innovation Policy**.

Results and Outputs

- **11 accelerator consortia** selected through a national call
- Coverage of all major Croatian regions → strong decentralisation effect
- **300+ startups supported** in the first cohort (2022–2023)
- Sectors supported include fintech, health tech, AI, smart manufacturing, agri-tech, and clean energy
- Many participating startups demonstrated improved investment readiness and visibility
- Several have secured follow-on financing or formed international partnerships

This demonstrates the instrument’s multiplier effect: rather than funding startups directly, it strengthens the infrastructure that supports them.

KPI Highlights

- **300+ early-stage companies supported**
- 11 accelerators operating nationally (coverage of all major regions)
- High-growth sectors represented: fintech, AI, health tech, green tech
- Evidence of follow-on investments and international partnerships among participants

Key Observations

→ **Strengths:** (1) ecosystem-building approach enhances long-term innovation capacity, (2) supports decentralisation of the innovation ecosystem beyond Zagreb, (3) enhances investor readiness and early-stage scaling potential, and (4) strong collaboration model across academia, private sector, and support institutions.

→ **Challenges:** (1) some consortia lacked experience in structured acceleration programmes, (2) operational standardisation and quality control require ongoing support, (3) regional disparities remain—some areas still struggle to attract high-potential applicants, and (4) absence of complementary seed capital instruments limits post-acceleration growth.

Contribution to Policy Objectives. The Accelerator Scheme aligns closely with the Digital Croatia Strategy 2032, the National Development Strategy, and the EU Digital Decade 2030 goals to increase the number of innovative SMEs and scaleups. By strengthening the intermediary support infrastructure, the measure bridges the gap between ideation and investment, enabling startups to achieve commercialisation and international scalability.

Its complementarity with other instruments—such as Startup Grants, Digital Vouchers, and EDIHs—creates a more coherent and integrated innovation support system. Long-term success will depend on sustained financing, capacity-building for accelerator partners, and stronger ties with private capital markets.

If these conditions are maintained, the Accelerator Scheme has the potential to become a cornerstone of Croatia’s digital and innovation-driven economic transformation.

Policy Instrument 6: Digital Vouchers Scheme

Description: The **Digital Vouchers Scheme** is a **planned policy instrument** designed to support the broad-based digital transformation of Croatian micro, small, and medium-sized enterprises (MSMEs). While still in development, the scheme is anticipated as a natural extension of Croatia’s digitalisation strategy and is expected to be implemented under the **Digital Croatia Strategy 2032**, with potential co-financing from national sources and European funds, including the **European Regional Development Fund (ERDF)** and/or **NextGenerationEU** facilities.

The concept of the Digital Vouchers Scheme draws on lessons learned from previous digitalisation calls and EU best practices, and is intended to provide **simple, fast, and**

demand- driven support for SMEs to procure digital services and technologies from registered and vetted providers. The instrument is aimed at increasing digital intensity and reducing the barriers for SMEs to access the digital tools needed to improve productivity, competitiveness, and resilience.

Strategic Goals and Supported Activities

The scheme draws on lessons from earlier digitalisation programmes and EU best practices. It is expected to support the procurement of:

- Website creation and e-commerce development
- Cybersecurity tools and services
- CRM and ERP software
- Digital marketing solutions
- Cloud-based operations and remote working tools
- Basic AI or data analytics applications
- Digital diagnostics and consultancy

Voucher values are expected to range from **€2,000 to €20,000**, with varying co-financing rates based on firm size and regional development level. Administrative requirements are intentionally kept low, making the scheme accessible even to SMEs with limited internal capacity.

The measure places particular emphasis on reaching SMEs in traditional sectors such as agriculture, hospitality, crafts, and construction, which were underrepresented in earlier innovation-oriented instruments.

Funding Source and Management

Implementation details are under development, but the scheme is expected to be co-financed from:

- *European Regional Development Fund (ERDF)*
- **NextGenerationEU mechanisms** (where applicable)
- *National budget allocations*

Key implementing and promotional bodies are expected to include:

- The **Ministry of Economy and Sustainable Development**
- The **Croatian Chamber of Economy (HGK)**
- **HAMAG-BICRO**

Anticipated Results and Outputs

As a planned scheme, results are prospective but expected to include:

- High uptake due to low administrative burden
- Broad reach across regions, including rural and low-innovation areas

- Increased use of digital services among traditional and lagging sectors
- Expanded ecosystem of certified Digital Solution Providers (DSPs)
- Strengthened SME participation in digital markets

Anticipated KPI Highlights

Because the instrument is not yet operational, KPIs are expected to include:

- Number of SMEs supported (target: large-scale outreach)
- SME digital intensity improvement per voucher
- Regional coverage (% of SMEs in lagging counties reached)
- Number of certified DSPs engaged
- Reduction in administrative barriers (time-to-application, time-to-approval)

Key Observations

→ **Strengths:** (1) highly accessible, low-barrier entry point for SME digitalisation, (2) scalable model capable of reaching thousands of SMEs, (3) supports digital inclusion across regions and sectors, and (4) builds local DSP ecosystems and improves SME-provider linkages.

→ **Challenges:** (1) requires high-quality control of DSP services, (2) potential risk of low-impact voucher use without proper diagnostics, (3) regional disparities in DSP availability may affect uptake, and (4) SMEs in rural areas may still require awareness-raising and digital literacy support.

Contribution to Policy Objectives

Once operational, the Digital Vouchers Scheme will directly support Croatia's commitments under the **EU Digital Decade 2030**, particularly the objective of ensuring that **all SMEs reach at least a basic level of digital intensity**.

It will also contribute to the **green-digital transition** by enabling SMEs to meet future regulatory and market requirements related to cybersecurity, digital compliance, and data governance.

With an effective provider registry, strong promotional outreach, and phased monitoring mechanisms, the scheme has the potential to become one of the most widely used digitalisation instruments in Croatia's policy portfolio.

Conclusion

In addition to the strategic design of the Digital Vouchers Scheme, **Croatia is actively preparing the ecosystem for its rollout** through structural partnerships and financial ecosystem development. For example, in **March 2024, HAMAG-BICRO and Erste Bank** signed an agreement to **enhance access to favourable SME financing**, enabling synergies

between public support and commercial banking in digital and green transition efforts. This forms part of a broader strategic move to **reduce SMEs’ digitalisation risks** by combining grants with low-interest loans and financial literacy support. The **Croatian Chamber of Economy (HGK)** has also publicly recognised Croatia’s **lagging position in SME digital transformation**, especially in traditional sectors, and is advocating for voucher-like measures to boost uptake of e-commerce, cybersecurity, and cloud solutions.

The **Digital Decade Country Report (2024)** further validates the urgency of such a measure: only **56% of SMEs** in Croatia have at least a basic level of digital intensity, and the **adoption rates of AI and cloud remain far below EU targets**. However, Croatia has shown potential, particularly in **data analytics** (51.7% SME usage, one of the highest in the EU), which suggests that voucher-based nudges could unlock significant growth if strategically targeted.

Given these conditions, the **Digital Vouchers Scheme** is **not only timely but essential** to bridge the digital divide, especially for SMEs in **less developed and rural regions**. To ensure equity and broad participation, it is recommended that the final design of the scheme includes a **regional outreach strategy**, collaboration with **Digital Innovation Hubs (EDIHs)**, and transparent **monitoring of provider performance**. If executed with precision, the scheme could become a **cornerstone of Croatia’s 2030 digitalisation strategy**, helping meet key EU Digital Decade objectives and reinforcing Croatia's ambition to become a digitally resilient economy.

Instrument Name	Digital Transformation Grants
Duration	2022–2026
Description of Goals	Support SME digital maturity through adoption of advanced digital tools (ERP, CRM, AI, cloud), employee training, and process optimisation.
Relevance to National and Regional Strategies	NPOOMeasureC1.1.2R3; aligned with Digital Croatia 2032 and EU Digital Decade 2030 targets.
Enhancing Digitalisation of SMEs	Co-funds strategic digital upgrades; targets medium-mature SMEs; over 700 SMEs expected to benefit in initial call.

Instrument Name	Grants for Commercialisation of Innovation
Duration	2022–2026
Description of Goals	Enable transition from RCD to market by supporting prototype development, IP protection, product certification, and pilot production.

Relevance to National and Regional Strategies	NPOO C1.1.2 R1; supports S3 domains, innovation agenda, and private RCD investment goals.
Enhancing Digitalisation of SMEs	Targets tech-intensive SMEs with high digital innovation potential; supports scaling of digital-based products and services.

Instrument Name	Grants for Startups
Duration	2022–2025
Description of Goals	Provide early-stage financial and technical support to startups developing digital solutions, digital platforms, or services.
Relevance to National and Regional Strategies	NPOO C1.1.2 R2; aligned with Digital Croatia 2032 and startup development under the National Innovation Policy.
Enhancing Digitalisation of SMEs	Lowers entry barriers; nurtures digitally native startups in health tech, fintech, SaaS, and AI.

Instrument Name	Support for EDIHs (European Digital Innovation Hubs)
Duration	2022–2025
Description of Goals	Provide SMEs with access to test-before-invest services, digital skills training, and access to EU funding and digital expertise.
Relevance to National and Regional Strategies	Part of Digital Europe Programme and NPOO C1.1.2 R3; aligned with S3 smart regions and Digital Decade goals.
Enhancing Digitalisation of SMEs	Regional one-stop-shops for SMEs; over 200 companies supported by 2023; tailored to sector-specific digital needs.

Instrument Name	Accelerator Scheme (Jačanje akceleracijske aktivnosti)
Duration	2022–2025
Description of Goals	Strengthen regional startup accelerators to provide business mentoring, investor matchmaking, and infrastructure access.

Relevance to National and Regional Strategies	NPOOC1.1.2R2; supports Digital Croatia 2032 entrepreneurship pillar and regional innovation ecosystems.
Enhancing Digitalisation of SMEs	Indirectly supports digital SMEs by creating growth-enabling environments; 11 consortia funded; 300+ startups reached.

Instrument Name	Digital Vouchers Scheme (Planned)
Duration	Expected 2024–2027
Description of Goals	Provide fast, accessible, small-scale co-financing for SMEs to procure digital services and tools from verified providers.
Relevance to National and Regional Strategies	Outlined in Digital Croatia 2032 and NDS; expected to support Digital Decade goals for SME digital intensity.
Enhancing Digitalisation of SMEs	Targets digitally immature SMEs; especially useful for crafts, agriculture, and rural firms; lowers entry barrier to digital tools.

2.2. General Assessment

The digitalisation of small and medium-sized enterprises (SMEs) in Croatia remains a key developmental challenge, despite recent progress and growing institutional support. The digital maturity of SMEs across the country is **uneven and fragmented**, with considerable differences by sector, firm size, and region. While Croatia has committed to aligning with the EU’s **Digital Decade 2030** goals, the current state of digital adoption among SMEs indicates that significant gaps remain, particularly outside urban centres and in traditional economic sectors.

Current State and Sectoral Variations

According to the **2024 Digital Decade Country Report**, only **56%** of Croatian SMEs have achieved at least a basic level of digital intensity—below the EU average. The uptake of cloud services (**42%**), data analytics (**51.7%**), and artificial intelligence (**8%**) remains concentrated among innovation-driven firms, primarily located in Zagreb and several developed counties such as Varaždin, Split-Dalmatia, and Primorje-Gorski Kotar.

Sectors such as **ICT, professional services, fintech, logistics, and export-oriented manufacturing** show the highest levels of digital integration. These industries are typically better positioned to adopt digital tools due to their business models, market exposure, and access to skilled personnel. In contrast, sectors like **agriculture, hospitality, construction, and crafts** continue to lag behind, with many SMEs using only basic tools

such as websites or social media, and lacking digital management systems, cloud platforms, or cybersecurity protocols.

Digitalisation in **rural and less-developed regions** is particularly weak, largely due to infrastructure deficits, brain drain, low awareness of available support, and lower absorptive capacity. These regional disparities contribute to a broader productivity and competitiveness gap between urban economic hubs and peripheral territories.

Digitalisation Snapshot - Croatia (2024)

- **56%** of SMEs have basic digital intensity
- **42%** use cloud technologies
- **51.7%** use data analytics (among the highest rates in the EU)
- **8%** use AI solutions
- Strong urban–rural digital divide persists

Main Issues and Gaps.

Several structural issues are hindering SME digitalisation in Croatia:

- **Low strategic awareness and prioritisation of digitalisation** among microenterprises and older SME managers.
- A **shortage of digital skills** within SME workforces, especially in firms operating outside the tech sector.
- **Limited access to finance**, particularly for microenterprises unable to self-fund digital investment or navigate complex application procedures.
- **Insufficient outreach and capacity** of innovation support systems in rural areas.
- A fragmented digital support landscape, with **limited coordination among public agencies, regional development actors, and chambers**.

Even when funding is available, many SMEs report difficulties in **project preparation, execution, and long-term integration** of digital tools into their operations. This reveals a gap not only in financial support but also in advisory and aftercare services.

Policy Agenda and Strategic Direction. Digitalisation of SMEs has become a **clear national priority** in Croatia and features prominently in major strategic frameworks:

- The **Digital Croatia Strategy 2032**, which provides long-term guidance for a digitally enabled economy and society;
- The **National Recovery and Resilience Plan (NPOO)**, which allocates over €100 million in combined funding across several instruments for SME digitalisation.
- The **Smart Specialisation Strategy (S3)**, which links innovation support to regionally relevant sectors;
- The **National Development Strategy (NDS) 2030**, which frames digital transformation as a pillar of economic resilience.

The government has launched multiple measures to accelerate SME digitalisation. These include direct investment grants (e.g., Digital Transformation Grants), ecosystem development instruments (e.g., Accelerator Scheme and EDIHs), and support for early-stage startups and innovation commercialisation. Additional measures are being prepared, such as the **Digital Vouchers Scheme**, which will provide fast, user-friendly co-financing for digital tool adoption— particularly targeting the most vulnerable SMEs.

Furthermore, **national institutions like HAMAG-BICRO and the Chamber of Economy (HGK)** are increasingly active in promoting digital tools, mapping service providers, and supporting ecosystem capacity building. The **partnership with Erste Bank (2024)** also represents a new hybrid financing model that blends public support with commercial credit products.

Despite these positive developments, implementation challenges remain. These include the need for **decentralised digital support structures, greater integration of funding and training**, and a **stronger monitoring system** to track the real-world impact of instruments on SME competitiveness.

In conclusion, Croatia's SME digitalisation agenda is evolving rapidly, backed by both political commitment and EU support. However, unlocking its full potential will require targeted outreach, simplification of access, and a focus on **bridging the digital divide between frontrunners and laggards**, both in sectoral and territorial terms.

2.3. Identification of Policy Challenges

Croatia has made substantial progress in designing and deploying a range of policy instruments aimed at accelerating the digitalisation of its SME sector. However, a review of current instruments and their implementation reveals persistent and systemic challenges that hinder full and inclusive digital transformation across all regions and sectors.

Main Challenges in SME Digitalisation.

The key challenge remains the **uneven digital maturity of SMEs**, with significant differences in uptake of digital tools depending on firm size, sector, and geographic location. While tech-savvy SMEs in urban centres are generally responsive to calls and instruments such as digital transformation grants and innovation vouchers, the majority of Croatian SMEs— especially those in rural and traditional sectors—lack the awareness, capacity, or confidence to engage with digital technologies or to apply for public support.

Instruments like the **Digital Transformation Grants** and **Grants for Commercialization of Innovation** have seen strong demand among better-prepared firms but have struggled to reach microenterprises and low-capacity SMEs. Many SMEs report challenges in understanding eligibility criteria, navigating application procedures, or implementing approved projects, especially where no advisory or aftercare support exists.

The **Accelerator Scheme** and **EDIHs** have made headway in strengthening the startup and innovation ecosystem, but their **impact is still concentrated in well-developed regions**, leaving peripheral and less connected SMEs underserved. Similarly, the planned **Digital Vouchers Scheme**, while promising in its simplicity, must overcome structural access barriers—especially among SMEs without basic digital literacy or access to service providers in their regions

Assessment of Policy Instruments and Barriers.

The policy instruments currently in place often exhibit **strong design logic** but **limited reach and scalability**. Barriers identified include:

- **Low awareness and outreach**, particularly among SMEs in rural or low-digital-intensity sectors.
- **Administrative complexity** in grant application processes, including burdensome documentation and formal requirements. In practice, SMEs face extensive documentation requirements, complex eligibility conditions, and multi-step reporting obligations.
- **Weak integration** of capacity-building or mentoring services with funding instruments, reducing implementation success rates.
- **Insufficient regional tailoring** of instruments to local SME profiles, market needs, and digital ecosystem maturity.
- **Short funding cycles** and unpredictable timelines, which discourage smaller firms from participating.

From a beneficiary perspective, many SMEs highlight the need for:

- **More practical support** before and after grant implementation;
- Access to standardised digital tools and service providers;
- **Flexible financing mechanisms**, including blended or phased instruments;
- Improved **information dissemination** at local levels through chambers, development agencies, or sectoral associations.

A critical distinction must be made between **general measures**, which indirectly support digitalisation, and **specific measures**, which target digital adoption directly.

General measures include:

1. Investments in broadband infrastructure and public e-services (e.g. e-Invoicing, e-Business portals);
2. Adult education and vocational training reforms (e.g. voucher-based upskilling);
3. Fiscal and legal reforms supporting entrepreneurship and startup capital access.

These general actions create **enabling conditions** but often lack immediate visibility or tailored impact for SMEs.

Specific measures include: digital Transformation Grants, commercialisation of Innovation Grants, Startup Support and Accelerators, EDIHs and their services, The planned Digital Vouchers Scheme.

These are **designed for direct uptake** by SMEs and are better suited to delivering measurable progress—provided implementation challenges are addressed.

Link to National and Regional Policy Frameworks. The challenges identified reflect broader **structural and institutional limitations** within Croatia’s digitalisation ecosystem, many of which have been acknowledged in strategic policy frameworks but remain only partially addressed in practice. While the **Digital Croatia Strategy 2032** articulates an ambitious and comprehensive vision for a competitive, inclusive, and digitally transformed economy, the **translation of this vision into measurable, territorially balanced outcomes is still insufficient.**

At the core of the issue is the **implementation gap**—a disconnect between strategic ambition at the national level and practical execution at the regional and local levels. The Digital Croatia Strategy clearly recognises the need for developing regional digital innovation ecosystems, strengthening the role of SMEs in digital value chains, and closing the digital divide across economic sectors. However, the strategy’s operationalisation still **lacks sufficient coordination mechanisms, clear delineation of responsibilities, and supporting instruments adapted to regional contexts.**

A similar challenge affects the **Smart Specialisation Strategy (S3)**. Designed to align RCD and innovation policy with regional economic strengths, the S3 framework offers sectoral direction (e.g. ICT, health, energy, creative industries), but its **territorial anchoring is weak.** Regional development agencies, local authorities, and business support organisations often do not have the **institutional capacity, decision-making autonomy, or funding leverage** to fully operationalise S3 goals in support of SME digitalisation. As a result, many regional economies remain passive recipients of national measures rather than active co-creators of locally grounded innovation agendas.

This institutional asymmetry is further reflected in the **National Recovery and Resilience Plan (NPOO)**, which includes a suite of instruments to support digitalisation, green transition, and innovation. While the NPOO aligns well with EU priorities, its instruments are often **complex, centralised, and project-driven**, limiting their accessibility to smaller SMEs and their adaptability to region-specific needs. Moreover, many NPOO-funded calls have required substantial project development capacities, often available only to firms in urban regions or those with prior experience in managing EU funds.

The **monitoring and evaluation frameworks** associated with these strategies are also fragmented. Although Croatia collects data on digital intensity, innovation uptake, and SME participation, **there is no unified national mechanism** that tracks the long-term performance and regional distribution of policy impacts. Without granular, disaggregated monitoring, it is difficult to identify what works where—and why—and to adjust instruments accordingly.

Furthermore, **regional and local actors**, including innovation centres, development agencies, and municipalities, often lack a **clear mandate or financial instruments** to adapt and complement national schemes. This leaves them in a reactive position, unable to tailor solutions to their local SME base or to serve as active nodes in the national innovation system. In the current institutional setting, there is a notable **absence of multi-level governance** that would enable vertical coordination (national-regional-local) and horizontal collaboration (between regions and sectors), both of which are crucial for effective digital transformation policy.

The **Digital Croatia Strategy 2032** acknowledges this fragmentation and proposes steps toward more integrated governance, including:

- Developing interoperable data platforms to track SME digital maturity across regions;
- Strengthening regional innovation systems through the establishment of Digital Innovation Hubs (EDIHs);
- Encouraging the use of smart regulation and regulatory sandboxes to test new policy approaches.
- Promoting digital champions at the local level who can serve as intermediaries between policy and practice.

However, implementation of these measures is at an early stage and requires **more robust political and financial support**. Without it, even the best-designed national tools risk being **underutilised, poorly targeted, or inequitably distributed**, particularly in regions facing systemic development constraints or low digital readiness.

Ultimately, the success of Croatia’s digital transformation strategy—especially as it relates to SMEs—depends on its ability to **build functional linkages between high-level policy ambitions and everyday business realities**. This requires not only continued investment in digital infrastructure and tools, but also **structural reform in how digital policies are governed**, delivered, and evaluated. Only through such an integrated and responsive policy system can Croatia close the digital gap between frontrunners and laggards and ensure that no region or sector is left behind in the digital decade.

Summary: Assessment of Challenges Related to SME Digitalisation Policy Instruments

Title of the Challenge	Description of the Challenge
C1: Uneven Access and Low Absorptive Capacity among SMEs	<p>Despite the availability of funding through instruments such as the Digital Transformation Grants and Innovation Commercialisation Grants, uptake remains concentrated in more digitally mature SMEs, primarily in urban areas. Micro and traditional SMEs often lack the skills, capacity, and awareness to engage with these opportunities. Rural and sector-specific disparities persist, especially in agriculture, crafts, and hospitality.</p> <p>→ Policy link: NPOO Measures C1.1.2 R1, R3; Digital Croatia Strategy 2032</p> <p>→ Measure Type: Specific</p>

Title of the Challenge	Description of the Challenge
C2: Fragmented Support Ecosystem and Implementation Gap	<p>Regional innovation stakeholders—such as local development agencies and innovation centres—lack sufficient mandate, funding, or autonomy to localise national instruments. As a result, many SMEs are not reached by support programs. There is a clear need for decentralised, multi-level governance and better horizontal coordination.</p> <p>→ Policy link: Digital Croatia Strategy 2032; S3 Strategy; NDS 2030</p> <p>→ Measure Type: General and specific (EDIHs, Accelerators, e-Infrastructure)</p>
C3: Lack of Integrated Capacity-Building with Financial Instruments	<p>Many instruments offer funding without embedded advisory, mentoring, or post-project support, leading to low impact in digital tool adoption. For instance, while EDIHs and Accelerators offer services, they are not systematically connected to grant schemes. Digital literacy, training, and implementation support must be embedded across all stages.</p> <p>→ Policy link: NPOO Measures R2, R3; Digital Skills pillar of Digital Croatia Strategy 2032</p> <p>→ Measure Type: Specific (but cross-cutting with general education efforts)</p>

2.4. Regional Competitiveness

Digitalisation of SMEs plays a critical role in enhancing regional competitiveness across economic, social, and innovation performance indicators. In Croatia, this impact is

particularly important due to the persistent disparities between urban and rural areas, and between the two NUTS2 regions: Continental Croatia and Adriatic Croatia.

a) Economic Impact

Croatia's GDP per capita in 2023 stood at approximately 73% of the EU average (Eurostat), with Continental Croatia outperforming Adriatic Croatia due to the concentration of high-value services, administrative functions, and research institutions in Zagreb. However, the regional economic gap is exacerbated by uneven levels of digitalisation. Regions with a more advanced SME digital base—such as Zagreb, Varaždin, and Rijeka—tend to exhibit higher productivity and employment rates, particularly in the ICT and innovation-driven SME sector.

The ICT sector in Croatia is among the best-paid industries, with average **gross monthly wages exceeding €2,000**, significantly above the national average (**around €1,200 gross**). Digitally mature SMEs in this sector tend to attract and retain higher-skilled workers, contributing to regional brain gain. Conversely, SMEs in low-tech or traditional sectors face wage stagnation and difficulty accessing skilled labor, partly due to insufficient digital transformation. Salary premiums for digitally skilled professionals continue to widen, reinforcing competitiveness in regions with a higher density of tech-enabled SMEs.

b) Social Impact: Quality of Life, Inclusion, and Community Resilience

The digitalisation of SMEs significantly influences social well-being across Croatia, affecting quality of life, social inclusion, and community resilience. The impact varies notably between urban and rural regions, reflecting disparities in digital infrastructure, economic opportunities, and access to services.

Quality of Life and Smart Services. Croatia's overall **Quality of Life Index** stands at **177.4**, ranking it 23rd globally. Regions with a high concentration of digitally mature SMEs, such as Zagreb, Rijeka, and Varaždin, benefit from:

- a. **Enhanced access to digital public services**, including e-health and e-government platforms.
- b. **Improved transportation and mobility solutions**, facilitated by digital logistics and smart city initiatives.
- c. **Increased remote work opportunities**, contributing to better work-life balance.
- d. **Greater resilience during crises**, as digitally equipped SMEs can adapt more readily to disruptions.

These factors collectively contribute to higher life satisfaction and attract a skilled workforce, further reinforcing regional development.

- **Rural and Underserved Areas: Digital Divide and Declining Services.** In contrast, rural regions like parts of Slavonia, Lika-Senj, and Banovina face challenges due to limited SME digitalisation:
- **Reduced access to digital services**, impacting healthcare, education, and administrative processes.

- **Higher unemployment rates**, as traditional industries struggle to compete without digital tools.
- **Youth migration**, driven by the search for better opportunities in digitally advanced urban centers.

This digital divide exacerbates regional inequalities and hampers overall national cohesion.

Social Inclusion and Gender Equality. Digitalisation fosters social inclusion by:

- e. **Creating flexible work environments**, accommodating diverse needs, including those of caregivers and individuals with disabilities.
- f. **Empowering women entrepreneurs**, particularly in sectors like e-commerce and digital marketing.
- g. **Facilitating access to education and upskilling**, through online platforms and resources.

However, these benefits are predominantly realized in regions with robust digital infrastructure, highlighting the need for targeted interventions in lagging areas.

Community Resilience and Digital Public Value. Digitally advanced SMEs contribute to community resilience by:

- h. **Maintaining operations during crises**, such as the COVID-19 pandemic, through remote work and online services.
- i. **Collaborating with public institutions**, to develop community support systems and digital tools.
- j. **Driving local innovation**, by integrating into regional development strategies and fostering public-private partnerships.

These contributions underscore the role of SME digitalisation in building adaptive and sustainable communities.

Conclusion

The digital transformation of SMEs is pivotal for enhancing social well-being and reducing regional disparities in Croatia. Strategic investments in digital infrastructure, targeted support for SME digitalisation, and inclusive policies are essential to ensure equitable development and social cohesion across all regions.

c) Innovation Performance: Regional Innovation Index

According to the European Innovation Scoreboard (EIS) 2023, Croatia is classified as an "Emerging Innovator", with an overall innovation performance at 63.6% of the EU average. This places Croatia in the lower tier of EU Member States regarding innovation capabilities. Key weaknesses contributing to this status include low private R&D investment, limited SME product and process innovation, and underutilization of intellectual property (IP) systems,

such as patents and trademarks. These deficiencies hinder the country's ability to foster a robust innovation ecosystem and integrate into higher-value segments of the global economy.

The Regional Innovation Scoreboard (RIS) 2023) further highlights significant internal disparities within Croatia. The City of Zagreb (Grad Zagreb) stands out as a "Strong Innovator", with an innovation index of 102.8, surpassing the EU average. This performance is attributed to a concentration of research institutions, higher education facilities, and a vibrant business environment that encourages innovation. In contrast, other regions, particularly in Eastern Croatia—such as Vukovar-Srijem, Brod-Posavina, and Požega-Slavonia—are categorized as "Emerging Innovators", with innovation indices ranging from 60.6 to 68.1, significantly below the EU average. These regions face challenges like low business R&D intensity, minimal SME collaboration on innovation, and limited access to innovation-supporting infrastructure.

The correlation between SME digitalisation and regional innovation performance in Croatia is evident and substantiated by recent data. Regions with higher levels of SME digital adoption tend to exhibit stronger innovation outputs, as digital tools enable firms to integrate into knowledge networks, leverage data for R&D, and collaborate effectively with universities and innovation hubs. Initiatives like the establishment of European Digital Innovation Hubs (EDIHs) and the Digital Innovation Hub (DIH) Croatia aim to bolster SME digital capabilities. However, the reach of these programs remains uneven, often limited to more developed urban areas.

The digitalisation of SMEs is directly correlated with improved regional innovation performance. Digital tools enable firms to integrate into knowledge networks, leverage data for R&D, and collaborate effectively with universities and innovation hubs. Where SME digitalisation is systematically supported, such as through EDIHs or DIH Croatia, innovation capacity improves. However, without expanding local access to digitalisation support and fostering smart specialisation linkages, Croatia risks consolidating innovation capacity in just a few metropolitan areas.

In 2023, Croatia advanced in the digitalisation of SMEs, reaching 56%, a 6.3% increase compared to the previous year, though this remains slightly under the EU average of 57.7%. Notably, Croatia is among the EU leaders for enterprises using data analytics, with 51.7% of enterprises compared to an EU average of 33.2%. Despite these advancements, challenges persist, particularly in the digitalisation of government services and increasing connectivity in rural areas. For example, only 25.5% of Croatian rural areas are covered by very high-capacity networks (VHCN), compared to an EU average of 55.6%.

To address these disparities, initiatives like EDIH ADRIA have been established. Coordinated by the University of Rijeka, EDIH ADRIA supports the digital transformation of companies in Adriatic Croatia. The project offers support in areas such as high-performance computing, artificial intelligence, cybersecurity, advanced digital skills, and the deployment of digital capacity. It operates as a user-centric consortium, allowing interested users to

test digital technologies, attend workshops, and learn how to implement various digital solutions in their businesses.

Despite these efforts, the reach of digital innovation programs remains uneven, often limited to more developed urban areas. Without expanding local access to digitalisation support and fostering smart specialisation linkages, Croatia risks consolidating innovation capacity in just a few metropolitan areas, leaving peripheral regions further behind.

In conclusion, while Croatia has made notable progress in SME digitalisation and innovation performance, significant regional disparities persist. Addressing these disparities requires expanding access to digitalisation support across all regions, fostering smart specialisation linkages, and ensuring that initiatives like EDIHs and DIH Croatia reach SMEs in less developed areas. Such efforts are crucial for enhancing regional innovation performance and ensuring balanced economic development across the country.

2.5. Good Practices and Recommendations:

Croatia has implemented a range of **policy instruments** at national and regional levels to boost innovation, entrepreneurship, and R&D, with a strong focus on small businesses and digitalisation. Below we highlight several successful initiatives since 2014 (especially from the last five years), describing their goals, structure, responsible bodies, and reported outcomes or impacts. These instruments have shown positive results and offer **lessons for transfer** or scaling to other regions.

Venture Capital and Financing Initiatives

Croatian Venture Capital Initiative (CVCi) – Phases I & II: To spur startup financing, the Ministry of Regional Development and EU Funds partnered with the European Investment Fund (EIF) to launch a fund-of-funds supporting venture capital. CVCi I was introduced in 2018 with €35 million, and by 2023 it had financed about 140 early-stage startups across Croatia. This success led to CVCi II in 2023, scaling up to €80 million (with ERDF 2021–27 funding and reinvested returns). The program invests through private VC funds and accelerators, aiming to “crowd-in” private investors and grow the innovation ecosystem. Implementing bodies: EIF manages the fund, with oversight by the Croatian Ministry. Outcomes: A stronger domestic VC market (initial fund almost fully invested) and dozens of startups funded; the follow-up fund expects a total impact around €100 million including private co-investment. This public-private VC model is seen as a replicable approach for other regions seeking to boost startup investment.

ESIF Loan and Guarantee Programs: Through HAMAG-BICRO (Croatian Agency for SMEs, Innovations and Investments) and HBOR (Croatian Development Bank), Croatia deployed EU Structural Funds 2014–20 to improve SME financing. For example, ESIF Micro and Small Loans provided affordable credit to SMEs (up to €50k) cepor.hr, and an ESIF individual guarantee scheme helped SMEs secure bank loans by covering part of the risk. These instruments improved access to finance (rejection rates for SME loans dropped to 0% in

2017). While not exclusively digital, they enabled SMEs to invest in new equipment and technology. Implementers: HAMAG-BICRO and HBOR, via local banks. Outcomes: Improved credit conditions for hundreds of SMEs; the cost of borrowing for small loans relative to large fell significantly by 2017. These financial tools complement innovation policy by strengthening the financial environment for SMEs, and are adaptable to other regions.

Innovation and R&D Grant Programs

RsD Grants (“IRI” Program): The IRI program (Istraživanje, Razvoj i Inovacije) is Croatia’s largest RsD grant scheme, funded by EU cohesion policy. Launched around 2016, its goals are to co-finance corporate RsD projects that develop new products or services, often in collaboration with research institutes. The Ministry of Economy (then Entrepreneurship and Crafts) and HAMAG-BICRO ran IRI calls (sometimes termed IRI-1, IRI-2 for successive rounds). Structure: Competitive calls awarding grants to innovative SMEs and partnerships, focusing on later-stage development to bring innovations to market. Outcomes: Over 250 projects have been supported (as of World Bank reviews), helping firms increase RsD investment and innovate. However, evaluations noted that while IRI addresses a clear market failure (low private RsD), it tended to favor less risky, near-market projects. Even so, many beneficiaries have commercialized new products. For instance, companies like Rimac Automobili (electric supercars) expanded exports after receiving RsD support, and multiple tech SMEs (e.g. Geolux sensors, Replsly SaaS, Amodo insurtech) grew into global markets following grant-backed innovation projects. The IRI model – large-scale matching grants for innovation – is common in the EU and transferable, though Croatia’s experience shows the importance of targeting truly risky, breakthrough RsD for greater impact.

Proof of Concept (PoC) Program: Originally developed by the pre-accession agency BICRO and later run by HAMAG-BICRO, PoC has been a flagship early-stage innovation instrument. It offers small grants to test and validate innovative ideas (prototyping, market research), aimed at researchers and nascent entrepreneurs. Goal: create a pipeline of RsD-based innovation by bridging the gap between idea and full RsD projects. Operational structure: Frequent calls where applicants (startups, SMEs or research teams) compete for grants (often ~\$35k each) to prove a concept’s feasibility. Implementing body: HAMAG-BICRO, with funding from national sources and the World Bank in earlier years. Outcomes: High success rate in spawning startups and technologies. A World Bank assessment noted PoC scored highly in Croatia’s policy mix, with a “proven track record of creating a pipeline of RsD- based innovation”. Despite funding fluctuations after 2015, PoC supported many firms that later achieved international success. For example, Geolux (now exporting hydrology sensors worldwide) and Amodo (telematics insurance platform with 75% export share) both benefited from PoC grants in their early stages. Rimac Automobili, Croatia’s first unicorn, also received PoC support for battery systems RsD. The PoC model has clear transfer potential – many regions adopt similar “innovation voucher” or proof-of-concept schemes to stimulate entrepreneurial experimentation with relatively small public funds.

“Entrepreneurial Impulse” Grant Scheme: The Entrepreneurial Impulse was a national SME grant program (run by the Ministry of Entrepreneurship and Crafts) active through the

mid-2010s. It consolidated various SME support measures into an annual call, making it easier for firms to access aid. It targeted different SME groups (startups, crafts, women entrepreneurs, exporters, etc.) with co-financing for equipment, training, and business development. Implementing body: Ministry (and HAMAG-BICRO for disbursement). Outcomes: It funded thousands of small businesses – e.g. in 2017 alone over 3,400 craft businesses received grants (including hundreds for training) cepor.hr. The 2018 EU SME Fact Sheet cited Entrepreneurial Impulse as a positive example of targeted state aid to SMEs. While it was phased out as EU structural fund programs took over, its integrated approach and reach (over 7,300 grants awarded by one report) helped strengthen the SME sector. The concept of a one-stop, broad-based SME grant program can be adapted by other regions to streamline support.

Title of the Good Practice	GP Description
GP 1: EDIH Adria – European Digital Innovation Hub	EDIH Adria, coordinated by the University of Rijeka, supports SME digital transformation in Adriatic Croatia. It provides access to services in AI, cybersecurity, advanced digital skills, and high-performance computing. Funded through the Digital Europe Programme and the NPOO, it operates as a regional one-stop shop for testing and adopting digital solutions, with strong potential for replication across other regions.
GP 2: PISMO Novska – Gaming Industry Incubator	The PISMO incubator in Novska, a rural region, focuses on developing Croatia's gaming industry. Co-funded by EU and local sources, it offers infrastructure, training, and incubation for gaming startups. Since 2018, it has supported over 60 companies and 200+ developers (source: PISMO 2023 report). The project illustrates how niche-focused incubation in underserved areas can yield transformative results and is widely seen as a top national example of EU fund use.
GP 3: Proof of Concept (PoC) Program – HAMAG-BICRO	Croatia's PoC program provides early-stage innovation grants to validate ideas through prototype development or market research. Operated by HAMAG-BICRO, it has supported hundreds of tech startups like Rimac and Amodo, many of which expanded globally. The instrument is seen as a pipeline builder for larger R&D and innovation funding and is easily adaptable across other regions or countries aiming to boost entrepreneurial innovation.

GP 4: ZICER – Zagreb Innovation Centre	ZICER, established by the City of Zagreb, serves as a central hub for startups and innovators. It offers co-working spaces, laboratories, mentorship, and acceleration programs. Since its inception, ZICER has incubated numerous startups, contributing significantly to the local innovation ecosystem. Its model of municipal support combined with comprehensive services provides a replicable framework for urban innovation centers.
GP 5: ICT Županija – Split-Dalmatia County Initiative	ICT Županija is a regional initiative aimed at fostering the ICT sector in Split- Dalmatia County. It encompasses various programs, including coding schools, startup incubators, and tech events, to stimulate digital skills and entrepreneurship. The initiative has successfully nurtured a vibrant tech community in the region, demonstrating the impact of coordinated regional efforts in digital development.
GP 6: CEKOM– Competence Centers for Smart Specialization	CEKOMs are collaborative platforms that bring together businesses, research institutions, and public entities to work on R&D projects aligned with Croatia's Smart Specialization Strategy. These centers focus on areas like smart cities, health, and energy, facilitating applied research and innovation. The CEKOM model promotes regional development through targeted innovation and has potential for adaptation in other contexts.
GP 7: Digital Innovation Hubs (DIHs) Network	Croatia's network of DIHs provides SMEs with access to digital technologies, expertise, and testing facilities. These hubs support companies in their digital transformation journeys, offering services like training, consultancy, and pilot projects. The DIH network enhances regional innovation capacities and serves as a bridge between research and industry, aligning with EU digitalization goals.
GP 8: Strategic Partnerships for Innovation (SPIN) under S3 Strategy	SPIN initiatives under Croatia's Smart Specialization Strategy foster collaboration among academia, industry, and government to drive innovation in key sectors. By aligning regional strengths with national priorities, SPIN projects enhance competitiveness and support the development of high- value products and services. This collaborative approach to innovation policy can be tailored to various regional contexts.

SME Digitalisation Support Programs

Digitalisation Vouchers (2023): In the wake of COVID-19, Croatia’s **National Recovery and Resilience Plan (NPOO)** earmarked significant funds for SME digital transformation. In

2023 the Ministry of Economy launched a **€G.G5 million “Vouchers for Digitalisation” program** (around \$11 million) offering small grants to help SMEs adopt new digital technologies. *Goals:* Increase the digital maturity of SMEs by funding specific digitalisation needs. *Structure:* SMEs apply for **vouchers in categories** such as improving digital skills, developing a digital transformation strategy, digital marketing, cybersecurity diagnostics, or implementing complex digital solutions. Each voucher (worth up to ~€10k) covers the cost of services or training in that domain. *Implementing body:* Ministry of Economy, funded by the EU Recovery Facility. *Reported outcomes:* As a very recent measure, full results are pending, but demand has been strong – the call aims to support **hundreds of SMEs** across all regions. The **expected impact** is to raise competitiveness and resilience by integrating digital tools (cloud, e-commerce, AI, etc.) in traditional businesses. This voucher model, already used in some EU countries, is **highly transferable:** it addresses common digitalisation hurdles (knowledge, strategy, cybersecurity) in an SME-friendly way. Croatia’s program is notable for its comprehensive scope (five voucher types) and alignment with EU’s Digital Decade targets.

Grants for Digitalisation (RRP): Alongside vouchers, Croatia’s RRP included **direct grants for SME digitalisation projects** (~€27 million allocated). A 2023 call invited proposals for larger projects involving deployment of new or significantly improved digital processes, products or business models in SMEs. *Goal:* Accelerate post-pandemic recovery by boosting productivity through advanced technology adoption (e.g. automation, digital customer service, etc.). *Implementer:* Ministry of Economy (funding from EU Recovery Plan). *Outcomes:* Still in early stages – expected to fund a portfolio of SME projects that demonstrate tangible business improvements via digital tech. These Recovery Plan measures fill a gap by funding digital upgrades that might be too costly for small firms alone.

They also complement longer-term cohesion policy programs and can be mirrored in other countries’ recovery strategies.

European Digital Innovation Hubs (EDIHs): In 2022–2023, Croatia joined the EU’s network of **European Digital Innovation Hubs**, which are one-stop shops helping SMEs navigate digital transformation. Examples include **EDIH Adria** (led from Pula, serving Adriatic Croatia) and **EDIH CroboHUB++** (focused on robotics and AI, led by the Innovation Center Nikola Tesla in Zagreb). *Structure:* Co-funded by the EU Digital Europe Programme and national sources, EDIHs offer services like digital maturity assessments, “test before invest” facilities (labs for trying AI, IoT, etc.), training for employees, and matchmaking with tech providers. *Implementing consortia:* Typically universities, research institutes, and chambers of commerce form the hubs. For instance, EDIH Adria is coordinated by University of Pula with partners, and CroboHUB++ by University of Zagreb’s innovation center. *Goals:* Increase adoption of advanced digital technologies (AI, big data, robotics) among SMEs and public sector in the region. *Outcomes:* Though just starting, they build on earlier pilot Digital Innovation Hubs. By 2030, Croatia aims to significantly raise the share of SMEs using cloud, AI, and big data (targets in its Digital Strategy), and the EDIHs are key enablers.

The **potential for transregional transfer** is inherent – EDIHs themselves form an EU-wide network to share best practices. Croatia’s hubs, covering specialized areas like smart cities, manufacturing, and healthcare, can serve as models for how less-developed regions can catch up on digitalisation by leveraging pan-European expertise.

Innovation Infrastructure and Incubation

Competence Centres (CEKOMs) – Cluster-Based Innovation: Croatia introduced Competence Centers (CEKOM) as part of its innovation infrastructure under the 2014–20 ERDF programs. A CEKOM is essentially an innovation cluster partnership focused on a strategic domain, which receives public funding to conduct collaborative R&D projects and build shared facilities. One notable example is the CEKOM for Smart Cities in Rijeka, approved in 2020 under the OP Competitiveness and Cohesion. It brings together 20 partners (companies, the City of Rijeka, and research institutes) to work on six R&D projects addressing urban challenges (traffic flow optimization, smart energy management, e-health, etc.), with 36 innovative solutions expected over three years. Goals: strengthen industry–science cooperation and produce marketable innovations that solve real-world problems (in this case, city services) Operational model: Each competence center is usually coordinated by a lead entity (e.g. SMART RI d.o.o for Smart Cities) and funded by grants (multi-million EUR) to execute a portfolio of sub- projects. Outcomes: While still ongoing, the Rijeka Smart City CEKOM is creating new products and startups (e.g. intelligent transport systems) and has fostered effective triple-helix collaboration. Another CEKOM, focusing on advanced engineering in Slavonia, aims to boost eastern Croatia’s competitiveness through applied innovation In policy evaluations, the CEKOM instrument was the only one rated “high” on strategic justification, directly tackling the market failure in industry-research linkages This cluster- centric approach has clear transfer value – it mirrors models like innovation clusters and living labss elsewhere. Croatia’s experience shows that a well-designed competency center can anchor regional innovation and align R&D with local economic needs.

Business Incubators and Accelerators: A network of incubators across Croatia has expanded since 2014, often with EU funding, providing critical support to startups and SMEs. For example, ZICER (Zagreb Innovation Centre) is a leading incubator owned by the City of Zagreb. Established in 2017 by repurposing a municipal space, ZICER offers coworking areas, labs, mentorship and an accelerator program to tech startups. Goals: nurture innovative companies from idea stage to market. Structure: ZICER houses around 80–100 startups on site and runs the Startup Factory pre-seed accelerator which has created 80 new companies since 2016. It’s managed by a city agency, demonstrating strong local government involvement in entrepreneurship. Outcomes: In five years, over 100 startups have passed through ZICER, some achieving global traction. The center has grown from 1,000 m² to a much larger facility and is now “the flagship of the city” for innovation. ZICER’s director notes that its model – a publicly backed hub with holistic startup support – could expand nationally or regionally, highlighting its potential as a template for other regions. Indeed, other cities have launched similar hubs: BIOS in Osijek (a long-running incubator

now expanded), and TIC Međimurje in Čakovec (a regional innovation center), have both been bolstered through EU projects, offering workspace, FabLabs and coaching to local entrepreneurs cepor.hr. These incubators have contributed to spreading tech startup activity beyond the capital.

PISMO – Novska Gaming Incubator: A standout regional success story is PISMO Business Incubator in the small town of Novska (Sisak-Moslavina County). Founded in 2018 with about €3.6 million from the EU and county funds, PISMO set out to create a video gaming industry hub in a formerly underserved region. Two refurbished buildings were equipped with state-of-the-art hardware for game development, VR/AR, and digital animation. Implementers: The Sisak-Moslavina County Development Agency led the project, with backing from the Ministry of Regional Development. Goals: generate new high-tech businesses and jobs in a region of high unemployment by focusing on the booming gaming sector; also, diversify the local economy (complementing the county’s tradition in metal industries). Operationally, PISMO provides office space, incubation for startups, specialized training programs, and access to game development labs. Outcomes: The project had immediate impact – within a few years, PISMO housed 60+ gaming startups and over 200 developers trained through its courses. It has put Novska on the tech map, to the extent that an ambitious €50–60 million Gaming Campus is now planned to further grow this ecosystem. In 2020, PISMO was voted the “Most Successful EU-Funded Project in Croatia” in a national competition, recognized for its contribution to entrepreneurship. This initiative clearly demonstrates transferable insight: even small, rural regions can carve out a niche in the digital economy with visionary focus and smart use of EU funds. Other regions could emulate the PISMO model by targeting a specific high-growth tech niche (gaming, AI, biotech, etc.) and building an innovation cluster around it.

Regional and Local Digitalisation Initiatives

“ICT Županija” – Split-Dalmatia County Project: At the regional level, one example is the ICT Županija program (Digital Dalmatia) initiated by Splitsko-dalmatinska County. This is a comprehensive effort by county authorities to improve the local tech startup scene and digital skills base. Goals: Encourage IT entrepreneurship and talent development in the Split region, traditionally not a tech hub. Measures: It unites a variety of actions – seed funding for startups, free coding schools and hackathons, support for tech events (conferences like Shift), and the creation of co-working spaces. ICT Županija also co-finances a local accelerator (Startup Academy) for early-stage teams. Implementer: The County’s Department for Economy, in partnership with local tech companies and the university. Outcomes: Since its start around 2016, the Split region has seen a renaissance in entrepreneurship – dozens of startups have emerged (e.g. Parklio, a smart parking startup that raised €1M), and the community of developers and “digital nomads” has grown. The initiative helped establish Digital Dalmatia as a brand and physical hub in Split for innovators. While harder to quantify than a single program, ICT Županija’s holistic approach (combining education, networking, and funding) has been credited with energizing the local tech ecosystem and is relevant to other regions seeking to build innovation culture outside

the capital. It shows the importance of regional authorities taking ownership of digital development by coordinating stakeholders and resources.

Smart Specialisation Strategy s Transregional Learning: Croatia’s Smart Specialisation Strategy (S3), implemented from 2016, provided an umbrella for many of these instruments by identifying priority domains (like ICT, biotech, energy, etc.) for investment. Under S3, Croatia has encouraged inter- regional collaboration and participation in EU programs (e.g. Horizon 2020, Interreg). For instance, the country has engaged in Interreg projects to exchange good practices on incubator management, cluster policies, and SME digitalisation. One concrete outcome is that Croatian agencies and regions have been actively learning from peers – e.g. taking part in the “Digital Europe for SMEs” initiative and OECD reviews on digital and green SMEs. Impact: This has led to continuous refinement of policy instruments. A recent OECD report noted that the number of Croatian SMEs in ICT sectors grew by over 50% between 2016 and 2023, suggesting an improving environment. The transregional knowledge transfer (through EU networks, clusters alliances, etc.) is both a policy instrument in itself and a driver to adapt successful tools from elsewhere. Croatia’s progress in the last five years – from launching voucher schemes to establishing EDIHs and niche incubators – reflects this interplay of domestic initiative and European- level support, offering a rich set of examples for other regions on their innovation journey.

Data Infrastructure

Croatia’s approach to SME digitalisation is guided by national strategies closely aligned with EU policies. The **National Development Strategy 2030** highlights the “digital transition of the economy” as a priority, alongside digitalising public administration and developing digital skills. Building on this, the government adopted the **Digital Croatia Strategy 2032**, which is led by the Središnji državni ured za razvoj digitalnog društva (SDURDD, Central State Office for Digital Society Development) . SDURDD is responsible for drafting and implementing the strategy in coordination with stakeholders across government, industry, and academia.

Data Sources and Tools for Assessing SME Digitalisation

Croatia’s **official statistical system** provides key data for assessing SME digitalisation and competitiveness. The national statistical office (DZS) conducts an annual survey on ICT usage in enterprises, aligned with Eurostat methodology. According to the latest results, *SS% of Croatian enterprises use computers with internet access, S2% have broadband, and c2% maintain a website* – indicating a broad basic digital uptake. More advanced metrics show growing adoption of digital tools: as of 2024, *42% of enterprises use cloud computing services*. However, **e-commerce remains underutilized**, accounting for only 19% of total business sales. These official statistics (published for businesses with 10 or more employees) are crucial for tracking digitalisation trends over time and by sector. DZS data releases break down ICT usage by broad industry categories and firm size, enabling analysis of how, say, manufacturing vs. services or small vs. medium firms utilize digital technology.

At the European level, Croatia’s performance is benchmarked through the **EU Digital Economy and Society indicators**, now part of the Digital Decade monitoring. These compile Transregional State of the Art Report

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national data (like DZS's survey) into comparable indicators. The European Commission's country reports highlight Croatia's mixed digitalisation landscape – e.g. near-average SME engagement in online trade, but strong leadership in data analytics usage. They also track advanced technology adoption: **65.6% of Croatian enterprises use at least one of AI, cloud, or big data**, above the EU average of 54.6%. Such indicators provide a composite view of SME digital competitiveness, feeding into policy reviews and targets.

Beyond official statistics, various **analyses and studies** contribute to understanding SME competitiveness in the digital era. For instance, the World Bank's *Croatia Digital Economy Diagnostic* finds that aside from tourism, Croatian firms lag regional peers in productivity, and it explicitly links this to slower uptake of digital technologies. The **OECD** and EU also produce *SME Performance Reviews* and *Small Business Act fact sheets* that include indicators on innovation, skills, and digitalisation for Croatian SMEs. These analyses often draw on a range of data (from ICT usage rates to SME value-added and innovation expenditure) to assess how digital readiness is affecting SME growth and competitiveness. Overall, Croatia's data infrastructure for SME digitalisation assessment is a combination of **national statistical surveys, administrative data, and EU-wide benchmarks**, supplemented by targeted reports or research. The data is increasingly accessible – e.g. through the DZS open data portal and Eurostat – and is used by institutions like SDURDD and the Ministry of Economy to identify gaps and measure the impact of digitalisation initiatives.

Role of SDURDD and CDU in Data Infrastructure

SDURDD (Central State Office for the Development of the Digital Society) plays a pivotal role in coordinating Croatia's digital transformation and the related data infrastructure. As the lead agency for the Digital Croatia Strategy, SDURDD not only formulates policy but also oversees its implementation and monitoring. This involves gathering data on digitalisation progress (for example, compiling inputs for the EU's Digital Decade reports) and ensuring different institutions contribute information. SDURDD also champions improvements in data sharing and e- government services that indirectly benefit SMEs. One priority in the digital strategy is to enhance the national **open data portal** and release “high-value datasets” based on interoperable public registers. By improving open data availability, SDURDD aims to provide businesses, researchers, and policymakers with richer data – for instance, data on companies, markets, or digital service usage – which can be used to assess and foster SME competitiveness.

A cornerstone of Croatia's digital infrastructure is the **Centar dijeljenih usluga (CDU)**, or Shared Services Center, which SDURDD helped establish. The CDU is essentially the government's cloud and data exchange platform – *a centralized IT infrastructure for public administration*. It provides a secure, scalable environment where ministries and agencies can host applications and share data. Importantly, the CDU has vastly improved the interconnection of national databases and registries. As of 2023, it had integrated **34 key registries with G4 e-services used by over 160 institutions**, enabling seamless digital data exchange across government. This has several benefits: faster and safer transfer of

information between agencies, central management of data resources, and elimination of previous paper-based data sharing

While CDU primarily serves government users, it significantly **supports the SME data ecosystem** indirectly. Better integration of business registries, tax data, employment data, etc., means that comprehensive information on companies can be aggregated more easily. For example, data from the business registry and financial reports could be linked to track SME performance, or e- government usage stats can show how many businesses use online administrative services. The CDU's secure cloud also hosts services like the e-Citizens/e-Companies portals, through which SMEs interact with government – usage of these services can be measured to gauge digital uptake. Moreover, by strengthening data security and reliability in government systems, CDU builds trust in digital services, encouraging more SMEs to go online. SDURDD and CDU together thus create the **digital backbone**: SDURDD sets standards and strategies for data and digital development, and CDU provides the technical infrastructure for data sharing and service delivery. This combination is crucial for collecting consistent data (through interoperable systems) and providing the analytical tools needed to assess SME digitalisation progress across Croatia's economy.

Key Data Gaps in Assessing SME Digitalisation

Despite the advances in data infrastructure, there are notable **gaps that hinder a high-quality assessment** of SME digitalisation and competitiveness in Croatia:

- **Limited coverage of micro-enterprises:** Official ICT surveys and EU indicators typically cover enterprises with **10 or more employees**, excluding micro-businesses. However, micro-firms form the vast majority of businesses (by count) – about *SS.8% of all Croatian business entities are SMEs*, many of them micro-enterprises. The digital behaviours of these smallest firms (e.g. family businesses, sole proprietors) are not well captured. This gap means that policy-makers lack data on a huge segment of the economy, which may have very different digitalisation challenges (often micros lag in adoption of advanced tools). Without extending surveys or data collection to micros, the overall picture of SME digital maturity is incomplete.
- **Insufficient regional data:** Most data on SME digitalisation is available only at the **national level**. Croatia's statistics and EU reports do not break down SME digital uptake by region or county in a meaningful way. This is problematic because digital development can be uneven – for instance, the capital city (Zagreb) and a few major hubs may far outpace rural or less developed regions in broadband access, IT skill availability, or technology adoption. The lack of granular regional indicators makes it difficult to identify local disparities or target regional policy measures. High-level national averages can mask the fact that, say, SMEs in Slavonia or Dalmatia might be much less digitalised than those in Zagreb. Currently, there is no regular, detailed **regional digitalisation index** for SMEs in Croatia.
- **Gaps in sector-specific insights:** While broad industry categories are reported (manufacturing vs. services, etc.), there is a lack of **fine-grained sector data** on

digital adoption. Different sectors face different digitalisation opportunities – e.g. tourism and retail SMEs might benefit from e-commerce and digital marketing, while manufacturing SMEs might need automation and AI. However, data on specific technologies (IoT, AI, cloud, etc.) by sector or use-case is scarce. The available statistics tend to aggregate all “SMEs” or only split by size, not by detailed industry. This makes it harder to assess which sectors are lagging (for example, are agricultural SMEs or construction firms notably behind in going digital?). Similarly, data on how SMEs use sector-specific digital platforms or standards (for instance, usage of e-invoicing in trade, or precision agriculture tools in farming) is not systematically collected.

- **Lack of longitudinal performance data linked to digitalisation:** To truly gauge competitiveness impacts, one would want to relate SMEs’ digital adoption to outcomes like productivity, export growth, or innovation. Currently, this linkage is not well documented due to data silos. **Administrative and financial data on SMEs** (revenues, productivity, exports) are collected by various agencies, but are not yet fully integrated with digital uptake data. For example, we know the share of firms using cloud services, but we cannot easily see if those firms perform better in sales or innovation than those who do not – such analysis would require micro-level data linking, which is still limited. The CDU’s integration of registries is a step toward enabling this, but as the digital strategy notes, much potential remains “*unused due to very limited access to data from public registries*” so far. Researchers and analysts often rely on ad-hoc surveys or case studies to infer these impacts, pointing to a gap in official analytical data.
- ****Real-time and SME-specific digital metrics:** In a fast-changing digital landscape, data collected annually (or less frequently) may be outdated by the time it’s reported. There is a gap in more real-time indicators of SME digital engagement. For instance, data on **website traffic, e-commerce transactions, or digital payment usage by SMEs** could complement traditional surveys, but such data either aren’t collected or aren’t publicly available in Croatia. Also, many global digital indexes (e.g. e-commerce penetration, startup ecosystem metrics) mix large and small firms, making it hard to isolate SME-specific performance. SME owners often point out the lack of detailed benchmarks to compare their digital maturity against peers in the same region or industry.

In summary, the **data gaps** center on granularity – by size (missing micros), geography, and sector – and on connecting digital adoption to competitiveness outcomes. These gaps make it challenging to design finely tuned policies (for example, regional digitalisation funds or sector training programs) and to rigorously evaluate how going digital translates into SME growth or resilience.

Recommendations for Improving Data Collection and Analysis

To strengthen the assessment of SME digitalisation and competitiveness, several improvements in data infrastructure and practices are recommended:

- **Expand survey coverage and frequency:** The national ICT usage survey should be extended to include micro-enterprises (perhaps via stratified sampling or separate surveys for businesses under 10 employees). Even a lighter version of the questionnaire for micros would yield invaluable insights into the smallest firms' digital tools and needs. Additionally, conducting key surveys more frequently or adding interim pulses (e.g. a mid-term mini survey on SME e-commerce) could capture trends in a timelier manner.
- **Enhance regional and sectoral data collection:** Statistical authorities and relevant ministries could collaborate to gather data at the **regional level**. This might involve oversampling certain regions in surveys or using administrative data (like broadband subscriptions or e-service usage by county) as proxies for digital readiness. Publishing an annual **“Digital Economy Regional Atlas”** for Croatia, with metrics for each county or region, would illuminate local disparities. Similarly, deeper dives into specific sectors can be done through occasional focused surveys or by partnering with industry associations. For example, a one-time survey on digital technology usage in agriculture SMEs, or in manufacturing, could fill knowledge gaps for those sectors.
- **Leverage administrative and platform data:** With the **CDU interconnecting databases**, Croatia is well-positioned to utilize administrative data for statistical insights. Authorities should identify and release relevant indicators derived from administrative sources – for instance, the percentage of companies in each region using the e-Tax system or e-invoicing, the number of SME users of the e-Citizens business portal, etc. Such data, when aggregated and anonymized, can provide up-to-date measures of digital engagement. Moreover, the government could collaborate with private platforms to obtain anonymized data on SMEs (for example, data from e-commerce marketplaces on Croatian SME sellers, or from payment processors on digital payment adoption). These would complement traditional surveys with real-world usage statistics.
- **Improve the Open Data portal for business data:** As envisaged in the Digital Croatia Strategy, the national open data portal should prioritize publishing **high-value datasets** related to businesses and the digital economy. This could include disaggregated results of the ICT usage survey, regional broadband coverage, startup ecosystem data, and datasets from projects like the digital voucher program (e.g. list of voucher recipients by sector and region). By making such data easily accessible to analysts and researchers, Croatia can encourage external analysis and feedback. Universities and think-tanks could then more readily study SME digitalisation, producing independent insights that feed back into policy.
- **Integrate digital and performance data for analysis:** To address the link between digitalisation and competitiveness, Croatia could set up a secure **data integration project** (perhaps under SDURDD or the Ministry of Economy) that combines different datasets at the firm level. Using strong privacy safeguards, data from the business registry, tax filings, innovation surveys, and ICT usage could be pseudonymously linked. This would enable economists to perform panel analyses – for example, checking if SMEs that adopted cloud or received a digital

voucher see faster growth in productivity or exports over time. The findings would help quantify the benefits of digitalisation. If direct integration is complex, an alternative is to conduct longitudinal “*SME Digital Maturity and Performance*” studies, tracking a sample of SMEs over several years with detailed questions on both tech usage and business results.

- **Regularly monitor and report on SME digital trends:** Establish a dedicated **SME Digitalisation Scoreboard** or annual report in Croatia. This report (possibly produced by SDURDD in collaboration with the statistical office and Ministry of Economy) would synthesize all available data each year – including DESI indicators, national survey results, program uptake stats, etc. – to provide a comprehensive state-of-play. It should highlight not just overall progress but also breakdowns by region and sector wherever possible, to keep inequalities visible. Such a report, presented to stakeholders and the public, would increase transparency and accountability for digitalisation efforts. It would also help measure the impact of initiatives like the voucher program (by reporting how many SMEs utilized it and to what effect). Over time, this could evolve into an interactive online dashboard where users can query SME digitalisation data by various filters.
- **Targeted qualitative research to fill gaps:** Not all aspects of digital competitiveness can be captured quantitatively. For nuanced areas where data is thin – for instance, the quality of SMEs’ digital skills, or barriers faced by specific sectors – the government should commission qualitative studies or case studies. Interviews, focus groups, and on-site assessments in different regions can reveal issues behind the numbers (e.g. why an SME in a certain county isn’t online, or how a manufacturing SME implemented robotics). Publishing these insights will provide context to the numbers and highlight areas for improvement that surveys might overlook (such as cultural attitudes or specific regulatory hurdles impacting digital uptake).

By implementing these recommendations, Croatia can develop a **more robust data infrastructure** that captures the multi-faceted nature of SME digitalisation. This will enable policymakers to track progress toward digital transformation goals more accurately and design interventions (be it training, infrastructure investment, or financial incentives) grounded in evidence. Ultimately, better data will support Croatia’s ambition to have all its SMEs – across every region and industry – fully participate in the digital economy, thereby boosting their competitiveness at home and in global markets.

3. Summary

The digitalisation of SMEs in Croatia is recognized as a strategic driver of regional competitiveness, innovation, and economic resilience. As SMEs make up over 99% of all businesses in the country, their ability to adopt and integrate digital technologies is essential for enhancing productivity, accessing new markets, and achieving alignment with EU Digital Decade goals. The process of digital transformation, however, remains **uneven across sectors and regions**. While progress has been made in adopting basic ICT infrastructure and cloud services— particularly among medium-sized enterprises and in urban areas—many

microenterprises and SMEs in rural or less developed counties lag behind in digital intensity and advanced technology uptake.

The government has responded with a comprehensive policy framework that includes strategic documents such as the **Digital Croatia Strategy 2032**, the **National Development Strategy 2030**, the **Smart Specialisation Strategy**, and the **National Recovery and Resilience Plan (NPOO)**. These are complemented by operational programs and targeted financial instruments such as:

- Digitalisation Vouchers Scheme (2023–2024),
- Grants for SME Digital Transformation (NPOO),
- European Digital Innovation Hubs (EDIHs),
- Proof of Concept (PoC) and RCD (IRI) Grants,
- Venture Capital Instruments (CVCi I and II),
- Regional innovation infrastructure like ZICER and PISMO Novska incubator.

Despite this multi-instrumental support system, several key **challenges persist**:

- Digitalisation support is **concentrated in urban areas**, leaving many peripheral regions underserved.
- The **smallest SMEs and traditional sectors** (e.g. agriculture, crafts, construction) face **low awareness, skill gaps**, and difficulty accessing financing or advisory support.
- Administrative burden and fragmented coordination among public bodies hamper full program uptake and impact.
- Many instruments, while well-designed, **lack sustained monitoring and impact evaluation frameworks**.

Another critical constraint is the **lack of granular, integrated, and real-time data** to track SME digital maturity and outcomes. Existing national data (e.g. ICT usage surveys by DZS, DESI/Digital Decade indicators) provide a general overview but do not adequately reflect:

- **Microenterprises** (under 10 employees),
- Regional disparities,
- **Sector-specific digitalisation patterns**, or
- The **link between digital adoption and business performance outcomes** (e.g. revenue, exports, innovation).

The institutional backbone for data collection and integration is provided by the **Središnji državni ured za razvoj digitalnog društva (SDURDD)** and the **Centar dijeljenih usluga (CDU)**. SDURDD leads strategic planning and coordination, while CDU provides cloud infrastructure and database interoperability for public sector digital services. However, the potential of integrated data use for policy evaluation is still **underdeveloped**, and open data access for external analysis is limited.

Key Measures Needed

- Expand data collection to include **micro-SMEs** and regional indicators;
- Improve **integration and accessibility of public registers** via CDU for analytical use;
- Provide **sector-specific and needs-based digitalisation programs**, especially for lagging regions;
- Reduce **administrative burden** in application and reporting processes;
- Establish an **SME Digitalisation Scoreboard** to annually track progress and regional disparities.

Overall Conclusion

Croatia has established a solid and comprehensive strategic framework for SME digitalisation, supported by significant EU and national investments. Moving forward, impact will depend on improving regional implementation capacity, ensuring equitable access for all SME groups, and strengthening the data infrastructure required for evidence-based policymaking. With targeted interventions and better-integrated governance mechanisms, Croatia can significantly accelerate SME digital transformation and narrow the digital divide across its regions.

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Regional State of the Art Report, Bosnia and Herzegovina

1. Regional Background Information

1.1 Introduction

Bosnia and Herzegovina is a country located in Southeastern Europe on the Balkan Peninsula. It shares borders with Croatia to the north, south, and southwest, Serbia to the east, and Montenegro to the southeast. The country has a diverse cultural and historical heritage, influenced by various civilizations and empires, including the Roman, Byzantine, Ottoman, Austro-Hungarian, and Yugoslav periods.

Bosnia and Herzegovina has a diversified economy dominated by the services sector, industrial production, and export-oriented raw material processing. GDP per capita was approximately USD 8,639 in 2023, while real GDP growth was estimated at 2.6% in 2024 and projected at 2.7% in 2025. Key drivers of growth include private consumption, remittances (which account for more than 10% of GDP), and investments in infrastructure and energy.

However, the country faces challenges such as high unemployment (around 10.7% in 2024), low productivity, and the need for structural reforms to attract foreign investment and increase competitiveness.

Bosnia and Herzegovina is experiencing a negative demographic trend, including population decline, aging, and continued emigration of young and educated people. The annual population growth rate was negative (-0.6% in 2023), and net migration is also negative. Despite this, the country has a relatively high literacy rate and access to basic services – 100% of the population has access to electricity, and 83% use the internet.

Bosnia and Herzegovina is a potential candidate for European Union membership and actively participates in regional initiatives such as the Berlin Process and the Common Regional Market of the Western Balkans. Although not yet an EU member, the country utilizes pre-accession funds (IPA) to strengthen institutional capacities, digitalization, and sustainable development.

At the national level, Bosnia and Herzegovina plays a key role in the stability and connectivity of the Western Balkans, particularly through infrastructure projects and the energy transition. Its geostrategic position and natural resources (water, forests, energy) make it an important factor in regional cooperation and sustainable development.

Geography:

Total area: approximately 51,200 square kilometers (19,774 square miles).

Features include rugged mountains, fertile plains, and a narrow coastline along the Adriatic Sea. The country is characterized by its mountainous terrain, with the Dinaric Alps dominating the landscape.

Population:

As of recent estimates, around 3.5 million people.

Capital and Major Cities:

Capital: Sarajevo, known as the historical, cultural, and political center. Other significant cities include Banja Luka, Mostar, Tuzla, and Zenica.

Government Structure of Bosnia and Herzegovina

State Level (National) Central government with limited powers: foreign policy, defense, fiscal policy

Entity Level

District Level

Cantonal/Municipal

Political Structure:

Federation of Bosnia and Herzegovina (FBiH), Republika Srpska (RS)

Brčko District (self-governing, multi-ethnic, under state sovereignty)

10 Cantons in FBiH, municipalities in RS and FBiH

The country operates under a complex political system established by the Dayton Accords (1995), which ended the civil war. It is a federal parliamentary divided into two main entities: the Federation of Bosnia and Herzegovina (and the Republika Srpska, along with the Brčko District).

Culture:

The country boasts a vibrant cultural heritage, reflected in its diverse religious traditions, architecture, music, and cuisine.

Economic Overview:

The economy is transitional, moving from a war-affected country to a market-oriented system. Key sectors include manufacturing, agriculture, and tourism, especially in natural and historical sites.

Unemployment and infrastructure development remain ongoing challenges.

1.2. Economic Profile of the Region

Bosnia and Herzegovina (BiH) is a small, upper-middle-income country with a population of approximately 3.5 million. The economy is characterized by a mix of traditional industries, a growing services sector, and an emerging digital economy. Despite structural challenges—including political fragmentation, labor shortages, and low productivity—certain regions are demonstrating increasing economic dynamism, particularly in the development of small and medium-sized enterprises (SMEs) and the information and communication technology (ICT) sector.

BiH consists of two main entities—the Federation of Bosnia and Herzegovina (FBiH) and Republika Srpska (RS)—along with the self-governing Brčko District. The Federation is further divided into **ten cantons**, each with its own government and development priorities. These

cantons differ significantly in terms of economic structure, industrial base, infrastructure, and digital readiness.

Due to the scope of this analysis, a detailed breakdown of each canton will not be provided. Instead, this section offers a general overview of regional economic and digital development trends, with a specific focus placed on **Tuzla Canton and the City of Tuzla**, which will be elaborated in subsequent sections.

Although Sarajevo is often viewed as the administrative and financial center of the country, it does not function as a national innovation hub. Instead, innovation and digitalisation are emerging in a **decentralized and regionally diverse manner**, with cities such as **Tuzla, Mostar, Zenica, and Banja Luka** developing their own ICT ecosystems and SME support structures.

Each of these regions exhibits unique strengths:

Tuzla Canton is increasingly recognized for its knowledge-based ICT firms, strong university-industry collaboration, and export-oriented digital services.

Herzegovina-Neretva Canton (Mostar) benefits from cross-border economic ties, a growing tech startup scene, and a diversified economy that includes tourism, construction, and light manufacturing.

Zenica-Doboj Canton is transitioning from a heavy industrial base to a more diversified economy, with growing interest in innovation and digital services.

Republika Srpska (Banja Luka) has seen growth in fintech and software development, supported by entity-level initiatives and a centralized administrative structure.

Despite these developments, regional disparities remain pronounced. Rural areas and smaller municipalities often lack the infrastructure, institutional support, and human capital needed to fully participate in the digital economy.

The digital maturity of SMEs in BiH varies significantly by region and sector. According to the **OECD**, only **45% of SMEs** in BiH have a basic level of digital intensity, compared to the EU average of 69%. The use of advanced technologies such as cloud computing (15%), big data (7%), and artificial intelligence (3%) remains limited and is largely concentrated in urban areas.

Urban centers such as Tuzla, Mostar, and Banja Luka are leading the digital transformation, supported by universities, innovation hubs, and international donor programs. However, many SMEs in traditional sectors—particularly in rural areas—continue to rely on outdated business models and lack the digital skills and infrastructure needed to modernize.

BiH benefits from several national and international initiatives aimed at supporting digital transformation and SME development:

EU IPA II and IPA III funds are used to support digital skills training, ICT infrastructure, and innovation grants.

Programs such as **EU4DigitalSME**, **Local Integrated Development (LID)**, and **Digital Innovation Hubs** promote digital entrepreneurship and regional innovation.

The **Digital Agenda for BiH** provides a strategic framework for digital development, though implementation varies across regions and is often hindered by administrative fragmentation.

Several cantonal governments—particularly in Tuzla, Mostar, and Zenica—have launched their own digitalisation strategies and support programs for SMEs, often in collaboration with international partners and local development agencies.

Economic institutions have provided varying projections for Bosnia and Herzegovina’s average inflation rate in 2025:

3,4% Inflation (CPI)

As of March 2025, the **average net monthly wage** in Bosnia and Herzegovina was approximately **1,534 BAM** (Bosnian Convertible Marks), equivalent to about **€784** or **\$890**.



According to the **2013 Population and Housing Census**, the most recent official census conducted in Bosnia and Herzegovina, the total population was recorded at **3,531,159** people.

ICT Sector Overview – Bosnia and Herzegovina

Bosnia and Herzegovina's ICT (Information and Communications Technology) sector is a growing and dynamic part of the economy, playing an increasingly important role in digital transformation, innovation, and integration into European and global markets.

Market Size & Growth

The ICT sector in BiH has been steadily growing, driven by increasing demand for digital services, software development, telecommunications, and IT outsourcing. The sector contributes significantly to GDP and employment.

Employment

The number of ICT professionals and companies has been rising. Skilled IT specialists, software developers, and engineers are increasingly recognized internationally.

Exports and Imports

Imports of ICT goods are substantial, reflecting ongoing investments in technology infrastructure. ICT exports are growing, including software solutions, IT services, and digital products, especially from software companies based in Bosnia and Herzegovina.

Moderate Digital Adoption: Many SMEs in Bosnia and Herzegovina have started adopting digital tools such as basic websites, email communication, and social media for marketing. However, more advanced digital technologies (like ERP systems, CRM, cloud computing, and e-commerce platforms) are less widespread.

Sector Variations:

SMEs in IT, finance, and services sectors tend to have higher digital maturity. Traditional sectors such as agriculture, manufacturing, and retail are slower to adopt advanced digital solutions.

1.3. HR Profile of the Region

Bosnia and Herzegovina (BiH) has a **developing human resources environment** shaped by its complex political structure, transitioning economy, and evolving labor market. The country faces challenges such as **youth unemployment, brain drain, and low labor force participation**, but also has strengths in **technical education, cost-effective talent, and emerging sectors** like IT and business process outsourcing.

According to the **European Commission's 2024 Country Report**, the share of the population aged 25–34 with tertiary education in BiH remains relatively low at **21.6%**, significantly below the EU average. The education system is fragmented across entities and cantons, which contributes to uneven quality and access. The **average expected years of schooling** for a child in BiH is **11.7 years**, according to the World Bank's Human Capital Index.

Bosnia and Herzegovina (BiH) has a **diverse and transitional labor market**, shaped by its post-war recovery, decentralised political structure, and efforts to align with European Union standards. While there is an educated and skilled labor force, the market faces key challenges such as low employment rates, high youth unemployment, and significant emigration of talent.

Bosnia and Herzegovina (BiH) faces ongoing challenges in its labor market and education system. The country has a relatively **low employment rate, high youth unemployment**, and a **mismatch between education and labor market needs**. However, education levels are improving, particularly in urban areas and in technical fields like ICT and engineering. Higher education institutions are concentrated in urban centers, and while enrollment has increased in recent years, many graduates face difficulties transitioning into the labor market due to outdated curricula and limited practical training. The **European Training Foundation (ETF)** notes that “the alignment between higher education and labor market needs remains weak, particularly in technical and ICT-related fields”.

Digital skills in BiH are unevenly distributed across age groups, regions, and socioeconomic backgrounds. According to the **UNDP Independent Country Programme Evaluation (2025)**, over **6,500 young people** gained 21st-century skills in 2023 through targeted investments in **STEM laboratories, digital classrooms, and entrepreneurship hubs**. However, these initiatives are still limited in scale and reach.

The **OECD** reports that only **45% of SMEs** in BiH have a basic level of digital intensity, and the use of advanced technologies such as cloud computing and AI remains low. This reflects broader gaps in digital literacy, particularly among older adults and rural populations.

Urban areas such as Tuzla and Banja Luka are seeing the emergence of ICT-focused education programs and private training centers, often supported by EU and donor-funded projects. These programs are helping to build a new generation of digitally skilled professionals, but the **brain drain of ICT graduates** remains a major concern.

Participation in lifelong learning remains critically low. According to the **European Commission**, adult participation in formal or non-formal education is estimated at **less than 3%**, far below the EU average of 11%. This is particularly problematic in the context of rapid technological change and the green and digital transitions.

Efforts to promote lifelong learning are underway through EU-funded projects such as **EU4DigitalSME**, which supports digital upskilling for entrepreneurs and SME employees. However, these programs are often project-based and lack long-term institutional integration.

Entrepreneurship education is gaining traction, particularly in the context of digital innovation. The **UNDP** highlights that “entrepreneurship and STEM learning are being integrated into secondary and tertiary education through pilot programs and innovation labs”. These efforts are most visible in Tuzla Canton, where local universities and business incubators are collaborating to support student-led startups and ICT ventures.

Despite these positive developments, systemic barriers remain. These include limited access to finance for young entrepreneurs, weak mentorship networks, and insufficient policy coordination between education and economic development sectors.

Employment Rates in Bosnia and Herzegovina

As of 30 September 2024, 324 712 people were registered as unemployed in Bosnia and Herzegovina. Compared to a month earlier, the number of the unemployed decreased by 5 117 or 1.55%. Of the total number of job seekers, 192 067 or 59.15% were women. Compared to the same period a year earlier, the unemployment level in BiH decreased by 22 136 or 6.38%.

Unemployment level fell by 4 888 (1.86%) in the FBiH and by 304 (0.55%) in RS, and it increased by 75 persons (0.64%) in the BD BiH.

The structure of job seekers as of 30 September 2024 is as follows:

Unskilled workers: 95 055 or 29.27%, comprising 37 969 (28.62%) men and 57 086 (29.72%) women

Semi-skilled workers/low educational background: 4 575 or 1.41%, comprising 2 149 (1.62%) men and 2 426 (1.26%) women

Skilled workers: 101 768 or 31.34%, comprising 51 928 (39.152%) men and 49 840 (25.95%) women

Highly skilled workers: 739 or 0.23%, comprising 574 (0.43%) men and 165 (0.09%) women
Secondary school qualifications: 92 280 or 28.42%, comprising 31 218 (23.53%) men and 61 062 (31.79%) women

Two-year post-secondary education: 4 935 or 1.52%, comprising 1 679 (1.27%) men and 3 256 (1.70%) women

University degree: 25 360 or 7.81%, comprising 7 128 (5.37%) men and 18 232 (9.49%) women

Within the total number of registered unemployed people, 13 146 were newly added to the register in September 2024, of whom 6 900 were women. The total number of people who were deregistered amounted to 18 370, of whom 10 907 were women. Of the total number of people who were deregistered, 13 220 or 71.96% were placed in jobs, of whom 8 204 or 62.06% were women.

In September 2024, employers reported 3 531 new vacancies to public employment services in BiH, of which 876 were for women, while the registered number of people whose employment was terminated during the reported period amounted to 8 983. The registered number of women whose employment was terminated during the reporting period was 4 788 or 53.30%.

According to the BiH Agency for Statistics, the number of people in paid work in BiH amounted to 847 865 in August 2024, of whom 383 360 were women. Compared to July 2024, the total number of people in work, as well as the number of women in paid work decreased, by 0.6% and 0.8%, respectively.

According to the results of the Labour Force Survey (LFS) for the second quarter 2024, the labour force in BiH (economically active population) comprised 1 410 000 people and the number of inactive people amounted to 1 466 000.

The labour force included 1 223 000 people in employment and 187 000 unemployed people. The LFS unemployment rate was significantly lower than the administrative one and it stood at 13.3% for the second quarter of 2024 at the level of BiH.

The number of people in work in the second quarter of 2024 increased by 1.5% compared to the first quarter, while the number of the unemployed remained unchanged.

The unemployment rate in BiH stood at 13.3% in the second quarter of 2024 and it was lower compared to the first quarter of 2024 (13.5%) by 0.2 percentage points. The

LFS employment rate in the second quarter of 2024 stood at 42.5% and compared to the first quarter of 2024 (41.9%) it increased by 0.6 percentage points.

The youth unemployment rate (aged 15-24) in BiH stood at 30.4% in the second quarter of 2024 and compared to the first quarter (27.4%) it increased by 3.0 percentage points.

1.4. Socioeconomic Conditions and Employment Opportunities

Bosnia and Herzegovina (BiH) is a country in transition — politically decentralized, economically developing, and facing both **structural challenges and emerging opportunities**. Its socioeconomic landscape is shaped by **post-war reconstruction, EU integration efforts**, and the **global push toward digitalization and green energy**.

According to the **European Commission's 2024 Country Report**, the employment rate for people aged 20–64 in BiH stood at **46.7%**, compared to the EU average of 74.6% . Youth unemployment remains critically high at **33.7%**, and long-term unemployment affects over **75%** of all unemployed persons. Female labour force participation is among the lowest in Europe, with a gender employment gap exceeding 20 percentage points.

The ICT sector is one of the few areas experiencing sustained growth and rising demand for skilled professionals. According to the **OECD Western Balkans Competitiveness Outlook 2024**, ICT companies in BiH are “increasingly export- oriented and face a chronic shortage of qualified workers”

While the **average gross monthly salary** in BiH was approximately **€830** in 2023, ICT professionals—particularly software developers and data engineers—can earn between **€1,500 and €2,500**, depending on experience and location. This wage premium reflects both the global demand for digital skills and the limited domestic supply.

Employment opportunities are unevenly distributed across the country. Urban centers such as **Sarajevo, Banja Luka, Tuzla, and Mostar** offer more diverse job markets and higher wages, while rural and post-industrial regions—particularly in northeastern and southeastern BiH—struggle with job scarcity and outmigration.

Labour mobility is constrained by poor transport infrastructure, housing shortages in urban areas, and administrative fragmentation between entities and cantons.

BiH continues to experience high levels of emigration, particularly among young and educated individuals. According to **UNDP**, over **400,000 people**—more than 10% of the population—have left the country in the past decade. This trend has led to a shrinking labour force, increased dependency ratios, and growing pressure on the pension and healthcare systems.

A wide range of national and international initiatives are in place to address employment challenges and support skills development:

EU4Employment, EU4DigitalSME, and EU4BusinessRecovery provide support for youth employment, digital skills, and entrepreneurship.

The **UNDP's Local Integrated Development (LID)** programme supports job creation and skills development in underdeveloped municipalities.

The **Swiss-funded MarketMakers** programme focuses on improving employment opportunities in ICT, tourism, and business services, particularly for youth and women.

The **GIZ-supported Youth Employment Project (YEP)** has helped establish employment bureaus and career counselling centers across the country.

The **World Bank's Employment Support Project** aims to modernize public employment services and expand active labour market measures.

Despite these efforts, many programs remain fragmented, short-term, and unevenly implemented across regions. Structural reforms, better coordination, and long-term investment in human capital are needed to ensure sustainable impact.

Employment Opportunities and Labor Market

Employment Trends

- **Unemployment Rate:** The unemployment rate is relatively high, especially among youth (ages 15-24), often exceeding 30%.

- **Informal Employment:** A significant share of employment is informal or under-the-table, which affects social security contributions and workers' rights. **Labor**
- **Force Participation:** Participation rates are moderate but show gender disparities, with women participating less frequently in the labor market.

Sectoral Employment

- **Services Sector:** The largest employer, including trade, tourism, finance, and public administration.
- **Industry and Manufacturing:** Important for employment, but has seen decline since the 1990s.
- **Agriculture:** Provides employment mainly in rural areas but with low productivity and income levels.
- **ICT Sector:** Growing but still limited in scale; represents a significant opportunity for youth employment.

Skills and Workforce Development

- **Skills Mismatch:** There is a mismatch between the skills provided by the education system and labor market demands.
- **Vocational Training:** Efforts are underway to improve vocational education and align it better with industry needs.
- **Digital Skills:** Increasing focus on digital literacy and ICT skills development to improve employability.

Government and International Support

- **Active Labor Market Policies:** Programs include training, subsidies, and incentives for employment, often supported by international donors.
- **EU Integration Efforts:** Bosnia and Herzegovina's path towards EU accession involves reforms aimed at improving the business environment and labor market efficiency.

2. Analysis and Assessment of Policy Instruments

As of **May 2024**, Bosnia and Herzegovina officially joined the **Digital Europe Programme**, a major EU initiative with a €7.5 billion budget (2021–2027). This membership allows BiH to:

- **Access EU funding** for digital projects.
- Participate in initiatives related to:
 - **Artificial Intelligence**
 - **Cybersecurity**
 - **Supercomputing**
 - **Advanced digital skills** ○ **Digital public services**
- **Set up Digital Innovation Hubs** to support SMEs and startups

Bosnia and Herzegovina is a small upper-middle-income economy. The classification of SMEs in Bosnia and Herzegovina varies throughout the economy, with each entity providing its definition under two pieces of legislation. Both entities define SMEs under the Law on Accounting and Auditing, which defines enterprises by the number of employees for accounting and financial reporting, in addition to the Law on Fostering Small Business Development in the Federation of Bosnia and Herzegovina and the Law on SME Development in Republika Srpska.

Bosnia and Herzegovina had a total number of businesses. Most were small enterprises with fewer than 50 employees, accounting for 91.6% of all companies. Medium-sized enterprises with 50 to 249 employees accounted for 5.6%. However, if we look at the revenue, small enterprises make up 96.1% of all businesses, and medium-sized enterprises account for only 1.5%.

Bosnia and Herzegovina is in the early stages of preparing for the green and digital transitions and enhancing its industry's global competitiveness in line with the EU's industrial strategy. Although Internet usage in enterprises is high, with 98% of businesses using computers and 96% having Internet access, only around 60% of small enterprises have a website, and only 18% are active in e-commerce.

The strategic objective underpinning these efforts is to create a **resilient, innovative, and digitally capable SME sector** that can compete in regional and global markets. This objective is operationalized through a combination of financial instruments, capacity-building programs, public-private partnerships, and educational initiatives.

2.1. Policy Instrument

In alignment with the broader European digital agenda and the goals of the Digital Decade 2030, Bosnia and Herzegovina has initiated a multi-tiered approach to support the digital transformation of micro, small, and medium-sized enterprises (MSMEs). Although the country does not yet have a unified national digital strategy, various levels of government—state, entity, district, cantonal, and municipal—have introduced targeted instruments and programs to foster digital innovation, enhance competitiveness, and build digital skills among SMEs.

Key Strategic Priorities:

1. **Direct Support for SME Digitalisation** This includes financial incentives such as grants, subsidized loans, and technical assistance to help SMEs adopt digital tools, automate processes, and integrate advanced technologies like ERP, CRM, AI, and cybersecurity systems. Programs such as *Go Digital in the Western Balkans* and *EU4DigitalSME* are central to this effort, offering both funding and advisory services.

2. **Integration of Education and Skills Development** Recognizing the digital skills gap as a major barrier to transformation, ministries of education at various levels have launched programs to upskill the workforce. These include lifelong learning initiatives, ICT training for adults, and partnerships between schools, universities, and SMEs to align curricula with labor market needs.
3. **Regional and Local Development Strategies** Cantonal and municipal governments have embedded digitalisation goals into their development strategies, focusing on support for startups, digital entrepreneurship, and innovation ecosystems. These strategies often include local grant schemes, incubators, and digital skills workshops tailored to the needs of the local economy.
4. **Public-Private and International Collaboration** Many of these instruments are implemented in partnership with international organizations such as the EU, EBRD, GIZ, and UNDP, ensuring alignment with EU funding mechanisms and best practices. This collaborative approach enhances the reach and effectiveness of digitalisation efforts across the country.

Table of SME digitalisation policy instruments in Bosnia and Herzegovina, structured from the **state to the city level**

Table 1: Table of SME digitalisation policy instruments in Bosnia and Herzegovina

Strategic Objective	Relevant Policy Instruments	Funding/Implementation	Framework
Accelerate SME digital transformation, promote innovation and green technologies	Go Digital in the Western Balkans	EBRD, EU WBIF (€377M total, €27.6M in grants)	Loans for digital investments, grants up to 10%, technical assistance and advisory services
Strengthen SME innovation capacity and digital readiness	EU4DigitalSME	EU IPA, BMZ Germany	Establishment of Digital Innovation Hubs (DIHs), training and mentoring, co-financing of digital solutions
Enhance digital and technological capabilities of SMEs	Program to Support SME Competitiveness	Federation of BiH Budget	Direct grants for digitalisation, co-financing of equipment and software
Promote digital adoption and entrepreneurship	Local SME support programmes	EU, GIZ, District Budget	Grants for digital tools, training and mentoring for SMEs
Foster digital economy and innovation ecosystems	Cantonal Development Strategy (2021–2027)	Cantonal Budget, EU funds	Incentives for SME digitalisation, ICT training programs, support for tech startups

Support digital entrepreneurship and local innovation	Local Economic Development Plan	City Budget, Donor Funds	Local grants for digital startups, digital skills workshops and hackathons
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Go Digital in Bosnia and Herzegovina

This program is implemented by the **European Bank for Reconstruction and Development (EBRD)** in partnership with the **European Union (EU)** and **GIZ**. It provides loans and grants (up to 15% of the loan amount) to SMEs for digital transformation investments, along with technical assistance .

EU4DigitalSME

A regional initiative co-funded by the **EU IPA** and **BMZ Germany**, implemented by **GIZ**, focusing on the establishment of **Digital Innovation Hubs (DIHs)**, training, mentoring, and co-financing digital solutions for SMEs. It also includes an education component involving universities and public institutions .

Federation of BiH – Program to Support SME Competitiveness

Managed by the **Federal Ministry of Development, Entrepreneurship and Crafts**, this program allocated over **1.375 million KM** to support 96 SMEs in 2022 for digitalisation and technical innovation .

Brčko District and Local Programs

Supported through **EU4Business** and **GIZ**, these programs offer co-financing and training for SMEs, although specific data on the number of supported SMEs is not always publicly disclosed .

Tuzla Canton and City of Tuzla

Digitalisation is embedded in the **Cantonal Development Strategy 2021–2027** and the **Local Economic Development Plan**, with funding from local budgets and EU sources. These include support for ICT training, startup grants, and digital skills workshops .

Strategic Objective 1: Accelerate SME Digital Transformation, Promote Innovation and Green Technologies

Duration. The “Go Digital in the Western Balkans” program is being implemented from **2022 to 2025**, with the possibility of extension based on performance evaluations and regional demand. It is part of a broader regional initiative that spans all six Western Balkan economies, including Bosnia and Herzegovina, and is designed to support long-term structural transformation of the SME sector.

Description of Goals. The primary goal of this strategic objective is to **enable SMEs to become more competitive, resilient, and future-ready** by integrating digital technologies into their core business operations. The program aims to:

- Facilitate the **adoption of digital tools and platforms** such as enterprise resource planning (ERP), customer relationship management (CRM), e-commerce, and cloud computing.
- Support the **transition to green and sustainable business models** by promoting energy-efficient technologies and digital solutions that reduce environmental impact.
- Enhance **productivity, innovation capacity, and market access** for SMEs, particularly in export-oriented sectors.
- Strengthen the **digital maturity** of SMEs by providing tailored advisory services, training, and access to finance.

This objective recognizes that digitalisation is not only a technological upgrade but a **strategic transformation** that affects business models, customer engagement, supply chains, and workforce development.

Relevance to National and Regional Strategies. Although Bosnia and Herzegovina does not yet have a unified national digital strategy, this objective is highly relevant to several key policy frameworks and strategic documents:

- It aligns with the **Digital Agenda for the Western Balkans**, launched by the European Commission, which promotes digital skills, infrastructure, and innovation across the region.
- It supports the **Economic Reform Programme of Bosnia and Herzegovina**, which identifies digitalisation and innovation as horizontal priorities for sustainable economic growth.
- It complements the **Green Agenda for the Western Balkans**, by encouraging SMEs to adopt digital solutions that also contribute to environmental sustainability.
- At the entity and cantonal levels, it is consistent with the **Federation of BiH Development Strategy**, the **Tuzla Canton Development Strategy**, and local economic development plans that emphasize digital transformation as a driver of competitiveness and job creation.

By aligning with these frameworks, the program ensures **policy coherence and funding synergy** with EU instruments such as the Instrument for Pre-Accession Assistance (IPA III), the Western Balkans Investment Framework (WBIF), and the Digital Europe Programme.

Enhancing Digitalisation of SMEs. The “Go Digital” program enhances SME digitalisation through a **comprehensive and integrated support model** that includes:

- **Financial Instruments:**
SMEs can access **dedicated credit lines** for digital investments through local partner banks. These loans are complemented by **performance-based grants** of up to **10–**

15% of the loan amount, reducing the financial burden and incentivizing investment in digital tools.

- Technical Assistance and Advisory Services:**
 Participating SMEs receive **tailored consulting support** to assess their digital readiness, identify appropriate technologies, and develop digitalisation roadmaps. This includes support for implementing ERP systems, digital marketing strategies, and cybersecurity measures.
- Capacity Building and Skills Development:**
 The program offers **training and mentoring** for SME managers and employees to build digital competencies. This includes workshops on e-commerce, data analytics, and digital project management, often delivered in partnership with local chambers of commerce and innovation hubs.
- Green-Digital Integration:**
 A unique feature of the program is its emphasis on **green digitalisation**—encouraging SMEs to adopt technologies that not only improve efficiency but also reduce carbon emissions and resource consumption. This dual focus supports the transition to a **low-carbon, circular economy**.
- Monitoring and Impact Measurement:**
 The program includes a robust monitoring framework to track progress, measure impact, and ensure accountability. Key performance indicators include the number of SMEs supported, digital tools adopted, productivity gains, and environmental benefits achieved.

Impact and Reach. As of 2024, over **200 SMEs in Bosnia and Herzegovina** have already benefited from the program, with a target of **750 SMEs across the Western Balkans** by the end of 2025. The program has been particularly impactful in:

- Enabling SMEs to **enter new markets** through digital channels.
- Improving **operational efficiency** and customer engagement.
- Reducing **energy consumption and environmental footprint** through smart technologies.

This strategic objective is a **cornerstone of Bosnia and Herzegovina’s digital transition**, laying the groundwork for a more innovative, inclusive, and sustainable SME ecosystem.

Table 2: Go Digital in the Western Balkans 2022-2025

Instrument name	Title
Duration	2022-2025

Description of goals	Strategic goal is to enable SMEs to become more competitive, resilient, and future-ready
Relevance to national and regional strategies	Aglines with Digital Agenda for the Western Balkans, it supports the Economic Reform Programme of Bosnia and Herzegovina, complements the Green Agenda for the Western Balkans, at the entity and cantonal levels, it is consistent with the Federation of BiH Development Strategy, the Tuzla Canton Development Strategy,
Enhancing digitalisation of SMEs	Enhances SME digitalisation through a comprehensive and integrated support model, as of 2024, over 200 SMEs in Bosnia and Herzegovina have already benefited from the program

Strategic Objective 2: Strengthen SME Innovation Capacity and Digital Readiness

Duration. The EU4DigitalSME project is being implemented over a four-year period, from **2021 to 2025**. This timeframe allows for the gradual development and institutionalization of support mechanisms for SME digitalisation, including the establishment of Digital Innovation Hubs (DIHs), capacity building, and policy alignment. The project is designed with flexibility to adapt to evolving needs and may be extended or integrated into future EU-funded programs depending on its impact and regional uptake.

Description of Goals. The primary goal of this strategic objective is to **enhance the innovation potential and digital readiness of SMEs** in Bosnia and Herzegovina. This is achieved by creating an ecosystem that supports the adoption of digital technologies, fosters innovation, and strengthens collaboration between SMEs, academia, and support institutions. Specifically, the project aims to:

- Establish and operationalize **Digital Innovation Hubs (DIHs)** as regional centers of excellence.
- Provide SMEs with **access to digital tools, expert mentoring, and testing environments**.
- Build the **capacity of business support organizations** to deliver digitalisation services.
- Promote **cross-sectoral innovation** and knowledge transfer.
- Raise awareness among SMEs about the **strategic importance of digital transformation** for competitiveness and sustainability.

Relevance to National and Regional Strategies: This objective is closely aligned with several national and regional policy frameworks. It supports the **Digital Agenda for the Western Balkans**, which emphasizes the development of digital skills, innovation ecosystems, and smart growth. It also contributes to the implementation of the **Economic Reform Programme**

of **Bosnia and Herzegovina**, particularly in the areas of innovation, SME competitiveness, and digital transformation. Furthermore, the project complements the development of **Smart Specialisation Strategies (S3)** at the entity and cantonal levels, which prioritize digital innovation in key economic sectors. At the European level, the initiative is consistent with the goals of the **EU’s Digital Europe Programme** and the **European Digital Innovation Hub (EDIH)** network, ensuring that Bosnia and Herzegovina’s SMEs are integrated into broader European innovation ecosystems.

Enhancing Digitalisation of SMEs. The EU4DigitalSME project enhances SME digitalisation through a **comprehensive and structured support system**. Four Digital Innovation Hubs (DIHs) have been established in Sarajevo, Banja Luka, Mostar, and Tuzla. These hubs serve as regional centers of expertise, offering SMEs access to digital technologies, mentoring, consulting, and networking opportunities. The project also provides **practical training and workshops** on digital marketing, e-commerce, data analytics, and cybersecurity, tailored to the needs of SMEs from various sectors.

In addition to direct support, the project works at the policy level to improve the national innovation framework. It supports the development of innovation strategies, strengthens the role of business support organizations, and facilitates public-private dialogue. A dedicated component focuses on **collaboration with educational institutions**, promoting digital skills development and lifelong learning.

As of 2024, the project has supported over **100 SMEs**, trained more than **700 SME representatives and 130 public officials**, and developed **five innovative services** through DIHs. With a total budget of **€6.1 million** (EU: €5M, Germany: €1.1M), EU4DigitalSME is a cornerstone of Bosnia and Herzegovina’s efforts to build a **resilient, innovative, and digitally capable SME sector**.

Table 3: Project EU4DigitalSME 2021-2025

Instrument name	Title
Duration	2021-2025
Description of goals	Strategic objective I to create a favorable environment for SMEs to successfully undertake digitalization and innovation transformations
Relevance to national and regional strategies	Aligns with Digital Agenda for the Western Balkans, contributes to the Economic Reform Programme of Bosnia and Herzegovina, it complements the development of Smart Specialization Strategic (S3) at entity and cantonal levels, it is consistent with goals EU Digital Europe Programme and EDIH

Enhancing digitalisation of SMEs	Enhances SME digitalisation through a comprehensive and structured support model, as of 2024, project supported over 100 SMEs in Bosnia and Herzegovina
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Strategic Objective 3: Supporting SME Digital Transformation through Federal Grant Schemes

Duration. The grant programs implemented by the Federal Ministry of Development, Entrepreneurship and Crafts (FMRPO) are **multi-annual and ongoing**, structured through annual public calls. These programs have been significantly expanded during the **2021–2025** period, both in terms of allocated funding and the number of supported

22 enterprises. In **2022 alone**, the Ministry allocated over **€1.375 million** to support **96 SMEs** through its flagship program “Enhancing SME Competitiveness”.

Description of Goals. The primary goal of this strategic objective is to **enable the technological modernization and digital transformation of SMEs** in the Federation of Bosnia and Herzegovina through direct financial support. The grant schemes are designed to:

- Facilitate the **procurement of digital tools and software solutions** (e.g., ERP, CRM, e-commerce platforms, cloud services).
- Support the **automation and optimization of business processes**.
- Increase **productivity and competitiveness** of SMEs in both domestic and international markets.
- Enable the **implementation of international standards** in quality management and cybersecurity.
- Encourage **investment in green and circular technologies**, aligning with the dual digital and green transition.

Grants are awarded through competitive public calls, with evaluation criteria based on the digital maturity of the applicant, the innovativeness of the proposed solution, and the potential for business growth and job creation.

Relevance to National and Regional Strategies. This objective is fully aligned with:

- The **Federation of BiH Development Strategy 2021–2027**, which identifies digitalisation as a key driver of economic resilience and competitiveness.
- The **Economic Reform Programme of Bosnia and Herzegovina**, which prioritizes SME digital transformation as a horizontal policy goal.
- The **Digital Agenda for the Western Balkans**, which promotes digital skills, infrastructure, and innovation across the region.
- The **Green Agenda for the Western Balkans**, as the grant schemes also support digital solutions that contribute to energy efficiency and environmental sustainability.

Additionally, FMRPO collaborates with international partners such as **UNDP**, **Swedish Development Agency (SIDA)**, and the **European Union**, ensuring technical and financial support and alignment with EU standards and funding mechanisms.

Enhancing Digitalisation of SMEs. The FMRPO grant program directly contributes to SME digitalisation through:

- **Financial support** for the acquisition and implementation of digital solutions.
- **Digitalisation of the application process itself**, via an online platform developed with EU support, improving transparency and efficiency.
- **Technical assistance and mentoring**, provided in cooperation with UNDP and other partners, to ensure proper use of funds and sustainability of results.
- **Targeted support for SMEs in less developed regions**, helping to reduce digital and regional disparities.

In **2024**, the Ministry announced a record allocation of **27.2 million BAM** (approx. €13.9 million) across seven support programs, with a significant portion dedicated to digitalisation and innovation. This represents a **fourfold increase** compared to previous years, signaling a strong strategic commitment to digital transformation of the SME sector .

Table 4: Program to Support SME Competitiveness 2021-2025

Instrument name	Title
Duration	2021-2025
Description of goals	Strategic objective Is to enable the technological modernization and digital transformation of SMEs in Federation of Bosnia and Herzegovina through direct financial support.
Relevance to national and regional strategies	Aligns with Federation of BH Development Strategy 2021-2027, Economics Reform Programme of Bosnia and Herzegovina, with Digital Agenda for the Western Balkans and with Green Agenda for the Western Balkans.
Enhancing digitalisation of SMEs	Enhances SME digitalisation through a comprehensive and structured support model, as of 2024, the Ministry allocated 13,9 Million across seven support programs

Strategic Objective 4: Promote Digital Adoption and Entrepreneurship

Duration. This strategic objective is implemented through **local and district-level programs**, primarily within the **Brčko District of Bosnia and Herzegovina**, and is supported by international development partners such as the **European Union (EU)** and **GIZ**. The programs

are active throughout the **2021–2025** period, with annual public calls and project cycles that support digital entrepreneurship, particularly among micro and small enterprises.

Description of Goals. The core aim of this objective is to **foster a culture of digital entrepreneurship** and to **encourage the adoption of digital tools and services** among small businesses and startups. The programs are designed to:

- Support **early-stage entrepreneurs and startups** in integrating digital technologies into their business models.
- Provide **financial incentives and co-financing** for the acquisition of digital tools, platforms, and services.
- Facilitate **training and mentoring** in digital business development, e-commerce, and innovation management.
- Promote **inclusive entrepreneurship**, with a focus on youth, women, and underrepresented groups in the digital economy.

These initiatives are particularly important in regions like the Brčko District, where local economic development depends on empowering small businesses to modernize and compete in digital markets.

Relevance to National and Regional Strategies. This objective is aligned with several strategic frameworks:

- The **Digital Agenda for the Western Balkans**, which emphasizes digital entrepreneurship and innovation as key drivers of economic growth.
- The **Economic Reform Programme of Bosnia and Herzegovina**, which identifies digitalisation and SME support as cross-cutting priorities.
- The **EU4BusinessRecovery** and **EU4DigitalSME** programs, which provide technical and financial support for digital transformation and entrepreneurship.
- Local development strategies in the Brčko District and other municipalities, which integrate digitalisation into broader economic planning and innovation policy.

By embedding digital entrepreneurship into local policy frameworks, this objective ensures that **grassroots innovation** is supported and scaled in line with national and EU-level priorities.

Enhancing Digitalisation of SMEs. The promotion of digital entrepreneurship enhances SME digitalisation through several key mechanisms:

- **Grant schemes and co-financing** for digital tools (e.g., website development, e-commerce platforms, cloud services, CRM systems).
- **Startup support programs**, including incubators and accelerators that provide digital infrastructure and mentorship.
- **Capacity-building workshops** on topics such as digital marketing, online sales, and cybersecurity.
- **Public-private partnerships** that connect SMEs with technology providers, educational institutions, and innovation hubs.

- **Targeted support for women-led and youth-led enterprises**, ensuring inclusive access to digital opportunities.

Although exact figures for the number of SMEs supported in the Brčko District are not publicly disclosed, the programs have been recognized for their **inclusive approach and regional impact**, particularly in enabling small businesses to survive and grow in the post-pandemic digital economy.

Table 5: Local SME Support Programs 2021-2025

Instrument name	Title
Duration	2021-2025
Description of goals	Strategic objective Is to foster a culture of digital entrepreneurship and encourage the adoption of digital tools and services among small businesses and startups.
Relevance to national and regional strategies	Aligns with Digital Agenda for the WB, Economics Reform Programme of Bosnia and Herzegovina, with EU4DigitalSME and local development strategies in the Brčko District.
Enhancing digitalisation of SMEs	Enhances SME digitalisation through mechanisms like grant schemes and co-financing, startup support programs, capacity building workshops, public private partnerships and targeted support for women led and youth led enterprises.

Strategic Objective 5: Foster Digital Economy and Innovation Ecosystems

Duration. This strategic objective is embedded in the **Development Strategy of Tuzla Canton 2021–2027**, a comprehensive policy framework that guides economic, social, and technological development in the region. The implementation of this objective is carried out through **annual development programs and budgetary allocations**, coordinated by the **Ministry of Economy of Tuzla Canton**. The programs are designed to be **sustainable and scalable**, with yearly evaluations and adjustments based on economic trends, SME needs, and technological advancements. In **2025**, the Canton allocated **670,000 BAM** (approx. €342,500) specifically for entrepreneurship, innovation, and digital economy development, marking a significant commitment to this strategic direction.

Description of Goals. The primary goal of this strategic objective is to **transform Tuzla Canton into a digitally empowered and innovation-driven regional economy**. This transformation is pursued through a set of interlinked goals:

- **Stimulating digital entrepreneurship** by supporting startups and SMEs in adopting digital technologies.
- **Modernizing traditional industries** through the integration of digital tools, automation, and smart systems.
- **Creating a supportive innovation ecosystem** that includes public institutions, academia, and the private sector.
- **Encouraging inclusive participation** in the digital economy, particularly among youth, women, and marginalized groups.
- **Improving public service delivery** through digital platforms that enhance transparency, efficiency, and accessibility.

These goals are operationalized through targeted financial incentives, regulatory improvements, and institutional support mechanisms that are tailored to the specific needs of the local economy.

Relevance to National and Regional Strategies. This objective is fully aligned with broader national and regional development frameworks:

- The **Federation of Bosnia and Herzegovina Development Strategy 2021–2027** identifies digitalisation and innovation as cross-cutting priorities for economic growth, competitiveness, and resilience.
- The **Economic Reform Programme of Bosnia and Herzegovina** emphasizes the importance of SME digital transformation and innovation capacity as key structural reforms.
- The **Digital Agenda for the Western Balkans** promotes regional cooperation in digital skills, infrastructure, and entrepreneurship, and Tuzla Canton’s strategy contributes to these goals at the subnational level.

By embedding digital economy objectives into its own strategic and budgetary planning, Tuzla Canton ensures **policy coherence, regional alignment, and local ownership** of the digital transition process.

Enhancing Digitalisation of SMEs. The Canton enhances SME digitalisation through a variety of mechanisms, all implemented directly by the **Cantonal Ministry of Economy**:

1. Direct Financial Support for Digitalisation Projects

Through the “Support for Canton Development” budget line, SMEs can apply for **grants to finance digital tools**, such as:

- Business process automation software
- E-commerce platforms
- Cloud-based services
- CRM and ERP systems
- Digital marketing tools

In 2025, **670,000 BAM** was allocated for these and related initiatives, with a focus on supporting SMEs that demonstrate innovation potential and readiness for digital transformation.

2. Digitalisation of Public Services

The Canton has introduced digital platforms such as **ePoticaji**, which allow SMEs to apply for funding online, track application status, and receive feedback electronically. This not only improves transparency and efficiency but also encourages SMEs to engage with digital tools in their interactions with government.

3. Support for Innovation and Entrepreneurship

The Ministry of Economy supports local innovation projects through:

- Public calls for innovation-driven business ideas
- Co-financing of pilot projects that integrate digital technologies
- Support for business incubators and coworking spaces

These initiatives aim to **bridge the gap between traditional business models and digital innovation**, enabling SMEs to scale and diversify.

4. Inclusive Digital Growth

Special attention is given to:

- **Women-led businesses**, through targeted grant schemes and mentorship programs
- **Youth entrepreneurship**, with support for digital startups and freelancing
- **Rural and underdeveloped areas**, to reduce regional disparities in digital access and capabilities

These efforts ensure that the benefits of digitalisation are **equitably distributed** and contribute to **social cohesion** and **economic inclusion**.

Table 6: Foster Digital Economy and Innovation Ecosystems 2021-2027

Instrument name	Title
Duration	2021-2027
Description of goals	Strategic objective Is to transform Tuzla Canton into a digitally empowered and innovation – driven regional economy.
Relevance to national and regional strategies	Aligns with Federation of Bosnia and Herzegovina Development Strategy 2021-2027, Digital Agenda for the WB, Economics Reform Programme of Bosnia and Herzegovina.
Enhancing digitalisation of SMEs	Enhances SME digitalisation through mechanisms like grant schemes and co-financing, digitalization of Public Services, Support for Innovation and Entrepreneurship, inclusive digital growth

Strategic Objective 6: Promote Digital Entrepreneurship through the Local Economic Development Plan of the City of Tuzla

Duration. The implementation of this strategic objective is framed within the City of Tuzla's Local Economic Development Plan, which is aligned with the city's broader Development Strategy for the period 2021–2026. The plan is executed through annual action programs and budgetary allocations managed by the City Department for Economic Development, Entrepreneurship, and Agriculture. Its duration spans six years, with flexibility for extension or adaptation based on the evolving needs of the local economy, particularly in the context of digital transformation and post-pandemic recovery.

Description of Goals. The main goal of this objective is to foster a dynamic and inclusive local digital economy by supporting entrepreneurship, innovation, and the adoption of digital technologies among micro, small, and medium-sized enterprises (MSMEs). The City of Tuzla aims to stimulate the creation and growth of digital startups, especially among youth and women, while also helping existing SMEs integrate digital tools to improve productivity, competitiveness, and access to new markets. The plan also envisions the development of digital infrastructure and services, including e-government platforms and digital registries, to streamline business operations and public service delivery.

Relevance to national and regional strategies. This objective is fully aligned with national and regional strategies, including the Federation of BiH Development Strategy 2021–2027, which identifies digitalisation and innovation as key drivers of economic growth. It also supports the Economic Reform Programme of Bosnia and Herzegovina, which prioritizes local economic development and SME support, and contributes to the goals of the Digital Agenda for the Western Balkans by promoting digital entrepreneurship and smart growth at the local level. Through this alignment, the City of Tuzla ensures that its local initiatives are coherent with broader policy frameworks while remaining responsive to the specific needs of its business community.

Enhancing digitalisation of SMEs. To enhance the digitalisation of SMEs, the City of Tuzla implements a range of locally funded initiatives. These include grant schemes for digital startups, which provide co-financing for the development of websites, e-commerce platforms, and digital tools. The city also organizes training programs and workshops in cooperation with local educational institutions and NGOs, focusing on digital marketing, cybersecurity, and e-business skills. Special attention is given to unemployed youth, women, and early-stage entrepreneurs.

In addition, the city supports freelancers and remote workers through the development of coworking spaces and digital hubs, as well as legal and administrative assistance. Public services are also being digitalised, with online platforms for business registration, licensing, and communication with municipal authorities. These efforts reduce administrative burdens and create a more transparent and efficient business environment.

Overall, this strategic objective reflects the City of Tuzla's commitment to building a resilient, innovation-driven local economy where digitalisation is not only a tool for growth but also a means of empowering citizens and businesses to thrive in a rapidly evolving digital landscape.

Table 7: Promote Digital Entrepreneurship through LEDP of the City of Tuzla 2021-2026

Instrument name	Title
Duration	2021-2026
Description of goals	The primary goal of this strategic objective is to foster a vibrant local digital economy by supporting entrepreneurship, innovation, and the adoption of digital technologies among micro, small, and medium-sized enterprises (MSMEs).
Relevance to national and regional strategies	Aligns with Federation of Bosnia and Herzegovina Development Strategy 2021-2027, Digital Agenda for the WB, Economics Reform Programme of Bosnia and Herzegovina.
Enhancing digitalisation of SMEs	Enhances SME digitalisation through mechanisms like grant schemes and co-financing, digital skills development programs, digital public services for businesses

Strategic Objective : Digital Bosnia and Herzegovina – National ICT Strategy Support (EDIH)

Table 8: Digital Bosnia and Herzegovina – National ICT Strategy Support (EDIH)

Title of the Challenge	Description of the challenge
Scope	Creating an integrated national framework for digital development
Partner	BiH authorities, international donors, EU
Focus Areas	<ul style="list-style-type: none"> • Digital infrastructure (broadband rollout) • Interoperability between government services • Cybersecurity and data protection • Digital education initiatives
Duration	2025-

2.2. General assessment

The digitalisation of small and medium-sized enterprises (SMEs) in Bosnia and Herzegovina (BiH) is a growing but still underdeveloped area of economic transformation. While there has been notable progress in recent years—particularly in urban centers and among innovation-driven firms—the overall digital maturity of SMEs remains low compared to EU standards. The country faces a complex set of challenges rooted in its administrative fragmentation, uneven regional development, and limited institutional capacity. These factors contribute to a digital divide that is both sectoral and territorial, with significant implications for productivity, competitiveness, and long-term economic resilience.

Current State and Regional Disparities. The digitalisation landscape in BiH is highly fragmented, reflecting the country’s complex political and administrative structure. The three main administrative units—Federation of Bosnia and Herzegovina (FBiH), Republika Srpska (RS), and Brčko District—each have their own economic development strategies, institutional frameworks, and levels of engagement with digital transformation. This fragmentation often results in inconsistent policy implementation and limited coordination across the country.

In the Federation of BiH, digitalisation has gained more traction, particularly through EU-funded initiatives and partnerships with international development agencies. Urban centers such as Sarajevo, Mostar, and Tuzla have emerged as digitalisation frontrunners, benefiting from better infrastructure, access to skilled labor, and proximity to academic and innovation institutions. Tuzla Canton, in particular, has shown promising developments, with the City of Tuzla positioning itself as a regional hub for ICT and digital entrepreneurship. The presence of institutions like the BIT Center, the University of Tuzla, and various startup incubators has fostered a growing ecosystem that supports digital innovation.

In contrast, Republika Srpska has made slower progress in this area. While cities like Banja Luka have seen some growth in digital services and innovation, the overall pace of digital adoption among SMEs remains modest. The lack of a comprehensive digital strategy and limited access to EU funding mechanisms have hindered broader progress. Brčko District, due to its small size and limited administrative capacity, has only recently begun to explore digitalisation as a development priority, mostly through donor-supported pilot projects.

Sectoral Variations in Digital Adoption. The level of digitalisation among SMEs in BiH varies significantly by sector. Firms operating in the ICT sector, professional services, logistics, and export-oriented manufacturing tend to be more digitally mature. These businesses are more likely to use advanced digital tools such as cloud computing, enterprise resource planning (ERP) systems, and e-commerce platforms. Their exposure to international markets and reliance on digital workflows make them more inclined to invest in digital transformation.

On the other hand, traditional sectors such as agriculture, construction, hospitality, and crafts continue to lag behind. Many SMEs in these industries still operate with minimal digital infrastructure, often limited to basic websites or social media presence. The use of digital management systems, cybersecurity protocols, or data analytics is rare. This digital lag is particularly pronounced in rural and less-developed areas, where infrastructure deficits, low digital literacy, and limited access to support services further constrain adoption.

Key Challenges and Structural Gaps. Several structural issues continue to hinder the digitalisation of SMEs across BiH:

1. **Low Awareness and Strategic Vision:** Many SME owners, particularly in microenterprises and older generations, lack awareness of the benefits of digitalisation. Digital transformation is often not seen as a strategic priority, especially in sectors where traditional business models still dominate.
2. **Digital Skills Gap:** There is a widespread shortage of digital skills within the SME workforce. This is especially acute outside the ICT sector and in rural areas, where access to training and education is limited. Even when digital tools are adopted, the lack of skilled personnel often prevents their effective use.
3. **Access to Finance:** SMEs frequently struggle to secure funding for digital investments. Microenterprises, in particular, face difficulties navigating complex application procedures for grants or loans. The absence of tailored financial instruments further limits their ability to invest in digital tools.
4. **Infrastructure Deficits:** In many parts of the country, especially rural and mountainous regions, basic digital infrastructure such as high-speed internet is still lacking. This creates a fundamental barrier to digital inclusion and limits the reach of support programs.
5. **Fragmented Support Ecosystem:** The digital support landscape in BiH is fragmented and lacks coordination. Multiple public agencies, chambers of commerce, and development organizations operate in parallel, often duplicating efforts or failing to reach the most vulnerable SMEs. Advisory and aftercare services are also underdeveloped, leaving many firms without the guidance needed to implement and sustain digital transformation.

Policy Agenda and Strategic Measures. Despite these challenges, the digitalisation of SMEs is increasingly recognized as a national development priority. Several strategic frameworks and initiatives have been launched to address the digital gap and support SME transformation:

- **EU4DigitalSME:** This flagship EU-funded project, co-financed by the German government, aims to strengthen the digital innovation ecosystem in BiH. It supports the establishment of Digital Innovation Hubs (DIHs), provides training and advisory services to SMEs, and promotes collaboration between academia, industry, and government.
- **Go Digital (EBRD):** A pilot program launched by the European Bank for Reconstruction and Development (EBRD) to help SMEs assess their digital readiness and implement tailored digital solutions. The program includes diagnostics, mentoring, and co-financing for digital investments.
- **Entity-Level Strategies:** In the Federation of BiH, cantonal development agencies—such as those in Tuzla Canton—are increasingly involved in digitalisation efforts. These include support for startups, innovation vouchers, and partnerships with universities. Republika Srpska has also begun to develop digital economy strategies, though implementation remains limited.

- **Local Initiatives in Tuzla Canton and City of Tuzla:** Tuzla has emerged as a leader in digital transformation at the local level. The city hosts several innovation hubs, including the BIT Center, which provides coworking spaces, training programs, and startup support. The University of Tuzla plays a key role in digital skills development, while the local government has shown openness to digital governance and smart city initiatives.

Conclusion and Outlook. The digitalisation of SMEs in Bosnia and Herzegovina is at a critical juncture. While there is growing political will and international support, the path forward requires a more integrated and inclusive approach. Bridging the digital divide will necessitate targeted outreach to lagging sectors and regions, simplification of access to funding and support services, and a stronger focus on building digital skills across the workforce.

Tuzla Canton and the City of Tuzla offer a promising model for regional digital transformation, combining institutional support, academic engagement, and entrepreneurial energy. However, scaling this success across the country will require systemic reforms, better coordination among stakeholders, and sustained investment in digital infrastructure and human capital.

In summary, BiH's SME digitalisation agenda is evolving, but unlocking its full potential will depend on addressing deep-rooted structural barriers and ensuring that no region or sector is left behind in the digital transition.

2.3. Identification of Policy Challenges

The digital transformation of small and medium-sized enterprises (SMEs) is increasingly recognized as a cornerstone of sustainable economic development, competitiveness, and resilience in the 21st century. In Bosnia and Herzegovina (BiH), a country characterized by a complex administrative structure and uneven regional development, the digitalisation of SMEs presents both a significant opportunity and a formidable policy challenge. While various policy instruments and support mechanisms have been introduced at the national, entity, and local levels, their effectiveness remains constrained by structural, institutional, and operational barriers. This section provides a critical analysis of the existing policy landscape, identifies key challenges and weaknesses, and assesses the impact of current measures on SME beneficiaries. It also distinguishes between general and specific policy instruments and links the identified challenges to broader national and regional policy frameworks.

Overview of Policy Instruments and Measures. The policy environment for SME digitalisation in BiH comprises a combination of general (indirect) and specific (targeted) measures. These instruments vary in scope, scale, and institutional ownership, reflecting the country's decentralized governance model.

General Measures (Indirect Influence). **General policy instruments are those that, while not explicitly designed to promote digitalisation, create enabling conditions for digital transformation. These include:**

- **National and Entity-Level Development Strategies:** Such as the Development Strategy of the Federation of BiH (2021–2027), the Economic Reform Programme of Republika Srpska, and the Brčko District Development Strategy. These documents often reference digitalisation as a cross-cutting theme but lack detailed implementation plans.
- **Education and Labor Market Reforms:** Aimed at improving digital literacy and aligning vocational training with market needs. However, these reforms are still in early stages and unevenly implemented across regions.
- **Infrastructure Investments:** Including broadband expansion and smart city initiatives, particularly in urban centers like Sarajevo, Banja Luka, and Tuzla.
- **SME Support Programs:** Broader innovation and competitiveness programs that may include digital components but are not specifically tailored to digital transformation.

Specific Measures (Direct Influence). **Specific policy instruments are those explicitly designed to support the digitalisation of SMEs. Key examples include:**

- **EU4DigitalSME:** A flagship EU and German government-funded initiative that supports the establishment of Digital Innovation Hubs (DIHs), provides training and advisory services, and promotes digital diagnostics for SMEs.
- **Go Digital (EBRD):** A pilot program offering tailored digitalisation support, including readiness assessments, mentoring, and co-financing for digital investments.
- **Local Initiatives:** Particularly in Tuzla Canton and the City of Tuzla, where institutions like the BIT Center and the University of Tuzla play a central role in fostering digital entrepreneurship and skills development.
- **Pilot Programs:** Including digital vouchers, e-commerce training, and cybersecurity awareness campaigns, often implemented in partnership with international donors.

Key Challenges and Weaknesses. Despite the presence of these instruments, several structural and operational challenges continue to hinder the effective digitalisation of SMEs in BiH.

Fragmentation and Institutional Discoordination. One of the most persistent challenges is the fragmentation of policy responsibilities across multiple levels of government. The absence of a unified national digitalisation strategy for SMEs results in a lack of coherence and synergy among various initiatives. Entity-level institutions (e.g., ministries in FBiH and RS) often operate in silos, with limited coordination or knowledge exchange. This fragmentation is further exacerbated by the weak integration of local development agencies and municipal governments into national policy frameworks.

Limited Outreach and Awareness. Many SMEs, particularly in rural and less-developed regions, remain unaware of available support mechanisms. Outreach efforts are often ad hoc and concentrated in urban centers, leaving peripheral areas underserved. Moreover, digitalisation is not yet embedded in the strategic thinking of many SME owners, especially in traditional sectors such as agriculture, construction, and crafts. This lack of awareness is

compounded by low levels of digital literacy and skepticism about the return on investment in digital tools.

Skills and Human Capital Deficit. The shortage of digital skills within the SME workforce is a critical barrier to digital transformation. While some progress has been made in integrating digital competencies into formal education, vocational training remains outdated and poorly aligned with industry needs. SMEs often lack the internal capacity to manage digital projects, even when external funding or tools are available. This skills gap is particularly acute outside the ICT sector and in regions with limited access to higher education institutions.

Financial Accessibility and Procedural Complexity. Access to finance for digital investments remains limited, particularly for microenterprises and startups. Existing grant schemes and loan programs are often characterized by complex application procedures, stringent eligibility criteria, and limited transparency. The lack of tailored financial instruments—such as microgrants, digital vouchers, or blended finance models—further restricts the ability of SMEs to invest in digital tools and services.

Monitoring and Evaluation Deficiencies. There is currently no unified system for monitoring the impact of digitalisation policies on SME performance. Data on digital maturity, adoption rates, and outcomes is scarce, fragmented, and often outdated. This lack of evidence-based policymaking undermines the ability of institutions to design targeted interventions, allocate resources efficiently, and measure progress toward strategic goals.

Assessment of Policy Impact. The impact of existing policy instruments on SME digitalisation is mixed and highly uneven across regions and sectors.

- **Urban SMEs** and those operating in the ICT, logistics, and export-oriented manufacturing sectors have benefited the most from targeted support programs. These firms are more likely to have the absorptive capacity, skills, and infrastructure needed to leverage digital tools effectively.
- **Rural and traditional SMEs**, by contrast, remain largely excluded from the digital transformation agenda. Their limited participation in support programs reflects both structural barriers (e.g., infrastructure deficits) and institutional shortcomings (e.g., weak outreach and advisory services).
- **Pilot programs** such as digital vouchers and DIHs have demonstrated potential but remain limited in scale and sustainability. Their long-term impact will depend on institutionalization, funding continuity, and integration into broader development strategies.

Unaddressed Needs and Emerging Priorities. Several critical needs of SMEs remain insufficiently addressed by current policy instruments:

- **Tailored advisory services** to support digital transformation planning, implementation, and aftercare.
- **Sector-specific digitalisation roadmaps**, particularly for agriculture, tourism, and crafts.

- **Decentralised support structures** capable of reaching SMEs in remote and underserved areas.
- **Simplified and inclusive funding mechanisms**, including fast-track applications and co-financing models.
- **Digital skills development programs** targeting both current employees and future workforce entrants.

Linkages to National and Regional Policies. The challenges identified above are closely linked to gaps and inconsistencies in national and regional policy frameworks:

- The **absence of a national SME digitalisation strategy** limits coherence and scalability of interventions.
- Entity-level strategies (e.g., FBiH Development Strategy, RS Economic Policy) reference digitalisation but lack operational detail and implementation mechanisms.
- Regional development plans (e.g., Tuzla Canton Development Strategy) are more proactive but require stronger alignment with national and EU-level objectives.
- The lack of a **national digital skills strategy** undermines efforts to build a digitally competent workforce, which is essential for SME transformation.

Table 9: Policy challenges

Title of the Challenge	Description of the challenge
C1: Absence of a Unified National Digitalisation Policy for SMEs	Bosnia and Herzegovina lacks a coherent, nationwide strategy specifically targeting the digital transformation of SMEs. While digitalisation is mentioned in broader development strategies at the entity and cantonal levels, there is no dedicated policy framework that outlines clear objectives, implementation mechanisms, or performance indicators for SME digitalisation. This policy vacuum leads to fragmented efforts, duplication of initiatives, and missed opportunities for synergy across administrative levels.
C2: Weak Intergovernmental Coordination and Policy Alignment	The country’s decentralized governance structure results in poor coordination between state, entity, cantonal, and municipal institutions. Policy instruments are often developed in isolation, without alignment to national priorities or EU digital agendas. This lack of vertical and horizontal coordination undermines the scalability and sustainability of digitalisation programs and limits the ability to deliver consistent support to SMEs across regions.

C3: Inadequate Policy Instruments for Micro and Rural Enterprises	<p>Most existing digitalisation support measures are designed for medium-sized or urban-based enterprises, leaving microenterprises and rural SMEs underserved. Policy instruments often fail to account for the specific constraints these businesses face, such as low digital literacy, limited infrastructure, and reduced access to advisory services. As a result, the digital divide between urban and rural SMEs continues to widen.</p>
C4: Underdeveloped Digital Skills Policy	<p>There is no comprehensive national policy focused on developing digital skills within the SME sector. While some education reforms and training programs exist, they are not systematically linked to SME needs or digitalisation goals. The absence of a coordinated digital skills strategy limits the effectiveness of other policy instruments and hinders the long-term sustainability of digital transformation efforts.</p>
C5: Ineffective Financial Support Mechanisms	<p>Current financial instruments for SME digitalisation—such as grants, loans, and co-financing schemes—are often overly complex, poorly targeted, and difficult to access. Application procedures are bureaucratic, and eligibility criteria are not adapted to the realities of small or informal businesses. Moreover, there is a lack of innovative financing models (e.g., digital vouchers, blended finance) that could lower entry barriers for SMEs.</p>
C6: Limited Policy Support for Sector- Specific Digitalisation	<p>Policy instruments tend to adopt a one-size-fits-all approach, without tailoring support to the unique digitalisation needs of different economic sectors. Sectors such as agriculture, tourism, crafts, and construction are particularly neglected, despite their economic importance and potential for digital transformation. The absence of sector-specific roadmaps or incentives limits the relevance and uptake of digital tools in these industries.</p>
C7: Insufficient Monitoring, Evaluation, and Policy Learning	<p>There is no robust system in place to monitor the implementation and impact of digitalisation policies on SMEs. Data on digital maturity, adoption rates, and outcomes is fragmented and rarely used to inform policy adjustments. This lack of evidence-based policymaking reduces accountability, impedes learning, and prevents the scaling of successful interventions.</p>

C8: Lack of Institutional Capacity and Policy Delivery Mechanisms	Many public institutions responsible for implementing digitalisation policies lack the technical expertise, human resources, and operational tools needed to deliver effective support. This institutional weakness is particularly evident at the local level, where development agencies and chambers of commerce often struggle to provide tailored services or manage complex funding programs.
C9: Policy Invisibility of Informal and Marginalised SMEs	Informal businesses and SMEs owned by women, youth, or minorities are often invisible in policy design and implementation. Existing instruments rarely include inclusive criteria or outreach strategies to engage these groups. As a result, digitalisation policies risk reinforcing existing inequalities and excluding vulnerable entrepreneurs from the benefits of digital transformation.
C10: Disconnection Between Innovation Policy and SME Digitalisation	Innovation policies in BiH tend to focus on research institutions, startups, and high-tech sectors, with limited integration of traditional SMEs into innovation ecosystems. This disconnect means that many SMEs are excluded from innovation funding, technology transfer programs, and collaborative platforms that could accelerate their digitalisation.

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The country's decentralized governance structure results in poor coordination between state, entity, cantonal, and municipal institutions. Policy instruments are often developed in isolation, without alignment to national priorities or EU digital agendas. This lack of vertical and horizontal coordination undermines the scalability and sustainability of digitalisation programs and limits the ability to deliver consistent support to SMEs across regions.

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limited infrastructure, and reduced access to advisory services. As a result, the digital divide between urban and rural SMEs continues to widen.

C4: Underdeveloped Digital Skills Policy

There is no comprehensive national policy focused on developing digital skills within the SME sector. While some education reforms and training programs exist, they are not systematically linked to SME needs or digitalisation goals. The absence of a coordinated digital skills strategy limits the effectiveness of other policy instruments and hinders the long-term sustainability of digital transformation efforts.

C5: Ineffective Financial Support Mechanisms

Current financial instruments for SME digitalisation—such as grants, loans, and co-financing schemes—are often overly complex, poorly targeted, and difficult to access. Application procedures are bureaucratic, and eligibility criteria are not adapted to the realities of small or informal businesses. Moreover, there is a lack of innovative financing models (e.g.,

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Policy instruments tend to adopt a one-size-fits-all approach, without tailoring support to the unique digitalisation needs of different economic sectors. Sectors such as agriculture, tourism, crafts, and construction are particularly neglected, despite their economic importance and potential for digital transformation. The absence of sector-specific roadmaps or incentives limits the relevance and uptake of digital tools in these industries.

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There is no robust system in place to monitor the implementation and impact of digitalisation policies on SMEs. Data on digital maturity, adoption rates, and outcomes is fragmented and rarely used to inform policy adjustments. This lack of evidence-based policymaking reduces accountability, impedes learning, and prevents the scaling of successful interventions.

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C10: Disconnection Between Innovation Policy and SME Digitalisation

Innovation policies in BiH tend to focus on research institutions, startups, and high-tech sectors, with limited integration of traditional SMEs into innovation ecosystems. This disconnect means that many SMEs are excluded from innovation funding, technology transfer programs, and collaborative platforms that could accelerate their digitalisation. (digital vouchers, blended finance) that could lower entry barriers for SMEs.

Challenges and Limitations

- **Fragmented Governance**
Due to the complex administrative structure (state, entities, cantons, and Brčko District), there is **no unified national digitalisation strategy**. This leads to duplication, delays, and inconsistent implementation across regions.
- **Limited Public Funding**
Many digital projects rely heavily on **donor support**, as public investments in ICT and digital infrastructure remain insufficient.
- **Uneven Infrastructure**
Rural areas and smaller municipalities still lack adequate **broadband access** and ICT tools, deepening the digital divide between urban and rural populations.

2.4. Regional Competitiveness

The digitalisation of small and medium-sized enterprises (SMEs) in Bosnia and Herzegovina plays a pivotal role in shaping regional competitiveness and innovation capacity. As digital technologies become increasingly embedded in business operations, their influence extends beyond firm-level productivity to broader economic, social, and innovation outcomes. In BiH, where regional disparities are pronounced and the economy is heavily reliant on SMEs, digitalisation has the potential to act as a transformative force—provided that structural barriers are addressed and policy frameworks are aligned with regional development goals.

From an economic perspective, the digitalisation of SMEs contributes directly to regional economic performance, particularly in terms of GDP per capita, employment rates, and salary levels in high-value sectors. Regions with more digitally mature SMEs—such as Sarajevo Canton and Tuzla Canton—tend to exhibit higher GDP per capita, reflecting the productivity gains associated with digital tools and processes. Digitalisation enables SMEs to streamline operations, access new markets, and innovate more efficiently, all of which contribute to economic growth. Employment rates in ICT and high-tech sectors have also benefited from digitalisation, as demand for digitally skilled labor increases. In urban centers like Tuzla and Sarajevo, the ICT sector has become a significant employer, offering stable and well-paying jobs. Salaries in these sectors are notably higher than the national average, often exceeding it by 30–50%, due to the premium placed on digital competencies and the global competitiveness of the services provided.

The social impact of SME digitalisation is equally significant, particularly in terms of quality of life. Digitalisation enhances access to services, supports remote work, and facilitates more efficient public administration, all of which contribute to improved living standards. According to recent quality of life indices, BiH scores moderately overall, but urban regions with higher levels of digital infrastructure and service availability— such as Sarajevo, Tuzla, and Banja Luka—tend to perform better. In these areas, residents benefit from greater access to digital public services, online education, and e-commerce platforms. Moreover, digitalisation supports social inclusion by enabling flexible work arrangements and lowering entry barriers for women, youth, and marginalized groups to participate in the economy. However, in rural and less- developed regions, limited digital infrastructure and low digital literacy continue to constrain these benefits, reinforcing existing inequalities.

In terms of innovation capacity, the digitalisation of SMEs is a key driver of regional innovation ecosystems. The European Innovation Scoreboard (EIS) and the Regional Innovation Scoreboard (RIS) classify Bosnia and Herzegovina as an “Emerging Innovator,” with an overall innovation performance at just over 33% of the EU average. While this places BiH among the lower-performing countries in Europe, there are notable strengths, particularly in the area of SME-driven innovation. For example, BiH scores well above the EU average in the share of SMEs introducing product or process innovations. This suggests that, despite structural challenges, SMEs in BiH are capable of leveraging digital tools to innovate when the right conditions are in place. However, the country scores poorly in critical areas such as public R&D investment, venture capital availability, and government support for business R&D. These weaknesses highlight the need for more targeted policy interventions to support innovation, particularly in regions outside the main urban centers.

Regional disparities in innovation performance are stark. Urban hubs like Mostar and Tuzla benefit from the presence of universities, technology parks, and international development projects, which together create a more conducive environment for innovation. In contrast, rural and peripheral regions lack the institutional infrastructure, skilled workforce, and financial resources needed to support digital and innovation- driven growth. This uneven distribution of innovation capacity limits the overall impact of digitalisation on national competitiveness and underscores the importance of regionally tailored strategies.

The digitalisation of SMEs in Bosnia and Herzegovina has a multifaceted impact on regional competitiveness and innovation capacity. Economically, it boosts productivity, employment, and wages in high-tech sectors. Socially, it enhances quality of life and supports inclusion, though benefits are unevenly distributed. From an innovation standpoint, it empowers SMEs to contribute to regional innovation ecosystems, but systemic weaknesses in policy support and infrastructure constrain broader progress. To fully harness the potential of digitalisation, BiH must invest in digital infrastructure, expand access to digital skills training, and develop integrated policy frameworks that address regional disparities and support inclusive innovation. Only through such a comprehensive approach can digitalisation become a true engine of regional development and resilience.

Bosnia and Herzegovina's regional competitiveness is **highly uneven** due to its complex political structure, fragmented governance, and disparities in infrastructure and investment. **Digitalisation is emerging as a key factor** for improving competitiveness, particularly in more developed urban areas. Small and medium-sized enterprises (SMEs) are the backbone of Bosnia and Herzegovina's economy, comprising over 99% of all businesses and generating more than 60% of employment. However, low productivity, digital gaps, and regional disparities in development significantly affect their competitiveness—especially in a fragmented and evolving digital landscape.

- SMEs are the primary source of non-public sector employment, especially in urban centers and for youth.
- Key role in absorbing labor from informal and post-industrial sectors
- Contribute over half of total GDP, especially in manufacturing, trade, and tourism.
- SMEs drive local economic development and diversify the economic base

Support for Vulnerable Groups Many SMEs hire:

- Youth and first-time job seekers
- Women, especially in the services, textile, and tourism sectors
- Returnees and displaced persons through reintegration projects

Social Inclusion and Gender Equality Women-Led SMEs

- Estimated that **20–25% of SMEs are women-owned or managed**.
- Women entrepreneurs play key roles in **retail, education, health, agriculture, and crafts**.
- Numerous donor programs (e.g., GIZ, UN Women, USAID) support female entrepreneurship through access to credit and training.

Inclusive Business Models

- SMEs are more likely to adopt **community-based or family-led business models**, fostering **intergenerational employment** and **workplace flexibility**. Rural Development and Community Empowerment
- SMEs are key drivers of **local economic revitalisation** in:
 - o Agriculture and agri-processing
- Rural tourism and crafts
- Renewable energy and eco-businesses
- SME development slows **rural-to-urban migration** by creating **viable livelihoods** in small towns and villages.

Community Engagement

- Many SMEs support local causes (e.g., schools, health centers, sports clubs).
- Social entrepreneurship is growing in areas such as **youth services, elderly care, and eco-tourism. Education, Skills, and Youth Retention**
- SMEs often **partner with local vocational schools and universities** to provide internships and apprenticeships.

- Encourage **entrepreneurship education**, especially among youth.
- **Digital start-ups and creative SMEs** help retain young talent and reduce brain drain.

Innovation Performance: Regional Innovation Index

Bosnia and Herzegovina is an Emerging Innovator with performance at 33.1% of the EU average in 2024. Performance is below the average of the Emerging Innovators (48%). Performance is increasing less than the EU (+10%)

Relative strengths

- Environment-related technologies
- SMEs introducing product innovations
- SMEs introducing business process innovations

Relative weaknesses

- R&D expenditure in the public sector
- Venture capital expenditures
- Direct and indirect government support of business R&D

Strong increases since 2023

- Broadband penetration
- Employment in knowledge-intensive activities
- Resource productivity

Strong decreases since 2023

- Scientific publications among the top 10% most cited
- Trademark applications
- Knowledge-intensive services exports

Innovation activities

Bosnia and Herzegovina demonstrates a strong performance of 117.6% of the 2024 EU average on Innovators dimension, with SMEs introducing new products to the market representing 165.7% of the EU level in 2024. The available data on Linkages dimension show a weak performance of 27.3% of the 2024 EU average on public private co-publications, as the infrastructure for business-academia collaboration remains underdeveloped and R&D funding is limited (OECD, 2024). Gaps in funding and linkages contribute to a weak performance on Intellectual assets, currently standing at 14.9% of the EU average in 2024. However, Bosnia and Herzegovina registered a 15.5%-point increase in patent applications since 2017, and a modest 2.9%-point increase in trademark applications. This increase is probably related to the higher share of doctorate students in the country, which, in STEM subjects, contribute to the growth of released patents, as well as a more vibrant research environment.

Impacts

Overall, Bosnia and Herzegovina has shown a positive trend in the areas of employment and sales impacts, as well as environmental sustainability for the period between 2017 and 2024, but the performance remains below the EU average. In fact, the employment in knowledge-intensive activities grew by 20.5%-points since 2017, and 12.0%-points compared to 2023, while innovative enterprises employ at 84.1% of the EU average in 2024. The 15.6%-point growth in exports of medium and high technology products (compared to 2017), together with a 7.8%-point increase in knowledge-intensive services exports, contribute to enhanced performance of the country on Sales impact (29.6% of the EU average in 2024). Finally, the 89% performance, compared to the EU in 2024, in Environmental sustainability in Bosnia and Herzegovina was driven by a 13.3%-point improvement in resource productivity since 2017, and substantial progress in the development of environment-related technologies, with Bosnia and Herzegovina performing at 171.9% of the EU level on this indicator in 2024. This progress has brought the Bosnian government closer to achieving the EU Green Deal goals (European Commission, 2023), demonstrating a commitment to sustainable development and environmental protection.

2.5. Good practices and recommendations

Bosnia and Herzegovina has seen progress in digital transformation, particularly through local initiatives, international support, and innovation hubs. Below are some **notable good practices**

Table 10: Good practices

Title of the Good Practice	GP Description
GP 1: BITCentar Tuzla	BIT Centar is a pioneering regional technology park located in Tuzla. It provides a comprehensive support system for startups and SMEs, particularly in the ICT sector. The center offers coworking spaces, business incubation, digital skills training, and access to advanced facilities such as a FabLab and CODE HUB. It also serves as a Digital Innovation Hub (DIH). BIT Centar is deeply integrated with the University of Tuzla and local government, fostering a strong quadruple-helix model of innovation. Its long-standing experience in managing EU-funded projects and its role in regional capacity building make it a model for replication in other cantons and municipalities.

<p>GP 2: Innovation Centre Banja Luka</p>	<p>ICBL is a dynamic innovation and entrepreneurship center based in Banja Luka. It supports startups and SMEs through incubation, acceleration programs, and digital transformation services. ICBL is particularly active in the ICT and creative industries and has a strong focus on youth and women's entrepreneurship. It offers training in digital skills, business development, and innovation management. The center also hosts hackathons, coding bootcamps, and networking events that connect entrepreneurs with investors and mentors. Its ability to bridge the gap between academia, business, and government makes it a replicable model for urban innovation ecosystems.</p>
<p>GP 3: INTERA Technolgy park</p>	<p>INTERA Technology Park is a regional innovation and business development center located in Mostar. It provides infrastructure and services for startups, SMEs, and individuals interested in technology and entrepreneurship. INTERA offers coworking spaces, business incubation, technical training, and access to digital fabrication tools. It is particularly active in promoting smart manufacturing, digital prototyping, and STEM education. The park collaborates closely with local universities and industry partners, creating a vibrant ecosystem for innovation. Its focus on applied technology and regional development makes it a strong candidate for transregional transfer.</p>
<p>GP4: STEM Academy</p>	<p>The STEM Academy is a national initiative aimed at strengthening science, technology, engineering, and mathematics (STEM) education and digital skills among youth. It provides hands-on training, mentorship, and innovation challenges for students, young professionals, and aspiring entrepreneurs. The Academy works closely with schools, universities, and private sector partners to deliver practical learning experiences that prepare participants for the digital economy. Its emphasis on experiential learning, inclusivity, and industry relevance makes it a valuable model for other regions seeking to build a future-ready workforce.</p>

GP5: The EU4DigitalSME	The EU4DigitalSME project has established a network of Digital Innovation Hubs across Bosnia and Herzegovina. These hubs serve as regional one-stop-shops for SMEs seeking to adopt digital technologies. They offer services such as digital maturity assessments, training, access to technology providers, and innovation consulting. The DIH model is modular and scalable, designed to support SMEs at different stages of digital transformation. It aligns with EU Digital Decade goals and is highly transferable to other regions.
GP6: Go Digital	Go Digital is a blended support program that helps SMEs in Bosnia and Herzegovina assess their digital readiness, develop tailored investment plans, and access co-financing for digital tools and services. The program combines technical assistance with financial support, working through local partner banks to deliver grants and loans. It includes a digital maturity diagnostic tool, mentoring, and implementation support. The program has already supported hundreds of SMEs and is being scaled across the Western Balkans. Its inclusive design, integration with financial institutions, and focus on measurable outcomes make it a standout example of a replicable digitalisation policy instrument.

2.6. Data infrastructure

The digital transformation of small and medium-sized enterprises (SMEs) is increasingly recognized as a cornerstone of economic modernization, innovation, and regional development. In Bosnia and Herzegovina (BiH), SMEs represent the backbone of the economy, accounting for over 99% of all registered businesses and employing a significant portion of the workforce. As such, understanding the extent and impact of digitalisation within this sector is essential for designing effective policy interventions, fostering competitiveness, and aligning with broader European Union (EU) digital and innovation agendas. However, the ability to conduct a comprehensive and evidence-based assessment of SME digitalisation and competitiveness is heavily dependent on the availability, quality, and granularity of relevant data. This paper explores the current landscape of data sources in BiH, identifies critical gaps, and proposes recommendations for improving the data ecosystem to support informed policymaking.

In recent years, several initiatives have contributed to the growing body of knowledge on SME digitalisation in BiH. One of the most significant is the Digital Transformation Readiness

Assessment of SMEs in BiH (2023), conducted under the EU4DigitalSME project. This assessment provides a structured overview of the digital maturity of SMEs across various dimensions, including digital infrastructure, workforce skills, technology adoption, and innovation capacity. It also maps the broader digital ecosystem, identifying key actors, support mechanisms, and barriers to transformation. The methodology used in this assessment aligns with EU best practices and offers a valuable baseline for future monitoring and evaluation. Complementing this, the European Innovation Scoreboard (EIS) 2024 includes BiH as an “Emerging Innovator,” with an overall innovation performance at approximately 33% of the EU average. The EIS provides comparative data on innovation inputs and outputs, including indicators such as SME product and process innovation, digital public services, and human capital. Although BiH’s inclusion in the EIS is a positive step, its participation is constrained by limited national reporting and the absence of harmonized data collection systems across entities and cantons.

At the national level, strategic documents such as the Development Strategy of the Federation of BiH, the Economic Policy Guidelines of Republika Srpska, and the Brčko District Development Strategy reference digitalisation as a cross-cutting priority. However, these strategies often lack detailed implementation plans, measurable targets, or robust monitoring frameworks. While they signal political commitment, they fall short in providing actionable data or mechanisms for tracking progress. Academic research has also contributed to the understanding of SME digitalisation in BiH. For instance, the 2023 study titled “Current Degree of Digitalization of Companies in Bosnia and Herzegovina” offers insights into firm-level digital practices and perceptions. These studies, while valuable, are typically based on small sample sizes and qualitative methods, limiting their generalizability and policy relevance.

Despite the existence of several data sources and analytical tools, significant gaps remain that hinder a comprehensive and policy-relevant assessment of SME digitalisation and competitiveness in BiH. One of the most pressing issues is the absence of disaggregated data at the entity, cantonal, and municipal levels. Most available statistics are aggregated at the national level, which obscures regional disparities in digital readiness, infrastructure, and innovation capacity. This lack of granularity makes it difficult to design regionally tailored interventions or to evaluate the effectiveness of local initiatives such as those implemented in Tuzla Canton, Banja Luka, or Mostar.

While basic indicators such as internet penetration and website usage are available, there is limited data on the adoption of advanced digital technologies, including artificial intelligence, big data analytics, cloud computing, and cybersecurity. Moreover, there is no systematic tracking of digital investment levels, the return on digital adoption, or the impact of digitalisation on firm productivity, employment, and export performance. Innovation and digitalisation are often treated as separate domains in policy and statistical reporting. This siloed approach limits the ability to assess how digital transformation contributes to innovation outcomes, particularly among SMEs. For example, there is little data on how digital tools are used to support product development, process optimization, or market

expansion. Furthermore, the lack of longitudinal data prevents the tracking of trends over time and the evaluation of policy impact.

Public institutions in BiH have not yet fully leveraged administrative data sources such as tax records, business registries, or procurement databases to monitor SME digitalisation. Nor have they adopted real-time data collection methods, such as digital platform analytics or mobile surveys, which could provide more timely and granular insights. This limits the responsiveness of the policy system and the ability to detect emerging trends or challenges. Currently, there is no national observatory or digitalisation dashboard that consolidates data on SME digitalisation, innovation, and competitiveness. The data landscape is fragmented across multiple institutions, including statistical agencies, development agencies, chambers of commerce, and donor organizations. This fragmentation creates inefficiencies, reduces transparency, and complicates access for policymakers, researchers, and business stakeholders.

To address these challenges and enable a more robust assessment of SME digitalisation and competitiveness, several strategic actions are recommended. First, BiH should develop a national digitalisation and innovation data strategy, aligned with EU frameworks such as the Digital Economy and Society Index (DESI) and the European Innovation Scoreboard. This strategy should define key indicators, data sources, and institutional responsibilities. Second, the establishment of a centralised digitalisation observatory or data portal would significantly enhance data accessibility and coordination. This platform could serve as a one-stop resource for policymakers, researchers, and SMEs, offering real-time data, analytical tools, and policy dashboards. Third, regional data infrastructure should be strengthened, including the implementation of digital maturity assessments at the cantonal and municipal levels. This would enable more targeted and effective policy interventions, particularly in lagging regions. Fourth, collaboration between statistical agencies, academic institutions, and business associations should be institutionalized to improve data collection, validation, and analysis. Public-private partnerships could also be leveraged to access proprietary data from digital service providers and platforms.

The Ministry of Communications and Transport of BiH has taken several important steps to advance digitalisation at the national level. One of the most significant developments is the signing of a Memorandum of Understanding on Digital Transformation with the Republic of Slovenia in May 2025. This agreement aims to foster bilateral cooperation in the field of digital transformation, including the exchange of best practices, joint projects, and capacity building. Such international partnerships are crucial for aligning BiH's digital agenda with EU standards and for facilitating knowledge transfer that can benefit SMEs across the country. Another major initiative under the Ministry's leadership is the Digital Terrestrial Television (DTT) Project, which represents a €13.3 million investment in the digitalisation of the country's broadcasting infrastructure. Although primarily focused on the media sector, the DTT project has broader implications for digital connectivity and access to information, which are foundational for SME digitalisation. The project, which had been stalled for years, was reactivated in 2024 and is expected to be completed by mid-2025, significantly

improving digital signal coverage across the country. In addition to these projects, the Ministry is involved in the IDEA (Inclusive Digital Economy Accelerator) initiative, which aims to support digital transformation in both the public and private sectors. While detailed documentation on IDEA is limited in the public domain, it is understood to include components related to digital infrastructure, e-governance, and SME support. The initiative is aligned with broader efforts to modernize public administration and create a more enabling environment for digital entrepreneurship.

The digitalisation of SMEs in Bosnia and Herzegovina holds significant potential to enhance productivity, innovation, and regional competitiveness. However, the realization of this potential is contingent upon the availability of high-quality, disaggregated, and timely data. While recent initiatives have laid a foundation for improved data collection and analysis, substantial gaps remain that limit the effectiveness of policy design and evaluation. Addressing these gaps requires a coordinated, strategic approach that integrates digitalisation and innovation metrics, strengthens regional data systems, and fosters collaboration across sectors. Only through such efforts can BiH build a robust evidence base to support its digital transformation agenda and ensure that no region or enterprise is left behind.

3. Summary

Small and Medium Enterprises (SMEs) account for **over 99% of all businesses** in Bosnia and Herzegovina (BiH) and are key to employment, innovation, and economic development. However, their **digital transformation is still at an early stage**, with significant gaps in technology adoption, skills, and infrastructure.

The document provides a comprehensive methodology and structured template for preparing a **Regional State of the Art Report** within the framework of the DIGITRANS project, coordinated by BIT Centar Tuzla. Its primary purpose is to guide project partners in analyzing the current state of digital transformation among small and medium-sized enterprises (SMEs) in their respective regions. The methodology aligns with the EU's 2030 Digital Decade Policy Programme and supports the implementation of regional and national smart specialisation strategies.

The report template is divided into several key sections:

1. **Regional Background Information**—This section includes an overview of the region's economic, human resource, and socio-economic profiles. It emphasizes the importance of understanding regional disparities, digital maturity levels, and the role of SMEs and the ICT sector in local economies.
2. **Analysis and Assessment of Policy Instruments**—Partners are instructed to identify and evaluate existing and past policy instruments that support SME digitalisation. This includes describing funding sources, goals, implementation outcomes, and the number of SMEs supported. The section also requires a general assessment of the

digitalisation landscape, identification of policy challenges, and an evaluation of how digitalisation affects regional competitiveness.

3. **Policy Challenges** – The methodology outlines how to identify structural and operational barriers to SME digitalisation, such as fragmented governance, limited outreach, skills gaps, and inadequate financial mechanisms. It encourages distinguishing between general (indirect) and specific (targeted) policy measures.
4. **Regional Competitiveness and Innovation Capacity** – This section focuses on how digitalisation influences economic indicators (GDP, employment, salaries), social outcomes (quality of life), and innovation performance (based on the European and Regional Innovation Scoreboards).
5. **Good Practices and Recommendations** – The report should highlight successful regional policy instruments and initiatives that can be replicated or scaled across regions. Examples include BIT Centar Tuzla, ICBL Banja Luka, INTERA Mostar, STEM Academy, EU4DigitalSME, and Go Digital.
6. **Data Infrastructure** – The methodology stresses the importance of reliable, disaggregated, and timely data for assessing SME digitalisation. It identifies current data sources (e.g., EU4DigitalSME assessments, EIS, national strategies) and highlights gaps such as the lack of regional data, limited use of administrative data, and absence of a centralized monitoring framework.
7. **Summary and Sources** – The final sections require a concise summary of findings and a list of references using the Chicago Manual of Style.

The document also includes detailed instructions on how to complete each section, encourages the use of visual elements and external data sources, and sets a submission deadline. It emphasizes the importance of aligning regional reports with broader EU digitalisation goals and ensuring comparability across partner regions.

Current State

- **Basic digital tools** like websites, social media, and email are common among urban SMEs.
- **Low uptake of advanced technologies** such as e-commerce platforms, digital payment systems, CRM, cloud computing, and automation.
- **Disparities** between urban and rural areas, and between larger SMEs and micro-enterprises.

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State of the Art Report, Albania

1. Regional Background Information

1.1. Introduction

General Overview of Albania

Albania, located in the Western Balkans and part of the ADRION macro-region, is a small yet increasingly strategic country in Southeast Europe. With a population of around 2.45 million (INSTAT, 2023), Albania is undergoing a dynamic process of economic and digital transformation. As a European Union candidate country since 2014, and with EU accession negotiations formally launched in 2022, Albania has prioritized reforms aligned with EU policy frameworks, including digitalisation, green transition, and innovation-led economic growth.

Tirana, the capital and largest city, functions as the main economic hub, contributing over 50% of national GDP. Albania's geographical position, with access to both the Adriatic and Ionian seas, reinforces its role in regional connectivity and cross-border collaboration, particularly through initiatives such as the Berlin Process, the Common Regional Market, and EU-funded programs like Interreg and Horizon Europe.

Role in National and European Contexts:

Albania plays an increasingly strategic role in Southeast Europe as both a contributor to regional stability and a proactive partner in European integration. Politically, Albania plays an active role in both European and transatlantic structures. As a full member of the North Atlantic Treaty Organization (NATO) since 2009, Albania contributes to regional security and global defense missions, reinforcing its profile as a reliable partner in both political and military terms. Its NATO membership has supported internal reforms, increased defense cooperation, and strengthened political stability, while positioning Albania as a bridge between Euro-Atlantic institutions and the wider Western Balkans.

Economic Significance

- **Small but steadily growing economy:** Albania's GDP reached approximately €20.6 billion in 2023, with an annual growth rate of 3.4% (Source: INSTAT, Bank of Albania). Key sectors include services (47.4%), industry (21.6%), and agriculture (18.3%).
- **SMEs as economic backbone:** SMEs account for over 99.6% of all businesses in Albania and contribute more than 70% of employment and approximately 65% of GDP (Source: European Commission Country Report Albania 2024).
- **Digital sector emerging:** The ICT sector contributes 3.5% to GDP and is rapidly growing, driven by business process outsourcing (BPO), software services, and increased exports of IT solutions.

Socio-Demographic Characteristics

- **Population size and structure:** Albania has a population of around 2.75 million (2023), with a declining trend due to emigration and low birth rates. The working-age population represents nearly 68% of the total.
- **Urbanization and education:** About 60% of the population resides in urban areas. Tertiary education enrollment has increased, with over 37% of youth aged 20–24 participating in higher education, particularly in economics, IT, and engineering fields (Source: INSTAT, 2023).
- **Digital skills and youth potential:** The Digital Economy and Society Index (DESI) shows Albania improving digital skills, especially among younger cohorts. However, basic and advanced digital skill gaps remain significant, especially in rural areas.

Role in National and European Contexts

- **EU integration and reform anchor:** Albania is an EU candidate country since 2014 and officially opened accession negotiations in 2022. Key reforms in public administration, digital governance, and competitiveness align with EU standards.
- **Regional economic partner:** As a participant in the Western Balkans Common Regional Market, Albania is integrated into regional value chains and EU-supported programs, including Horizon Europe and Digital Europe.
- **NATO member with strategic relevance:** Albania has been a NATO member since 2009, contributing to regional stability and cooperation in cybersecurity, defense innovation, and digital resilience.

1.2 Economic Profile of the Region

In 2023, Albania’s GDP reached approximately EUR 20.5 billion, marking a real growth rate of 3.4% (Bank of Albania). The economy is largely service-oriented (accounting for ~47% of GDP), followed by industry (21%) and agriculture (18%). Tourism, construction, and ICT are among the fastest-growing sectors. The country’s unemployment rate declined to 10.7% in 2023, showing resilience despite regional challenges.

Small and medium-sized enterprises (SMEs) dominate the Albanian business landscape, representing over 99,6% of all registered enterprises and contributing approximately 70% of total employment (INSTAT, 2023). However, their digital maturity remains uneven. According to the World Bank’s “Western Balkans Digital Economy Assessment” (2022), around 60% of Albanian SMEs use basic digital tools (e.g., email and websites), but only 17% have adopted advanced technologies such as ERP systems or cloud computing.

The ICT sector, while still emerging, has shown promising growth. In 2023, ICT services exports exceeded EUR 206 million (WTO), a significant increase from under EUR 100 million five years earlier. Most ICT companies are concentrated in Tirana and Durrës, though other

regions are slowly developing digital capabilities, often through donor-supported innovation hubs and public-private initiatives.

Digital public services have seen major progress. Albania is one of the few countries in the region that has implemented a fully online government service portal (e-Albania), used by over 95% of adult citizens. This transformation has created indirect demand for ICT solutions and improved digital literacy across the population. More than 7 million monthly interactions take place through this platform – from vehicle registration, to applications for certificates, consular services, or state aid schemes. In 2013, there were only 15 services available online. Today, citizens have access to 1,252 digital services, which are offered free of charge, without time restrictions and without the need for human intervention.

- **Business Process Outsourcing (BPO):** The largest vertical, including call centers, data entry, and administrative support services. This segment benefits from Albania’s multilingual talent and time-zone compatibility with EU markets.
- **Software Development and IT Services:** Comprising custom software, web and app development, system integration, and enterprise IT services. A growing number of Albanian companies now serve international clients, particularly in Italy, Germany, and the UK.
- **FinTech:** Still nascent but growing steadily, supported by regulatory developments in open banking and payment systems. Startups are emerging in areas such as digital wallets, payment processing, and embedded finance.
- **EduTech:** Catalyzed by the pandemic and increased demand for online learning, this segment includes e-learning platforms, digital content creation, and learning management systems.
- **AgriTech and GreenTech:** Early-stage verticals with high potential. Pilot solutions have been developed in precision agriculture, climate data services, and energy efficiency monitoring, mostly through donor-backed initiatives.
- **AI and Automation:** While small in size, several startups and research projects are working on AI-based tools for translation, customer service, and data analytics. The Polytechnic University of Tirana and innovation hubs are key enablers in this area.

Despite the progress, the ICT sector faces challenges in workforce retention, access to finance, and international positioning. Many companies operate as subcontractors, limiting their ability to build scalable intellectual property or global brands. Nevertheless, the government’s increasing focus on innovation policy, digital trade, and upskilling, combined with Albania’s strong diaspora networks, position the sector as a strategic pillar for national development and regional competitiveness.

1.3 HR Profile of the Region

Albania has made substantial progress in educational attainment. As of 2023, 84% of adults aged 25–64 have completed upper secondary education, while 31% hold a tertiary degree

(INSTAT, Eurostat). However, regional disparities remain, with higher education institutions concentrated in the capital and major urban centers.

The digital skills gap persists as a key challenge. While 62% of youth (16–24) report basic digital skills, only 28% of the adult population has above-basic digital competence (DESI 2023 estimates). Lifelong learning participation is relatively low, at just 4.9%, compared to the EU average of 11.9%—indicating the need for stronger reskilling and upskilling programs, especially in rural areas and among older workers.

Higher education institutions are expanding digital and entrepreneurial curricula. Universities such as the Polytechnic University of Tirana and Metropolitan University have launched ICT and innovation-focused degrees and incubation programs. Still, collaboration between academia and the private sector remains limited, and stronger links are needed to translate research and skills into marketable solutions.

At the pre-university level, the government has undertaken a profound educational reform by adding coding to 100 schools, starting in the first grade, and by building 684 smart labs in schools across the country. This initiative will enable more than 190,000 students to gain basic knowledge in programming and technology from an early age. Moreover, student cards now offer significant discounts on training programs at private institutions, while the government subsidizes up to 100% of the cost of courses at private technology schools, making specialized education more accessible than ever before.

One of the most important initiatives in pre-university education is the TUMO Tirana program, located in the iconic Pyramid Center, where every day over 1,800 young people are trained in advanced fields such as programming, artificial intelligence, graphic design and animation. This model will soon expand to Shkodra and Vlora, and then to Elbasan, extending its influence on a national scale.

1.4 Socioeconomic Conditions and Employment Opportunities

Albania's labour market reflects its ongoing economic transition. Service sectors—especially tourism, trade, and ICT—account for the highest share of new job creation. The demand for digital and technical profiles has increased, driven by the outsourcing industry, fintech growth, and the digitalization of traditional sectors. However, job availability and salaries vary significantly by region and sector.

The average monthly gross salary in Albania reached EUR 635 in 2023, with ICT professionals earning between EUR 1,000–2,000 depending on role and experience (INSTAT, salary database; Future of IT Report). Despite these relatively high wages for ICT workers, the sector struggles with talent retention due to emigration and global competition.

Youth unemployment remains high at 19,2%, but self-employment and entrepreneurial initiatives are growing, supported by national grant schemes and donor-backed programs.

Nonetheless, rural areas still face limited employment opportunities, pushing migration to urban centers or abroad.

Compared to other countries in the ADRIAN region, Albania has made rapid progress in digital public services and startup support frameworks but lags in innovation output, R&D expenditure (less than 0.2% of GDP), and SME digitalization rates.

Country	Average Monthly Gross Salary (ICT Sector)	Notes
Albania	€1,000 – €2,000	Salaries vary significantly by experience and role. High-end figures apply mostly in Tirana and for international subcontracting firms. Entry-level: €600–900.
Bulgaria	€1,800 – €2,800	Sofia is the main tech hub. Bulgaria is a popular outsourcing destination with competitive wages for EU standards.
Croatia	€2,000 – €3,200	ICT salaries have risen steadily due to EU integration and digital sector growth. Zagreb and Rijeka lead the tech ecosystem.
Greece	€2,200 – €3,000	Despite economic challenges, the ICT sector has remained resilient, especially in Athens and Thessaloniki.
Italy	€2,800 – €4,000+	Milan and Rome are the largest tech markets. Entry-level positions still start around €1,800–€2,500.

2. Analysis and Assessment of Policy Instruments

2.1 Policy Instruments

Small and Medium-sized Enterprises (SMEs) continue to constitute the backbone of Albania’s economy in 2024, both in terms of volume and contribution to employment and value creation. According to INSTAT and the latest national enterprise register, SMEs account for approximately 99.8% of all active enterprises, maintaining the same structural

dominance recorded in previous years. Of these, over 93% are classified as micro-enterprises, employing fewer than 10 people.

As of 2024, Albania has over 108,000 registered SMEs, reflecting a moderate increase compared to 103,856 in 2021. These enterprises are responsible for approximately 81.7% of total employment in the business sector and generate around 76.4% of the gross value added (GVA) in the non-agricultural economy. The concentration of SMEs remains highest in Tirana, especially in sectors such as accommodation and food services, retail trade, construction, and professional services, which collectively account for the majority of SME activity.

The legal framework governing SMEs in Albania is defined under Law No. 43/2022 “On the Development of Micro, Small and Medium Enterprises”, which aligns the national SME definition with the EU recommendation 2003/361/EC. This law sets criteria based on the number of employees, annual turnover, and balance sheet totals, and it lays the foundation for tailored policy support mechanisms including financial instruments, innovation support, and capacity building for micro and small businesses.

Efforts to support the digital transformation and competitiveness of SMEs have intensified under various national strategies, including the Business Investment and Development Strategy 2021–2027 (BIDS) and the Digital Agenda 2022–2026, which emphasize enabling infrastructure, skills development, and innovation adoption among SMEs.

The country's SME policy is guided by the Business and Investment Development Strategy (BIDS) 2021- 2027 and its action plan, which aims to foster a competitive, innovative economy, create quality jobs, integrate into international value chains, focus on sustainable development. Albania is currently revising the action plan to include green, digital, and social responsibility aspects, aiming to consolidate these initiatives. The Ministry of Economy, Innovation and Culture, along with about 10 other institutions and business associations, drives this strategy. The Albanian Investment Development Agency (AIDA), the National Employment and Skills Agency (NESA), the National Business Centre (NBC), the National Agency for Science, Research and Innovation (NASRI), and the national Union of Chambers of Commerce and Industry (UCCIAL) are also involved.

AIDA leads key SME initiatives, including the ‘Made in Albania’ promotion and an access to finance platform. AIDA has facilitated initiatives to enhance Micro SMEs (MSMEs) business and e-commerce capabilities. The NBC has digitalised all services since 2022.

In its SME policy index report, the OECD recognises Albania’s SME focus, suggesting improvements in specific areas, including entrepreneurial learning, bankruptcy law, women’s entrepreneurship and innovation policy. As part of its digital reforms started in 2022, Albania has streamlined company registration via the National Business Centre (NBC), offering digital licensing that speeds up processes, increases transparency, and reduces SME costs. This measure also enables the government to track economic activity

and helps monitor products to reduce informality. The Albanian Investment Development Agency (AIDA) also finalised sector-specific guides for eight key industries—including Textiles, ICT, and Tourism—to support SMEs and attract foreign investment. Albania will also focus on E-commerce. Public "access to finance" platform contributes to enhance MSME support: By April 2023, the platform published 106 calls for applications, received 8,192 interactions, and had 44,702 webpage visits.

Table 1. Business and Investment Development Strategy 2021-2027

Instrument name	Business and Investment Development Strategy (BIDS)
Duration	From - 2021-2027 Q1 2021 – Q4 2027
Description of goals	BIDS aims to foster a dynamic business environment by improving competitiveness, productivity, and innovation. Key goals include: (1) improving SME access to finance, (2) supporting startups and entrepreneurship, (3) advancing internationalisation, and (4) investing in digitalisation.
Relevance to national and regional strategies	Aligned with Albania’s National Strategy for Development and Integration (NSDI) 2021–2027, the EU pre-accession economic reform programme, and the Western Balkans Agenda for Innovation, Research, Education, Culture and Youth. Supports objectives under the EU’s SME Strategy and Digital Agenda.
Enhancing digitalisation of SMEs	One of BIDS’ three main pillars focuses on innovation and SME digitalisation. Key tools include: the SME Development Fund (ALL 6.45 billion allocated, ~€53 million), targeting 60 SMEs per year (360 total by 2027), capacity building, and support for digital tools adoption and tech upgrading. Measures are aligned with Albania’s Digital Agenda 2022–2026 and EU support through instruments like IPA III and EBRD’s €377 million regional digitalisation programme.

Table 2. SME Reboot Program (EBRD)

Instrument name	SME Reboot Programme (Sustainable Reboot SME – PCBA)
Duration	2024 – 2026
Description of goals	The SME Reboot Programme aims to enhance the competitiveness and sustainability of Albanian small and medium-sized enterprises (SMEs) by providing financial support and technical assistance. Specifically, the programme offers:

	<ul style="list-style-type: none"> • A €6 million senior unsecured loan from the European Bank for Reconstruction and Development (EBRD) to ProCredit Bank Albania for on-lending to SMEs. • Sub-loans to finance investments that improve SMEs' competitiveness and compliance with European Union (EU) directives and other internationally recognized standards.EBRD • At least 70% of the investments are allocated to Green Economy Transition (GET) eligible technologies, promoting energy efficiency, resource efficiency, and renewable energy investments.A2 News+2Federal Department of Foreign Affairs+2EBRD+2 • Technical assistance and a 10% cashback grant upon successful completion of investment projects.Federal Department of Foreign Affairs+1A2 News+1 <p>The programme is supported by multiple donors, including Luxembourg, Norway, Switzerland, the United States, and Denmark, through the EBRD Small Business Impact Fund (SBIF)</p>
Relevance to national and regional strategies	Supports EU Green Agenda and Albania's pre-accession objectives; aligned with the National Green Economy Action Plan.
Enhancing digitalisation of SMEs	Funds digital infrastructure and process automation projects as part of green compliance support..

Table 3. EBRD Country Strategy for Albania 2025–2030

Instrument name	EBRD Country Strategy for Albania 2025–2030
Duration	2025 – 2030
Description of goals	<p>The European Bank for Reconstruction and Development (EBRD) aims to support Albania's transition to a sustainable, inclusive, and competitive economy. The strategy focuses on:</p> <ul style="list-style-type: none"> • Accelerating the green transition: Enhancing renewable energy capacity, improving energy efficiency, and building climate resilience. • Enhancing private sector competitiveness and inclusion: Improving access to finance for SMEs, promoting innovation, and supporting skills development.

	<ul style="list-style-type: none"> • Strengthening governance and institutions: Improving public administration, enhancing the rule of law, and fostering a better business environment. <p>The EBRD plans to invest €900 million over this period to support these objectives.</p>
Relevance to national and regional strategies	<p>The EBRD's strategy aligns with Albania's national priorities and regional commitments:</p> <ul style="list-style-type: none"> • National Strategy for Development and Integration (NSDI) 2023–2030: Supports Albania's EU integration goals by promoting sustainable economic growth and institutional reforms. • Economic Reform Programme (ERP) 2025–2027: Contributes to macroeconomic stability, fiscal consolidation, and structural reforms. • EU's Strategy for the Western Balkans: Enhances regional cooperation, supports socio-economic development, and strengthens the rule of law.
Enhancing digitalisation of SMEs	<p>The strategy places a strong emphasis on digital transformation, particularly for SMEs:</p> <ul style="list-style-type: none"> • Access to finance: Providing credit lines and guarantee facilities to support investments in digital technologies. • Advisory services: Offering technical assistance and training to help SMEs adopt digital solutions and improve competitiveness. • Infrastructure development: Investing in digital infrastructure to bridge the digital divide, especially in rural areas.

Table 4. Digital Agenda 2022–2026

Instrument name	Digital Agenda 2022–2026
Duration	2022 – 2026
Description of goals	<p>The Digital Agenda 2022–2026 is Albania's comprehensive strategy aimed at advancing the country's digital transformation. Its primary objectives include:</p> <ul style="list-style-type: none"> • Digital Infrastructure Development: Enhancing broadband connectivity and expanding access to high-speed internet across the country.

	<ul style="list-style-type: none"> • E-Governance Enhancement: Digitizing public services to improve efficiency, transparency, and accessibility for citizens and businesses. • Cybersecurity Strengthening: Implementing robust cybersecurity measures to protect digital infrastructure and data. • Digital Skills and Education: Promoting digital literacy and integrating digital competencies into the education system to prepare the workforce for the digital economy. • Innovation and Entrepreneurship Support: Fostering a conducive environment for digital innovation and supporting startups and SMEs in adopting digital technologies.
Relevance to national and regional strategies	<ul style="list-style-type: none"> • The Digital Agenda 2022–2026 is integral to Albania’s national development and EU integration efforts. It complements the National Strategy for Development and Integration 2023–2030 by promoting sustainable economic growth through digital transformation. Regionally, it aligns with the EU’s Digital Decade and the Western Balkans Digital Agenda, facilitating cross-border digital cooperation and integration.
Enhancing digitalisation of SMEs	<p>The strategy places significant emphasis on the digitalization of Small and Medium-sized Enterprises (SMEs) by:</p> <ul style="list-style-type: none"> • Access to Digital Tools: Providing SMEs with access to digital platforms and tools to enhance their operational efficiency and market reach. • Digital Skills Training: Offering training programs to improve digital literacy among SME employees, enabling them to leverage digital technologies effectively. • Financial Support: Facilitating access to funding and incentives for SMEs to invest in digital infrastructure and services. • Regulatory Framework: Establishing policies that encourage digital innovation and reduce barriers to digital adoption for SMEs.

Table 5. National Strategy for the Development of Innovative Entrepreneurship 2024–2030

Instrument name	National Strategy for the Development of Innovative Entrepreneurship 2024–2030
Duration	2024 – 2030

<p>Description of goals</p>	<p>The SDIE aims to transform Albania into a hub of innovation-driven entrepreneurship by:</p> <ul style="list-style-type: none"> • Strengthening the Entrepreneurial Ecosystem: Enhancing support structures, including incubators, accelerators, and co-working spaces. • Focusing on Strategic Sectors: Promoting innovation in key areas such as Information and Communication Technology (ICT), energy, manufacturing, tourism, agribusiness, and Business Process Outsourcing (BPO) • Promoting Inclusive Development: Ensuring equal opportunities for all, including women, youth, and marginalized groups, to participate in entrepreneurial activities. • Enhancing Access to Finance: Developing financial instruments like grants, venture capital, and angel investor networks to support startups and innovative enterprises. • Improving Legal and Regulatory Frameworks: Simplifying procedures and regulations to foster a conducive environment for entrepreneurship.
<p>Relevance to national and regional strategies</p>	<p>The SDIE is aligned with Albania's broader development and integration goals:</p> <ul style="list-style-type: none"> • National Strategy for Development and European Integration (NSDEI) 2022–2030: Supports Albania's EU accession by fostering a competitive and innovative economy. • Smart Specialisation Strategy (S3) 2025–2030: Identifies and promotes sectors with high innovation potential, ensuring coherence between national priorities and regional development. • Economic Reform Programme (ERP) 2025–2027: Contributes to structural reforms aimed at enhancing competitiveness and economic resilience.
<p>Enhancing digitalisation of SMEs</p>	<p>The SDIE places significant emphasis on the digital transformation of Small and Medium-sized Enterprises (SMEs):</p> <ul style="list-style-type: none"> • Digital Skills Development: Implementing training programs to enhance digital competencies among entrepreneurs and SME employees. • Adoption of Digital Technologies: Encouraging the integration of digital tools and platforms to improve business processes and market reach. • Support for Digital Startups: Providing tailored support to startups operating in the digital space, including access to finance and mentorship.

	<ul style="list-style-type: none"> • Infrastructure Enhancement: Investing in digital infrastructure to ensure reliable and widespread internet connectivity, facilitating digital business operations.
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Table 6. Growth Plan for the Western Balkans

Instrument name	National Strategy for the Development of Innovative Entrepreneurship 2024–2030
Duration	2024 – 2030
Description of goals	<p>The Growth Plan for the Western Balkans, introduced by the European Commission on 8 November 2023, aims to accelerate the socio-economic convergence of the Western Balkan countries with the European Union (EU). The plan offers early access to certain benefits of EU membership, contingent upon the implementation of significant reforms. Key objectives include:</p> <ul style="list-style-type: none"> • Enhancing Economic Integration with the EU Single Market: Facilitating access to the EU's single market by aligning regulations and standards. • Boosting Regional Economic Integration: Strengthening economic ties among Western Balkan countries through the Common Regional Market. • Accelerating Fundamental Reforms: Encouraging reforms in areas such as the rule of law, public administration, and the fight against corruption. • Increasing Financial Assistance: Providing €6 billion through the Reform and Growth Facility, comprising €2 billion in grants and €4 billion in concessional loans, to support reform implementation and economic development.
Relevance to national and regional strategies	<p>The Growth Plan aligns with several national and regional strategies:</p> <ul style="list-style-type: none"> • EU Enlargement Policy: It serves as a catalyst for the EU accession process by providing tangible benefits in exchange for reforms • Common Regional Market (CRM): The plan reinforces the CRM initiative, aiming to add 10% to the region's GDP by enhancing intra-regional trade and cooperation. • Instrument for Pre-Accession Assistance (IPA III): The Reform and Growth Facility complements existing IPA III funding, focusing on specific socio-economic reforms

<p>Enhancing digitalisation of SMEs</p>	<p>The Growth Plan places significant emphasis on the digital transformation of Small and Medium-sized Enterprises (SMEs):</p> <ul style="list-style-type: none"> • Digital Single Market Integration: Encouraging SMEs to adopt digital technologies and participate in the EU's Digital Single Market. • Access to the Single Euro Payments Area (SEPA): Facilitating seamless and cost-effective euro transactions for SMEs, enhancing their competitiveness. • Support for Digital Infrastructure: Investing in digital infrastructure to ensure that SMEs have the necessary tools and connectivity to thrive in a digital economy. • Infrastructure Enhancement: Investing in digital infrastructure to ensure reliable and widespread internet connectivity, facilitating digital business operations.
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2.2 General Assessment

SMEs in the domestic economy

In Albania, the digitalisation of SMEs is progressing but remains uneven across sectors and regions. While ICT startups and tourism-related businesses are increasingly adopting digital tools, traditional sectors such as agriculture, construction, and small-scale manufacturing continue to lag behind. Key challenges include limited digital skills, low uptake of advanced technologies, and restricted access to digital infrastructure in rural areas. Digitalisation is now recognised as a national priority, reflected in strategies like the Digital Agenda 2022–2026 and the Strategy for Innovative Entrepreneurship 2024–2030. The government has introduced targeted measures—including grant schemes, digital skill initiatives, and plans for a national digital innovation hub—to support SMEs in adopting new technologies and improving competitiveness.

Albania’s 2002 Law on Small and Medium Enterprises, which defines SMEs according to their number of employees, annual turnover and balance sheet, was amended in 2008 to align it with the European Union’s definition in terms of employee numbers . While a new Law for the Development of Micro, Small and Medium Enterprises was adopted in 2022 to revise the definition and categorisation of such enterprises, the financial requirements included in the definition have not been amended. Moreover, it is important to note that the Albanian Institute of Statistics, unlike the European Union, defines company size based on the number of people employed, which is different from the number of employees. The term

“employed” refers to people who work at the company regardless of whether they are paid or not, thus including employees, owners and unpaid family members (INSTAT, 2020).

Figure 1. Scores for Albania across Competitiveness Outlook policy dimensions (2021 and 2024)

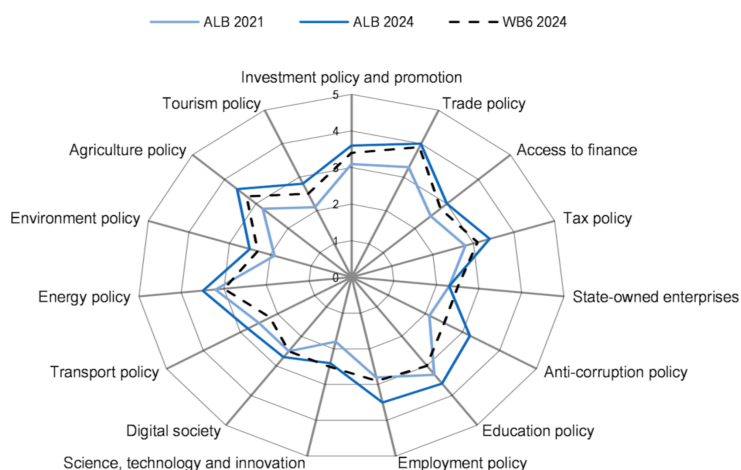


Table 1.2. Definition of micro, small and medium-sized enterprises in Albania

	EU definition	Albania definition
Micro	< 10 employees = EUR 2 million turnover or balance sheet	≤ 10 employees = ALL 10 million (EUR 82 600) turnover and/or balance sheet
Small	< 50 employees = EUR 10 million turnover or balance sheet	< 50 employees = ALL 50 million (EUR 413 125) turnover and/or balance sheet
Medium-sized	250 employees = EUR 50 million turnover = EUR 43 million balance sheet	< 250 employees = ALL 250 million (EUR 2 065 625) turnover and/or balance sheet

Note: ALL = Albanian lek (100 ALL = 0,98 Euro)

Albania’s Digitalisation Journey Among SMEs: Progress and Persistent Gaps

Albania has embarked on a gradual but determined path to foster digitalisation among its small and medium-sized enterprises (SMEs), supported by a growing policy commitment and alignment with EU digital transition goals. However, much like its regional peers, Albania still faces notable disparities in digital maturity across sectors, regions, and enterprise sizes.

advanced digital technologies among SMEs. While national strategies such as the Digital Agenda 2022–2026 and the National Strategy for the Development of Innovative Entrepreneurship 2024–2030 have introduced measures to improve digital capabilities, the pace of adoption lags behind both EU averages and countries such as Slovenia and Croatia.

- As of 2023, only around 23% of Albanian SMEs had achieved even a basic level of digital intensity, significantly lower than the EU average of 57.7% and far below Slovenia’s 50.4% or Croatia’s 45.2% (Eurostat, 2023; EC Progress Report).
- Advanced digital technology adoption—such as AI, cloud computing, or data analytics—remains confined largely to a small subset of ICT companies and tech-oriented startups, most of which are based in Tirana or Durrës.
- Digital skills among the workforce also remain low: according to INSTAT (2023), only 31% of adults in Albania possess at least basic digital skills, in contrast to 46.7% in Slovenia and 52% in Croatia.

Sectoral and Regional Digital Divide

Some Albanian sectors have shown promising digital uptake:

- ICT services and software startups—particularly those supported by initiatives like Startup Albania—are leading in the use of digital tools and platforms.
- Tourism companies, especially in the south, have adopted online booking, social media marketing, and digital payment solutions, spurred by increasing international exposure.

However, gaps persist:

- Agriculture, construction, and low-tech manufacturing sectors show minimal digitalisation, often due to a lack of infrastructure or digital awareness.
- Micro-enterprises—which make up 94% of Albanian businesses—face the greatest challenges, especially in rural areas where access to broadband internet and advisory support is limited.

Key Challenges Identified

1. Digital Divide by Enterprise Size and Location

Micro and rural businesses have significantly lower digital maturity than larger, urban-based companies. This mirrors trends seen in Slovenia’s eastern regions, but the gap in Albania is wider due to infrastructure deficits.

2. Low Uptake of Emerging Technologies

Use of technologies like artificial intelligence, blockchain, or big data remains marginal, limited to a few startups and outsourced service providers.

3. Digital Skills Deficit

The Albanian labour force continues to struggle with low digital literacy. This is particularly pronounced in older generations and among low-skilled workers in traditional sectors. Despite the government's investment in Smart Labs and vocational tech schools, results are still slow to materialise.

4. **Fragmented Support and Complex Schemes:** Several national and donor-supported programs exist (e.g., SME Reboot, EU4Innovation), yet SMEs frequently cite difficulties in navigating these schemes. The Startup and Enabler Grant Scheme, for example, saw over 400 applications in 2024, but outreach in rural areas remained limited.
5. **Lack of Impact Measurement**

Albania, like Slovenia, lacks comprehensive data on the long-term effects of digital investment in SMEs—whether in terms of productivity, competitiveness, or innovation outcomes.

Albania’s Policy Agenda and Support Instruments for SME Digitalisation

In recent years, Albania has placed digitalisation of small and medium-sized enterprises (SMEs) at the centre of its economic and innovation agenda. The shift reflects a growing recognition of digital transformation as a lever for increased competitiveness, inclusion in global value chains, and long-term productivity growth. Several national strategies now articulate clear digital goals for the business sector, backed by concrete support programs and public investment mechanisms.

Strategic Framework

The national policy framework guiding SME digitalisation is anchored in three interlinked strategies:

- **Digital Agenda 2022–2026:** This strategy outlines Albania’s ambitions to expand broadband infrastructure, improve digital public services, and encourage the digital transformation of the private sector. It targets the enhancement of digital skills and the development of a digital innovation ecosystem.
- **National Strategy for the Development of Innovative Entrepreneurship 2024–2030:** Approved in 2024, this strategy positions digital transformation as a horizontal priority across key sectors—such as tourism, manufacturing, agriculture, and services—and calls for public support to develop smart business models, digital products, and innovation-oriented startups.
- **National Employment and Skills Strategy (extended):** With a focus on human capital, this strategy promotes digital upskilling and lifelong learning, supporting the digital transition of SMEs through partnerships with vocational schools, universities, and private training providers.

These strategies signal the government’s commitment to transforming the Albanian economy into one that is innovation-driven, digitally connected, and future-ready.

Key Support Programs and Measures

Over the past three years, Albania has launched or expanded a number of financial and technical assistance schemes aimed at SMEs pursuing digitalisation:

Table 7: Key Support measures

Program	Description	Status
Digital Agenda 2022–2026:	This strategy outlines Albania’s ambitions to expand broadband infrastructure, improve digital public services, and encourage the digital transformation of the private sector.	Supported a number of large public digital infrastructure developments, including e-albania portal, public data centre and many more.
National Strategy for the Development of Innovative Entrepreneurship 2024–2030	This strategy positions digital transformation as a horizontal priority across key sectors—such as tourism, manufacturing, agriculture, and services—and calls for public support to develop smart business models, digital products, and innovation-oriented startups.	already supported 173 SME/startup companies.
Business and Investment Development Strategy (BIDS)	Designed to support SMEs in their post-COVID transformation. Includes advisory and financial aid for digital marketing, process digitisation, and new technology adoption	100s of SMEs supported through direct innovation funding, digital tool support mechanisms.
SME Reboot Programme	Designed to support SMEs in their post-COVID transformation. Includes advisory and financial aid for digital marketing, process digitisation, and new technology adoption	Implemented by AIDA. Benefited SMEs in tourism, agri-business, and creative industries.

These programs are supported by a growing digital support ecosystem, involving state agencies (Startup Albania, AIDA), universities, tech hubs, and donor partners.

Sources of Funding

Albania’s digitalisation efforts for SMEs are financed through a blend of national and international sources:

- National Grant Scheme supporting startups and innovative companies (launched under the Ministry of Entrepreneurship and Business Climate)
- EU Instrument for Pre-Accession Assistance (IPA III)
- EU4Innovation Challenge Fund (2023–2026), co-financed by the European Union, BMZ (Germany), and Sida (Sweden) and implemented by GIZ and the Embassy of Sweden
- Digital Europe Programme, supporting the future EDIH

- Bilateral technical assistance from UNDP, GIZ, and others

2.3 Identification of Policy Challenges

In recent years, Albania has demonstrated sustained political and institutional commitment to strengthening its SME sector. A series of structural reforms, guided by the Business Development and Investment Strategy (BIDS) 2021–2027 and the updated Law on SMEs (2022), have enhanced regulatory clarity, improved the business climate, and expanded access to public support mechanisms. The National Strategy for Innovative Entrepreneurship 2024–2030 further reinforces this momentum by placing innovation and digitalisation at the centre of Albania’s economic vision.

The OECD report *Western Balkans Competitiveness Outlook 2024* notes that Albania is a regional leader in several dimensions—anti-corruption, employment, and education policies—all of which are vital enablers of private sector growth. The establishment of one-stop-shops for business registration (e.g., NBC), the ongoing digitalisation of government services, and expanded support for entrepreneurship and skills development have produced tangible results.

Moreover, Albania’s tourism recovery, strong exports in services, and public investments in digital and physical infrastructure have contributed to the resilience and growth of SMEs, particularly in ICT, agriculture, and services.

Policy Gaps and Structural Weaknesses

Despite these achievements, several persistent weaknesses continue to constrain Albania’s SME ecosystem and competitiveness. These are not only technical, but often institutional and systemic, requiring coordinated reform efforts.

Institutional Gaps

- There is still no unified national monitoring framework for evaluating the impact of SME support programs. Ministries and implementing agencies operate with limited interlinkages, leading to fragmented implementation and scattered results.
- Inter-ministerial coordination remains uneven, especially in areas where SME policies intersect with innovation, education, and regional development.

Access and Inclusion

- Micro-enterprises, which represent over 93% of firms in Albania, are underrepresented in formal support programs. SMEs in remote and rural areas face barriers in accessing finance, training, and digital infrastructure.
- Women-led businesses and youth entrepreneurs, while receiving growing attention, still face unequal access to capital, networks, and tailored advisory services.

Capacity and Competitiveness

- SMEs continue to lag in the adoption of advanced technologies, including digital tools, green solutions, and R&D-based innovation. This is linked to a lack of financial incentives, limited knowledge transfer from universities, and a weak culture of innovation.
- Public R&D investment remains below regional and EU averages, and business-academia collaboration is still minimal. The national innovation system lacks mechanisms for co-creation and tech transfer, particularly for early-stage companies.

Table 8: Policy Challenges

Title of the Challenge	Description of the challenge
C1: Fragmented coordination between ministries, agencies, and local actors	Leads to duplication of programs, inefficient resource allocation, and inconsistent policy coverage
C2: Lack of impact evaluation mechanisms for SME programs	Limits the ability to measure outcomes, adjust interventions, and ensure accountability
C3: Low inclusion of micro-enterprises, rural SMEs, and informal businesses	Excludes the majority of SMEs from growth-oriented policies and hampers formalisation efforts
C4: Underdeveloped public-private-academic partnerships	Hampers innovation, commercialization of research, and participation in smart specialization strategies
C5: Limited digital and financial literacy among SMEs	Reduces absorption capacity for advanced tools, hinders productivity, and impairs competitiveness
C6: Weak pipeline for access to growth capital (early-stage equity, venture, angel networks)	Constrains startup scaling, tech adoption, and long-term viability

Assessment of SME Policy Instruments and their Impact in Albania

Over the past five years, Albania has made commendable efforts to foster a supportive environment for its SMEs, particularly in the areas of innovation, digital transformation, and access to finance. Several national policy instruments—such as the *Business and Investment Development Strategy (BIDS 2021–2027)*, *Digital Agenda 2022–2026*, *SME Reboot Programme*, and the *Startup and Enabler Grant Scheme*—have been deployed with increasing intensity.

However, despite this growing ecosystem of support, the tangible impact of these instruments remains uneven and under-assessed. The 2024 European Innovation Scoreboard categorizes Albania as an “Emerging Innovator,” with a performance standing at just 41.8% of the EU average. While sales of new-to-market innovations and environment-related technologies significantly exceed EU benchmarks, other indicators—such as public-private collaboration, broadband penetration, ICT skills, and patenting activity—reveal serious structural gaps.

The challenge now lies in improving both the targeting and effectiveness of these policy tools, ensuring that digitalisation efforts penetrate beyond urban centers and high-tech sectors, and into micro-enterprises and rural SMEs.

Table 9: Key Weaknesses to be Improved

Title of the Good Practice	GP Description	Policy Gap
Digital Skills	Only 16.1% of individuals in Albania have above-basic digital skills, compared to the EU average of ~54%	Lack of targeted upskilling programs for SME employees, especially in non-tech sectors
Innovation Collaboration	Only 4.9% of public-private co-publications compared to the EU average. Collaborating SMEs down by 27.5% since 2017	Weak academia-business linkages, no systemic incentive structure for R&D partnerships.
Infrastructure	Broadband penetration at 12.8% of the EU average. Digital access remains low in rural areas	Delayed rollout of last-mile infrastructure and low prioritization of digital inclusion policies
Regulatory Support	Limited data on venture capital, R&D expenditure, and intellectual assets	Fragmented and under-financed innovation governance structures.
Data Monitoring	Very limited long-term impact tracking of SME-targeted programmes	Absence of performance metrics or longitudinal databases in SME support schemes.

Table 10: Impact Assessment of Key Policy Instruments

Instrument	Intended Outcomes	Observed Impact	Structural Gaps	Policy Linkages
Startup and Enabler Grant Scheme (2022–2025)	Accelerate innovative, tech-driven startups and build support infrastructure (incubators, accelerators)	Over 500 startups evaluated, 68% tech-focused; diaspora engagement improved	No unified follow-up; limited impact outside urban centers	Aligned with SDIE 2024–2030; supports EU4Innovation & CRM Action Plan
SME Reboot Programme	Strengthen resilience and digital adoption post-COVID	Practical support in marketing and operations for selected SMEs	Small scale; lacks visibility; weak rural outreach	Linked to BIDS and EU Green Deal principles
Digital Agenda 2022–2026	Improve connectivity, e-services, and digital skills	Strong on infrastructure and public services; weak on SME-targeted actions	Not sector-specific; low penetration in crafts, agri, and manufacturing	Part of EU Digital Compass; relevant to CRM Action Plan 2021–2024
BIDS 2021–2027	Enable investment climate, business services, and competitiveness	Business registration improved; alignment with EU SBA advanced	Digitalisation and innovation are peripheral, not core strategic pillars	Anchors Albania’s Economic Reform Programme and EU SME Strategy
Smart Labs and Skills Programmes	Develop human capital for digital economy	100+ labs installed in vocational schools	Still disconnected from SME market needs; low inclusion of adult learning	Linked to the Employment and Skills Strategy; supports CRM Skills Agenda

Structural Barriers to SME Digital Transformation

1. Policy Fragmentation & Institutional Coordination

Despite overlapping mandates, ministries (Finance, Economy, Education, Innovation) operate in silos. This results in:

- Overlap in grant schemes.
- Inconsistent regional outreach.
- Limited knowledge sharing or joint impact tracking.

2. *Policy Reference*: BIDS acknowledges the need for policy coordination but lacks an implementation mechanism; SDIE calls for an Innovation Council, not yet fully functional.

3. Limited Financial Instruments for Scale and Growth

While grants exist for ideation and early-stage development, **there are no risk-sharing instruments**, convertible equity schemes, or public co-investment vehicles that encourage follow-on capital.

- Lack of incentives for angel and VC networks.
- Rural SMEs and non-tech sectors are underserved.

4. *Policy Reference*: EU SME Strategy (2020) promotes financial innovation; Albania's SDIE mentions a tech fund, but it's still in planning.

5. Weak Innovation-Industry-Academia Nexus

Public R&D spending remains low. Few incentives exist to encourage universities to commercialise research or collaborate with SMEs on applied innovation.

- No tax incentives for R&D partnerships.
- Technology transfer offices underfunded and underused.

6. *Policy Reference*: The EU Green Deal and CRM Smart Specialisation agendas emphasize cross-sectoral collaboration.

7. Low Absorptive Capacity among SMEs

Many SMEs lack the internal capabilities to adopt digital tools or implement innovation due to:

- Lack of basic digital skills.
- Managerial conservatism.
- Poor understanding of value-added from tech investment.

8. *Policy Reference*: Digital Agenda 2022–2026 promotes digital literacy but lacks a mechanism for SME-centric training rollouts.

Table 11: Strategic Recommendations

Recommendation	Policy Linkage	Action Steps
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1. Create a National Innovation Implementation Council to coordinate all SME and innovation policy instruments under one umbrella (e.g. under AIDA or Prime Minister’s Office)	SDIE 2024–2030; EU SBA; CRM Action Plan	- Formalize institutional mandates- Appoint policy leads- Publish annual SME/innovation dashboard
2. Launch a Digital Transformation Voucher Scheme targeting rural and traditional SMEs (e.g. agribusiness, crafts, tourism)	Digital Agenda 2022–2026; EU SME Strategy	- Vouchers for ERP, e-commerce, digital marketing- Managed via local chambers and startup hubs
3. Operationalize the Public Co-Investment Innovation Fund to co-finance startups, spinoffs, and digital SMEs, particularly outside Tirana	BIDS 2021–2027; SDIE; EU4 Innovation	- Blended finance with donors and diaspora- Include convertible grants and follow-on investments
4. Scale Smart Specialisation Pilots through Regional Innovation Hubs (Shkodra, Korça, Gjirokastër)	CRM Innovation Agenda; JRC Smart Specialisation Mapping	- Focus on digital tech transfer in priority sectors- Public-private-academic consortia- Local business incubation support
5. Build a National SME Digital Skills Framework integrated into VET and lifelong learning programmes	Employment & Skills Strategy; Digital Agenda	- Co-designed with private sector- Certified modular programs- Target managers, not just employees

2.4 Regional Competitiveness

The Role of SME Digitalisation in Shaping Regional Competitiveness and Innovation in Albania

The digitalization of SMEs is increasingly recognized as a critical lever for boosting regional economic growth, employment, and Albania’s overall innovation performance. While Albania’s digital economy is still in its formative stages, targeted investments in digital transformation—especially among SMEs—are beginning to shape regional development outcomes.

Digitalisation enables small businesses to expand markets, improve productivity, and develop new business models. However, its benefits are **unevenly distributed** across regions and sectors. In Albania, urban hubs like Tirana and Durrës are better positioned to absorb digitalization's benefits, while rural regions and traditional sectors risk being left behind.

Economic Impact: Productivity, Employment, and Income

Digitalisation of SMEs affects economic competitiveness by:

- **Boosting productivity and output:**
SMEs that adopt digital tools (e.g., ERP systems, e-commerce, automation) experience **significant increases in efficiency**, enabling them to scale with fewer resources.
- **Improving employment dynamics:**
While digitalization may reduce low-skill jobs, it creates **demand for tech-literate positions**, particularly in ICT, digital marketing, logistics, and software sectors.
- **Raising average salary levels:**
ICT firms and digitally mature SMEs tend to pay **20–30% higher wages** compared to traditional sectors. However, wage gaps persist between regions.

Key Data Points (2024):

- **GDP per capita (nominal):** €6,680 (Albania)
- **Employment in SMEs:** ~89.2% of total private sector employment
- **ICT sector wage premium:** Average ICT salary ~€950/month vs national average ~€600/month
- **Digital sector GDP share:** ~6.8% of GDP, growing at ~8–10% annually (est.)
- **SMEs with online presence:** Only ~35% outside Tirana/Durrës regions

Social Dimension: Quality of Life and Inclusion

Digital SMEs also contribute to **better social outcomes**:

- **Reduced urban-rural divides:** Remote work opportunities and e-commerce enable regional economies to stay connected to global markets.
- **Skills development:** SMEs are engines of applied learning; digital adoption pushes demand for digital literacy, upskilling, and continuous training.
- **Improved quality of life:** Access to digital services, higher incomes, and increased job flexibility enhance the overall well-being of communities.

Quality of Life Index Indicators (2023-24):

- **Tirana** ranks highest in digital access and service provision
- **Rural regions** lag behind in broadband coverage and digital public services
- **National average download speed:** ~28 Mbps vs EU average of 75+ Mbps

- **Access to tech-enabled jobs:** Highly concentrated in ICT clusters (Tirana, Durres)

Regional Innovation Capacity: Insights from EIS & RIS

Albania is classified as an "**Emerging Innovator**" under the **European Innovation Scoreboard 2024**, with performance at **41.8% of the EU average**. Within Albania, the gap between the most and least innovative regions is substantial, driven by access to finance, R&D partnerships, and digital maturity.

Innovation Indicators – National Highlights (EIS 2024):

- **Above EU average in:**
 - Sales of new-to-market innovations
 - Environmental innovation (green SMEs)
- **Below average in:**
 - Public-private R&D collaboration
 - IP and patent applications
 - Digital skills and ICT training in SMEs

Regional Innovation (RIS trends applied to Albania):

While RIS does not formally rank Albania's subnational regions, proxy data suggest:

- **Tirana & Durrës:**
 - Relatively stronger startup ecosystem
 - Higher digital adoption in SMEs
 - Better access to universities and incubators
- **Northern & Southeastern Albania:**
 - Lower R&D investment
 - Fewer tech-enabled SMEs
 - Weaker integration with national innovation programs

Strategic Implications and Policy Recommendations

To unlock the full regional and national potential of SME digitalisation, Albania must move beyond policy pilots and toward integrated, long-term frameworks. Digitalisation should no longer be a sectoral objective—it must become a **horizontal development driver** across economic, social, and innovation domains.

Recommendations Linked to Policy Frameworks:

2. **Expand broadband and 5G infrastructure** (Linked to Digital Agenda 2022–2026)
→ Target under-served regions to enable remote work, digital education, and rural SME access.
3. **Decentralise innovation support** (Linked to SDIE 2024–2030)
→ Set up regional innovation hubs and voucher schemes to enable digital catch-up in lagging areas.

4. **Establish a Digital Inclusion Index** (New proposal)
 - Track regional disparities in digital SME adoption, internet access, and tech-skills.
5. **Scale Smart Specialisation** (Linked to BIDS 2021–2027 and CRM Action Plan)
 - Build regional clusters around digital-enabled sectors like agritech, tourism, and green energy.
6. **Align VET and lifelong learning programs with SME needs** (Linked to National Employment & Skills Strategy)
 - Focus on practical ICT skills, cybersecurity, AI for SMEs, and SME management tools.

2.5 Good Practices and Recommendations

Promising Regional Policy Instruments in Albania: Good Practices and Lessons for Transregional Application

In recent years, Albania has taken significant strides toward building an enabling environment for small and medium-sized enterprises (SMEs), positioning digitalisation, innovation, and entrepreneurship as cross-cutting priorities. The country is classified as an *Emerging Innovator* in the European Innovation Scoreboard (EIS) 2024, with performance at 41.8% of the EU average—showing clear momentum, especially in new-to-market innovations and environmental technologies.

Despite structural weaknesses, several national and regional-level policy instruments stand out as *effective and transferable models* that may inspire cross-border policy learning within the Western Balkans and beyond. Below is a structured account of these instruments and their relevance to regional innovation ecosystems.

Business Development and Investment Strategy (BIDS) 2021–2027

Key Highlights:

- Serves as a national umbrella strategy for investment attraction, innovation, SME competitiveness, and human capital development.
- Emphasises smart specialisation, green transition, and digital innovation.

Regional Implementation Strengths:

- Strong policy coherence with the EU’s SME Strategy and Smart Specialisation Agenda.
- Established regional support centres and one-stop-shops like the **National Business Centre** (NBC) that have streamlined licensing and registration procedures digitally.

Good Practice Dimensions:

- Alignment with EU directives on public procurement.
- Integration of sustainability criteria for SMEs.

Transferability:

- Particularly effective for countries aiming to balance regulatory reform with innovation policy and business climate improvements.

Digital Agenda 2022–2026 – Infrastructure, Inclusion, and Innovation

Key Achievements:

- Prioritises broadband expansion, e-government integration, and the development of smart labs and ICT-focused VET institutions.
- Envisions 95% internet coverage for SMEs and public institutions by 2026.

Regional Innovation Impact:

- Helped bridge the urban-rural digital divide through digital vouchers and inclusion indices.
- Strong focus on women in tech and coding initiatives in peripheral areas.

Why It Works:

- Whole-of-government approach coordinated by the National Agency for Information Society (NAIS).
- Regular monitoring and stakeholder consultation mechanisms built in.

Transregional Relevance:

- Particularly relevant for economies with regional disparities and low digital maturity in SMEs.

Startup and Enabler Grant Scheme (2023–2025)

Overview:

- Implemented by AIDA and Startup Albania, this scheme supports early-stage startups and ecosystem builders (incubators, accelerators).
- Financed over 500 startups with more than €10.5 million in just three years.

Outcomes:

- 68% of funded startups operate in tech and innovation fields.
- Specific quota set for diaspora entrepreneurs and university-based innovations.

Regional Learning Point:

- Demonstrates how startup support can be embedded into broader entrepreneurship and innovation strategies, offering both financial and non-financial tools.

Transfer Potential:

- Could serve as a regional model for diaspora engagement and academic-commercial collaboration.

SME Reboot Programme – Digital Empowerment and Crisis Recovery

Key Highlights:

- Launched post-COVID-19, this programme targeted micro and small businesses with financial assistance and digital skills support.
- It combined grants with mentoring, digital toolkits, and capacity-building actions in rural and urban areas.

Success Factors:

- Strong uptake among women-led and youth-led enterprises.
- Low administrative burden and quick disbursement made it widely accessible.
- Synergy with the Digital Agenda 2022–2026 boosted its effectiveness.

Transregional Potential:

This model is suitable for replication in other Western Balkan countries where micro-enterprises form the economic backbone, but face high barriers to digital transition.

Weaknesses and Areas for Improvement

Category	Identified Challenge
Policy Coordination	Fragmentation across ministries and agencies impedes continuity of support
Digital Skills Gap	Low basic digital skills among SME workforce; regional disparities persist
Monitoring & Impact Assessment	Limited data tracking of long-term results of SME support programmes
Innovation Linkages	Weak academia-industry-public sector cooperation; few co-publications and R&D ties
Regional Ecosystem Development	Concentration of initiatives in Tirana/Durrës; underserved regions lag significantly

Table 12: Good practices

Title of the Good Practice	Good Practice Description
GP1: Startup and Enabler Grant Scheme (2022–2025)	<p>Why it works: • Targets early-stage startups and support organisations (incubators, accelerators). • Includes quota for diaspora entrepreneurs and academic spinoffs. • Covers multiple sectors (ICT, tourism, green tech, agri-tech).</p> <p>Impact: • Over 500 startups supported. • 68% in tech/digital-related sectors. • High interest from young and women-led enterprises.</p> <p>Transferability Potential: • Easily adaptable for regional ecosystems aiming to stimulate innovation through seed funding and ecosystem building.</p>
GP2: Smart Labs Programme (2022–ongoing)	<p>Why it works: • Installs high-tech laboratories in VET schools across regions. • Builds digital infrastructure and offers applied learning in tech and innovation.</p> <p>Impact: • Over 100 labs installed. • Linked with national digital skills agenda. • Encourages youth inclusion in digital careers.</p> <p>Transferability Potential: • Applicable across Western Balkan countries for bridging education-employment gaps in tech.</p>
GP3: e-Albania Platform Integration for SMEs	<p>Why it works: • Provides one-stop-shop for licenses, permits, and registrations digitally. • Reduces bureaucracy and increases transparency.</p> <p>Impact: • Over 1,200 services digitised. • Business registration process reduced from weeks to days.</p> <p>Transferability Potential: • Model for regional digital governance platforms tailored to SME needs.</p>
GP4: SME Reboot Programme (2020–2023)	<p>Why it works: • Focused on supporting SMEs post-COVID with digital toolkits and advisory support. • Easy application and small grants for digital promotion and tech adoption.</p> <p>Impact: • Over 300 SMEs are supported, especially in rural areas. Significant uptake among women-led businesses.</p> <p>Transferability Potential: • Suitable for countries with large informal and micro-enterprise segments recovering from economic shocks.</p>

<p>GP5: National Business Centre (NBC) Digitisation Services</p>	<p>Why it works: • Fully digitised system for company registration and service access. • Integrates with other agencies (e.g. taxes, statistics, licensing).</p> <p>Impact: • Major increase in business formalisation, especially among SMEs. • Reduction in time and costs for entrepreneurs.</p> <p>Transferability Potential: • Ideal model for countries in EU accession or SBA harmonisation process.</p>
<p>GP6: Green and Digital Startup Support (under SDIE 2024–2030)</p>	<p>Why it works: • Prioritises startups in green tech, circular economy, and digitalisation. • Offers technical assistance alongside funding.</p> <p>Impact: • Early-stage implementation, but promising uptake in eco-innovation. • Aligns with EU Green Deal and Digital Compass.</p> <p>Transferability Potential: • Strategic for regions focusing on green-digital transition.</p>

2.6 Data Infrastructure

Strategic Framework and Available Instruments

1. National Strategy for the Development of Innovative Entrepreneurship (SDIE 2024–2030)

This strategy sets the roadmap for Albania's transition to a knowledge-based and innovation-driven economy. It explicitly links SME growth to digital and green transformation, prioritising investment in emerging technology sectors such as AI, digital agriculture, fintech, and e-commerce. Key objectives include fostering academic-commercialisation linkages, promoting green/digital startups, and creating regional innovation hubs.

2. Digital Agenda of Albania 2022–2026

Aimed at improving broadband infrastructure, digital public services, and digital skills, this agenda outlines the state's commitment to ensuring universal internet access, 95% coverage for public services, and enhanced digital inclusion across remote areas. The strategy includes SME-relevant objectives, such as e-service provision, support for e-commerce uptake, and enhanced digital literacy, but lacks sector-specific data on SME adoption.

3. Business and Investment Development Strategy (BIDS 2021–2027)

This broader economic framework touches on SME competitiveness, simplification of administrative procedures, and access to finance. It includes targets on digital tools for business services and promotes the alignment of Albania's SME framework with EU's Small Business Act. However, digitalisation is not treated as a primary pillar.

4. SME Reboot Programme (2020–2023)

This initiative provided short-term grants and digital training for micro and small

enterprises recovering from the COVID-19 crisis. While it demonstrated strong uptake—especially among women and rural entrepreneurs—there is no comprehensive data collection or evaluation system in place to assess its long-term outcomes.

5. **Startup and Enabler Grant Scheme (2022–2025)**

Administered by the State Agency for Startups, this scheme supports high-potential startups and supports entities like incubators and accelerators. With over 500 startups evaluated and funded, the programme gathers demographic and sectoral data but does not yet measure digitalisation maturity or track business growth over time.

Key Data Tools and Analytical Efforts

While Albania does not yet have a national-level Digital Intensity Index (DII) or Digital Maturity Assessment (DMA) for SMEs, several institutional efforts contribute partial insights:

- **e-Albania Platform Data:** Reports on digital public service uptake by businesses, including registration, licensing, and permit requests.
- **INSTAT Enterprise Statistics:** Provides general data on SMEs by size, sector, and region, but lacks indicators on digital tools or innovation investments.
- **European Innovation Scoreboard (EIS) 2024:** Classifies Albania as an *Emerging Innovator*, with relative strengths in environmental innovation and weaknesses in public-private R&D collaboration, IP generation, and digital skills.
- **Open Data Government Platform:** OpenData.gov.al is integral to Albania's Digital Agenda 2022–2026, which emphasizes the importance of digital governance and open data in promoting transparency and citizen participation. The portal supports the government's commitment to the Open Government Partnership (OGP), aiming to increase the availability and quality of open data. Efforts are underway to expand the volume of datasets and improve the portal's user interface and functionality.
- **Startup Albania Platform:** Upcoming data for Albanian startup ecosystem will collect all information regarding the startup ecosystem, such as funding, employment and vacancies and more. It will be available by autumn 2025.

Additionally, donor-supported initiatives such as EU4Innovation and GIZ, World Bank and EBRD have commissioned baseline studies and piloted digital tools for SMEs, but results are often unpublished or time-limited.

Persistent Data Gaps and Evaluation Challenges

Despite the existence of these strategic and operational frameworks, Albania faces significant constraints in generating high-quality, actionable data for policy-making in SME digitalisation:

- **Lack of SME Digital Intensity Index:** There is no national tool to assess SME usage of key technologies like cloud computing, CRM systems, digital marketing, or cybersecurity practices.
- **No Sectoral or Regional Digital Maturity Breakdown:** Albania lacks disaggregated data that shows how digitalisation varies between key sectors (e.g. manufacturing vs tourism vs agriculture) or across regions (e.g. Tirana vs Gjirokastër).
- **Insufficient Monitoring of Policy Impact:** Existing grant and voucher programmes for SMEs (e.g. Startup Grants, SME Reboot) are not consistently monitored for long-term business impact (e.g. productivity gains, market growth, innovation output).
- **No National Digital Skills Mapping Linked to SMEs:** While Albania reports on general digital skills acquisition (e.g. through VET), there is no mechanism linking SME needs with workforce capabilities.
- **Limited Data on Micro-Enterprises:** Most national and international statistics focus on SMEs with 10+ employees, overlooking micro-enterprises that make up the majority of Albania’s business base.
- **Innovation Investment Data Missing:** There are no systematic statistics on SME-driven R&D spending, patent applications, or collaboration with universities.

3. Summary

Nature and Significance

Digitalisation is increasingly recognised as a critical factor for enhancing the competitiveness, resilience, and innovation potential of SMEs in Albania. While digital public services have rapidly expanded through platforms like *e-Albania*, the level of digital maturity among SMEs—especially outside the ICT sector—remains relatively low. Most SMEs use digital tools at a basic level (e.g., email, social media), but lack structured adoption of advanced technologies such as CRM systems, cloud computing, AI, or automation. The digital transformation of SMEs is vital for achieving broader goals related to EU integration, productivity growth, and inclusive regional development.

Main Policy Instruments

Several national strategies and programs address SME digitalisation:

1. **Digital Agenda 2022–2026** – aims at enhancing digital infrastructure, e-services, and connectivity, with indirect support to SMEs through platform access and literacy programs.
2. **Business and Investment Development Strategy (BIDS) 2021–2027** – includes provisions for improving SME competitiveness, innovation, and regulatory environment.

3. **National Strategy for the Development of Innovative Entrepreneurship (2024–2030)** – emphasizes digital and green startups, with grant schemes targeting innovation-driven SMEs.
4. **Startup and Enabler Grant Scheme (2022–2025)** – finances early-stage startups, many of which are tech-oriented, though without long-term follow-up mechanisms.
5. **SME Reboot Programme** (post-COVID) – supported recovery with limited-scale digital marketing and toolkits for small firms.
6. **e-Albania and NBC platforms** – contribute to digital uptake in administrative services, business registration, and compliance processes.

Main Challenges

- **Low Digital Maturity:** Most SMEs operate below the EU benchmark for digital intensity; advanced tech adoption is rare outside urban areas.
- **Skill Gaps:** Digital skill levels among SME employees are far below EU averages; no structured matching system between enterprise needs and workforce capabilities.
- **Fragmented Support Landscape:** Policies exist but are often underfunded, poorly coordinated, or difficult to access, especially for micro-enterprises.
- **Weak Data Systems:** No national digital maturity index for SMEs; no regular, sector-specific tracking of SME digital transformation progress.
- **Innovation Infrastructure Gaps:** Weak academia-business linkages, lack of regional digital innovation hubs, and limited R&D activity among SMEs.

Data Infrastructure and Gaps

Existing Sources:

- INSTAT enterprise statistics (size, region, sector—but only limited digital indicators).
- OpenData.gov.al (limited SME-related datasets).
- Reports by AIDA, AKSHI, and donor programs (project-specific, not centralized).
- EIS 2024 and OECD SME Policy Index (comparative but sparse).

Key Gaps:

- Absence of sectoral or regional data on SME digital maturity.
- Lack of impact evaluations of support schemes.
- No national digital transformation observatory or consistent data-sharing protocols across institutions.

Needed Measures

- Develop a Digital Maturity Index for SMEs, harmonised with EU frameworks.
- Strengthen regional data collection and analysis capacity (INSTAT, AIDA, NAIS).
- Create digital innovation hubs in non-metropolitan regions.
- Improve integration of skills development programs with SME needs.

- Establish monitoring and impact assessment mechanisms for all SME-targeted schemes.

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State of the Art Report, Serbia

1. Regional Background Information

1.1 Introduction

Purpose of the Report

This Regional State of the Art Report for Serbia, focused on the Autonomous Province of Vojvodina, serves as a foundational analysis within the DIGITRANS project. It aims to provide a comprehensive understanding of the current state of digital transformation, innovation ecosystems, and policy frameworks in the region, with a specific emphasis on SMEs and regional competitiveness.

The report supports the overarching DIGITRANS goal of reinforcing transnational cooperation and policy learning to unlock the potential of digitalisation across the ADRION region. It seeks to identify challenges and opportunities at regional level and align strategic efforts with the broader RIS3 framework, EU cohesion policies, and the green and digital twin transitions.

Scope and Methodology

The scope of this report covers the economic, human resource, and policy landscape of Vojvodina. It is informed by:

- An in-depth desk review of national and regional policy documents (including Serbia's Smart Specialisation Strategy – RIS3 Serbia, Digital Serbia, and related strategic frameworks);
- Existing statistical and economic data from the Statistical Office of the Republic of Serbia (SORS), Eurostat, and relevant reports by international institutions (e.g., OECD, World Bank, EU Commission);
- Insights gathered through the DIGITRANS stakeholder engagement process, including consultations with members of the Regional Stakeholder Group (RSG);
- Analysis of good practices and regional innovation infrastructure, including cluster networks, science and technology parks, digital innovation hubs, and SME support mechanisms.

Regional Context and Relevance

Vojvodina, located in the northern part of Serbia, is a unique region in the Western Balkans with a distinctive economic, social, and cultural profile. As one of Serbia's most developed provinces, it contributes significantly to the national GDP, exports, and innovation output. The region hosts several key industries - agriculture, food processing, ICT, and manufacturing - that are well positioned for digital transformation and smart specialisation.

Despite progress, structural challenges persist. These include brain drain, fragmented innovation policies, insufficient SME support, and underutilisation of digital technologies in traditional sectors. The DIGITRANS project provides a timely platform to address these issues through coordinated transnational action.

Alignment with DIGITRANS Objectives

This report contributes directly to DIGITRANS Work Package 1 by mapping the regional innovation ecosystem, identifying gaps in policy implementation, and setting the analytical groundwork for future pilot actions and recommendations. It also serves as a strategic tool for fostering dialogue between public authorities, academia, business support organisations, and SMEs - all essential actors in the region's digital transformation journey.

1.2 Economic Profile of the Region

Macroeconomic Overview

The Autonomous Province of Vojvodina, located in the northern part of Serbia, represents a significant economic driver of the country, accounting for approximately **27–30% of Serbia's GDP** over the past decade. As of 2023, Serbia's GDP stood at **approximately €63 billion**, with Vojvodina contributing around **€17–18 billion**, based on Statistical Office of the Republic of Serbia (SORS) regional estimates.

Vojvodina's economy is characterized by a diversified structure with a balanced contribution from **agriculture, manufacturing, energy, and services**, underpinned by relatively stable macroeconomic indicators. Despite persistent structural challenges - particularly in innovation output, productivity, and rural employment - the region remains resilient and adaptive, supported by a strong export base and rising integration into global value chains.

Key Economic Sectors

- **Agriculture and Agribusiness:** Vojvodina is the agricultural heartland of Serbia, responsible for more than **40% of national agricultural production**. It boasts fertile plains, a strong food processing industry, and an established tradition of agro-technical knowledge. Major outputs include cereals (maize, wheat), oilseeds (sunflower, soy), vegetables, fruits, and increasingly value-added organic produce. Agribusiness in the region is a critical export and innovation opportunity, particularly with the integration of **precision agriculture and digital solutions**.
- **Manufacturing and Industry:** The industrial sector, particularly **automotive components, machinery, metal processing, chemicals, and plastics**, has seen significant FDI inflows in recent years. Clusters in Novi Sad, Zrenjanin, and Subotica are home to domestic SMEs and multinational Tier 1 and Tier 2 suppliers. A growing

trend is the **servitization of manufacturing** - with ICT services and industrial automation playing a transformative role.

- **ICT and Knowledge Economy:** Vojvodina's ICT sector is concentrated in Novi Sad, Serbia's second-largest technology hub. It features more than **1,000 ICT companies**, including globally active software exporters and a dense startup ecosystem. The regional digital economy is a significant contributor to exports, knowledge transfer, and employment, particularly among the youth and returnees from abroad.
- **Energy and Green Transition:** While Serbia remains reliant on fossil fuels, Vojvodina has seen increasing investment in **renewables (wind, solar, biomass)** and **energy efficiency retrofitting**, partially driven by EU pre-accession funding (IPA) and EBRD support. The energy sector's transformation represents a vital component of regional economic modernization.
- **Services and Logistics:** The services sector - including retail, logistics, financial services, and tourism - has grown steadily, benefiting from Vojvodina's **strategic position** on pan-European corridors VII and X. The **Danube river transport system**, cross-border logistics zones (with Hungary, Romania, Croatia), and intermodal terminals present major development levers.

Trade and Investment Patterns

Vojvodina accounts for over **25% of Serbia's exports**, with key trading partners including **Germany, Italy, Romania, Hungary, and the Netherlands**. Export growth is strongest in **processed agricultural goods, ICT services, automotive components**, and electrical equipment.

The region continues to attract **foreign direct investment (FDI)**, thanks to its skilled workforce, logistic access, and incentives. Recent investment trends show a shift toward **higher value-added segments** and **digitally-enabled industries**, though gaps persist in access to finance for SMEs and R&D-intensive ventures.

Regional Disparities and Convergence Challenges

While Novi Sad and several industrial centers perform well in terms of productivity and innovation, **significant intra-regional disparities** remain. Peripheral and rural municipalities face lower employment rates, higher youth outmigration, and limited innovation capacity. Structural weaknesses include:

- Low participation in global innovation networks,
- Weak linkages between academia and industry,
- Limited commercialization of R&D,
- High informal economy presence in rural areas.

Bridging these disparities is critical for smart specialization and effective deployment of EU cohesion policy instruments.

Alignment with EU Cohesion Priorities

Vojvodina's economic structure broadly aligns with the **Smart Specialisation Strategy of Serbia (adopted in 2020)**, which prioritizes ICT, creative industries, agri-food, and machinery & equipment. The region is also well-positioned to benefit from:

- IPA III support,
- the Green Agenda for the Western Balkans,
- and the Digital Europe Programme.

Synergies are expected with cross-border cooperation programs (e.g., Hungary-Serbia IPA CBC), Interreg Danube, and the EU's support for **digital innovation hubs (DIHs)** and **regional innovation valleys**.

1.3 HR Profile of the Region

Educational Attainment and Higher Education

Vojvodina's human capital landscape reflects the complex interplay of legacy industrial structures, rural-urban demographic divides, education reform, and growing outmigration trends. The region hosts approximately **1.85 million inhabitants**, representing about **26–27% of Serbia's total population**. Despite a decline in total population due to negative demographic trends and emigration, the region retains significant human capital reserves—particularly in urban centres such as Novi Sad, Subotica, Zrenjanin, and Pančevo.

Educational Attainment and Workforce Structure

According to the latest data from the Statistical Office of the Republic of Serbia, educational attainment in Vojvodina has improved steadily. The share of population aged 25–64 with **tertiary education exceeds 25%**, in line with national averages but still below EU27 benchmarks. However, a significant segment of the labour force continues to have **low or medium qualifications**, especially in rural and semi-urban municipalities.

The **vocational education and training (VET)** system plays a key role in workforce preparation, with strong representation in fields such as agriculture, mechanics, electrical engineering, and ICT. However, outdated curricula, weak industry engagement, and limited access to modern equipment remain common shortcomings.

The **unemployment rate in Vojvodina** (2023) hovered around **9.5%**, slightly above the national average. Youth unemployment remains particularly high, at over **20%**, exacerbated by limited job opportunities in smaller towns and inadequate alignment between education outcomes and labour market needs.

Brain Drain and Migration Patterns

Vojvodina is significantly affected by **brain drain**, particularly among university graduates in ICT, medicine, engineering, and natural sciences. Emigration toward Germany, Austria, Switzerland, and Scandinavian countries remains a dominant trend. Eurostat and OECD data suggest that Serbia loses **30,000–40,000 skilled individuals annually**, with Vojvodina accounting for a disproportionate share.

Outmigration is further compounded by internal migration toward Belgrade, draining talent from Vojvodina's peripheral areas. This has led to **regional labour shortages** in both high-skilled domains (engineering, IT) and low-skilled sectors (construction, caregiving, seasonal agriculture).

Talent Pools and Innovation Potential

Despite these challenges, Vojvodina retains vibrant human capital potential, particularly in sectors with **high innovation and digital transformation potential**. Novi Sad, as a university city, hosts a critical mass of **STEM graduates**, supported by the University of Novi Sad's faculties of technical sciences, natural sciences, agriculture, and economics. The region produces **over 5,000 STEM graduates annually**, many of whom feed into the ICT, industrial automation, and engineering services sectors.

Emerging talent hubs are forming around **digital skills bootcamps, non-formal education providers, and dual education schemes**, many led by clusters, private companies, and donor-funded projects. The role of organizations such as the Vojvodina ICT Cluster in **digital upskilling, women's inclusion, and youth engagement** has been particularly notable.

Labour Market Challenges and Opportunities

Key structural challenges in Vojvodina's HR landscape include:

- **Skills mismatch** between graduates and employer demands;
- **Underemployment** of youth and women, especially in rural areas;
- **Insufficient lifelong learning opportunities**, particularly for low-skilled adults;
- **Low labour mobility** within the region;
- Weak links between employers and formal education institutions.

On the other hand, opportunities exist in:

- Expanding **regional digital academies and reskilling programs**;
- Strengthening **intergenerational learning and returnee engagement**;
- Boosting **women's participation in STEM and entrepreneurship**;
- Establishing **place-based HR strategies** in line with smart specialisation priorities.

These dynamics make human capital both the bottleneck and the lever for sustainable and inclusive regional transformation.

1.4 Socioeconomic Conditions and Employment Opportunities

Vojvodina's socioeconomic structure reflects its dual character as both a traditionally agrarian territory and a rapidly modernizing industrial and service region. The Autonomous Province plays a pivotal role in Serbia's economic development, contributing approximately **27–28% of national GDP**, with above-average productivity in key sectors such as agriculture, food processing, and ICT.

Income, Living Standards, and Regional Disparities

Despite notable economic contributions, **living standards in Vojvodina remain below EU averages**, with GDP per capita still trailing the European mean by a significant margin. According to the Statistical Office of the Republic of Serbia, **GDP per capita (PPS) in Vojvodina** is estimated at around **60–65% of the national average**, while remaining substantially below the EU27 average (hovering around 35–40% of the EU average).

Significant **intra-regional disparities** are present. Urban centres such as Novi Sad and Pančevo exhibit higher wages, better infrastructure, and more dynamic service sectors, whereas rural municipalities, especially in North and Central Banat, face economic stagnation, underemployment, and depopulation. These disparities are closely linked to **infrastructure investment gaps, lower innovation absorption**, and limited local administrative capacity.

Poverty, Inequality, and Vulnerable Groups

According to Eurostat and the World Bank, **Serbia's at-risk-of-poverty rate** remains high, with estimates ranging from **20–24%** nationally, and comparable figures in Vojvodina. The **Gini coefficient**, which measures income inequality, has slightly increased in recent years, indicating growing socioeconomic polarization.

Vulnerable groups include:

- **Youth (under 30)**, facing persistent unemployment and emigration pressure.
- **Women**, particularly in rural areas, with lower economic activity rates and limited access to entrepreneurship support.
- **Roma communities**, concentrated in peri-urban settlements, with high unemployment, low educational attainment, and weak access to public services.
- **Older rural populations**, affected by aging, isolation, and digital exclusion.

Labour Market Trends and Employment Structures

The employment structure in Vojvodina mirrors the gradual transition from traditional industry to service- and knowledge-based activities. Employment is concentrated in:

- **Manufacturing and industrial production** (automotive components, machinery, metal processing).
- **Agriculture and food processing**, which remain labour-intensive in many subregions.
- **ICT, logistics, trade, and professional services**, particularly in urban nodes.

The **employment rate** in Vojvodina stands at around **48–50%**, with **youth employment below 30%**, reflecting skills mismatch, lack of entry-level jobs, and weak local business dynamism in smaller municipalities.

Labour mobility is limited. Most cross-municipal commuting is toward regional centres (Novi Sad, Zrenjanin), with weak transport connectivity constraining job access in peripheral areas.

Entrepreneurship and Business Environment

Vojvodina has seen a **rise in entrepreneurial activity**, especially in ICT, creative industries, and agrifood innovation. Business incubators, co-working hubs, and cluster initiatives (e.g. VOICT, ICT Hub, and the Science and Technology Park in Novi Sad) support early-stage ventures and tech-driven SMEs. However, **access to finance, mentorship, and internationalization support** remain limited, particularly outside urban cores.

Women's entrepreneurship is underdeveloped, with barriers including traditional gender roles, lack of confidence, low digital skills, and limited exposure to innovation ecosystems. Targeted programs remain scarce and underfunded.

Digital and Green Transitions as New Vectors

The green and digital transitions provide new opportunities to stimulate employment and social inclusion in Vojvodina:

- **Smart farming and agritech** can revitalise rural labour markets.
- **Digital literacy programs** are expanding access to remote work and lifelong learning.
- **Green construction, circular economy, and renewable energy** create demand for new skills and training pathways.

Strategic alignment with **national recovery and resilience plans**, as well as EU-level initiatives (e.g. Green Deal, Digital Europe), is essential to leverage these opportunities and embed inclusive growth.

2. Analysis and Assessment of Policy Instruments

This section provides a structured analysis of regional and national policy instruments relevant to digital transformation and innovation in the Autonomous Province of Vojvodina, Republic of Serbia. The purpose is to assess how these instruments shape the regional development landscape, address existing challenges, and support the adoption of digital technologies across key sectors, particularly SMEs.

The analysis focuses on instruments that influence strategic planning, funding, institutional capacity, and stakeholder collaboration within the digital ecosystem. The selected

instruments are evaluated based on their design, implementation, and outcomes, with particular attention given to their alignment with EU digital and innovation agendas. The chapter also identifies policy gaps and proposes recommendations for more effective and inclusive governance of digital transitions in the region.

2.1 Policy Instruments

Strategic Frameworks

Title of the Policy Instrument: Smart Specialisation Strategy of the Republic of Serbia (4S) 2020–2027

Level: National, with regional implementation mechanisms

Managing Authority: Ministry of Education, Science and Technological Development (MoESTD) of the Republic of Serbia

Implementation Period: 2020–2027

Budget: Co-funded through national sources and EU pre-accession funds (IPA III)

Objective: The strategy aims to stimulate innovation-driven growth in Serbia by focusing on competitive advantages, increasing the capacity of the innovation ecosystem, and supporting digital and technological transformation aligned with EU Smart Specialisation principles.

Thematic Priorities: The strategy identifies four national priority domains:

- Food for the Future (agrifood innovation, bioeconomy)
- Information and Communication Technologies (ICT)
- Machines and Equipment of the Future (advanced manufacturing)
- Creative Industries

Horizontal support areas include human capital development, research and development (R&D) infrastructure, and digital transformation.

Key Instruments:

- Financial incentives for R&D and innovation in priority domains
- Support for digitalisation of SMEs and traditional industries
- Cluster development and quadruple-helix collaboration
- Support for regional innovation ecosystems (via RIS3 implementation plans)

Relevance to Vojvodina: Vojvodina has been central to the implementation of 4S, particularly in the ICT and agrifood sectors. The region's innovation stakeholders (e.g.

VOICT, BioSense Institute, Science and Technology Park Novi Sad, University of Novi Sad) have contributed to the entrepreneurial discovery process and to the elaboration of sector-specific roadmaps.

Vojvodina ICT Cluster (VOICT) has played a pivotal role as the RIS3 Priority Area Leader for ICT, coordinating inter-institutional dialogue, identifying bottlenecks, and proposing measures for digital skills, AI uptake, and SME innovation in the regional context. Several VOICT-led or supported initiatives (e.g. BRAINS Academy, SEED project concept) directly align with the goals and implementation modalities of 4S.

Challenges Identified:

- Limited coordination between national and regional implementing bodies
- Fragmented funding streams and overlapping competencies
- Insufficient alignment of education/training systems with identified priority sectors
- Digital skills gap and low awareness of innovation funding among SMEs

Achievements:

- Operationalisation of several regional innovation hubs and living labs
- Increased cooperation between academia, industry, and public authorities in Vojvodina
- Strong participation of Vojvodina actors in EU-funded innovation and digitalisation projects
- Awareness-raising and capacity-building actions on AI, IoT, blockchain and smart agritech

Monitoring: Implementation is tracked via national indicators and supported by the Smart Specialisation Monitoring Committee. However, disaggregated regional data are limited, making local impact assessment challenging.

2.2 General Assessment

The Smart Specialisation Strategy (4S) represents a significant milestone in Serbia's innovation policy landscape. Its design is strongly aligned with the European Commission's RIS3 methodology, combining national development priorities with bottom-up regional specialisation and stakeholder participation. The overall framework is conceptually robust, targeting economic transformation through focused investment in areas with high potential for growth and competitiveness.

From a strategic standpoint, 4S fosters a much-needed shift from horizontal, sector-neutral policies to focused, innovation-driven policy instruments. It promotes synergies between R&D, human capital, industrial ecosystems, and digitalisation. The Strategy provides a clear orientation towards increasing Serbia's competitiveness through technological modernisation, digital upskilling, and enhanced research-business collaboration.

Strengths of the Policy Instrument:

- The Entrepreneurial Discovery Process (EDP) has enabled broad engagement of regional stakeholders, especially in Vojvodina, creating a more accurate mapping of needs and assets.
- 4S implementation has catalysed the creation of pilot actions, such as innovation vouchers, AI roadmaps, and domain-specific training programmes, with strong regional uptake.
- Institutional roles have become more clearly defined, with the Smart Specialisation Monitoring Committee and regional working groups facilitating ongoing dialogue.

Limitations and Gaps:

Despite its strengths, the policy faces structural and operational limitations:

- Implementation remains uneven, with centralised governance and limited operational capacity at the regional level.
- Inter-ministerial coordination is insufficient, especially between education, digital, economic, and R&D portfolios.
- Monitoring and evaluation systems are not yet capable of disaggregating regional-level impact, making local responsiveness weak.
- A notable disconnect persists between the Strategy's ambition and the practical availability of targeted financial instruments (e.g., limited alignment of national funding calls with priority domains).

Regional-Specific Observations for Vojvodina:

- Vojvodina's strong innovation ecosystem (ICT sector, BioSense Institute, NT Park Novi Sad, University of Novi Sad) aligns well with 4S domains.
- The ICT Priority Area Working Group, coordinated by VOICT, is one of the most active and well-structured in Serbia.
- Regional innovation actors are frequently participating in EU-funded projects (Interreg, Horizon Europe, Digital Europe), demonstrating strategic alignment and operational capacity.

Alignment with EU Policy Priorities:

4S is well positioned within Serbia's broader EU integration trajectory. It reinforces the objectives of the EU Digital Single Market, Green Deal, and Cohesion Policy. However, Serbia's candidate status poses limitations in access to some EU funding mechanisms, necessitating stronger national co-financing frameworks.

In conclusion, while the Smart Specialisation Strategy marks a transformative step in Serbia's innovation and digitalisation agenda, its effectiveness relies on further capacity-

building, decentralisation, and the alignment of funding and skills development instruments with regional needs and actor capabilities.

2.3 Identification of Policy Challenges

Despite the conceptual strengths of Serbia's Smart Specialisation Strategy and its alignment with EU innovation frameworks, several persistent challenges hinder its effective implementation and territorial impact, particularly at the regional level.

1. Weak Regionalisation and Centralised Governance

Although the Strategy was built through regional consultations, implementation mechanisms remain centralised. This leads to:

- Limited autonomy and operational capacity for regional actors to tailor interventions to their specific innovation ecosystems.
- Delayed responses to region-specific opportunities or bottlenecks, especially in areas like Vojvodina that have mature innovation infrastructure.

2. Inadequate Integration of Education and Skills Policies

There is a disconnect between innovation priorities and the national/regional education and training systems:

- Curricula are slow to adapt to the needs of emerging sectors such as AI, cybersecurity, and agri-digitalisation.
- Regional initiatives like BRAINS (in Vojvodina) remain isolated from mainstream education policy.
- Shortage of digital skills in the workforce limits the absorption capacity of innovation-driven SMEs.

3. Funding Misalignment and Fragmentation

Strategic funding instruments are either underdeveloped or poorly aligned with 4S priorities:

- Lack of regionally managed innovation funds.
- Most public calls are generic and do not prioritise cross-sectoral innovation (e.g. ICT x agrifood).
- Innovation vouchers and other incentive schemes remain underfunded or administrative burdens discourage uptake.

4. Data Infrastructure and Monitoring Gaps

Policy decisions are often made with insufficient access to disaggregated, timely, and interoperable data:

- Regional innovation performance is poorly captured in national indicators.
- Feedback loops between monitoring bodies and regional stakeholders are weak.
- No real-time or dynamic data integration across education, innovation, labour, and enterprise systems.

5. Stakeholder Engagement and Retention

While the Entrepreneurial Discovery Process initially mobilised stakeholders, ongoing engagement is uneven:

- Key innovation actors often perceive the policy framework as top-down and non-inclusive.
- Stakeholder fatigue has been reported, particularly where feedback does not lead to visible policy adjustments.
- No permanent mechanism exists for maintaining engagement beyond individual working group meetings.

6. Interministerial and Intersectoral Coordination Deficits

The implementation of smart specialisation cuts across multiple ministries (economy, science, education, digitalisation, agriculture), yet:

- Coordination remains informal and ad hoc.
- There is no unified digital transformation framework at national level to integrate policy instruments across sectors.

7. Access to Talent and Brain Drain

Persistent emigration of young skilled workers weakens regional innovation ecosystems:

- While Vojvodina has a strong university base, many graduates leave the region or the country.
- Talent retention and return policies are underdeveloped and not integrated into innovation strategies.

8. Limited Inclusion of Marginalised Groups

Innovation policy design and implementation rarely consider inclusion indicators:

- Women, rural youth, and minority populations are underrepresented in R&D and high-tech employment.
- Social innovation is not mainstreamed as a domain of smart specialisation.

In sum, while the 4S framework has successfully defined Serbia's innovation priorities and mobilised important actors, its implementation is constrained by governance, institutional, financial, and infrastructural weaknesses. Without addressing these challenges, the Strategy risks stagnation and disconnection from actual regional development needs.

2.4 Regional Competitiveness

Vojvodina, as the northern autonomous province of Serbia, stands out as one of the most economically advanced and internationally integrated regions of the country. Its strategic geographical location, robust agricultural base, vibrant ICT ecosystem, and strong higher education infrastructure contribute significantly to its competitiveness, both within Serbia and in the broader Western Balkans and Central European regions. However, structural weaknesses, institutional inertia, and socio-demographic dynamics present obstacles to sustained competitiveness.

Strengths

- **Sectoral Specialisation:** Vojvodina demonstrates strong comparative advantages in:
 - **Agri-food production and processing**, supported by fertile land and extensive know-how.
 - **Information and Communication Technologies (ICT)**, with Novi Sad emerging as a regional tech hub.
 - **Mechanical and electrical engineering**, linked to legacy industrial clusters and export value chains.
- **R&D and Human Capital:**
 - The University of Novi Sad is one of the largest academic centres in Southeast Europe, with recognised faculties in engineering, natural sciences, and agriculture.
 - A growing number of R&D institutes and science/technology parks (e.g., Science and Technology Park Novi Sad) are fostering innovation ecosystems.
- **Entrepreneurial Support Infrastructure:**
 - Over 20 tech hubs, startup incubators, and innovation centres operate in Vojvodina, including Vojvodina ICT Cluster (VOICT), providing services to SMEs and startups.
 - Active participation in EU-funded projects and cross-border initiatives (Danube, Horizon, Erasmus+, etc.) enhances knowledge transfer and visibility.
- **Export Orientation:**
 - The region contributes disproportionately to Serbia's exports, particularly in processed food, IT services, machinery, and rubber/plastics.
 - Its proximity to EU markets facilitates trade and cross-border value chains.

Weaknesses

- **Low Private Sector Investment in R&D:**
 - Despite university and public research strength, private R&D investment remains limited, especially among SMEs.
 - Weak university-industry collaboration reduces commercialisation of research outputs.
- **Institutional Capacity and Policy Execution Gaps:**
 - While regional actors are active in the innovation ecosystem, they lack formalised authority or resources to influence national policy instruments.
 - Absence of a fully functional regional development agency with innovation governance capacity.
- **Infrastructure and Connectivity Disparities:**
 - Rural parts of Vojvodina face significant gaps in digital infrastructure, limiting adoption of smart solutions in agriculture and local industry.

- Intermodal transport connectivity is underdeveloped relative to regional competitors (e.g. Hungary, Croatia).
- **Labour Market Frictions:**
 - Although educational institutions produce a large number of graduates, mismatch with industry needs persists.
 - Skilled labour shortages in IT, automation, and green technologies are intensifying, further aggravated by brain drain.

Opportunities

- **Green and Digital Twin Transitions:**
 - Vojvodina can position itself as a frontrunner in combining digital innovation with sustainable agriculture, leveraging existing strengths.
 - Potential for specialisation in smart farming, precision food production, and renewable energy systems.
- **Nearshoring and EU Integration:**
 - Geopolitical shifts and EU supply chain reconfiguration open up space for Serbia to attract manufacturing and service nearshoring.
 - Alignment with EU Green Deal and Digital Compass priorities can unlock investment streams and partnerships.
- **Cross-sectoral Innovation:**
 - Strong synergies exist between ICT and other sectors (agrifood, healthtech, manufacturing), ripe for smart specialisation deepening.

Threats

- **Macroeconomic and Political Volatility:**
 - Regional competitiveness is sensitive to broader national challenges: inflation, political instability, corruption, and regulatory unpredictability.
 - EU accession fatigue and policy inconsistency can erode investor confidence.
- **Demographic Decline and Emigration:**
 - Population ageing and loss of young professionals threaten innovation capacity and labour market vitality.
 - Low fertility and weak returnee policies exacerbate the talent drain.
- **Innovation System Fragmentation:**
 - Lack of horizontal coordination across sectors and vertical coordination between governance levels risks policy incoherence.

Conclusion

Vojvodina's competitive advantage rests on a strong sectoral base, institutional assets, and geographic position. However, to convert this into sustained smart growth, it must address structural gaps in innovation governance, align education and labour market systems with its economic ambitions, and develop resilient, inclusive, and green-focused value chains.

Targeted regional instruments and better integration into EU innovation ecosystems are key to unlocking its full competitiveness potential.

2.5 Good Practices and Recommendations

Identified Good Practices in the Region

- 1. Living Labs and Quadruple Helix Collaboration (e.g. VOICT and NT Park Novi Sad)**
The Vojvodina ICT Cluster (VOICT) has successfully operationalised a model of quadruple helix cooperation between businesses, academia, government, and civil society. This includes collaborative training initiatives, policy input platforms, and innovation hackathons. Similarly, the Science and Technology Park Novi Sad acts as a hub connecting startups with research and development facilities, co-creating tech-driven solutions for agriculture, mobility, and smart cities.
- 2. Dual Education Pilots in ICT and Mechatronics**
Pilot initiatives integrating vocational education with company-based apprenticeships have been launched in cooperation with the Chamber of Commerce and sectoral clusters. These serve as good practices in aligning educational output with labour market demand, especially in mechatronics and ICT-related sectors.
- 3. Regional Smart Specialisation (S3) Platform Implementation**
Vojvodina's active role in Serbia's RIS3 development process, including targeted RIS3 pilot projects in agritech and digitalisation, represents a good practice in decentralised innovation planning. The use of Entrepreneurial Discovery Process (EDP) to inform regional planning is especially noteworthy.
- 4. Local Government Innovation Support (e.g. Novi Sad and Subotica Initiatives)**
Municipal-level support schemes for innovation and digital transformation (e.g. digitalisation vouchers, startup competitions) have been introduced with varying success. While small in scale, these initiatives show the potential of local administrations in complementing national policy instruments.
- 5. Interregional Project Participation**
Vojvodina-based institutions are frequently involved in transnational cooperation (Interreg, Horizon Europe, Erasmus+), which contributes to knowledge diffusion and institutional learning. Examples include projects on digital skills for agriculture, AI policy for SMEs, and circular economy transitions.

Policy Recommendations

- 1. Strengthen Regional Innovation Governance Structures**
Establish or reinforce a dedicated regional innovation body with mandate and resources to coordinate stakeholders, monitor RIS3 implementation, and interface with national and EU levels.

2. **Institutionalise Quadruple Helix Platforms**
Formalise and support multi-stakeholder collaboration platforms (e.g. clusters, innovation councils) to enhance policy co-design, ecosystem intelligence, and cross-sector synergies.
3. **Align Education and Skills Systems with Regional Needs**
Expand dual education programmes and short-cycle credentials in emerging fields (green tech, digital agriculture, AI), with stronger industry involvement and feedback loops.
4. **Mobilise Local Governments for Innovation Support**
Enable cities and municipalities to introduce small-scale innovation support tools, particularly for SMEs and local service providers, aligned with smart specialisation domains.
5. **Improve Data Infrastructure and Monitoring**
Enhance regional access to real-time labour market, R&D, and innovation activity data, to enable evidence-based planning. This includes strengthening open data ecosystems and regional statistics capacity.
6. **Leverage EU and International Networks for Scaling Up**
Encourage regional actors to continue and expand participation in EU-funded collaborative projects, aiming to scale local good practices and ensure alignment with EU priorities.
7. **Prioritise Digital Inclusion in Rural and Vulnerable Areas**
Ensure that smart specialisation efforts include measures for digital literacy, connectivity, and innovation uptake in rural communities, elderly populations, and women-led enterprises.

2.6 Data Infrastructure

The data infrastructure in Serbia reflects both the country's digital ambitions and the constraints typical of a transitioning economy. Significant steps have been taken in recent years to establish a modern data ecosystem through public sector reforms, digital services expansion, and the strategic alignment of data governance with European standards.

National-Level Initiatives:

The backbone of Serbia's public sector data infrastructure is the *e-Government Cloud* managed by the Office for IT and eGovernment. It enables centralized data storage and interinstitutional exchange across government bodies, including civil registries, taxation, customs, education, and health. Complementary platforms such as *eZUP* (Interoperability Platform) allow public institutions to request data directly from one another instead of asking citizens to provide it, contributing to service efficiency and user experience.

The *Open Data Portal* (data.gov.rs), coordinated by the Ministry of Public Administration and Local Self-Government and supported by UNDP, is operational and hosts a growing number of datasets released by public institutions and local governments. These include

environmental data, infrastructure projects, traffic information, and budget data. However, uptake among SMEs and researchers is limited by inconsistent metadata quality, delayed updates, and lack of standardization.

Regional and Local Data Ecosystems:

At the regional level, Novi Sad and the Autonomous Province of Vojvodina have emerged as digital frontrunners. Initiatives such as *NS Geoportal*, the *City of Novi Sad Smart City Platform*, and the regional *Statistical Office* portal have enabled data accessibility for urban planning, mobility, and spatial analysis. The BioSense Institute also contributes datasets from agricultural research and precision farming, enhancing the regional digital agri-infrastructure.

Private Sector and Research Actors:

Several universities and R&D centers, including the University of Novi Sad and BioSense, maintain sector-specific databases related to health, biotech, and agriculture. However, there is limited integration with public systems or commercialization pathways for SMEs. Private IT companies and system integrators often build proprietary solutions for municipalities or utilities (e.g., smart metering), but the data remains siloed, hindering broader innovation and analytics. There is currently no unified regional data lake, nor an effective open access policy to data generated via public-private partnerships.

Challenges:

- Lack of standardized data formats and insufficient interoperability among systems
- Limited cross-sectoral and public-private data exchange
- Underutilization of open data by SMEs, academia, and civic tech innovators
- Weak incentives for institutions to regularly update datasets
- Cybersecurity and privacy frameworks still in developmental phases

Opportunities and Forward Outlook:

Serbia's integration into the European Data Spaces and participation in the Western Balkans Digital Agenda could catalyze investment in open, interoperable, and secure data infrastructures. Pilot initiatives in AI, digital agriculture, and smart cities—if linked to robust data governance—could serve as templates for regional scalability. Strengthening collaboration between municipalities, IT clusters, and academia will be vital for unlocking data-driven innovation.

3. Summary

The Republic of Serbia, and particularly the region of Vojvodina, demonstrates significant potential in driving regional digital transformation, rooted in its expanding innovation

ecosystem, improving policy landscape, and growing base of skilled professionals in the ICT sector. The region benefits from strong academic institutions, dynamic ICT clusters, and public sector actors increasingly engaged in digital modernization. However, gaps persist in policy coherence, data governance, and practical support mechanisms for SMEs and regional innovation actors.

The analysis of national and regional policy instruments reveals a progressive shift toward alignment with EU digital agendas and innovation frameworks, such as Smart Specialisation and the Digital Agenda for the Western Balkans. While strategies such as the Digital Serbia Strategy, RIS3, and the Smart Specialisation Strategy for Vojvodina provide a solid policy foundation, their implementation remains uneven, hindered by institutional fragmentation, limited monitoring frameworks, and underdeveloped synergies between regional stakeholders.

Data infrastructure remains a bottleneck. Despite progress in eGovernment and open data initiatives, systemic challenges persist in terms of interoperability, data standardization, and real-time access for SMEs, academia, and innovation hubs. The data remains underutilized as a public asset to support AI, analytics, and innovation-driven decision-making.

In conclusion, Serbia's regional innovation system is advancing but still requires targeted efforts in governance, coordination, and data-driven transformation. Enhancing intersectoral cooperation, supporting SME digitalization, and strengthening data ecosystems will be critical for improving competitiveness and preparing the region for inclusion into European innovation and data spaces. The findings and recommendations from this State of the Art Report will serve as a strategic input for the upcoming policy recommendations and pilot actions in the DIGITTRANS project.

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State of the Art Report, Greece

1. Regional Background Information

1.1 Introduction

The Region of Western Greece (R.W.G.) is one of the 13 administrative regions of Greece and serves as a second-level local government authority. It comprises the Regional Units of Aetolia-Acarmania, Achaia, and Ilia, and spans a total area of 11,350 km²—approximately 8.6% of the national territory. Geographically, it occupies the western part of mainland Greece, covering the northwestern section of the Peloponnese and the western frontier of Central Greece. The region borders the administrative regions of the Peloponnese and Central Greece and lies adjacent to the Ionian Islands Region. Strategically positioned along the Ionian Sea and the gulfs of Ambracian, Patras, and Corinthian, Western Greece functions as a natural gateway to the Adriatic and Western Europe.

The regional capital is the city of Patras, which serves as a key administrative, commercial, and port hub both at national and transnational levels—due to its direct maritime connections with Italy. Other significant urban centers include Agrinio, Messolonghi, Pyrgos, Amaliada, Aigio, Kato Achaia, and Nafpaktos. The region consists of three regional units and is further subdivided into 19 municipalities. Administratively, it falls under the Decentralized Administration of Peloponnese, Western Greece, and the Ionian Islands.

The territory of Western Greece is predominantly mountainous (45.3%) and semi-mountainous (25.6%), with only 29.1% consisting of lowland areas. As a result, the settlement pattern is largely shaped by the topography, with higher population densities in coastal and urban zones. In terms of human development, the region ranks sixth nationally, with a Human Development Index (HDI) of 0.861, reflecting a relatively balanced combination of education, income, and life expectancy indicators.

In terms of per capita income, Western Greece remains among the least developed regions of both Greece and the EU, despite modest recovery trends. According to revised Eurostat data (PPS), the region's GDP per capita in 2021 corresponded to approximately 54% of the EU average, slightly higher than in 2019 but still below the national convergence threshold. This reflects persistent structural weaknesses—including low productivity, limited economic diversification, and demographic contraction—particularly outside the urban pole of Patras. The updated Regional Operational Programme 2021–2027 classifies Western Greece as a “Less Developed Region” under Cohesion Policy criteria, eligible for enhanced support to bridge development gaps, enhance SME competitiveness, and accelerate green and digital transitions.

The regional economy of Western Greece is predominantly based on traditional, low value-added sectors such as agriculture, construction, and small-scale manufacturing. Micro, small, and medium-sized enterprises (SMEs) form the backbone of the local economy,

accounting for over 97% of active businesses. Although the primary sector holds a relatively high share in both GDP and employment—above the national average—its productivity remains low. The secondary sector (mainly food processing and construction) exhibits moderate productivity, while the tertiary sector is dominated by retail and public administration. The digital and innovation intensity of firms is limited, indicating a need for deeper economic diversification.

Western Greece has benefited significantly from the EU’s Cohesion Policy through ERDF and ESF funds, as well as from the Recovery and Resilience Facility (RRF) launched in response to the COVID-19 pandemic. The Regional Operational Programme 2021–2027 foresees targeted investments exceeding €400 million to support green and digital transition, enhance SME competitiveness, and promote social inclusion. Additionally, national RRF measures—such as vouchers for digitalization and energy upgrades—are being deployed regionally, albeit at uneven rates. These funding instruments are crucial for addressing long-standing structural gaps and stimulating economic convergence.

The region is undergoing a marked demographic decline, with its population dropping from 679,796 in 2011 to 655,189 in 2019, and projections indicating further contraction in the coming decades. The ageing index and old-age dependency ratio have increased substantially, reaching 35.2% in 2019, above the national average. Youth outmigration, especially among tertiary graduates, continues to erode the regional talent pool, particularly in sectors like ICT, engineering, and health sciences. These demographic trends place direct pressure on the region’s labour market, welfare systems, and long-term development potential.

Western Greece’s innovation profile is modest, yet evolving, with areas of emerging specialization in agri-food technologies, energy efficiency, and health-related applications. The Smart Specialisation Strategy (RIS3) of the region identifies six priority areas and promotes synergies between academia, SMEs, and research centers. Institutions like the University of Patras and the Hellenic Open University provide a strong knowledge base, while regional innovation ecosystems—such as the Patras Science Park and POS4Work incubator—serve as critical infrastructure for tech transfer and entrepreneurship. However, the innovation performance remains below the EU average, requiring further investment and governance reform.

Thanks to its strategic location along the Ionian coast, the Region of Western Greece actively participates in several cross-border and transnational cooperation programmes, including Interreg Greece–Italy, Interreg Balkan–Mediterranean, and ADRION. These programmes foster regional integration in fields such as sustainable mobility, blue economy, and cultural heritage. The region also contributes to macro-regional strategies such as the EU Strategy for the Adriatic-Ionian Region (EUSAIR), enhancing institutional capacity and innovation through cross-border collaboration. Such participation supports the region’s outward orientation and European territorial cohesion.

In line with the EU Digital Decade framework, Greece has adopted its National Digital Decade Strategic Roadmap (2023), which sets measurable targets for digital skills, digital infrastructure, business digitalization, and public e-services by 2030. Although these targets apply nationally, their implementation is regionally differentiated. For Western Greece, key challenges persist: only about 54% of the adults possess at least basic digital skills, compared to the EU average of 56%, while the share of SMEs with a basic level of digital intensity is estimated at only 53%, far below the EU target of 90%. Additionally, the use of advanced digital technologies such as cloud computing, AI, and big data remains limited among regional enterprises—below 20% in most cases—particularly outside urban hubs like Patras. These gaps reinforce the urgency of targeted support for digital capacity building, especially among rural SMEs, citizens aged 55+, and public sector entities at local level. Such disparities directly affect SME competitiveness and must be addressed through coordinated regional and national interventions.

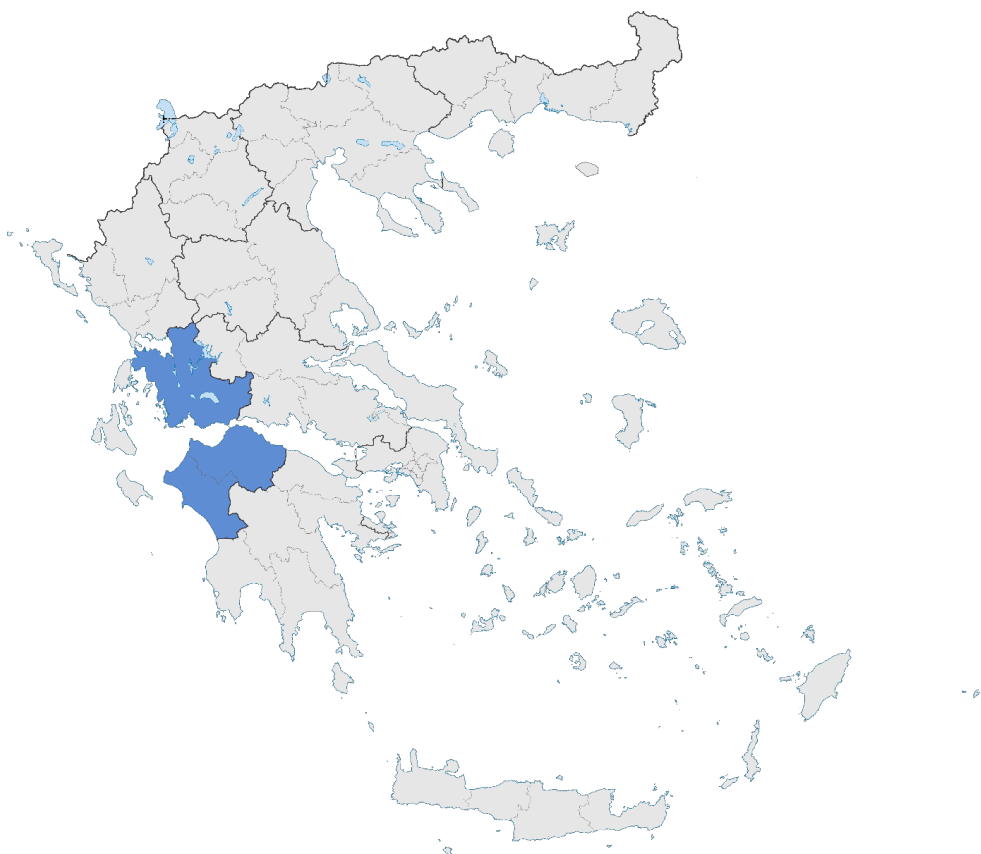


Figure 1: Location of the Region of Western Greece within Greece.

1.2 Economic Profile of the Region

General Overview

The economy of the Region of Western Greece is characterized by a traditional and relatively undiversified production base, with dominant shares in the primary and tertiary sectors. Agriculture and agri-food processing remain central to the regional economic fabric, especially in the Regional Units of Aetolia-Acarnania and Ilia, while the service sector is concentrated in urban centers such as Patras, which also functions as a port and logistics hub. The industrial sector is comparatively limited and primarily concentrated in low to medium technology branches, including food and beverage manufacturing, construction materials, and basic chemical products. Micro, small, and medium-sized enterprises (SMEs) account for more than 97% of active businesses in the region, yet their contribution to regional value added remains modest due to low productivity, weak internationalization, and limited innovation intensity. Structural challenges such as outdated infrastructure, skill shortages, and insufficient sectoral interconnection hinder the transition toward a more knowledge-intensive and export-oriented growth model.

In terms of Gross Domestic Product (GDP), the Region of Western Greece ranks eleventh among the thirteen regions of the country. Its GDP per capita also ranks eleventh among the thirteen Greek regions. The ten-year economic crisis affected every region in Greece, leading to a general decline in development levels across the country. By 2018, all Greek regions—including Attica—were recorded as having development levels below the European average (Eurostat). Notably, the North Aegean Region had reached just 46% of the EU average. The Region of Western Greece ranked sixth in terms of overall contribution to national GDP, accounting for approximately 4.5% of Greece's total economic output. This context reinforces the strategic relevance of targeted digitalisation policies for SMEs under the 2021–2027 programming period.

Western Greece is among the poorest regions in both national and European terms and lags in competitiveness. This underscores the need for targeted development measures during the 2021–2027 programming period, aiming to act as levers for recovery and convergence with European economic and social cohesion.

The region demonstrates strong specialization in the primary sector, with GDP and employment levels significantly above the national and EU averages, though productivity remains low. The secondary sector also has a notable presence, with relative productivity exceeding the national average. The tertiary sector shows a slightly smaller share but marginally higher productivity compared to the national average. Deindustrialization has been a chronic issue for the region since the 1990s.

According to the Location Quotient (LQ) using ISIC Rev.4 classification, Western Greece shows strong specialization (LQ > 1.25) in agriculture (LQ 1.59), ICT (LQ 1.35), and other services (LQ 1.26), with moderate specialization in administrative/support services (LQ 1.11) and construction (LQ 1.01). In terms of export performance (Revealed Comparative Advantage – RCA), the region exhibits significant specialization in agricultural products.

At a more detailed level (NACE2), the productive base is moderately diversified, with the region showing specialization in 10 out of 38 sectors. Strong specialization is seen in agriculture and wood processing, while moderate to weak specialization exists in sectors such as metal products, electronics, machinery, energy, construction, retail, and education. Overall, the region specializes in six tradable sectors.

The limited diversification of the productive base could be addressed through the development of value chains via stronger backward and forward linkages, especially in sectors of specialization. However, these linkages remain weak, and local economic multipliers are low. Only one sector shows regional multipliers above one, and it does not belong to the tradable or specialized sectors. This implies that increases in demand (e.g. from tourism, public spending, or exports) are unlikely to translate into proportional increases in local production. This structural limitation underscores the importance of developing stronger value chains and technology uptake among SMEs.

Regional Disparities

Western Greece displays significant intraregional disparities—both socioeconomically and digitally. Patras and the Regional Unit of Achaia serve as the administrative and developmental hub of the region, hosting the University of Patras, major research institutions, and most knowledge-intensive enterprises. In contrast, the Regional Units of Aetolia-Acarnania and Ilia show weaker performance in key indicators related to innovation, entrepreneurship, and connectivity, reinforcing the digital divide. While innovation hubs and incubators are concentrated in Patras, broadband infrastructure remains limited in rural and mountainous areas. In 2019, only 70% of residents had internet access, highlighting persistent digital connectivity gaps in rural areas. Fewer than 10% of businesses offered online payment or ordering services.

These inequalities extend beyond infrastructure and entrepreneurship to human capital. More remote areas exhibit higher unemployment, lower participation in training programmes, and reduced access to educational and research resources—factors that contribute to a brain drain towards Patras and other urban centers.

Digital Transformation

Digital transformation is a fundamental prerequisite for improving the competitiveness, outward orientation, and sustainability of businesses and the regional economy overall. The regional strategy emphasizes supporting SMEs, the public sector, and citizens in adopting digital technologies, enhancing connectivity, and developing digital skills.

Recent data show that Western Greece lags in key digital maturity indicators: only 70% of citizens had internet access in 2019, and only 10% of businesses handled electronic orders or payments. Furthermore, only 17% of SMEs had adopted ICT solutions in their production processes, intensifying the digital gap compared to other European regions.

Challenges include digital illiteracy, lack of ICT skills, insufficient broadband coverage in rural areas, and a limited supply of digital public services. Nevertheless, the region hosts important research and academic institutions (e.g., University of Patras, Hellenic Open University), as well as a notable presence of startups and innovative companies, which could act as catalysts for digital transition in the framework of smart specialization (RIS3), particularly through enhanced collaboration between SMEs, universities, and regional innovation intermediaries.

Under Specific Objective RSO1.2 of the Regional Operational Programme 2021–2027, interventions are planned to:

- support SMEs with digital tools (ERP, CRM, e-commerce),
- expand broadband networks and telecom infrastructure,
- fund innovation hubs, tech transfer structures, and incubators,
- train business and public sector personnel in digital skills.

The COVID-19 pandemic further emphasized the need to accelerate digitalization, with encouraging but uneven signs of adoption in areas such as education and e-governance. However, progress remains uneven between urban centers and more remote units. In conclusion, while Western Greece has made steps toward digital transformation, further targeted institutional and financial support is required to achieve full digital convergence.

Barriers to Digital Transformation

Despite strategic efforts to improve digital readiness, significant barriers remain—especially for SMEs in rural areas. The main obstacles fall into four categories: digital skills, infrastructure, organizational culture, and access to support/funding.

As previously noted, most micro and small enterprises in the region show limited strategic readiness for digitalization, with only 17% integrating ICT into production and fewer than 10% offering digital services.

Low levels of digital literacy affect both entrepreneurs and citizens, with limited participation in upskilling and reskilling programmes undermining the effectiveness of digital investment. The lack of local ICT providers, digital consultants, and mentoring structures exacerbates the isolation of smaller firms, particularly in rural areas.

Several key sectors—such as small-scale manufacturing, agri-food, and tourism—remain traditional in operation, slowing the diffusion of digital technologies. This is further hindered by bureaucratic obstacles, poor awareness of available funding tools, and concerns over adaptation costs.

The 2023 revision of the Regional Operational Programme for Western Greece incorporates performance-based objectives and new strategic priorities aligned with national and EU policy frameworks. The region is expected to benefit from over €400 million in co-financed

investments during the 2021–2027 programming period, covering a broad spectrum of interventions. These include SME digitalization support (through vouchers and technical assistance), investment in green innovation, circular economy practices, and renewable energy infrastructure. Selected actions are co-funded through both the European Regional Development Fund (ERDF) and the Recovery and Resilience Facility (RRF), with targeted emphasis on promoting regional resilience, sustainable growth, and technology adoption. These measures are expected to contribute to improved SME competitiveness, enhanced regional productivity, and gradual digital convergence.

1.3 HR Profile of the Region

Regarding demographic indicators the permanent population of the Region of Western Greece is 655,189 inhabitants (ELSTAT), accounting for approximately 6.3% of the country’s total population. The region exhibits a lower population density than the national average, while its age structure closely resembles that of Greece as a whole— indicating similar challenges of population ageing.

Compared to other Greek regions, Western Greece ranked fourth in population size in 2019 (ELSTAT). Patras is the largest city in the region and one of the major Functional Urban Areas (FUAs) of the country, with a population of around 210,000 residents, placing it third in terms of population among mainland cities. Moreover, Patras is an important port and commercial hub, not only at the regional but also at the national level, due to its maritime connections with Italy.

The region has experienced a slight population decline since 2008, accompanied by a corresponding decrease in population density, which remains significantly below both national and EU averages. The share of the population aged 25–64 with tertiary education is 23.8%, also below the national and European averages. Most residents live in urban centres, with an urbanisation rate of 61.7%, still below the national.

Table 1: Permanent population by Region (ELSTAT, 2019).

Region	Permanent Population 2019
Attica	3.742.235
Central Macedonia	1.873.777
Thessaly	718.640
Western Greece	655.189

Crete	634.930
Eastern Macedonia and Thrace	599.723
Peloponnese	574.447
Central Greece	555.960
South Aegean	344.027
Epirus	333.696
Western Macedonia	267.008
North Aegean	221.098
Ionian Islands	203.869
Total	10.724.599

Population ageing in Western Greece represents a significant demographic challenge. The share of residents aged over 70 is higher than both the national and European Union averages and increased substantially—by around 2.6%—during the economic crisis. The old-age dependency ratio, which reflects the burden placed on the working-age population, stood at 35.2% in 2019, slightly above the national average. The region also records a negative gross migration balance, although this has improved slightly, with a reduction of around 2.2% in recent years.

Despite the presence of major academic and research institutions, the region exhibits lower rates of tertiary education attainment and limited alignment between education and labour market needs. A significant share of SMEs report difficulties in recruiting qualified personnel, particularly in areas such as digital transformation, ICT, and technical occupations.

Participation in lifelong learning and skill development activities remains well below both the national and EU averages. The share of adults involved in formal continuing education does not exceed 3.5%, with the greatest obstacles recorded in rural areas and among low-income or low-education groups. Many residents also report limited access to digital learning platforms or insufficient skills to use them effectively.

The Region of Western Greece continues to experience high levels of brain drain, especially among those aged 20–34. Many young people particularly -particularly graduates in science and technology- migrate to Attica or abroad, weakening the region’s human capital base. Vulnerable groups such as rural women, people with disabilities, and long-term unemployed individuals over the age of 55 face persistent structural barriers in accessing education, training, and employment.

Overall, the Region of Western Greece needs to develop a coherent and multi-level human capital strategy, including reforms in education and vocational training, stronger links between research and the labour market, incentives for the return of skilled professionals, and investments in digital and green skills—particularly for socially vulnerable groups. Such measures are essential for improving regional competitiveness, supporting digital transformation among SMEs, and reducing long-term demographic imbalances.

labourSocioeconomic Conditions and Employment Opportunities

The labour market in the Region of Western Greece is marked by structural imbalances and limited opportunities, particularly in rural and declining areas. The region's employment rate remains consistently below both national and European averages. In 2020, only 56.8% of individuals aged 20–64 were employed, compared to 61.2% in Greece and 72.4% in the EU. Western Greece is ranked among the four Greek regions with the lowest employment rates, demonstrating clear challenges in integrating its active population into the labour market. Youth unemployment remains particularly high, reaching approximately 38% in 2021, while long-term unemployed individuals account for approximately 65% of all unemployed in the region. Vulnerable groups include women, secondary education graduates, individuals over 55, and residents of remote areas. Limited upskilling opportunities and weak alignment between training systems and actual labour market needs further exacerbate underemployment and repeated unemployment.

Productivity remains unevenly distributed across sectors and territories. Most businesses in the region are micro-enterprises operating in traditional, low-value-added sectors such as agri-food, construction, and tourism. At the same time, the adoption of digital technologies remains limited, perpetuating a cycle of low productivity and low wages. Wages remain below the national average, with significant disparities based on gender and between the public and private sectors. Flexibility in forms of employment is limited, while collective bargaining mechanisms are only partially applied at the local level. Housing shortages, rising living costs, and insufficient transport infrastructure between rural and urban zones create additional barriers to labour mobility, particularly for vulnerable groups. Outmigration directly impacts both the size and the skills profile of the region's labour force. Many young tertiary graduates in high-demand fields such as STEM, ICT, and engineering migrate to other urban centers or abroad, resulting in a shortage of specialized professionals. Internal imbalances shift employment concentration toward metropolitan areas, leaving rural communities without the human resources to revitalize their local labour markets.

At the institutional level, the Region of Western Greece has initiated active labour market policies, including adult training vouchers in green and digital skills, social entrepreneurship schemes, and support mechanisms for the long-term unemployed and young people. However, participation remains limited due to cost barriers, lack of information, and training formats that are often unsuitable for older age groups. Additionally, socioeconomic indicators such as poverty rates, material deprivation, and social exclusion suggest that a

significant portion of the population—particularly in mountainous or remote municipalities—has limited access to the benefits of existing development policies. Approximately 24% of the region’s population is at risk of poverty or social exclusion, a figure higher than the national average, exacerbating inequalities in access to employment.

In conclusion, the Region of Western Greece faces significant challenges related to low employability, skills mismatches, brain drain, skills mismatches, and spatial and social inequalities. Strengthening employment and social cohesion will require long-term investments in skills development, digital and green transitions, and targeted actions for vulnerable groups and structurally weak regional labour markets.

2. Analysis and Assessment of Policy Instruments

The policy instruments shaping the digital transformation of Western Greece are primarily embedded within two key funding mechanisms: **the National Recovery and Resilience Plan (RRP) “Greece 2.0”**, implemented under the EU’s NextGenerationEU framework, and **the National Strategic Reference Framework (NSRF) 2021–2027 Operational Programmes (ERDF & ESF)**. Together, these instruments mobilise significant national and EU resources—exceeding €7 billion—to advance Greece’s digital targets, with a strong emphasis on infrastructure development, skills enhancement, and the modernization of public services. In the case of Western Greece, these policy instruments are particularly relevant given the region’s structural challenges in connectivity, digital skills, and socioeconomic disparities compared to the national average. The inclusion of Public-Private Partnerships (PPPs)—most notably the Ultra-Fast Broadband (UFBB) project—alongside significant private investments in telecommunications infrastructure, such as Fiber-to-the-Home and 5G deployment, demonstrates a strategic reliance on blended funding models to address gaps in digital access. This hybrid approach is significant for Western Greece, where geographical and demographic constraints necessitate coordinated investment from both public and private actors. Moreover, the planned update of the National Digital Transformation Strategy (“Digital Bible”) for 2025–2030 underscores the forward-looking orientation of these policy instruments, ensuring continuity beyond the expiration of current EU funding cycles. Key measures targeting the digital divide, ICT workforce development, and secure digital infrastructures directly align with Western Greece’s regional development priorities, as they not only enhance competitiveness but also foster social inclusion. Overall, the policy framework reflects a comprehensive, multi-layered approach that combines immediate infrastructure expansion with long-term capacity building, thereby situating Western Greece’s capacity to integrate into the national and European digital ecosystem.

The digital transformation of businesses in Greece, including Western Greece, is a central priority within the framework of the National Recovery and Resilience Plan “Greece 2.0”, funded by the European Union’s NextGenerationEU. In 2022, the flagship programme supporting small and medium-sized enterprises (SMEs) was launched with a total budget of approximately €445 million, implemented by Information Society S.A. under the supervision of the Ministry of Digital Governance. The programme aims to strengthen the digital maturity of SMEs by modernizing their productive, commercial, and administrative functions through three State aid schemes: “SME Digital Tools”, which provides vouchers for acquiring digital products and services; “Development of Digital Products and Services”, offering non-refundable grants ranging from €200,000 to €2 million to support cloud infrastructure and digital innovation; and “Digital Transactions”, which focuses on upgrading cash registers and replacing outdated POS machines. These initiatives are complemented by Greece’s growing startup ecosystem, which has expanded significantly since the financial crisis, attracting investments from major international funds such as Intel Capital, Accel, Sequoia, and others, while producing successful unicorns including Viva Wallet, Beta Cae, Skroutz, PeopleCert and “soonicorn” such as Persado, Blueground,.

To support the broader digital transformation of enterprises, Greece has implemented a range of measures and programmes that combine public and private investment. Initiatives such as the European Digital Innovation Hubs (€34.3 million EDIHs, €34.3 million combined national and EU funding), “Development of Digital Products and Services” (€100 million), the “Research – Create – Innovate” schemes (€650 million for 2014–2020 and €300 million for 2021–2027), and the Digital Transformation of SMEs Programme (€210 million) provide both financial resources and technical guidance for SMEs to adopt advanced technologies, including cloud computing, big data, and artificial intelligence. Additional programmes, including the acceleration of smart manufacturing (€75 million) and the establishment of industrial data platforms (€145 million), aligned with the EU Data Strategy, further enhance digital capacities across enterprises. Legal and strategic frameworks, such as the National AI Strategy and Law 4961/2022 on emerging ICT technologies, institutionalize long-term support for digital innovation. Complementary measures, including co-financing loans for digitalization (€100 million) and the Development Law (Law 4887/2022), support SMEs in achieving a baseline level of digital intensity, helping bridge the digital divide. Finally, programmes supporting startups and scale-ups, such as “EquiFund I and II” fund-of-funds (exceeding €500 million in Equity capital) backed by NSRF 2014-2020 and 2021-2027, new VCs backed by HDBI’s sovereign fund, 17 up to date, with an availability of approximately 1 billion euros in equity capital and the Elevate Greece platform (€2.85 million), alongside the Angel Investors framework, create an environment conducive to investment, innovation, and growth. Collectively, these measures not only enhance SMEs’ competitiveness but also foster an innovative business ecosystem in Western Greece, ensuring the region participates fully in the country’s broader digital transformation. These instruments collectively address the main barriers identified in Western Greece—limited digital skills, low ICT adoption, and restricted access to finance—while strengthening SME competitiveness and enhancing regional resilience.

2.1 Policy Instrument

Policy Instrument 1: Regional Operational Programme 2021–2027 of Western Greece

The **Regional Operational Programme (ROP) 2021–2027 of Western Greece** constitutes a central policy instrument for the region’s economic transformation. It was approved in 2022, with a total public expenditure of €628,447,202. Out of this, €534,180,118 is funded by the European Union, and €94,267,084 is provided by national resources. The programme is co-financed by the European Regional Development Fund (ERDF) and the European Social Fund Plus (ESF+).

The development vision for the **Region of Western Greece** for the 2021–2027 period is based on implementing a holistic strategy to transform the region into a fair, smart, and competitive European region. The region will serve as a hub for technology, innovation, research, and creativity, setting an example for social solidarity, cohesion, and the promotion of Olympic ideals, volunteering, and culture.

To achieve this vision, five strategic objectives have been set as follows:

1. **Improving competitiveness in production, strengthening entrepreneurship through innovation, openness to international markets, and digital upgrading.**
2. **Protecting the natural environment, addressing climate change, enhancing energy self-sufficiency, and promoting a circular economy.**
3. **Enhancing mobility within the region.**
4. **Strengthening social cohesion within the region.**
5. **Promoting sustainable local development through integrated interventions.**

Among its core objectives, the programme prioritizes the **digital transformation of small and medium-sized enterprises (SMEs)** through targeted actions under **Policy Objective 1: A Smarter Europe**. Specifically, it addresses **Specific Objective RSO1.2**, which aims to leverage the benefits of digitalisation for citizens, businesses, research organisations, and public authorities. The digitalisation axis is included under **Priority 1 (P1)** of the programme: “Enhancing competitiveness in production, strengthening entrepreneurship through innovation, extroversion, and digital upgrading”.

The following amounts refer to **selected indicative interventions** under RSO1.2 and do not do not reflect the full financial allocation of Priority 1. The strategic priority of digitalisation is co-financed by the **European Regional Development Fund (ERDF)** and national resources, with a total public expenditure of **€70,804,450** allocated to **Priority 1**. This funding aims to support the digital upgrading of SMEs within the Region of Western Greece. The objective is aligned with European and national strategies, including the **National Smart Specialisation Strategy (RIS3)**, the **Digital Transformation Bible (2021–2025)**, and the **National Recovery and Resilience Plan**, particularly under the pillars of 'Digital Transformation' and 'Private Investment and Economic Transformation.' Additionally, the

actions of the Specific Objective are designed and will be implemented in complementarity and synergy with the policy choices of the national **NSRF 2021-2027**, the **Development Goal 'Smart Growth' of the National Development Programme 2021-2025**, and the policies of the sectoral programme ANTAGONISTIKOTITA (ex EPANEK).

Measures and Actions for SME Digitalisation

The programme promotes **two main types of actions** in support of SME digitalisation:

1. **Action Type 1.ii.1 – Business plans for the development and commercialization of innovative, value-added digital products and services:** This action is primarily aimed at high-digital-intensity SMEs in Western Greece and focuses on enhancing their competitiveness by integrating digital technologies into their production and administrative processes. The objective is to support businesses in the region by facilitating the development and commercialization of new, innovative products and services that incorporate digital innovations. Eligible activities under this action include investments in digital tools, implementation of enterprise resource planning (ERP) and customer relationship management (CRM) systems, the creation of e-commerce platforms, and the adoption of digital marketing strategies. These measures are designed to strengthen the digital transformation of business models and operational processes, with broader benefits for productivity, competitiveness, and innovation across various sectors and industries. The ultimate goal is to help businesses in Western Greece remain competitive in the evolving digital landscape and prepare for future challenges driven by Industry 4.0.
2. **Action Type 1.ii.2 – Exploiting Data using innovative technologies (Artificial Intelligence, Virtual Reality, Internet of Things, Big Data, Data Analytics, etc.) to improve services for citizens and businesses:** This action focuses on supporting the digital transformation of the public sector and public services by encouraging the adoption of **innovative technologies** that facilitate data utilization. By employing technologies such as **artificial intelligence (AI)**, **big data**, **virtual reality (VR)**, and the **Internet of Things (IoT)**, the action aims to enhance the quality of services provided to both citizens and businesses. Additionally, it seeks to foster digital innovation that will strengthen the regional infrastructure supporting entrepreneurship. These technologies are expected to significantly contribute to the development and expansion of the local business ecosystem, ensuring better service delivery and higher efficiency. Although primarily focused on public services, this action indirectly supports SME digitalisation by improving the availability and quality of digital public services and the data infrastructures on which businesses depend.

Distribution of Funds

The **Indicative Distribution of Planned Resources (EU)** for **Priority 1, Specific Objective**

RSO1.2, under the **ERDF** funding in the **Less Developed Regions** is as follows:

- The first intervention is focused on the **digitalisation of large enterprises**, which includes e-commerce, electronic business activity, networked business processes, digital innovation hubs, living labs, internet entrepreneurs, and start-ups in the ICT sector, specifically in **B2B**. The allocated funding for this intervention amounts to **€3,145,000**. Although targeted at large enterprises, the intervention strengthens regional digital capacity and indirectly benefits SMEs through spillover effects.
- The second intervention is centred on **ICT solutions, e-services, and digital applications for the public sector**. This aims to enhance the public sector's efficiency by promoting digital solutions that improve the services provided to both citizens and businesses. The allocated funding for this intervention is **€3,913,782**. Although primarily targeted at public administration, the intervention indirectly supports SMEs by improving the quality and interoperability of digital public services.

Policy Instrument 2: Policy Instrument 2: Digital Transformation Programme (NSRF 2021–2027)

Within the framework of the new Programming Period 2021–2027, the **Digital Transformation Programme** aims to facilitate the implementation of the actions described in the “**Digital Transformation Bible**” and contribute to the digital transformation of the Greek economy. The strategic goals set by the Digital Transformation Programme include:

- Innovative digital services and applications from the Public Sector and Local Authorities
- Environmentally friendly cloud infrastructures
- Completion of the Public Sector Network
- Digital platforms to support business activity
- Further enhancement of the unified digital public services portal **gov.gr**
- Strengthening the **National Alliance for Digital Skills and Jobs** and the **National Digital Skills Academy**
- Ultra-high-speed connectivity and expansion of wireless access points

The total budget of the programme amounts to **€943 million**, the allocation of which (excluding Technical Assistance) is presented in the diagram below (Diagram 1).

Flagship Digital Transformation Actions in the Public Sector:

- Applications & tools for Public Administration – **€85 million**
- Support for entrepreneurship – **€35 million**
- Digitisation actions – **€30 million**
- Digital transformation of Local Authorities – **€220 million**
- ICT infrastructures: cloud, wireless access, SYZEFXIS, data centers – **€97 million**
- Enhancement of eHealth services and independent living – **€46.5 million**

Flagship Connectivity Enhancement Actions with High-Speed Broadband Access:

- Development of Ultra-Fast Broadband infrastructures – **€190 million**
- Infrastructure development in areas with no coverage (Very High Capacity Networks) – **€110 million**
- Support actions for planning, development, management, and monitoring – **€3 million**

Flagship Actions for Digital Skills Development:

- **Reskilling – upskilling programmes** for General Government employees – **€45 million**
- Upskilling programmes on innovative digital technology utilisation and management – **€20 million**
- Development of an inter-ministerial branch for **Digital Policy Analysts** – **€15 million**
- Support for the **National Alliance for Digital Skills and Jobs** – **€15 million**
- Support for the **National Digital Skills Academy** – **€3 million**
- Development of basic digital skills among the general population – **€15 million**

Although primarily focused on public administration, the programme creates an enabling digital environment that indirectly supports SME digitalisation at the national and regional level.

Presented below are specific measures from Policy Instrument 2: National Strategic Reference Framework (NSRF) 2021–2027 pertaining to the digitalisation of SMEs.

Table 2: Measure 1 - Promotion of employment through programmes Public Beneficial Character - Training voucher

<p>Short description of the measure</p>	<p>The object of the action is the provision of training programmes for horizontal or specialized skills and the certification of the knowledge and skills that will be acquired by the beneficiary participants in the Program of Community Benefit in Municipalities, Regions, Regional Social Welfare Centers (RCCs)/ related bodies, Ministry Services and other agencies.</p> <p>Theoretical training program from 120-150 hours depending on the subject of the training program that will lead to the certification of the knowledge and skills acquired within the program.</p> <p>The thematic subjects of the theoretical training are the following:</p> <ul style="list-style-type: none"> • Basic ICT Skills (1st level) • Basic ICT Skills (2nd level) • Basic ICT Skills (3rd level) • Organization & Operation of Public Services, Organizations & Businesses • Environmental Protection and Product Recycling • Digital Social Networking Skills with applications in the workplace (Social Media) • Secretarial support <p>The action will be implemented with the training voucher system.</p> <p><i>Link to the target:</i></p> <p>The measure contributes to the target by providing basic digital skills training programmes to a large part of the population.</p> <p><i>Tentative timeline:</i></p> <p>The programme started in Q2 of 2023 (administrative decision) and the first results expected in Q4 of 2023. The programme is expected to be available at least until the end of 2027.</p>
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Budget allocated or planned and, if relevant, other resources – including human resources – [allocated]	<p>Total: €19.8 million</p> <ul style="list-style-type: none"> • National: €X million allocated • EU: €X million allocated through NSRF 2021 - 2027
Expected impact and related timing:	<p>In total, approximately 19 146 beneficiaries are expected to benefit, who will be trained. This number is based on the number of beneficiaries up to 54 years of age who are required to participate in this action, as well as the number of over 55 years of age who participate based on their choice during the first individual consultation.</p>

Table 3: Measure 2 - National Academy for Digital Skills

Short description of the measure	<p>The National Academy of Digital Skills (NADS) is an initiative of the Ministry of Digital Governance with the aim of developing and gathering educational content on an online platform. It is available from May 2021 with free and open access for everyone who wants to improve, strengthen and develop their digital skills.</p> <p>For the first time, citizens are given the opportunity to choose and follow suitable open training programmes in IT and communication technologies for free, in order to acquire basic as well as advanced digital skills. It also accelerates the digital literacy of citizens by mitigating educational, economic and social inequalities. By improving their level of digital skills, citizens can:</p> <ul style="list-style-type: none"> – to know how to use the digital services of the Greek government, – to utilise ICT in all aspects of their daily life and – to enrich their already existing knowledge to become more attractive in the labour market. <p>In the context of the National Academy of Digital Skills, among others, a set of activities and actions aimed at the development and creation of an integrated electronic platform for uniform and direct access to</p>
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	<p>educational content for broad population groups of citizens, professionals, students, etc.</p> <p><i>Link to the target:</i></p> <p>The NADS provides a digital platform for upgrading the basic digital skills (among others) to all citizens.</p> <p><i>Tentative timeline:</i></p> <p>The programme started in Q2 of 2021 and it is expected to be available at least until the end of 2030.</p>
<p>Budget allocated or planned and, if relevant, other resources – including human resources – [allocated]</p>	<p>Total: €8.6 million</p> <ul style="list-style-type: none"> • National: €X million allocated • EU: €X million allocated through NSRF 2021 - 2027
<p>Expected impact and related timing:</p>	<p>The National Academy of Digital Skills aspires to play an active role in the field of digital literacy, constantly enriching the educational content available to citizens. It has more than 290 basic and advanced level courses corresponding to over 1 800 hours of training. Also, the courses are offered by organisations with recognized academic and educational prestige, such as Greek academic institutions, well-known international companies, banking institutions, telecommunication providers and digital education organisations.</p>

Table 4: Measure 3 - Ultra-Fast Broadband - PPT Project

<p>Short description of the measure</p>	<p>The project "Ultra-Fast Broadband Infrastructure" (UFBB) is the largest telecommunications infrastructure project that has been announced in Greece, and one of the largest Public-Private Partnership (PPP) projects in Europe. It envisages the creation of telecommunication infrastructures that will ensure the possibility of ultra-highspeed Internet in areas that were not included in the planning of private investments. The implementation of the UFBB project is expected to contribute to the support and development of local businesses, the creation of new jobs and the support of decentralisation, through the reduction of the digital divide between urban and semi-urban areas. In total, it is estimated that about 830,000 households and businesses, in areas that were not included in the planning of private investments, will benefit from Ultra-Fast Broadband, ensuring the possibility of an Internet speed of up to 1Gbps.</p> <p><i>Link to the target:</i></p> <p>The programme will contribute to the expansion of the internet speed of up to 1Gbps to households in areas that were not included in the planning of private investments.</p> <p><i>Tentative timeline:</i></p> <p>The programme started in Q2 2023, and it will be implemented until 2027.</p>
<p>Budget allocated or planned and, if relevant, other resources – including human resources – allocated]</p>	<p>Total: €870 million</p> <ul style="list-style-type: none"> • National: €35 million allocated • EU: €265 million allocated through NSRF 2021 - 2027 • Private: €570 million
<p>Expected impact and</p>	<p>It is estimated that about 830 000 households and businesses, including about 10 000 public buildings (schools, health centres, etc.), in areas that were not included in the planning of private investments,</p>

related timing:	will benefit from Ultra-Fast Broadband, ensuring the possibility of an Internet speed of up to 1Gbps
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Table 5: Measure 4 - Programme “Research - Create - Innovate” 2021 - 2027

<p>Short description of the measure</p>	<p>The programme is a continuation of the “Research - Create - Innovate” in the period 2021 – 2027. The objective of the funding program "Research - Innovate" is to connect research and innovation with entrepreneurship and to strengthen the competitiveness, productivity and extroversion of companies towards international markets, with the aim of transitioning to quality innovative entrepreneurship and increasing domestic value added. In addition, the aim of the programme is to strengthen Research and Innovation, which is fully aligned with the country's strategy to place innovation at the heart of a sustainable and resilient recovery from the pandemic, to accelerate the green and digital transition and ensure technological development of Greece.</p> <p><i>Link to the target:</i></p> <p>The SMEs participating in the programme will be supported to test and develop products and services related (among others) to new technologies like big data, artificial intelligence and cloud computing services.</p> <p><i>Tentative timeline:</i></p> <p>The programme will start in Q3 of 2023 and it is expected to be available until end of 2027</p>
<p>Budget allocated or planned and, if relevant, other resources – including human resources - allocated]</p>	<p>Total: €300 million</p> <ul style="list-style-type: none"> • National: €X million allocated • EU: €X million allocated through NSRF 2021 - 2027

Expected impact and related timing:	It is expected that more than XX will participate to the programme and develop products and solutions related (among others) to new technologies like big data, artificial intelligence and cloud computing services
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Table 6: Measure 5 - Digital Transformation of SMEs Programme

Short description of the measure	<p>The programme of state aid actions “Digital Transformation of SMEs” aims to address the lag of Greek businesses in the adoption and integration of modern digital technologies in their production activity. Recognizing the different levels of digital and technological maturity of SMEs but also the different investment needs, the set of actions encourages, as a matter of priority, the implementation of targeted investment projects, as well as of comprehensive initial digital transformation investment plans that contribute to one extroverted, innovative, competitive and sustainable critical production of higher quality products and services added value. In particular:</p> <ul style="list-style-type: none"> • the Action 2 - Advanced Digital Transformation of SMEs concerns companies which aim to expand their digital and technological maturity with integrated investments in new ICT that will upgrade their competitiveness. It concerns business plans with a budget from €50 000 to €650 000 • the Action 3 Edge Digital Transformation of SMEs: concerns businesses that have already integrated ICT in many of their operations and now seek to implement integrated investments in cutting-edge technologies or 4th industrial revolution solutions. It concerns business plans with a budget from €200.001 to €1.200.000 <p><i>Link to the target:</i></p> <p>The Action 2 and 3 of the Programme “Digital Transformation of SMEs” promote the use of edge technologies in order to provide higher quality products and services by the SMEs. It is expected that part of the investment projects will include the integration of new technologies like big data, artificial intelligence and cloud computing services in the production process of the business.</p> <p><i>Tentative timeline:</i></p> <p>The programme started in Q4 of 2022 and it will be available until the</p>
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	end of 2027.
Budget allocated or planned and, if relevant, other resources – including human resources – allocated]	<p>Total: €210 million</p> <ul style="list-style-type: none"> • National: €X million allocated • EU: €X million allocated through NSRF 2021-2027
Expected impact and related timing:	It is expected that a large number of SMEs will participate in the programme and integrate new technologies like big data, artificial intelligence and cloud computing services in the production process.

Table 7: Measure 6 - Digital Transformation of SMEs Programme - Action 1: Basic Digital Transformation of SMEs

Short description of the measure	<p>The Action 1 "Basic Digital Transformation of SMEs" of the programme "Digital Transformation of SMEs" is to meet the basic needs of SMEs with modern information and communication technologies (ICT).</p> <p>The Action encourages the implementation of targeted investment projects of basic digital transformation that contribute to an extroverted, innovative and competitive production of products or services of higher added value.</p> <p><i>Link to the target:</i></p> <p>The programme provides funding to Greek SMEs to increase their basic level of digital intensity.</p> <p><i>Tentative timeline:</i></p> <p>The programme started in Q4 of 2022 and it will be available until the end of 2027.</p>
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Budget allocated or planned and, if relevant, other resources – including human resources – [allocated]	<p>Total: €90 million</p> <ul style="list-style-type: none"> • National: €X million allocated • EU: €X million allocated through NSRF 2021-2027
Expected impact and related timing:	<p>It is expected that a large number of SMEs will participate in the programme and increase their basic level of digital intensity.</p>

Policy Instrument 3: National Recovery and Resilience Facility– Greece 2.0 (Recovery and Resilience Fund)

The Recovery and Resilience Facility – RRF was established to tackle the crisis triggered by the Covid-19 pandemic and to support the transition to a green and digital economy. The Recovery and Resilience Fund, supports reforms and investments, particularly in green and digital technologies, with a lasting impact on the productivity and resilience of the EU economy. The ‘Greece 2.0’ National Recovery and Resilience Plan includes 105 investments and 75 reforms, utilising a total of €35.95 billion — €18.22 billion in grants and €17.73 billion in loans.

Specifically, Pillar 2 “Digital Transition” includes three (3) Action Axes, aimed at the digital transformation of Greece. The total budget from the Recovery and Resilience Fund (RRF) to support and implement these actions amounts to €2.2 billion, while an additional €2.3 billion in private investment resources is expected to be mobilized.

Axis 2.1 Connectivity for citizens, businesses, the state

RRF Budget €522 m – Private Investment Resources €582 m

The core objective of this axis is the installation of fibre-optic infrastructure in buildings, the development of 5G networks covering the major Greek motorways, the assurance of transition to high-speed broadband connections for remote islands via undersea cables, as

well as the utilization of space technologies and applications and their integration into the national economy in order to provide secure telecommunications services.

These connectivity investments indirectly support SME digitalisation by improving broadband quality and expanding access to Very High Capacity Networks, particularly in rural and remote areas.

Axis 2.2 Digital transformation of the state

RRF Budget €1.3 billion – Private Investment Resources €1.3 billion

The core objective of this axis is the modernization of the Public Sector and the integration of new technologies, increasing its efficiency and effectiveness, and achieving the provision of improved, quality services to citizens and businesses.

For SMEs, the expansion of digital public services reduces administrative burden and enables more efficient digital interactions with public authorities.

Axis 2.3 Digital transformation of businesses

RRF Budget €375 million – Private Investment Resources €475 million

The core objective of this axis is to enhance SME digital readiness and accelerate the adoption of digital technologies, enabling businesses to expand their digital presence and integrate innovative digital channels into their operations. Also, the actions of this axis aim to support further development of businesses through tax incentives for investment in digital technologies, as well as to enhance their resilience to crises.

It includes actions such as:

- the provision of digital products and services aimed at supporting the digital transformation of SMEs
- the creation of a central mechanism to assess the needs of individual SMEs, evaluate the outcomes of digital transformation service provision, raise awareness among business executives and provide support, transfer know-how and plan training by specialists, so that businesses are in a position to exploit the tools and services offered via a digital marketplace platform (creation of digital marketplace)
- the provision of tax incentives in the form of super-deductions of expenses and assets for the purchase of software, cloud services, installation of specialized equipment etc., in order to accelerate investments in modern digital technologies.

Pillar 3 (“Employment, Skills, Social Cohesion”) includes Axis 3.2, which finances large-scale digital upskilling and reskilling programmes in education and vocational training. These interventions indirectly support SMEs by expanding the pool of digitally skilled workers and improving the long-term matching between skills and labour-market needs. Achieving the above objectives will contribute to increasing long-term development, creating jobs and strengthening worker mobility and, consequently, the economic and social resilience of the economy and the labour market.

Flagship Actions Funded by the RRF:

- **Municipality of Patras – Greek Smart Cities:** Investments in SSC (Smart Sustainable Cities) infrastructures and systems for a sustainable & green urban future – **€4.8 million**
- **Smart Manufacturing – €75 million**
- **Digital Transformation of Businesses – €180 million**

Presented below are specific measures from Policy Instrument 3: National Recovery and Resilience Plan – Greece 2.0 (Recovery and Resilience Fund) pertaining to the digitalisation of SMEs.

Table 8: Measure 1 - Upskilling and reskilling program in high-demand sectors with an emphasis on digital and green skill

Short description of the measure	<p>The programme “Upskilling and reskilling program in high-demand sectors with an emphasis on digital and green skills” concerns the provision of vocational training programmes to 150 000 beneficiaries with the aim of upgrading their skills (upskilling) and reskilling them in digital and green skills in high demand industries. The programme is being implemented in the framework of the action: “Horizontal upskilling / reskilling programmes to targeted populations” funded by the Recovery and Resilience Fund.</p> <p>D.YP.A will cooperate with the licensed LLL centres. that meet specific quality assurance criteria, for the provision of training programmes to unemployed people registered in the unemployment registers, as part of the national effort to upgrade the skills of the Human Resources, mainly in "digital" and "green" skills, aiming both their effective interconnection with the labour market and the improvement of their employability, as well as the preservation of future jobs.</p> <p>The object of this project is the provision of theoretical training services - which will lead to certification of the knowledge and skills that will be acquired during the training - and will be addressed to beneficiaries, registered in the Register of unemployed, over 18 years of age.</p> <p>In particular, the services provided under this project include:</p> <ul style="list-style-type: none">• Theoretical training programmes for the unemployed - beneficiaries lasting 50 - 200 hours that lead to the acquisition of digital and "green" knowledge and skills, as will be described in each call.• Certification of knowledge and skills that will be acquired within the training programmes. <p><i>Link to the target:</i></p> <p>This Measure tackles the need for digital, green and financial literacy</p>
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	<p>skills of the following population groups: a) unemployed, especially the youth and long-term unemployed, b) employees, especially those with high unemployment risk and those who are left behind by workspace technology, c) employees, especially at SMEs with limited in-house training capacity, d) public sector employees, including teachers. Skills offered are: a) Baseline digital skills, b) Medium-level digital skills, c) Green skills and d) Financial literacy skills. Therefore, the measure will increase the digitally skilled population and at the same time will support the employability of 150 000 beneficiaries.</p> <p><i>Tentative timeline:</i> The programme started in Q4 of 2022 (administrative decision) and the first results expected in Q3 of 2023. The programme is expected to be available at least until the end of 2025.</p>
<p>Budget allocated or planned and, if relevant, other resources – including human resources – allocated]</p>	<p>Total: €302 million National: €9 million allocated EU: €293 million allocated through RRF</p>
<p>Expected impact and related timing:</p>	<p>150 000 individuals with at least basic digital skills until end of 2025</p>

Table 9: Measure 2 - New Strategy for Lifelong Skilling: Modernising and Upgrading Greece's Upskilling and Reskilling System

<p>Short description of the measure</p>	<p>A New Strategy for Lifelong Skilling: Modernising and Upgrading Greece's Upskilling and Reskilling System puts in place a new governance providing an incentives-compatible framework of training provision in Greece. The reform envisages an outcomes-based skilling-reskilling system, providing the right incentives for trainees and training providers, as well as an error-proof certification framework. By linking the financial remuneration of providers to training and labour market outcomes, as well as ensuring high certification standards, the reform provides incentives promoting adoption and scaling up of best practices, resulting in systemic improvement of training and labour market outcomes.</p> <p><i>Link to the target:</i></p> <p>The reform is linked to a horizontal upskilling programme aiming to develop the skills - mainly digital - of the working age population and build a more sustainable workforce.</p> <p><i>Tentative timeline:</i></p> <p>The programme started in Q4 of 2023 and it is expected to be available at least until the end of 2030.</p>
<p>Budget allocated or planned and, if relevant, other resources – including human resources – allocated]</p>	<p>Total: €40 million</p> <ul style="list-style-type: none"> • National: €1.2 million allocated • EU: €38.8 million allocated through RRF
<p>Expected impact and related timing:</p>	<p>The reform is linked to a horizontal upskilling programme aiming to develop the skills - mainly digital - of the working age population and build a more sustainable workforce.</p>

Table 10: Measure 3 - National Coalition for Digital Skills and Jobs (NC)

<p>Short description of the measure</p>	<p>The National Alliance for Digital Skills and Employment, as a member of the European Alliance for Digital Skills and Employment, is part of the General Secretariat for Digital Governance and Simplification of the Ministry of Digital Governance and has as its central mission to improve digital skills, increase the employment of the population and support digital transformation at national, regional and local level in the context of the government's broader skills policy.</p> <p>The mission of the National Coalition includes:</p> <ul style="list-style-type: none"> • the adaptation, at national, regional and local level, of the political and operational priorities of the European Union (EU) and the EU institutions in matters of digital skills, • submitting proposals to the Ministry of Digital Governance in matters of planning and updating the national strategy for digital skills, • supporting the networking and cooperation of the members of the National Alliance, in order to plan and implement actions to upgrade the digital skills of the population and strengthen employment, • the exchange of know-how and best practices between the members of the National Alliance and Alliances of other EU member states, as well as the exchange of know-how and best practices in the context of related initiatives of third countries, • the formulation of project proposals, co-financed or not, to strengthen the digital skills of the population, • the organisation of events, conferences and workshops to promote digital skills policy, • cooperation with corresponding initiatives of the private sector • its participation, if requested by the relevant body, in the certification of educational structures or training structures with the object of digital skills, training or training programmes with content of digital skills and digital knowledge and skills of the trainees <p><i>Link to the target:</i></p> <p>The National Alliance for Digital Skills and Employment supports and coordinates several actions regarding the upgrade of basic digital skills of the population.</p> <p><i>Tentative timeline:</i></p> <p>The programme started in Q1 of 2020 and it is expected to be available</p>
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	at least until the end of 2027.
Budget allocated or planned and, if relevant, other resources – including human resources – allocated]	<p>Total: X</p> <ul style="list-style-type: none"> • National: €X million allocated • EU: €X million allocated through RRF
Expected impact and related timing:	The National Alliance for Digital Skills and Employment supports and coordinates several actions regarding the upgrade of basic digital skills of the population.

Table 11: Measure 4 - Vocational Education & Training Reform

Short description of the measure	<p>The overall aim of this reform is to effectively address current skills mismatch and create a direct link between qualifications and jobs. To this end both the reforms of OAED (namely “Labour force skilling, reskilling and upskilling through a reformed training model for the working population” and “Strengthening the apprenticeship system”) and the reform and investments of the Ministry of Education and Religious Affairs through RRF will further upgrade the Vocational Education and Training (VET) in Greece, create opportunities to respond effectively to unemployment and address labour market imbalances, while contributing to making the VET system an appealing educational pathway. The aforementioned projects also invest in the digital transformation of the VET system and the provision of the</p>
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	<p>required equipment and tools that will help meet the shifts in skill demand and supply that have been reflected in the inability of employers to fill their vacancies with people that have the right skills. Towards this goal the Horizontal Upskilling Programme will further support the undertaking policies to reduce skills mismatch.</p> <p><i>Link to the target:</i></p> <p>The reform will address current skills mismatch and cover a significant part of the ICT specialist’s gap.</p> <p><i>Tentative timeline:</i></p> <p>The programme will start in Q4 of 2023 and it is expected to be available at least until the end of 2025.</p>
Budget allocated or planned and, if relevant, other resources – including human resources – allocated]	<p>Total: €131 million</p> <ul style="list-style-type: none"> • National: €4 million allocated • EU: €127 million allocated through RRF
Expected impact and related timing:	<p>A strengthened professional and vocational training system will strengthen the Greek economy and help to alleviate the social costs of the economic downturn. At the same time, it will facilitate the supply of new, relevant and rewarding skills as a response to the increased demand of the labour market. Innovation, economic growth and competitiveness of the workforce are the expected lasting outcomes of investing in revamping labour force skilling, reskilling and upskilling. To this end, it is expected that the reform will cover a significant part of the ICT specialist’s gap.</p>

Table 12: Measure 5 - The Project “Choose Greece”

Short description of the measure	<p>The project “Choose Greece”, concerning the repatriation of highly skilled Greeks working abroad, is the most emblematic initiative of Rebrain Greece. The project includes a wage subsidy scheme offered to Greek companies for hiring in total 500 young Greeks of high qualifications and scientific experience with a salary of 3 000 euros for</p>
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	<p>a minimum duration of two years.</p> <p><i>Link to the target:</i></p> <p>The project “Choose Greece” provides incentives for ICT specialists to join the workforce of Greek ICT companies.</p> <p><i>Tentative timeline:</i></p> <p>The programme started in Q1 of 2020 and it is expected to be available at least until end of 2030</p>
Budget allocated or planned and, if relevant, other resources – including human resources – [allocated]	<p>Total: €X million</p> <ul style="list-style-type: none"> • National: € million allocated • EU: € million allocated through RRF
Expected impact and related timing:	<p>It is expected that a large number of ICT specialists will participate in the programme and join the workforce of Greek ICT companies.</p>

Table 13: Measure 6 - New Institutional Framework for Lifelong Learning and skills development

Short description of the measure	<p>The policy measure “New Institutional Framework for Lifelong Learning and Development skills” is financed by the European Union – NextGeneration EU and concerns the primary/secondary legislation to modernise the ongoing system vocational training, so that it evolves into an effective system that is widely accessible, simpler and more flexible, and responsive to modern socio-economic needs, emphasises quality results and promotes the redefining and upgrading the skills of the country's workforce. The legislation will enforce the new Strategy for Lifelong Skilling.</p> <p><i>Link to the target:</i></p> <p>The new institutional framework will support the implementation of</p>
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	<p>the new Strategy for Lifelong Skilling, in order to address the current skills mismatch and cover a significant part of the ICT specialist's gap.</p> <p><i>Tentative timeline:</i></p> <p>Most of the programmes started in Q1 of 2022 and it is expected to be available at least until the end of 2030.</p>
<p>Budget allocated or planned and, if relevant, other resources – including human resources – allocated]</p>	<p>Total: €1.236 million</p> <ul style="list-style-type: none"> • National: €0.239 million allocated • EU: €0.997 million allocated through RRF
<p>Expected impact and related timing:</p>	<p>The specific policy measure will support the reforms for developing the skills -mainly digital - of the working age population and build a more sustainable workforce</p>

Table 14: Measure 7 - Smart Readiness Programme

<p>Short description of the measure</p>	<p>The "Smart Readiness" Program grants the implementation of works related to the installation of infrastructure that will facilitate the transformation of a building into a "smart" one, as well as its interconnection with utility networks (electricity, natural gas) through new "smart" meters.</p> <p>For this purpose, the "Smart Readiness" Program will provide checks (Vouchers) that will be allocated to cover part of the cost of the above works, the nominal value of which will be determined according to the type of work to be carried out and the special characteristics of the buildings.</p> <p><i>Link to the target:</i></p> <p>The Smart Readiness Program will address the problem of lack of the necessary infrastructure in existing buildings and acts in addition to another envisaged action (Gigabit Voucher) in order to remove obstacles that limit citizens' access to ultra-high speed broadband</p>
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	<p>services.</p> <p><i>Tentative timeline:</i></p> <p>The programme launched in 2023 and it will be available until the end of 2025.</p>
<p>Budget allocated or planned and, if relevant, other resources – including human resources – allocated]</p>	<p>Total: €100 million</p> <p>EU: €100 million allocated through RRF</p>
<p>Expected impact and related timing:</p>	<p>The Smart Readiness Program comes to address the problem of lack of the necessary infrastructure in existing buildings and acts in addition to another envisaged action (Gigabit Voucher) in order to remove obstacles that limit citizens' access to ultra-high speed broadband services. In addition, upgrading a building's infrastructure to support ultra-high-speed broadband services allows work to be carried out in parallel to facilitate interconnection with utility grid smart meters and the installation of sensors aimed at reducing the environmental footprint of buildings. Most basic communal facilities of the buildings.</p>

Table 15: Measure 8 - Programme “Development of Digital Products and Services”

<p>Short description of the measure</p>	<p>Strengthening of private Businesses for the implementation of investment projects that cover the entire development cycle of digital products and services (new product development). This funding program emphasizes the implementation by private IT companies of cloud services (SaaS, PaaS, IaaS) and the provision of vouchers to SMEs in order to make use of these cloud services.</p> <p>The products and services should be based on modern technologies and have as their goals (among others) the operation of new computing infrastructures and services for small and medium enterprises, the support of small and medium enterprises for the utilisation of Cloud infrastructures and services and the development</p>
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	<p>of online software services.</p> <p><i>Link to the target:</i></p> <p>The programme provides financial assistance to Greek companies to develop products and services related to cloud computing services.</p> <p><i>Tentative timeline:</i></p> <p>The programme started in Q2 of 2022 and it is expected to be available at least until the end of 2025.</p>
Budget allocated or planned and, if relevant, other resources – including human resources – [allocated]	<p>Total: €100 million</p> <ul style="list-style-type: none"> • National: €21 million allocated • EU: €79 million allocated through RRF
Expected impact and related timing:	<p>It is expected that more than 1 000 SMEs will participate in the programme.</p>

Table 16: Measure 9 - Programme “Smart manufacturing”

Short description of the measure	<p>The programme provides funding of investment projects of very small, small and medium enterprises in the industry sector. Investment plans should aim to improve business resilience through upgrading digital production management and control systems, procurement of advanced and digitally controlled industrial equipment, digitalisation of interconnection systems throughout the supply chain, and production systems and technology that support digital transformation. In addition, the action will finance 5G high-speed network infrastructure, mechanical equipment, laboratory equipment and quality control equipment, ICT & software equipment, software licences, cloud licences, IT security services, product design, intellectual property, patents, costs certification, technical consulting services for the implementation of new IT and software infrastructures</p>
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	<p>or for carrying out a feasibility analysis for the development of new smart products and services, staff and workforce training in the new Industry 4.0 technologies.</p> <p><i>Link to the target:</i></p> <p>It is expected that part of the investment projects will include the integration of new technologies like big data, artificial intelligence and cloud computing services in the production process of the business.</p> <p><i>Tentative timeline:</i></p> <p>The programme started in Q3 of 2022 and it will be available until the end of 2025.</p>
Budget allocated or planned and, if relevant, other resources – including human resources – allocated]	<p>Total: €75 million</p> <ul style="list-style-type: none"> • National: €36 million allocated • EU: €39 million allocated through RRF
Expected impact and related timing:	<p>It is expected that a large number of SMEs will participate in the programme and will integrate new technologies like big data, artificial intelligence and cloud computing services in the production process.</p>

Table 17: Measure 10 - Programme “Industrial Data Platforms”

Short description of the measure	<p>In the context of the Project, the financing of the development of innovators is foreseen services based on modern technologies aimed at the operation of new computers infrastructure and services for small and medium enterprises (Cloud Infrastructure & Services), the support of small and medium enterprises for the utilisation of CloudOnly infrastructures and services, the development of online software services (cloud Only Software framework) that will be available to SMEs based on its policies and standards GAIA-X initiative and the EU's International Data Spaces Association (IDSA).</p>
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	<p><i>Link to the target:</i></p> <p>The aim of the programme is to support the utilisation of Cloud only infrastructures and services by the business.</p> <p><i>Tentative timeline:</i></p> <p>The programme started in Q3 of 2022 and it will be available until the end of 2025.</p>
Budget allocated or planned and, if relevant, other resources – including human resources – [allocated]	<p>Total: €145 million</p> <ul style="list-style-type: none"> • National: €X million allocated • EU: €X million allocated through RRF
Expected impact and related timing:	<p>It is expected that a large number of SMEs will participate in the programme and utilise cloud computing services in their operating models.</p>

Table 18: Measure 11 - Programme “Digital Tools for SMEs”

Short description of the measure	<p>The programme is about strengthening the small and medium enterprises in the Greek territory, with the aim of adopting modern digital tools which will support the business processes. More specific businesses using new digital tools could:</p> <ul style="list-style-type: none"> • modernise their productive, commercial and administrative function, • upgrade the way of communication and collaboration and introduce new forms of hybrid work (hybrid workplace), • digitise electronic transactions with customers and partners, including e-commerce, • increase the level of security and trust in electronic transactions. <p>The Program will provide vouchers for the acquisition of new digital</p>
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	<p>tools.</p> <p><i>Link to the target:</i></p> <p>The programme provides funding to Greek SMEs to increase their basic level of digital intensity.</p> <p><i>Tentative timeline:</i></p> <p>The programme started in Q2 of 2022 and it is expected to be available at least until the end of 2025.</p>
Budget allocated or planned and, if relevant, other resources – including human resources – [allocated]	<p>Total: €180 million</p> <ul style="list-style-type: none"> • National: €37.8 million allocated • EU: €142.2 million allocated through RRF
Expected impact and related timing:	<p>It is expected that approximately 100 000 SMEs will participate in the programme and increase their basic level of digital intensity.</p>

Table 19: Measure 12 - Programme “Digital Transactions”

Short description of the measure	<p>The programme is about strengthening the small and medium enterprises in the Greek territory, with the aim of adopting modern digital tools which will support the processes of invoicing, issuing and handling tax documents and making electronic payments. The Program will provide vouchers for the acquisition of new digital tools.</p> <p><i>Link to the target:</i></p> <p>The programme provides funding to Greek SMEs to increase their basic level of digital intensity.</p> <p><i>Tentative timeline:</i></p> <p>The programme started in Q2 of 2022 and it is expected to be available at least until the end of 2025.</p>
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Budget allocated or planned and, if relevant, other resources – including human resources – [allocated]	<p>Total: €162 million</p> <ul style="list-style-type: none"> • National: €34 million allocated • EU: €128 million allocated through RRF
Expected impact and related timing:	<p>It is expected that approximately 500 000 cash registers will be upgraded or replaced with computer-based solutions.</p>

Table 20: Regional Operational Programme (ROP) 2021–2027 of Western Greece

Instrument name	Regional Operational Programme (ROP) 2021–2027 of Western Greece
Duration	2021–2027 (approved in 2022)
Description of goals	<p>The programme aims to transform Western Greece into a fair, smart, and competitive European region serving as a hub for technology, innovation, research, and creativity. It pursues five strategic objectives: (1) improving competitiveness and entrepreneurship through innovation and digital upgrading; (2) protecting the environment and promoting a circular economy; (3) enhancing mobility; (4) strengthening social cohesion; and (5) promoting sustainable local development. Total public expenditure amounts to €628,447,202 (€534,180,118 EU funding; €94,267,084 national funding).</p>
Relevance to national and regional strategies	<p>The digitalisation strategy under Priority 1 aligns with the National Smart Specialisation Strategy (RIS3), the Digital Transformation Bible (2021–2025), and the National Recovery and Resilience Plan—particularly the pillars “Digital</p>

	Transformation” and “Private Investment and Economic Transformation.” It also complements the NSRF 2021–2027 , the National Development Programme 2021–2025 (Goal: Smart Growth) , and the sectoral programme EPANEK .
Enhancing digitalisation of SMEs	Under Policy Objective 1: A Smarter Europe and Specific Objective RSO1.2, €70,804,450 is allocated to Priority 1, co-financed by ERDF and national resources, to support SME digital upgrading. Two main action types are included: Action Type 1.ii.1 – business plans for innovative digital products/services (ERP, CRM, e-commerce, digital marketing) to strengthen SME competitiveness and digital transformation; Action Type 1.ii.2 – exploitation of data using AI, VR, IoT, and Big Data to improve public services and entrepreneurship support. The indicative ERDF distribution includes €3,145,000 for digitisation of large enterprises and €3,913,782 for ICT and e-services for governments.

Table 21: National Strategic Reference Framework (NSRF) 2021–2027 – Digital Transformation Programme

Instrument name	National Strategic Reference Framework (NSRF) 2021–2027 – Digital Transformation Programme
Duration	2021–2027
Description of goals	The Digital Transformation Programme aims to implement the objectives of the <i>Digital Transformation Bible</i> and accelerate Greece’s digital transition across the public and private sectors. Its main goals include: providing innovative digital services and applications for the public sector and local authorities; developing environmentally friendly cloud infrastructures; completing the Public Sector Network; creating digital platforms to support business activity; enhancing the <i>gov.gr</i> portal; strengthening the National Alliance for Digital Skills and Jobs and the National Digital Skills Academy; and expanding ultra-high-speed connectivity and wireless access. The total programme budget is €943 million.

<p>Relevance to national and regional strategies</p>	<p>The programme is a central component of the Digital Transformation Bible (2021–2025) and directly supports the implementation of Greece’s National Digital Strategy. It aligns with the overarching priorities of the NSRF 2021–2027, the National Recovery and Resilience Plan, and the European Digital Decade objectives. Its actions complement regional programmes, such as the Western Greece ROP, ensuring coordinated national and regional digital transformation.</p>
<p>Enhancing digitalisation of SMEs</p>	<p>The programme supports SME digitalisation primarily through actions that create enabling infrastructures and services, such as digital platforms for business activity (€35 million), digitisation actions (€30 million), and connectivity enhancements (€190 million for ultra-fast broadband and €110 million for Very High Capacity Networks). These initiatives provide the technological foundation for SMEs to adopt digital tools, access e-services, and operate efficiently in a fully digital economy. Additionally, the digital skills development actions (€113 million total) strengthen human capital, enabling SMEs to benefit from reskilled and upskilled workforces capable of leveraging digital technologies.</p>

Table 22: National Recovery and Resilience Plan – Greece 2.0 (Recovery and Resilience Fund – RRF)

<p>Instrument name</p>	<p>National Recovery and Resilience Plan – Greece 2.0 (Recovery and Resilience Fund – RRF)</p>
<p>Duration</p>	<p>2021–2026 (implementation period of the RRF for Greece)</p>
<p>Description of goals</p>	<p>The Recovery and Resilience Fund (RRF) was established to address the economic and social impacts of the COVID-19 crisis and support the transition to a green and digital economy. With an overall EU budget of €672.5 billion, Greece’s allocation amounts to €31 billion, expected to mobilize €60 billion in total investments. The Greek Plan focuses on reforms and investments that enhance productivity, sustainability, and resilience. Pillar 2: Digital Transition (€2.2 billion RRF + €2.3 billion private) aims to accelerate the country’s digital transformation, while Pillar 3: Employment, Skills, Social</p>

	Cohesion (€2.3 billion) focuses on enhancing digital skills and education.
Relevance to national and regional strategies	The Greece 2.0 plan is fully aligned with the European Commission’s priorities under the EU Recovery and Resilience Facility and complements Greece’s Digital Transformation Bible (2021–2025), National Smart Specialisation Strategy (RIS3), and NSRF 2021–2027 . It contributes directly to the EU’s twin transition (green and digital) and supports regional programmes such as the Western Greece ROP , ensuring coherent policy implementation across governance levels.
Enhancing digitalisation of SMEs	Under Axis 2.3 – Digital Transformation of Businesses (€375 million RRF and €475 million private resources) , the plan promotes SME digitalisation through: (1) provision of digital products and services supporting SME transformation; (2) creation of a central mechanism to assess SME needs, evaluate results, and provide training and know-how transfer via a digital marketplace ; and (3) tax incentives (super deductions) for investments in software, cloud services, and digital equipment. Complementary flagship actions include Smart Manufacturing (€75 million) and Digital Transformation of Businesses (€180 million) , aimed at enhancing innovation, competitiveness, and resilience of Greek enterprises.

2.2 General Assessment

Regional Context and General Overview

The Region of Western Greece (RWG) is actively pursuing digital transformation across various sectors, including public administration, education, and enterprise development. While the region benefits from a solid research and academic base, as well as notable infrastructure in ICT, the level of digital adoption among small and medium-sized enterprises (SMEs) remains relatively low. Digitalisation has increasingly emerged as a policy priority, with regional strategies progressively aligned with both national and European frameworks. Despite this progress, a series of structural and operational challenges continue to constrain the pace and overall scale of SME digital transformation, underlining the need for targeted support mechanisms and coherent policy interventions.

Current State of Digital Adoption in SMEs

The current state of digital adoption in SMEs within the Region of Western Greece (RWG) reflects significant challenges despite notable infrastructure, business, and human resource potential in the ICT sector. Although there has been progress in recent years, the region has not yet achieved a model of digital operation. The use of computers and the Internet remains particularly low. Internet use remaining low prior to the pandemic, with only 70% of residents using the Internet in 2019 (ELSTAT), placing RWG 5th among Greek regions in terms of Internet use. . This limited adoption is also reflected in SMEs: although 82% report having an Internet connection, the quality and speed of connectivity—especially in rural and mountainous areas—remain inadequate for modern digital business operations. In addition to limited connectivity, the integration of technology within the business processes of SMEs in RWG is relatively minimal. Only around 17% of SMEs have integrated technological solutions into their production processes, indicating very low digital maturity. Adoption of even basic digital tools remains limited: fewer than 10% of micro and small enterprises offer online ordering or electronic payment capabilities, particularly in rural areas. This highlights the slow adoption of digital tools that are essential for streamlining operations, improving efficiency, and fostering growth in the modern economy.

Another key issue concerns the limited uptake of digital public services at regional and local level. Although Greece has significantly expanded the range of services available through gov.gr, the adoption and effective use of these services in RWG remains uneven—particularly in smaller municipalities and rural areas—reducing the extent to which SMEs can interact digitally with public authorities.

The Region of Western Greece also faces a significant shortage of specialised ICT personnel. The share of ICT specialists in the regional labour force is among the lowest in Greece, making it difficult for SMEs to recruit qualified digital professionals and slowing the adoption of advanced technologies.

Despite these challenges, RWG has shown some positive trends, especially in terms of collaboration **between SMEs**. The European Regional Innovation Scoreboard 2023 highlights RWG’s strong performance in this area, which suggests that there is potential for growth through collaboration and the sharing of digital knowledge and resources among businesses.

The broadband gap between rural and urban areas remains a significant barrier to SME digitalisation. Many mountainous and remote areas of RWG still fall within ‘white’ or ‘grey’ NGA zones, lacking access to Very High Capacity Networks (VHCN), which restricts SMEs from adopting cloud services, e-commerce solutions and other advanced digital tools. Overall, although the COVID-19 pandemic accelerated the demand for digital tools, SMEs in RWG were unable to fully capitalise on this momentum due to persistent structural barriers—limited digital skills, uneven broadband coverage and the absence of tailored support mechanisms for micro and small enterprises.

Technological Infrastructure in the RWG

The evolution of technology is such that the existence of basic ICT infrastructure, such as broadband networks or mobile telephony/data networks and the ability to connect to them, is considered a given in most developed countries. For this reason, statistical measurements tend to focus on the **use** of ICT rather than the **existence** of ICT infrastructure. Greece lags in this area, as many remote regions lack access to the internet via terrestrial networks and instead rely on alternative methods (e.g., satellite, mobile data, etc.). Additionally, internet speed in the country is among the worst in the EU, ranking 93rd globally. Despite the above, the vast majority of Greeks can access the internet at home, in their workplaces, in public open spaces, and while on the move.

Within this context, Western Greece appears to be significantly behind in the use of ICT, both in comparison to other Greek regions and at the European level. In 2019, only 70% of the population in the RWG were internet users, placing it fifth among the Greek regions. Among these users, only half had been using the internet for more than 11 years—the time period during which widespread internet use began in Greece (EUROSTAT, 2019). This lag may be attributed to the fact that RWG has a large rural and elderly population—groups traditionally less familiar with ICT. On the other hand, this situation potentially indicates both low digital skills among large segments of the workforce and the risk that substantial population groups in RWG could face digital—and consequently social—exclusion in the medium term, given the rapid penetration of ICT into daily human activities, especially following the advent of 5G networks.

In 2019, 511,000 citizens in RWG had access to a broadband connection. Of these, 407,000 also had mobile internet access, i.e., through some mobile device (tablet, smartphone, etc.). The mobile telephony penetration rate reaches 152%, meaning many citizens of Western Greece have more than one mobile subscription. Finally, in 2019, 254,000 citizens used at least one e-government service (estimate based on EUROSTAT, 2019 data). The number of e-government service users is particularly low compared to European regions with similar characteristics, mainly due to the limited offering of state services through electronic/remote means. Given the ongoing digitalisation of many procedures by central government services, this number is expected to improve. In any case, it confirms the earlier observation regarding ICT penetration levels.

RWG faces a challenge of low digital skills among its population, with limited prospects for improvement under current conditions. Only 56% of the population are daily internet users, while an even smaller percentage use e-banking services—a clear indicator of a population group's digital maturity (estimate based on EUROSTAT, 2019 data). Only 25% of RWG's workforce is employed in ICT-intensive sectors, placing Western Greece at the bottom among Greek regions. A similar picture emerges regarding tertiary education graduates with advanced digital skills, who make up only 25% of the regional workforce (EUROSTAT, 2019). Only 50% of citizens have basic digital skills, and 56% have basic software usage skills.

Furthermore, only 2% of Western Greece’s citizens have digital skills beyond the basic level—a figure particularly low compared to the European average.

Another major challenge, even for the global economy and major regional economic powers (e.g., USA, EU, BRICS, etc.), over the past decade has been the adoption of the principles and tools of the **Fourth Industrial Revolution (Industry 4.0)** into their existing economic and production models. The EU, in fact, is expected to place special emphasis on promoting these principles and tools during the current funding period (2021–2027). At the national and regional level, there is significant lag in adopting these principles compared to regions and other EU member states.

Greece significantly lags in integrating the principles of the Fourth Industrial Revolution into the current model of public sector operation and business activity. The COVID-19 pandemic crisis strongly highlighted the need to promote digital maturity among Greek organizations and businesses, accelerating digitalisation across all levels (personal life, business activity, and state operation). In Greece, limited digital maturity has resulted in only 36% of employees working in jobs where the use of basic ICT tools and/or programming languages accounts for at least 50% of their tasks. Similarly, out of the 20 occupations with the highest number of workers in Greece (a total of 2,184,690 individuals), only in 8 (650,620 individuals, 29.8%) does ICT usage account for more than 50% of the job duties. This highlights the general digital lag of businesses and workers, as well as the limited technological content of many occupations.

In RWG, only 82% of businesses had an internet connection, and only 17% had introduced technological solutions at any stage of their production process. Among primary sector enterprises, internet access is limited to approximately 37%. Moreover, only 40% of Western Greece businesses have a website, and just about 10% are capable of processing online orders or electronic payments.

The figures across all sectors of the regional economy could improve through the promotion of startup and outward-looking entrepreneurship. In Achaia, an innovation ecosystem has begun to form in recent years; however, it needs to be strengthened in order for its contribution to local and regional economy to grow to a competitive level. Still, the number of individuals—particularly recent graduates in technology- and innovation-intensive fields—who proceed to establish their own businesses or participate in the founding of a business in RWG and Greece remains low compared to the EU. As a result, the regional and national economy is deprived of opportunities to create jobs, develop a strong export-oriented production profile, retain highly qualified graduates in the country, and attract investments.

The integration of Industry 4.0 principles and tools into the regional economy is a complex process. It requires a focus on producing specialized human capital, as well as increased investment in a combination of physical and digital (cyber-physical) infrastructure, aimed at achieving the most efficient possible integration of humans and machines in the production

process. It also requires both the entities responsible for shaping and regulating the business environment, and the businesses themselves, to focus on data processing (big data, open data, metadata) in order to extract useful business insights and support decision-making processes with the goal of improving productivity and efficiency. Businesses in Western Greece appear to have recognized the shift but are unable to keep pace with it. Their main stated needs include electronic invoicing (35.3%), creation of a modern website and/or e-shop (33.9%), and full support for conducting electronic transactions (21.6%).

Sectoral Differences in Digital Maturity

Digitalisation is not uniformly distributed across economic sectors in RWG. The ICT services sector—especially in the regional unit of Achaia—shows higher levels of digital readiness, particularly in software development, IT consulting, and digital services.

In the Region of Western Greece (RWG), **73.7% of ICT enterprises operate in the services sector**, and a large portion of these (59.8%) are involved in **programming and consultancy**, followed by **data processing and web portal-related activities (20.7%)**. These subsectors require high levels of digital infrastructure, skilled personnel, and continuous innovation, indicating a relatively advanced state of digital maturity. Employment patterns reinforce this, with **59.5% of ICT workers** in RWG employed in services—mirroring the sector’s dominance in enterprise distribution.

Within RWG, **Achaia leads** in digital development, hosting **76% of ICT services firms** and **nearly 70% of ICT employment**. This concentration suggests the presence of digital hubs, access to tech talent, and stronger ICT ecosystems. In contrast, the regional units of Aetolia-Acarnania and Ilia lag behind, highlighting geographic disparities in digitalisation within RWG.

By contrast, the **ICT manufacturing sector** shows very low levels of digital presence and maturity, accounting for only **0.8% of ICT enterprises** in RWG and **3% of employment**. Similarly, the **ICT trade sector**, although more developed than manufacturing, remains less digitally intensive, focused more on hardware and equipment distribution than on value-added digital services.

More broadly, the fact that only **0.8% of all enterprises in RWG operate in the ICT sector**, compared to **1.2% nationally**, implies that **traditional economic sectors in the region—such as agriculture, construction, and small-scale manufacturing—are significantly less digitalised**. These sectors typically show slower adoption of digital tools, lack ICT integration in core processes, and face greater barriers in terms of infrastructure, investment, and digital skills.

In summary, digital maturity in RWG is **highly concentrated in the ICT services sector**, particularly in Achaia, with clear gaps in manufacturing, trade, and non-ICT sectors. This uneven distribution of digitalisation points to both **opportunities for targeted digital policy**

interventions and the need to **support lagging sectors and regions** to ensure a more balanced digital transition.

Innovation Capacity and Human Capital Constraints

Digital and innovation capacity in the Region of Western Greece (RWG) is constrained by both structural and human capital limitations, despite some areas of emerging strength. RWG is classified as a **“moderate innovator”** in the 2023 **Regional Innovation Scoreboard (RIS)**, with a **Regional Innovation Index (RII) score of 0.419**. This reflects an **improving performance over time**—notably, a **20.9% increase relative to the EU average since 2016**—yet the region still underperforms compared to both national and European innovation leaders.

RWG demonstrates strengths in **SME collaboration on innovation**, with a high score of **0.918**, placing it significantly above the Greek average and close to the EU frontier in this dimension. The region also performs relatively well in **public sector R&D expenditure (1.26% of GDP; score 0.752)** and **public-private co-publications (score 0.627)**—indicative of a supportive institutional framework and research potential.

However, **critical weaknesses persist in human capital and digital employment**, limiting the region’s capacity to absorb and implement innovation at scale:

- **ICT Employment Deficit:** Only **1.3% of the workforce** in RWG consists of **ICT specialists** (score: **0.100**), the **lowest share among all Greek regions**, and well below the EU average. This shortage is a **key bottleneck** for digital transformation, as SMEs struggle to find qualified personnel to implement and maintain digital systems internally.
- **Low Digital Skills Base:** The share of adults with **above average digital skills** is just **20.9%** (score: **0.344**), also below both national and EU benchmarks. This limits not only the adaptability of the workforce but also the uptake of advanced digital tools by businesses and public services.
- **Tertiary Education & Skills Mismatch:** Although RWG has relatively **strong tertiary education participation (38.3%, score: 0.461)**, and decent infrastructure in its educational institutions, **alignment with labour market needs in the digital economy remains weak**. A key indicator of this misalignment is the **very low rate of lifelong learning (3.2%, score: 0.083)**, which restricts opportunities for upskilling and reskilling in fast-evolving digital domains.
- **Innovation Employment Gap:** Employment in **knowledge-intensive activities** stands at only **7.8%** (score: **0.171**), far below both the Greek average (46) and EU norms (30), suggesting a narrow innovation-driven employment base. Similarly, **only 25% of the workforce is employed in ICT-intensive sectors**, underscoring a broader lack of digital absorption across the regional economy.

While RWG exhibits a growing innovation trajectory and notable strengths in **public sector research** and **SME collaboration**, its **digital transformation is hampered by persistent human capital constraints**. The **shortage of ICT specialists**, **low digital skills levels**, and

limited participation in lifelong learning all present significant barriers to digital and innovation-driven growth.

Policy Agenda and Strategic Direction

Digitalisation of SMEs has become an increasingly prominent priority for the Region of Western Greece and is explicitly integrated across strategic regional, national, and EU-aligned frameworks. Key instruments at both levels seek to promote SME digital adoption, strengthen competitiveness, and close existing digital and innovation gaps—particularly in less developed areas.

Strategic frameworks supporting this agenda include:

- **The Operational Programme of the Region of Western Greece 2021–2027**, which identifies SME digitalisation as a key enabler of regional competitiveness under Specific Objective RSO1.2, with targeted measures for high-intensity digital adopters;
- **The National Recovery and Resilience Plan (Greece 2.0)**, which dedicates over €375 million to SME digital transformation through financial incentives, advisory services, and a national digital marketplace;
- **The NSRF 2021–2027 – Digital Transformation Programme**, which provides dedicated funding for SMEs to adopt digital tools, platforms, and services, alongside investment in digital connectivity and infrastructure;
- **The Digital Transformation Bible 2020–2025**, Greece’s national roadmap that frames SME digitalisation as essential to economic renewal, competitiveness, and inclusion;
- **The Greek National Digital Decade Strategic Roadmap**, which sets quantified national targets for digital business transformation in line with EU 2030 goals;
- **The Regional Smart Specialisation Strategy (RIS3)**, which links digital transformation with innovation in priority sectors like agri-food, green energy, and manufacturing, and supports SMEs through R&D cooperation and technology diffusion.

A particularly relevant initiative at the regional level is the **“DigiWest – Hub for Digital Business Transformation” project**, funded by the Public Investment Program and part of the Operational Programme “Western Greece 2021–2027”. The project is designed to support the integration of ICT in the operations and processes of businesses across the region. Structured in two phases, DigiWest first gathers and adapts international best practices in line with Industry 4.0 principles, compiling them into a methodological guide tailored to the regional context. In its second phase, the project delivers **personalised digital transformation services to 500 selected businesses**, helping them enhance their digital maturity, upskill their workforce, improve productivity, and embrace modern technologies. Rather than offering direct financial aid, DigiWest provides indirect support through dedicated consulting, training, and transformation services, contributing to the formation of a dynamic digital ecosystem in the region.

A broad mix of policy instruments has been introduced to operationalise these strategies. These include **investment grants for digital technology adoption, digital platform development, training and upskilling for SME workforces**, and **connectivity upgrades**—particularly in remote or underserved areas. Horizontal support measures are complemented by more targeted schemes aimed at boosting digital intensity in key sectors and among low-digital SMEs.

Capacity-building initiatives also play a central role. The **National Academy of Digital Skills** and the **National Alliance for Digital Skills and Employment** offer accessible training and lifelong learning opportunities for SME owners and employees, helping to overcome one of the most persistent barriers to digital uptake: lack of digital skills.

Implementation is further reinforced by the region’s alignment with national coordination bodies and European mechanisms such as the European Digital Innovation Hubs (EDIHs). A key role in this direction is expected to be played by the newly established EDIH “easyHPC”, based in Patras with national reach. It is one of seven hubs representing Greece in the newly formed European network and aims to promote the broad adoption of advanced digital technologies—including Artificial Intelligence (AI), High-Performance Computing (HPC), and Cybersecurity—by industry and businesses. The hub specifically focuses on developing digital solutions for the plastics and packaging sector, contributing to the diffusion of innovation and strengthening the digital capacity of SMEs.

Despite the strong strategic orientation and financial support, challenges remain, including the need to better integrate digital and innovation policy across levels of governance, enhance outreach to lagging SMEs, and ensure that digital tools are tailored to the diverse needs of regional businesses. Ongoing monitoring and evaluation mechanisms are being developed to assess the effectiveness and inclusiveness of these instruments.

In conclusion, the Region of Western Greece is actively advancing a multi-level digitalisation agenda for SMEs, supported by a combination of EU, national, and regional instruments. While significant progress is underway, unlocking the full benefits of digital transformation will require targeted implementation, effective coordination, and a sustained focus on bridging both sectoral and territorial divides.

2.3 Identification of Policy Challenges

The policy framework currently supporting SME digitalisation in the Region of Western Greece includes a combination of national and regional instruments. Key among them are the Regional Operational Programme (ROP) 2021–2027, the National Strategic Reference Framework (NSRF) Digital Transformation Programme, and the Greece 2.0 Recovery and Resilience Plan (RRP). These frameworks collectively aim to enhance the digital capabilities of small and medium-sized enterprises through funding, capacity-building, infrastructure,

and advisory support. While the strategic direction of these instruments is consistent with EU policy objectives for the digital transition, several implementation-level challenges persist, limiting their accessibility, effectiveness, and territorial inclusiveness.

One of the most significant challenges remains the uneven level of digital maturity across the SME population in the region. The adoption of digital technologies is concentrated in urban centres—most notably in Patras—where firms are more likely to have the internal capacity and strategic orientation to engage with digital innovation. In contrast, the vast majority of SMEs in rural and semi-urban areas, especially in Aetolia-Acarnania and Ilia, continue to operate with limited or no digital integration. These disparities are shaped by sectoral characteristics, firm size, educational levels of entrepreneurs, and geographic isolation. As a result, a large number of enterprises in agriculture, agri-food processing, hospitality, construction, and retail remain disconnected from digital funding programmes, both in terms of awareness and readiness.

The instruments currently in place, including the ROP measures focused on digital transformation and Greece 2.0's digital toolkits, tend to attract participation from already well-positioned firms. Microenterprises, family-run businesses, and firms lacking prior experience with EU-funded projects often find the administrative burden of these instruments too high. Application processes involve complex documentation, rigid eligibility criteria, and tight implementation timelines, which deter less digitally mature firms from applying. In several cases, SMEs face difficulties in understanding the scope of eligible activities, choosing appropriate digital solutions, or estimating project costs—issues that are rarely addressed through structured pre-application guidance.

Another core weakness is the absence of integrated support services accompanying financial instruments. Although funding is available for digital tools, few schemes offer embedded advisory or mentoring services to help SMEs plan, implement, and sustain their digital investments. This leads to a situation where grants are disbursed without ensuring that the receiving SMEs possess the necessary digital literacy, change management capabilities, or technical knowledge to implement the funded actions effectively. As a result, the long-term impact of such investments is often diminished, with many firms adopting superficial or poorly integrated digital solutions that do not transform their core business processes.

The policy ecosystem also suffers from fragmentation and insufficient coordination among support actors. While there are strong institutions present their activities are largely concentrated in metropolitan areas and are not sufficiently connected to the broader SME population across the region. Innovation support services, business development agencies, and digital consulting networks are either missing or underdeveloped in rural areas, leaving a large portion of SMEs without access to localised, sector-specific digitalisation support. A further barrier is the lack of sector-specific approaches within current instruments. The digitalisation needs of SMEs vary significantly by sector, yet most funding and support measures are designed generically. For example, the requirements of a small hospitality

business seeking to adopt online booking tools differ substantially from those of an agri-food processor considering IoT-based quality control. Without tailored guidance or sector-adapted tools, many SMEs either opt out of applying or make suboptimal investment decisions.

In addition, there is currently no comprehensive monitoring system to assess digital maturity levels among SMEs at the regional level. While data is collected at national scale, disaggregated indicators on digital uptake, policy instrument performance, and regional impact are lacking. This absence of granular monitoring impairs policymakers' ability to track the territorial distribution of digitalisation benefits, identify underserved SME groups, or adapt support mechanisms in real time.

From the perspective of beneficiaries, several barriers continue to surface, such as limited access to information, lack of local advisory services, the high cost of digital transition, and uncertainty about future digital demands and technologies. Among non-beneficiaries—particularly smaller or more traditional enterprises—the most pressing needs include: easy-to-understand, simplified digitalisation schemes; access to local ICT service providers; sector-specific digital solutions; and financial instruments that can be phased or blended with capacity-building support.

A clear distinction must be made between general and specific measures impacting SME digitalisation in the region. **General measures** are those that indirectly influence digital transformation by creating an enabling environment. These include broadband infrastructure expansion, public digital services (e.g., gov.gr), digital skills development initiatives, education reforms, and tax incentives for digital investments. While essential, these measures are broad in scope and do not directly engage SMEs in structured transformation processes. **Specific measures**, on the other hand, are targeted interventions designed to directly support SME digitalisation. These include the ROP actions focused on digital upgrading of enterprises, the digital toolkits under Greece 2.0, EDIH services, and regional initiatives such as DigiWest. These instruments are intended to trigger measurable progress among SMEs but require improvements in accessibility, delivery mechanisms, and integration with skills development programmes.

The challenges identified are deeply linked to both national and regional policy frameworks. The **Digital Transformation Bible (2021–2025)** sets ambitious targets for increasing the digital intensity of enterprises, promoting interoperability, and accelerating digital public services. However, its operationalisation at regional level remains uneven. Similarly, the **National Recovery and Resilience Plan** includes well-funded components for digital investments, yet these instruments often rely on centralised structures and lack the flexibility needed for regional tailoring. At the regional level, the **ROP 2021–2027** aligns well with thematic objectives on SME competitiveness and digital innovation, but local delivery is hindered by institutional capacity gaps, limited multi-level coordination, and insufficient involvement of regional innovation actors in co-designing support mechanisms.

In conclusion, despite the availability of well-structured funding programmes and alignment with EU strategic objectives, the digital transformation of SMEs in the Region of Western Greece remains constrained by a combination of institutional, procedural, and territorial factors. Closing the gap between strategic ambition and practical implementation will require a stronger focus on integrated, localised, and demand-driven support models that reflect the real needs of SMEs across all sectors and geographies of the region.

Table 23: Policy challenges

Title of the Challenge	Description of the challenge
C1: Uneven Digital Maturity and Territorial Disparities	SMEs in urban centres show higher engagement with digital tools, while rural and traditional SMEs—particularly in Aetolia-Acarnania and Ilia—lag behind due to low awareness, skills, and infrastructural barriers. This digital divide remains a structural challenge across the region.
C2: Administrative and Procedural Barriers to Access	Many SMEs face high administrative burdens in accessing digital support instruments. Complex application processes, unclear eligibility criteria, and short implementation deadlines discourage participation, particularly among micro and less-experienced firms.
C3: Lack of Integrated Advisory and Implementation Support	Financial tools are not accompanied by sufficient advisory, mentoring, or aftercare support. SMEs often receive grants without adequate preparation, leading to weak implementation, poor adoption of technologies, and underutilised investments.
C4: Fragmentation of the Innovation and Support Ecosystem	Innovation support structures (universities, incubators, EDIHs) are concentrated in urban areas and poorly connected to the broader regional SME base. Rural and sector-specific SMEs lack access to localised, continuous support services.
C5: Absence of Sector-Specific and Localised Instruments	Current digitalisation schemes are too generic and fail to address the distinct needs of key regional sectors like agri-food, tourism, crafts, or construction. This limits both the relevance and uptake of available tools.
C6: Lack of Monitoring and Regional Performance Data	There is no unified system at regional level to track SME digital maturity or assess the territorial impact of policy instruments. The lack of disaggregated data limits policymakers’ ability to make evidence-based, adaptive decisions.

2.4 Regional Competitiveness

Economic: Employment rates and salary levels in SMEs and ICT sectors

With 643.188 inhabitants, Western Greece represented about 6.2% of the population in Greece in 2023. The gross domestic product per capita, adjusted for price levels (PPS) in Western Greece was 40.1% of the EU27 average, well below the national average of 55.1%. Western Greece benefits from various subsidy programmes aimed at boosting employment, particularly in disadvantaged groups, such as entrepreneurs and youth. These include public benefit employment schemes and training programmes for reskilling in green and digital technologies. These initiatives are designed to promote long-term job creation and workforce development.

DYPA offers subsidies to businesses to hire jobseekers, covering significant portions of wage and social insurance costs. This incentivizes companies to create new jobs while ensuring workers gain meaningful employment. In 2023, more than 281.700 people were active in the labour market in Western Greece. 30.8% had tertiary education, 48.5% had secondary education, and 20.8% had primary education. The employment rate in Western Greece was 45 % in 2023, 1.4 percentage points lower than the national average in Greece and 2.3 percentage points higher compared to 2022. The employment rate for women in 2023 was 34.6%, men had an employment rate of 55.6%, and for the youth the employment rate was 15.9%. The employment rates for women and the youth were below the national average, while the employment rate for men was above the national average.

A pronounced gender employment gap persists, with male employment at 55.6% and female employment at only 34.6% (European Labour Authority, 2024). Moreover, long-term unemployment accounts for over 60% of total unemployment in the region, indicating persistent structural imbalances and limited absorption capacity in local labour markets. Small and medium-sized enterprises (SMEs) form the backbone of the regional economy, primarily in low value-added sectors such as agriculture, construction, and retail (INSETE, 2023). These businesses generally offer salaries below both national and sectoral averages due to low productivity levels and reduced innovation capacity. In contrast, ICT-intensive SMEs in the region tend to offer wages up to 25–30% higher than the regional average, mainly driven by acute shortages in digitally skilled professionals (European Labour Authority, 2024). However, their overall share in the regional employment structure remains marginal, and their spatial concentration is mainly limited to urban centers such as Patras.

Flexible work arrangements such as teleworking or flexible schedules are significantly underutilized, particularly in rural and mountainous areas. These weaknesses, combined with limited digital transformation in traditional SMEs, reinforce youth outmigration and the ongoing brain drain of highly educated professionals to metropolitan areas or abroad (INSETE, 2023). Addressing these asymmetries requires robust policy interventions targeting digital upskilling, financial incentives for SMEs engaging in digital transformation,

and support for ICT cluster development in non-metropolitan areas. Without such measures, regional competitiveness and labour market resilience will remain under threat.

Social: Quality of life index

Although Greece reports moderate life satisfaction levels compared to other EU Member States, the Region of Western Greece (RWG) experiences intensified challenges linked to its demographic composition, geographic morphology, and infrastructural underdevelopment. According to the most recent Quality of Life in European Cities Report Greece achieved an average life satisfaction score of 6.9 out of 10, slightly below the EU-27 average of 7.3. While regional disaggregation is limited in the report, the RWG is notably affected by elevated youth unemployment, ageing population trends, and spatial isolation, particularly in remote areas of Aetolia-Acarmania and mountainous Ilia.

These socio-territorial factors translate into structural deficiencies in access to public goods and services, including primary healthcare, secondary education, and digital connectivity. The Regional Development Programme of Western Greece 2021–2025 underscores that rural and highland municipalities face significant delays in receiving state-provided services, contributing to an uneven distribution of life opportunities across the territory. Environmental safety concerns, linked to extreme weather events and poor waste management infrastructure, particularly in peri-urban zones of Patras and Pyrgos, further undermine subjective well-being indicators.

Additionally, intra-regional mobility remains significantly constrained. According to the Operational Programme of Western Greece 2021–2027, insufficient public transportation options, fragmented inter-municipal networks, and limited multimodal integration contribute to spatial exclusion and curtail labour mobility between rural hinterlands and regional urban centers. This limits the capacity of residents to access higher-order services and employment nodes, reinforcing geographic and socioeconomic disparities within the region.

Despite moderate national performance in quality-of-life metrics, the Region of Western Greece (RWG) remains structurally disadvantaged in terms of digital access and technological equity. Digital infrastructure deficits particularly in remote municipalities of Aetolia-Acarmania and mountainous Ilia reinforce broader spatial and social inequalities. According to empirical data from SMEs operating in RWG, more than 70% of small enterprises in rural areas lack access to advanced digital tools such as ERP, CRM, or cloud-based service platforms. This digital underdevelopment not only constrains local business innovation but also limits community access to e-government, telemedicine, and distance learning services, which are essential public goods in sparsely populated territories.

Furthermore, the digital maturity index (DMI) for RWG SMEs is the lowest among the other Greek regions. The limited uptake of foundational tools such as the national MyData platform or integrated online tax and social security services reflects both infrastructural

weaknesses and cultural resistance to digital transformation. This lag exacerbates service delivery delays and further impedes the region's capacity to meet evolving citizen needs in health, education, and administrative sectors.

Additionally, the lack of regional digital competence centers and public ICT training programmes creates digital skills divide, particularly among older residents and economically inactive youth. According to findings from Anagnostopoulou (2024), the absence of targeted ESG-related digital initiatives in RWG's enterprises diminishes not only the region's economic resilience but also the broader subjective well-being of its population—who perceive themselves as being excluded from the benefits of digital modernisation.

In sum, digital deprivation operates as a key vector of socio-territorial inequality in RWG, amplifying pre-existing gaps in access to public services, job opportunities, and quality-of-life outcomes. Bridging this digital divide requires territorially sensitive investments in connectivity, institutional support for SME digitalization, and inclusive digital literacy initiatives, particularly in rural and peri-urban areas.

In summary, despite moderate national performance in quality-of-life metrics, the Region of Western Greece is marked by internal inequalities that stem from systemic territorial disadvantages. Addressing these gaps requires strategic investments in social infrastructure, spatial planning, and inclusive digital services to enhance regional cohesion and life satisfaction outcomes.

Regional innovation index and innovation ecosystem in Western Greece

Western Greece is classified as a “Moderate Innovator” in the 2023 edition of the Regional Innovation Scoreboard (RIS), exhibiting an overall innovation performance that remains well below the EU-27 average. The region's innovation index stands at approximately 70% of the EU average, reflecting structural limitations in its research and development (R&D) ecosystem and innovation capacity. Despite the presence of institutional assets such as the University of Patras, the Patras Science Park, and the Computer Technology Institute & Press “Diophantus”, the translation of academic research into market-oriented applications remains limited due to insufficient technology transfer mechanisms and fragmented linkages between academia and the private sector.

Furthermore, the region's R&D intensity, as measured by gross domestic expenditure on R&D (GERD) as a percentage of GDP, is among the lowest in the country. This underinvestment constrains the ability of local firms especially SMEs to engage in high-risk, high-return innovation activities. According to the European Innovation Scoreboard 2023, Greece as a whole ranks among the lowest-performing EU Member States in several key innovation dimensions, including firm-level digitalisation, patent applications per million inhabitants, and the availability of venture capital for start-ups and scale-ups. These systemic weaknesses at the national level disproportionately affect regions such as

Western Greece, which lack large metropolitan agglomerations and major industrial anchors.

Moreover, collaborative R&D efforts between firms and public research organizations in Western Greece remain sporadic and uncoordinated. The Revised Operational Programme 2021–2027 acknowledges that while smart specialization strategies (RIS3) are formally in place, their implementation has been partial, with limited spillover effects across traditional sectors such as agri-food, tourism, and manufacturing. Innovation intermediaries and clusters often operate in isolation, and support services for innovation, such as incubators and accelerators, are unevenly distributed across the territory.

In summary, while Western Greece possesses certain institutional and academic assets with innovation potential, these remain underutilized within a fragmented innovation ecosystem. Strengthening regional innovation performance will require a coordinated policy mix focusing on increased R&D funding, reinforcement of university-industry partnerships, improved access to venture financing, and inclusive implementation of RIS3 priorities aligned with the region’s socio-economic profile.

Impact of SME digitalisation on regional competitiveness

Digitalisation plays a critical role in enhancing the competitiveness of SMEs in Western Greece, particularly in the post-pandemic recovery and in alignment with the European Union's dual green and digital transition. Multiple official sources, including the OECD and the European Commission, indicate that SMEs integrating digital tools—such as e-commerce platforms, cloud computing services, artificial intelligence applications, and data analytics—exhibit increased productivity, resilience to external shocks, innovation performance, and export capacity.

According to the Digital Economy and Society Index (DESI), in 2024 approximately 73% of SMEs in the EU had reached a basic level of digital intensity—defined as using at least four out of twelve digital technologies. However, Greece continues to underperform, with only about 53% of SMEs reaching this threshold. This gap is particularly pronounced in rural and less developed regions such as Western Greece, where SMEs face persistent structural barriers: low broadband coverage, limited financial capacity to adopt digital tools, and deficits in digital skills and advisory support.

Quantitative studies based on EU27 data from 2017 to 2021 confirm a strong statistical correlation between higher digital intensity in SMEs and improved innovation performance. One econometric analysis reveals that a 1% increase in SME digital adoption is associated with a 0.16% increase in patent applications, underlining the role of digitalisation in enhancing research outputs and innovation capacity.

The OECD’s 2024 report on “SME Digitalisation to Manage Shocks and Transitions” highlights that digital infrastructure—such as remote working software, digital logistics, and

cloud-based platforms—allowed SMEs to maintain operations during crises such as COVID-19. Nevertheless, the same report documents the obstacles that continue to hinder SME digitalisation: managerial inertia, low awareness of available tools, lack of digital capabilities, and uneven access to high-speed internet services in non-urban areas. In conclusion, while the benefits of digitalisation for SME competitiveness are well-documented, their realisation in Western Greece requires strategic support. Policy recommendations include investment in regional digital infrastructure, subsidised training for digital skills, advisory schemes tailored to SMEs, and the development of regional digital innovation ecosystems that support transformation through coordinated public–private partnerships.

In summary, improved SME digitalisation can unlock higher productivity, innovation capacity, international competitiveness, and resilience. However, closing the gap in regions like Western Greece will require comprehensive support: infrastructure investment, digital skills training (especially for SMEs), tailored funding, and coordinated ecosystem building through digital innovation hubs and policy frameworks.

2.5 Good Practices and Recommendations

Good Practices and Policy Tools – Region of Western Greece

The Region of Western Greece has implemented a targeted portfolio of policy instruments to support innovation, digitalisation, and SME competitiveness, drawing on national and European funding streams, particularly the Recovery and Resilience Facility (RRF), the National Strategic Reference Framework (NSRF) 2021–2027, and regional development programmes. Since 2021, these tools have contributed to strengthening the innovation and entrepreneurship ecosystem, with a focus on digital transition and internationalisation.

One of the flagship instruments is the set of digital transformation schemes funded by the RRF, including programmes such as “Digital Tools for SMEs,” “Digital Transactions,” and “. Programme “Smart Manufacturing” These actions provide direct financial support to micro, small, and medium-sized enterprises for investing in software, automation systems, ERP/CRM platforms, and cybersecurity upgrades. The schemes are implemented by the Ministry of Digital Governance in collaboration with the Ministry of Development and Investments, with voucher-type support ranging from €1,000 to €200,000 per enterprise. In Western Greece, more than 1,000 SMEs have applied under these programmes, aiming to enhance productivity, reduce operational costs, and transition toward more sustainable and resilient business models.

Complementing this, the Regional Operational Program (ROP) of Western Greece under NSRF 2021–2027 has introduced initiatives targeting digital upskilling and technology adoption. Notably, action supporting digital upskilling under the ROP WG 2021–2027” supports training for SME personnel and entrepreneurs in areas such as e-commerce, cloud computing, and data analytics. At the same time, the regional smart specialisation strategy

(RIS3) prioritises sectors such as agri-food, energy, and transport, enabling businesses to align with innovation trends through co-financed R&D and business development projects. A good practice with strong transferability potential is the “DigiWest” initiative, implemented by the Region of Western Greece. This program fosters cross-border cooperation for developing digital platforms, services, and training curricula for SMEs, particularly in rural and less-developed areas. With a total budget of over €1 million (co-financed by Interreg and regional funds), DigiWest promotes access to e-government services and smart tools for business planning. Outcomes include the development of online portals, mentoring networks, and digital readiness diagnostics for over 150 SMEs. Additionally, the region participates in national schemes supported by the RRF such as the “Enhancing Extroversion of Agri-Food SMEs” program (part of Greece 2.0), which enhances export capacity and digital visibility for agro-industrial SMEs. The program funds branding, certification, and digital marketing activities, with significant uptake by producers and cooperatives in Achaia and Ilia.

These interventions are coordinated through a multi-level governance framework the Regional Development Fund, the Managing Authority of the ROP, local chambers, and innovation intermediaries such as Patras Science Park . Together, they help bridge the gap between funding opportunities and SME capacity for digital and green transformation. Overall, Western Greece’s approach highlights the importance of combining national recovery funds with regional smart specialisation and place-based innovation strategies. It offers valuable insights for other EU regions seeking to enhance digital competitiveness, particularly in peripheral or structurally disadvantaged areas.

Table 24: Good practices

Title of the Good Practice	GP Description
Digital Tools for SMEs – Vouchers for Digital Transformation https://greece20.gov.gr/?calls=psifiaka-ergaleia-mme	The action supported SMEs in the Region of Western Greece through vouchers ranging from €900 to €18,000 for the acquisition or leasing of digital products and services (e.g., software, cloud solutions), aiming to enhance digital modernization, remote work, e-commerce, and cybersecurity. It was implemented under the Recovery and Resilience Facility "Greece 2.0" with a total budget of €180,000,000 and duration from 22/06/2022 to 01/11/2022.
Digital Transactions II – Vouchers for e-	The program supports SMEs in the Region of Western Greece through vouchers covering the adoption of digital tools for

<p>Invoicing and e-Payments</p> <p>https://greece20.gov.gr/?calls=psifiakes-synallages-v</p>	<p>invoicing, e-tax documents, and electronic payments, including POS devices, e-invoicing software, and integrated cash systems. Co-funded under the Recovery and Resilience Facility "Greece 2.0", the scheme has a total budget of €61,257,500 and runs from 23/06/2025 to 05/09/2025.</p>
<p>Digital Tools for SMEs – Vouchers for Digital Transformation 2nd Call</p> <p>https://greece20.gov.gr/?calls=prosklisi-ypovolis-aitiseon-chrimatodotisis-gia-tin-entaxi-sto-programma-psifiaka-ergaleia-mme-v</p>	<p>The program supports existing SMEs in the Region of Western Greece through vouchers ranging from €630 upwards, covering up to 90% of eligible costs for acquiring or leasing new digital tools and services to improve business operations, hybrid work, e-commerce, and cybersecurity. It targets specific SME categories, including professionals (e.g., notaries), businesses in disaster-affected areas, and general SMEs. Implemented under the Recovery and Resilience Facility "Greece 2.0", the scheme has a total budget of €42,000,000 and runs from 16/12/2024 to 03/01/2025.</p>
<p>Gigabit Connectivity Voucher Scheme</p> <p>https://greece20.gov.gr/?calls=prosklisi-ypovolis-aitiseon-symmetochis-sto-programma-koyponi-syndesimotitas-gigabit-gigabit-voucher</p>	<p>This scheme provides a one-time voucher of €200 to citizens and SMEs in the Region of Western Greece who currently lack a broadband connection of at least 100 Mbps. Covering up to 50% of eligible expenses, it supports the acquisition and installation of gigabit broadband services, including in-building cabling, activation fees, terminal equipment, and monthly subscription costs for 24 months. The program aims to boost the penetration of high-speed internet across Greece and is implemented in four phases, linked to the Smart Readiness initiative. The total budget amounts to €79,999,921, with €22,875,390 co-funded by the RRF "Greece 2.0". Applications are open from 18/11/2024 to 30/09/2025 (for individuals) and until 15/09/2025 (for SMEs).</p>
<p>Digital Transactions – Vouchers for SMEs</p> <p>https://greece20.gov.gr/?calls=programma-psifiakes-synallages</p>	<p>The “Digital Transactions” program supports SMEs across Greece, including the Region of Western Greece, through vouchers for adopting digital tools related to invoicing, tax documentation, and electronic payments. Beneficiaries can receive funding for a wide range of eligible actions, such as replacing EFT/POS terminals, using mobile invoicing, subscribing to certified e-invoicing services, upgrading fiscal</p>

	<p>devices (FIM, EAFDSS, ADIME), and adopting modern cash register systems. Each category has predefined funding caps and support rates ranging from 90% to 100%. The program targets SMEs active before 01/01/2022, in eligible economic activities, and compliant with EU and national legislation. It is co-funded by the RRF “Greece 2.0” with a total budget of €137,400,000. Applications for the current call (Cycle D and Cycle C) were open from 26/02/2024 to 12/03/2024.</p>
<p>Development of Digital Products and Services https://greece20.gov.gr/?calls=programma-anaptyxi-psifiakon-proionton-kai-ypiresion</p>	<p>The “Development of Digital Products and Services” program provides grants to support investment projects by micro, small, and medium-sized enterprises (SMEs) in the Information and Communication Technologies (ICT) sector in Greece. It funds the full cycle of digital product/service development, including preparatory activities (e.g. market research, feasibility studies, upskilling), development of new digital products/services, and complementary commercialization actions. Eligible enterprises must operate legally in Greece, belong to the ICT sector, and meet specific financial and legal requirements (e.g. not under bankruptcy or recovery orders). Each enterprise can submit only one proposal. Projects must have a budget between €200,000 and €2,000,000. The grant intensity depends on company size, type of activities, and eligible expenditures. It was implemented under the Recovery and Resilience Facility "Greece 2.0". The total program budget is €100 million, fully funded by public resources. The call was open from 22/06/2022 to 31/12/2022.</p>
<p>Digital Tools for SMEs https://greece20.gov.gr/?calls=psifiaka-ergaleia-mme</p>	<p>The “Digital Tools for SMEs” program supported Greek small and medium-sized enterprises with vouchers ranging from €900 to €18,000, intended for the purchase or lease of standardized digital products and related services (e.g., software, cloud tools, cybersecurity solutions). The goal was to enhance business operations, promote hybrid work, improve e-commerce capabilities, and strengthen trust in digital transactions. Eligible beneficiaries included legally established businesses across Greece from key sectors (agri-food, health, ICT, energy, tourism, etc.) that were</p>

	<p>founded before 01/01/2022 and employed between 0.01 and 250 Annual Work Units (AWUs) in 2021. The program was implemented under the EU de minimis regulation, had a total budget of €180 million, and accepted applications via the national Digital SME platform between June 22 and November 1, 2022.</p>
<p>Digital Transformation of the Tourism Enterprises Registry https://greece20.gov.gr/?tenders=psifiakos-metaschimatismos-mitrooy-toyristikon-epicheiriseon</p>	<p>The project “Digital Transformation of the Tourism Enterprises Registry” aims to modernize the national registry system for tourism businesses in Greece through the development of the digital platform mydigitaltourism.gr. The initiative is implemented by the Information Society S.A. under the supervision of the Ministry of Digital Governance, as part of Greece’s Recovery and Resilience Plan (Greece 2.0), Pillar 2: Digital Transition – Action 2.2.6 (16785). The action falls under the broader objective of digital transformation of public administration. The contract is executed via an international open tender procedure above EU thresholds. The project has a total budget of €13,142,880 (excluding VAT). It is fully publicly funded. The deadline for submitting tenders was 27/01/2024. The project aims to enhance administrative efficiency and improve service delivery to tourism enterprises by digitizing processes and establishing a centralized digital registry.</p>
<p>Value-Added Services for the Support Mechanism of the Digital Transformation of SMEs https://greece20.gov.gr/?tenders=psifiakos-metaschimatismos-mikromesaion-epicheiriseon-16706</p>	<p>The project “Value-Added Services for the Support Mechanism of the Digital Transformation of SMEs” concerns the procurement of a multi-lot framework agreement for Subproject 9 of the broader initiative “Digital Transformation of Small and Medium Enterprises.” It is implemented by the Information Society S.A. (KtP M.A.E.) under the responsibility of the Ministry of Digital Governance and is part of Greece’s Recovery and Resilience Plan (Greece 2.0), Pillar 2: Digital Transition – Action 2.3.1 (16706). The action falls within the strategy for advancing the digital transformation of businesses. The aim is to provide high-quality, value-added support services to facilitate the implementation and success of Subprojects 1 & 2 of the overall SME digitalisation initiative. The procedure was conducted through an</p>

	<p>international open tender above EU thresholds. The total contract budget amounts to €9,360,000, fully publicly funded. The tender submission deadline was 24/03/2023. The project seeks to enhance the uptake, coordination, and impact of the digital tools and services offered to SMEs under the digital transformation scheme.</p>
<p>Subproject 2 (SUB2) – Digital Transformation of the Agri-Food Sector (export-oriented agriculture component)</p> <p>https://greece20.gov.gr/?tenders=psifiakos-metaschimatismos-agrodiatروفikoy-tomea-2</p>	<p>The project “Extroverted Agriculture” is Subproject 2 (SUB2) of the broader Action 16653 “Digital Transformation of the Agri-Food Sector.” It is implemented by the Information Society S.A. (KtP M.A.E.) under the responsibility of the Ministry of Rural Development and Food. The project is part of Greece’s Recovery and Resilience Plan (Greece 2.0), under Pillar 4: Private Investments and Economic Transformation – Axis 4.6: Modernization and resilience of key economic sectors – Action 4.6.20. The aim of this subproject is to enhance the digital capabilities and international competitiveness of agricultural and food sector stakeholders by developing and deploying digital tools, platforms, and services that support smart, data-driven, and export-oriented agriculture. The procurement was conducted through an international open tender procedure above EU thresholds. The total contract budget is €25,483,406.45 (excluding VAT), fully publicly funded. The deadline for tender submission was 20/01/2023.</p>
<p>Support for ICT Enterprises in Western Greece</p> <p>https://www.pde.gov.gr/ependyseis/actions/cti.html</p>	<p>This action, funded by the European Regional Development Fund (ERDF) under the Regional Operational Programme “Western Greece 2014–2020,” supported ICT SMEs in the region to develop innovative digital products and services. It aimed to enhance competitiveness, productivity, knowledge-intensive entrepreneurship, and internationalization of the regional ICT sector, especially through synergies with dynamic sectors such as manufacturing, tourism, culture, and agri-food. The program also contributed to job retention and creation, particularly of high-skilled and high-value positions. It aligned with Priority Axis 1 of the ROP and targeted the Specific Objective 2.b.1 – increasing the number of enterprises modernizing through</p>

	<p>ICT-based product and service development. Grants were provided under the General Block Exemption Regulation (GBER – 651/2014), with a focus on turning knowledge into business opportunities through applied research, academia-industry collaboration, product development, and pilot production in Western Greece.</p>
<p>Modern Manufacturing in Western Greece – Boosting the Scale and Competitiveness of Manufacturing and Related Enterprises</p> <p>https://www.espa.gr/el/Pages/ProclamationsFS.aspx?item=6472</p>	<p>This action, co-funded by the European Regional Development Fund (ERDF) and the European Social Fund (ESF) through flexibility provisions, is part of the Operational Programme "Western Greece 2014–2020" under the National Strategic Reference Framework (NSRF 2014–2020). It falls under Priority Axis 1: "Enhancing competitiveness and extroversion of enterprises, transition to quality entrepreneurship, with a focus on innovation and increasing domestic added value", and contributes to Specific Objectives 1.b.1 (Increasing private sector participation in research and innovation) and 3.a.1 (Strengthening SME activity in smart specialisation sectors).</p>
<p>Modern Manufacturing in Western Greece</p> <p>https://www.espa.gr/el/Pages/ProclamationsFS.aspx?item=5660</p>	<p>The “Modern Manufacturing in Western Greece” program, co-funded by the European Regional Development Fund (ERDF) and the European Social Fund (ESF) through flexibility rules, supports SMEs in the region to expand and modernize manufacturing activities. Implemented under the Operational Programme "Western Greece 2014–2020", it aligns with Priority Axis 1 and contributes to Specific Objectives 1.b.1 (increase private sector participation in R&D) and 3.a.1 (strengthen SME activity in smart specialisation sectors). The program funds projects across three strategic pillars: manufacturing diversification and transformation (towards innovative, export-oriented, and environmentally friendly products), digital industry (supporting flexible and digitalized production and distribution processes), and energy efficiency (reducing energy consumption and aligning with future EU energy standards). It offers financial incentives and investment</p>

	<p>tools to drive competitiveness, productivity, and technological adaptation among manufacturing SMEs in Western Greece.</p>
<p>Green Transition for SMEs</p> <p>https://www.espa.gr/el/Pages/ProclamationsFS.aspx?item=5666</p>	<p>Funded through the National Strategic Reference Framework (NSRF) and co-financed by the ERDF and national resources, the “Green Transition for SMEs” initiative promotes sustainable transformation among micro, small, and medium-sized enterprises across Greece. Implemented under the NSRF 2021–2027, it consists of two distinct actions: (1) "Green Transformation of SMEs" (€300 million), which supports energy efficiency upgrades, circular economy practices, and low-carbon solutions using modern technologies and infrastructure, and (2) "Green Productive Investment of SMEs" (€400 million), which fosters sustainable production, green mobility, and digital innovation. Both actions provide grants for eligible costs such as green equipment, electric vehicles, eco-certifications, consultancy, and salary costs for new staff. The program targets enterprises with at least one full financial year and specific sector eligibility (based on NACE codes), and it requires a minimum employment level prior to application. Implementation duration is capped at 30 months from project approval.</p>

<p>Implementation of Upskilling Programmes in Digital Technologies for Private Sector Employees</p> <p>https://www.espa.gr/el/Pages/ProclamationsFS.aspx?item=5733</p> <p>https://www.espa.gr/el/Pages/ProclamationsFS.aspx?item=6377</p>	<p>Implemented within the framework of the National Alliance for Digital Skills and Employment and funded by the NSRF 2021–2027, this initiative supported the development of upskilling actions for private sector employees with medium to high levels of digital maturity. With a total budget of €62.5 million, the program focused on training in the use and management of innovative digital technologies and cybersecurity. The training was delivered remotely, aiming to enhance personal development and better prepare participants for evolving labour market demands. Eligible applicants included national-level institutional social partners, chambers, associations of chambers, and ICT business associations that are members of the National Alliance. The program contributed to strengthening Greece’s digital workforce in line with the country’s digital transition strategy.</p>
<p>DigiWest – Regional Hub for Business Digital Transformation</p> <p>https://digiwest-pde.gr/index.php/to-ergo</p>	<p>The DigiWest – Business Digital Transformation Hub is an initiative of the Region of Western Greece under the framework of regional cohesion policy. It aims to support local enterprises through the integration of advanced information and communication technologies into their operations and processes. The project provides tailored services to 500 businesses in the region to enhance their digital skills and capabilities, improve productivity, and boost competitiveness. Drawing on the principles of Industry 4.0, international models and best practices for digital transformation are collected and adapted to the regional business context, forming a methodological guide specifically designed for local needs. These practices are piloted in selected enterprises, with the broader goal of strengthening digital maturity, fostering digital competencies among entrepreneurs and employees, promoting innovation and extroversion, and ultimately establishing a regional digital hub for networking and business support.</p>

2.6 Data Infrastructure

Assessing the level of digitalisation and competitiveness of SMEs in the Region of Western Greece (RWG) requires a multi-layered data infrastructure that combines national and regional statistical sources, administrative registries, and European benchmarking tools. In recent years, Greece has advanced in developing strategic and technical frameworks to monitor digital transformation, yet significant gaps persist in terms of regional disaggregation, SME-specific metrics, and real-time performance indicators.

Strategic and Institutional Framework

At the national level, the Ministry of Digital Governance is the lead authority overseeing Greece's digital transformation agenda, in line with the Digital Transformation Bible (2020–2025) and the strategic priorities of the Greek Recovery and Resilience Plan (RRP). These frameworks emphasise SME digitalisation, digital public services, broadband infrastructure, and innovation ecosystems as pillars of competitiveness.

At the regional level, the Region of Western Greece has incorporated digitalisation priorities within its Regional Development Programme (RDP) 2021–2025 and the updated Operational Programme 2021–2027 under the NSRF. These documents outline objectives such as upgrading digital infrastructure in rural municipalities, improving SME access to e-government services, and strengthening digital skills through vocational training and technical education initiatives.

Available Data Sources and Monitoring Tools

The main source for national-level statistics on SME digitalisation is the Hellenic Statistical Authority (ELSTAT), which annually conducts the Survey on ICT Usage in Enterprises in alignment with Eurostat methodologies. These data provide insights into digital tool adoption (e.g., cloud computing, ERP systems, websites), broken down by enterprise size and economic sector; however, regional-level breakdowns are not provided. According to the latest available results (2023), only 53% of Greek SMEs achieved a basic level of digital intensity, compared to the EU average of 73%.

Additional information on Greece's digitalisation progress is captured through the historical DESI indicators (up to 2022) and Digital Decade Country Reports (from 2023 onward), which aggregates national indicators across dimensions such as connectivity, digital public services, human capital, and integration of digital technologies. Although these indicators are available only at the national level, with no NUTS 2 regional data provided, they still serve as a key benchmarking tool for identifying structural weaknesses, including low broadband coverage in rural areas and underdeveloped digital skills in the workforce.

Administrative and institutional datasets also play a critical role. The National Register of Businesses (GEMI), the General Secretariat for Information Systems (GSIS), and the Independent Authority for Public Revenue (IAPR) maintain registries of digital service uptake on firms, including e-invoicing adoption, participation in digital voucher schemes, and use

of online tax platforms. Additionally, the digital platform gov.gr has expanded significantly since 2020, offering over 1,500 online services, many of which are utilised by SMEs for licensing, certification, and compliance processes.

At the regional level, data availability is more limited. Some monitoring is conducted through the Regional Observatory for Social Inclusion and Development of Western Greece; however, its focus is primarily socio-economic, and it does not systematically track SME digitalisation metrics. This limited regional-level monitoring highlights the need for targeted data collection to support evidence-based policymaking on SME digitalisation.

Technical Infrastructure and Platforms

Greece has made considerable strides in building digital infrastructure that supports data generation, integration, and service delivery. Projects such as Syzefxis II and the National Cloud (G-Cloud) provide the backbone for interconnecting public institutions, which in turn improves the availability and quality of administrative data relevant to SMEs. Moreover, platforms such as IDIKA (eHealth infrastructure), ERGANI (labour market monitoring system), and the E-Services Portal of the Ministry of Labour offer structured datasets on employment, training, and service delivery that can indirectly inform digital competitiveness assessments (IDIKA, 2023, Ministry of Labour, 2023).

In addition to national infrastructure, EU-funded programmes have further strengthened SME digital engagement. For instance, the “Digital Transformation of SMEs” subsidy scheme under the Recovery and Resilience Plan (RRP) provides digital vouchers for acquiring hardware, software, and consulting services. The platform kynotita.gov.gr monitors uptake by region and sector, although access to more granular, region- and sector-specific data is limited. Similar initiatives, such as “Digital Tools for SMEs” and “Digital Skills Upskilling for Employees,” are currently being implemented, but detailed NUTS2-level reporting remains limited, constraining region-specific policy evaluation.

Gaps in Data Infrastructure

Despite the growing number of initiatives and data sources, several limitations persist in capturing SMEs' digital maturity and competitiveness in Western Greece: Lack of regionalised indicators: Most national datasets do not offer NUTS2 or NUTS3 breakdowns. Thus, regional policymakers lack precise data on digital adoption among SMEs in Aetolia-Acarnania, Iliia, and Achaia, hindering targeted intervention design. Exclusion of micro-enterprises: most surveys typically cover only enterprises with 10 or more employees, neglecting micro-firms, which constitute over 96% of businesses in RWG (ELSTAT, 2023). These firms are less likely to adopt advanced digital tools but are disproportionately affected by digital exclusion. Weak integration between digitalisation and performance data: There is limited availability of linked microdata that combines digital uptake with outcomes such as productivity, exports, or innovation activity. This hampers the ability to assess the real impact of digital tools on SME competitiveness. Insufficient real-time and digital-behaviour

data: Data on SME participation in e-commerce, digital payments, or online service usage is often outdated or unavailable. There is no real-time dashboard to monitor progress at the regional level. Lack of sector-specific insights: While broad sector categories exist, there is insufficient detail on how specific industries e.g., agri-food, manufacturing, or tourism—utilize digital tools. Sectoral variation is essential for smart specialisation strategies.

3. Summary

The digitalisation of SMEs in the Region of **Western Greece** is increasingly recognised as a catalyst for productivity, competitiveness, and regional convergence with EU priorities. SMEs constitute the overwhelming majority of enterprises in the region and are central to economic activity, yet they exhibit **low to moderate levels of digital maturity**. While basic ICT tools are used by many firms, especially those located near Patras and linked to academic and research institutions, the uptake of advanced technologies—such as artificial intelligence, big data analytics, cloud computing, and Industry 4.0 solutions—remains limited. SMEs in rural parts of Aetolia-Acarmania and Ilia continue to lag behind due to skills shortages, poor broadband infrastructure, and low awareness of digital benefits.

The regional and national policy framework provides targeted digitalisation support through strategic and funding instruments aligned with EU Cohesion Policy and Digital Europe priorities. Key frameworks include the **Regional Operational Programme (ROP) of Western Greece 2021–2027**, the **National Recovery and Resilience Plan (Greece 2.0)**, the **NSRF 2021–2027**, and the **Smart Specialisation Strategy (RIS3)**. These are complemented by specific measures to enhance the digital transformation of SMEs such as:

- **Digital Transformation for SMEs (NSRF & RRF funding tools)**
- **Digital Business Upgrading Actions under RSO1.2 (ROP Western Greece)**
- **Digital Skills Enhancement Programmes (national VET and reskilling initiatives)**
- **Ultra-Fast Broadband (UFBB) and Rural Connectivity Projects**
- **Innovation Vouchers and Technology Transfer Support actions**

Despite this structured policy mix, **major challenges** remain:

- **Digital divide within the region:** Patras benefits from proximity to universities and ICT clusters, while rural and peripheral areas face structural barriers.
- **Skills gap:** SMEs lack digitally skilled staff, while brain drain reduces the regional talent pool.
- **Low awareness and limited advisory support:** Many SMEs do not have access to tailored digital transformation guidance.
- **Fragmentation of support:** Limited integration between regional, national, and EU initiatives reduces long-term impact.
- **Insufficient innovation culture:** Few SMEs engage in R&D or adopt strategic digitalisation roadmaps.

A further constraint is the **limited data infrastructure** for evidence-based policymaking. Existing regional assessments draw on ROP monitoring data, RRF programme reports, RIS3 updates, and EU datasets (e.g. Digital Decade indicators and historical DESI metrics), but these do not provide:

- Micro-level SME indicators on digital adoption,
- Sector-specific digitalisation trends,
- Geographically disaggregated data within the region,
- Outcome-based evaluation linking digital investment to SME performance.

Currently, data is collected by regional managing authorities, national ministries, and statistical services, but **there is no integrated regional dashboard** to monitor SME digital maturity or programme effectiveness.

Key Measures Needed

- Strengthen regional data collection systems and establish **digital maturity assessments** at SME level;
- Develop a **Regional SME Digitalisation Observatory**;
- Promote **targeted advisory services** and digital coaching through regional networks;
- Ensure **balanced access** to funding and broadband infrastructure across all subregions;
- Integrate **skills development** with SME digital upgrade initiatives;
- Introduce clear **monitoring and evaluation mechanisms** to assess policy impact.

Overall, Western Greece has established a coherent strategic foundation for SME digitalisation. However, bridging the regional digital divide, improving programme coordination, and enhancing the data ecosystem are essential to accelerate a fair and effective digital transition.

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State of the Art Report, North Macedonia

1. Regional Background Information

1.1 Introduction

North Macedonia, a landlocked country in Southeast Europe on the Balkan Peninsula, is an official candidate country for European Union (EU) membership, a status that profoundly shapes its national development agenda. This commitment is reflected in its National Development Strategy (NDS) 2024-2044 and other policy reforms, which are explicitly aligned with EU policies and integration efforts. The country actively participates in EU pre-accession assistance programs, such as IPA III, and various other EU initiatives aimed at fostering digital transition and regional development. Digitalisation is identified as a central element and a fundamental prerequisite for progress across all strategic areas outlined in the NDS 2024-2044¹, including economic competitiveness, sustainable local development, social inclusion, effective governance, and societal resilience.

Economic Significance: North Macedonia is categorized as an upper-middle-income economy. According to official data from the State Statistical Office, North Macedonia's gross domestic product (GDP) in 2023 amounted to 897.7 billion denars, which is approximately €14.6 billion, reflecting a nominal growth of 10.0% over 2022 and a real growth rate of 2.1%. This is the last officially confirmed annual figure. For 2024 and 2025, the data are estimates rather than final results. In 2024, quarterly estimates suggested that the economy expanded by about 3.2% year-on-year in the fourth quarter, while for 2025, the second-quarter estimate indicated continued momentum with 3.4% growth compared to the same quarter of the previous year. In euro terms, these estimates imply that GDP remains on a steady upward trajectory, with the economy hovering in the range of €15–16 billion, though the final annual figures will only be confirmed once the official accounts are published²³. The manufacturing sector forms the largest component of the economy, accounting for 30.4% of GDP in 2022, followed by wholesale and retail trade at 11.2% and construction at 8.6%⁴. Micro, small, and medium-sized enterprises (MSMEs) form the core

¹North Macedonia, *National Development Strategy 2024-2044* (Skopje: Government of North Macedonia, 2024), https://www.nrs.mk/content/NDS%206.11.2024_EN.pdf.

²State Statistical Office of the Republic of North Macedonia. Gross Domestic Product 2023, Preliminary Data. Skopje: State Statistical Office, 2024. <https://www.stat.gov.mk/PrikaziSooostenie.aspx?rbtxt=32>

³State Statistical Office of the Republic of North Macedonia. Gross Domestic Product, Quarterly Data, Second Quarter 2025. Skopje: State Statistical Office, 2025. <https://www.stat.mk/en/stat/economy-and-finances/gross-domestic-product/gross-domestic-product-quarterly-data/gross-domestic-product-second-quarter-2025/>

⁴State Statistical Office (Republic of North Macedonia). "Components of GDP by Sections and Divisions of NKD Rev. 2, by Years." MakStat Database. https://makstat.stat.gov.mk/PXWeb/pxweb/mk/MakStat/MakStat__BDP__BDPInvesGodisni__GodisniBDPsp

of North Macedonia's economy, comprising 98.5% of all registered businesses and contributing 54.8% of total employment in 2023⁵. However, SME productivity, measured as value added per person employed, stood at only EUR 10,900 in 2019, approximately one-quarter of the EU average of EUR 42,600⁶. The ICT sector in North Macedonia has sustained steady growth, with annual expansion rates between 2.5% and 8%, reaching a market value of approximately USD 1 billion in 2022. By 2024, the sector employed 23,948 people—an increase of 10.7% compared to the previous year—and generated €1.655 billion in operating revenues, reflecting a 12.5% year-on-year rise⁷.

Socio-Demographic Characteristics: According to the census from 2021, North Macedonia has a population of approximately 1.83 million people. The society is predominantly urban, with 62% of its population residing in urban areas, and exhibits a median age of 40.08 years⁸. These demographic characteristics, including a declining birth rate (fertility rate of 1.5 children per woman) and an increasing median age, are consistent with trends observed in many other European nations. The country faces a long tradition of emigration, with more than 500,000 citizens residing abroad (unofficially speculated), which is one of the largest diasporas globally as a share of the total population. This out-migration of the working-age population, coupled with an aging populace, presents a compelling case for accelerated digitalisation to enhance productivity per worker and sustain economic growth.

Role in National and European Contexts: North Macedonia's strategic orientation towards EU integration is clearly reflected in its National Development Strategy (NDS) 2024-2044, which identifies digitalisation as a central element for progress across all strategic areas.

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⁵ State Statistical Office of the Republic of North Macedonia. "Structural Business Statistics 2023" <https://www.stat.mk/mk/stat/%D0%B5%D0%BA%D0%BE%D0%BD%D0%BE%D0%BC%D0%B8%D1%98%D0%B0-%D0%B8-%D1%84%D0%B8%D0%BD%D0%B0%D0%BD%D1%81%D0%B8%D0%B8/struktturni-delovni-statistiki/struktturni-delovni-statistiki/struktturni-delovni-statistiki-2023-godina-definitivni-podatofi/>.

⁶ European Commission. *North Macedonia – 2021 SME Country Fact Sheet*. Brussels: Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, September 2021. https://enlargement.ec.europa.eu/system/files/2021-09/north_macedonia_-_sme_fact_sheet_2021.pdf.

⁷ MASIT – ICT Chamber of Commerce. "Comparative Analysis of ICT Sector Parameters in Macedonia 2024". <https://masit.org.mk/wp-content/uploads/2025/06/komparativna-analiza-na-parametrite-vo-ikt-sektorot-vo-makedoni-a.pdf>.

⁸ State Statistical Office of the Republic of North Macedonia. *Census of Population, Households and Dwellings in the Republic of North Macedonia, 2021*. Skopje: State Statistical Office, 2022. <https://popis2021.stat.gov.mk/>

The Smart Specialisation Strategy (S3-MK) 2024-2027⁹ explicitly focuses on embedding knowledge, innovation, and technology across key economic sectors, designating Information and Communication Technologies (ICT) as a core priority domain. Legislative reforms, such as the Law on Electronic Communications¹⁰ and the pioneering Law on Safety of Networks and Information Systems (Cybersecurity Law)¹¹, directly mirror key EU directives like the NIS 2 Directive, the Electronic Communications Code, and the Gigabit Infrastructure Act. This alignment demonstrates a strategic understanding that digital maturity is crucial for meeting the *acquis communautaire* and facilitating EU accession.

1.2 Economic Profile of the Region

North Macedonia is categorized as an upper-middle-income economy. According to official data, North Macedonia's GDP in 2023 reached €14.6 billion, while estimates for 2024 and 2025 indicate steady growth of around 3.2% and 3.4%, with the latest projection placing GDP for 2025 at approximately €15–16 billion. The economy is anticipated to experience a growth rate of 3.2% in 2025¹². The manufacturing sector forms the largest component of the economy, accounting for 30.4% of GDP in 2022, followed by wholesale and retail trade at 11.2% and construction at 8.6%¹³.

In 2023, 68,004 enterprises engaged in market activities, generating 2,078,605 million denars of turnover and 445,041 million denars of value added¹⁴. Micro, small, and medium-sized enterprises (MSMEs) form the core of North Macedonia's economy, comprising 98.5% of all registered businesses and contributing 54.8% of total employment in 2023¹⁵. In the

⁹ Ministry of Economy of the Republic of North Macedonia. *Draft Smart Specialisation Strategy of the Republic of North Macedonia (S3 – MK 2023–2027)*. Skopje: Ministry of Economy, November 2023. <https://mon.gov.mk/stored/document/Draft%20S3%20MK.pdf>

¹⁰ Agency for Electronic Communications of the Republic of North Macedonia. *Law on Electronic Communications*, March 2018. https://aek.mk/wp-content/uploads/2018/03/k2_attachments_2018_ZEK_Prechisten_tekst.pdf

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¹² International Monetary Fund. "North Macedonia." IMF. <https://www.imf.org/en/Countries/MKD>.

¹³ State Statistical Office (Republic of North Macedonia). "Components of GDP by Sections and Divisions of NKD Rev. 2, by Years." MakStat Database. https://makstat.stat.gov.mk/PXWeb/pxweb/mk/MakStat/MakStat__BDP__BDPInvesGodisni__GodisniBDPsporedESS2010/375_NacSma_Mk_09p2a_01ml.px/table/tableViewLayout1/?rxid=46ee0f64-2992-4b45-a2d9-cb4e5f7ec5ef.

¹⁴ State Statistical Office of the Republic of North Macedonia. "Structural Business Statistics, 2023, Final Data." Skopje: State Statistical Office, June 18, 2025. <https://www.stat.mk/en/stat/economy-and-finances/structural-business-statistics/structural-business-statistics/structural-business-statistics-2023-final-data/>

¹⁵ State Statistical Office of the Republic of North Macedonia. "Structural Business Statistics 2023" <https://www.stat.mk/mk/stat/%D0%B5%D0%BA%D0%BE%D0%BD%D0%BE%D0%BC%D0%B8%D1%98%>

Skopje region, there were 28.531 businesses in 2023, out of which 88.4% micro(employing up to 10 people), 8.7% small(employing up to 50 people), and 2.3% medium sized enterprises(employing up to 250 people).¹⁶

The ICT sector in North Macedonia has sustained steady growth, with annual expansion rates between 2.5% and 8%, reaching a market value of approximately USD 1 billion in 2022. By 2024, the sector employed 23,948 people—an increase of 10.7% compared to the previous year—and generated €1.655 billion in operating revenues, reflecting a 12.5% year-on-year rise.

As of 2024, the percentage of enterprises with 10 or more employees that have internet access has increased significantly to 98.9%¹⁷. ICT usage among enterprises in North Macedonia was widespread across most sectors, with overall computer usage at 99.3% and internet access at 99.1%. Fixed broadband connections were the dominant form of internet access, reaching 97.2% of enterprises, while 91.9% reported contracted download speeds of at least 30 Mbit/s and 58.0% speeds of at least 100 Mbit/s. E-sales (via web or EDI) were most prevalent in the trade (23.5%) and accommodation/food services (29.3%) sectors, with web sales alone showing similar patterns. EDI-type sales were relatively rare, peaking in manufacturing (3.2%) and trade (3.7%). These figures indicate a mature stage of basic ICT adoption across sectors, though the intensity of digital commerce varies considerably by industry, with service-oriented sectors leading in online transactions.

1.3 HR Profile of the Region

Higher education in North Macedonia is characterized by a significant number of students pursuing tertiary education, though recent data indicates a slight decline in enrollment. For the 2023/2024 academic year, there were 52,316 students enrolled in the first cycle of studies, a 2.8% decrease from the previous year. Despite this, the gross tertiary education enrollment rate was 53.16% as of 2022, a notable increase from prior years. A significant trend is the higher enrollment of women, who make up 58.7% of the student body. The vast majority of students, around 77.9%, choose to attend state-funded higher education institutions over private ones. These enrollment trends occur within a broader context of a shrinking school-age population and "brain drain," where many young, educated people

[D0%B0-%D0%B8-%D1%84%D0%B8%D0%BD%D0%B0%D0%BD%D1%81%D0%B8%D0%B8/strukturni-delovni-statistiki/strukturni-delovni-statistiki/strukturni-delovni-statistiki-2023-godina-definitivni-podatofi/](https://makstat.stat.gov.mk/PXWeb/pxweb/mk/MakStat/MakStat__DelovniSubj__AktDelovniSubjekti/400_Delovni_Reg_Ops_Golemina_Vraboteni_ml.px/table/tableViewLayout2/).

¹⁶ State Statistical Office of the Republic of North Macedonia. Number of Active Business Entities by Region, Activity, and Size (by Number of Employees), MakStat PX-Web database. https://makstat.stat.gov.mk/PXWeb/pxweb/mk/MakStat/MakStat__DelovniSubj__AktDelovniSubjekti/400_Delovni_Reg_Ops_Golemina_Vraboteni_ml.px/table/tableViewLayout2/.

¹⁷ **State Statistical Office of the Republic of North Macedonia.** *Usage of Information and Communication Technologies in Enterprises, 2024.* Skopje: State Statistical Office, October 2, 2024. https://www.stat.gov.mk/PrikaziSoopstenie_en.aspx?rbtxt=76.

emigrate for better opportunities abroad, posing a long-term challenge to the country's skilled workforce.¹⁸

Among young adults, tertiary attainment remains below the EU average but rising: in 2022, 37.7% of North Macedonians aged 25–34 had completed tertiary education.¹⁹ Results from the Adult Education Survey 2022 show robust participation in learning: 27.7% of people aged 18–69 took part in formal or non-formal education and training, rising to 37.2% among those 25–34. Learning was mainly non-formal (71.8%), especially on-the-job training (48.7%) and courses (37.8%).²⁰

Digital literacy rates in North Macedonia consistently remain below the EU average. While urban areas have shown some improvement, rural communities and marginalized groups face significant barriers in accessing digital education programs. Only 32% of North Macedonia's population possesses basic digital skills, despite approximately 80% having internet access. This highlights a critical "skill-access paradox"²¹.

A significant impediment for Macedonian SMEs is the pronounced lack of digital skills among their employees, particularly the ability to effectively use online tools and digital platforms. Micro-businesses, in particular, exhibit low levels of digital skills, often limited to very basic competencies.

Recent analyses point to a misalignment between the education system and the needs of the ICT industry. While there is a high demand for programmers, software engineers, and AI specialists, the supply of graduates with the right skills is insufficient. This issue is compounded by low wages and a perception of limited opportunities, which further encourage emigration.²²

¹⁸ **State Statistical Office of the Republic of North Macedonia.** "Enrolled Students at Higher Vocational Schools and Faculties in the Republic of North Macedonia for the 2023/2024 Academic Year (First Cycle of Studies)." Skopje: State Statistical Office, July 3, 2024. Accessed August 8, 2025. <https://www.stat.gov.mk/PrikaziSoopstenie.aspx?rbtxt=29>.

¹⁹ https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Tertiary_education_statistics

²⁰ https://www.stat.gov.mk/pdf/2023/2.1.23.31_mk.pdf

²¹ **Zekiri, Ardita, and Darinka Vasquez.** "North Macedonia Sets a Benchmark for Digital Readiness in the Region." *UNDP North Macedonia Blog*, August 14, 2024. <https://www.undp.org/north-macedonia/blog/north-macedonia-sets-benchmark-digital-readiness-region>.

²² **Ss. Cyril and Methodius University in Skopje, Istanbul University, Van Yüzüncü Yıl University, Yozgat Bozok University, Adama Science and Technology University, Bule Hora University, National University of Life and Environmental Sciences of Ukraine, National Aviation University, and Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University.** "Comparative Analysis of Skill Shortages, Skill Mismatches, and the Threats of Migration in Labor Markets: A Sectoral Approach in North Macedonia, Türkiye, Ethiopia, and Ukraine." *Social Sciences* 14, no. 5 (2025): 294. <https://doi.org/10.3390/socsci14050294>.

The National ICT Strategy 2023-2027²³ specifically focuses on aligning education curricula with the evolving needs of the industry . Initiatives like the Education Management Information System (EMIS) project have improved data management and analysis within the education sector.²⁴ Vocational education and training (VET) participation rose from 64% (2022/23) to 67.3% (2023/24), with graduates achieving higher employment rates than general education peers. Two new regional VET centers were established, enhancing collaboration with businesses to offer training aligned with labor market needs. Dual education has expanded, with more companies offering placements, and 84% of VET schools participated, with one in three VET students enrolled in dual VET.²⁵

1.4 Socioeconomic Conditions and Employment Opportunities

North Macedonia's labor market has strengthened, with the employment rate reaching 45.8% in 2024²⁶, though it remains well below the EU-27 average of 75.8%²⁷. The total unemployment rate dropped to 12.4% in 2024. Furthermore, the unemployment rate of people with university level education dropped by 15.4% in comparison to the year before. The youth unemployment rate (15-24) remains high at 29%. The overall labor force was 792,779 in 2024, with 688,296 employed . In 2024, the wholesale and retail trade sector employed the largest share of the workforce in North Macedonia, accounting for approximately 14.8% of total employment, while the information and communication (ICT) sector represented about 3.3%.

In January 2025, the average monthly net wage in North Macedonia was 43,050 denars. In 2024/2025, the average net monthly wage in North Macedonia was approximately €730, compared to €923 in Bulgaria, €1,318 in Croatia, and €1,225 in Greece. The highest sectoral wage was in Information and Communication at around 78,000 denars(approx.1300€), while the lowest was in Accommodation and Food Service Activities at roughly 27,000

²³ Government of the Republic of North Macedonia. *National ICT Strategy 2023–2027 (Draft)*. Skopje: Ministry of Information Society and Administration, 2023. <https://mon.gov.mk/stored/document/Draft%20S3%20MK.pdf>.

²⁴ European Commission, “**North Macedonia Report 2024**,” Directorate-General for Neighbourhood and Enlargement Negotiations, Brussels, 30 October 2024, PDF. https://enlargement.ec.europa.eu/document/download/5f0c9185-ce46-46fc-bf44-82318ab47e88_en?filename=North+Macedonia+Report+2024.pdf

²⁵ European Training Foundation. *North Macedonia: VET System and Employment Outcomes*. Turin: ETF, 2023. <https://www.etf.europa.eu>.

²⁶ **State Statistical Office of the Republic of North Macedonia**. *Labour Market News Release No. 2.1.25.04: Active Population in the Republic of North Macedonia, 2024*. Skopje: State Statistical Office, March 14, 2024. PDF. https://www.stat.gov.mk/pdf/2025/2.1.25.04_mk.pdf.

²⁷ Eurostat. “EU’s Employment Rate Reached Almost 76 % in 2024.” *Eurostat News*, April 15, 2025. <https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20250415-1>.

denars(approx.450€)²⁸. The ICT sector's wage level is therefore the top among all sectors, significantly exceeding both the national average and other high-paying sectors.

In the fourth quarter of 2024, North Macedonia recorded a job vacancy rate of 1.93%, below the euro area average of 2.4%. In North Macedonia, the accommodation and food service activities sector posted the highest job vacancy rate at 3.47% (662 vacancies out of 18,410 occupied posts), slightly above the rates recorded in the euro area (3.4%) and the EU (3.3%). By contrast, the information and communication (ICT) sector registered a vacancy rate of 1.71% (359 vacancies out of 20,646 occupied posts), well below the corresponding figures for the euro area (2.7%) and the EU (2.5%), suggesting comparatively stronger demand pressures in hospitality and more moderate demand in ICT.^{29,30}

2. Analysis and Assessment of Policy Instruments

2.1 Policy Instruments

Institutional Background

Small and medium-sized enterprises (SMEs) are widely recognized as the dominant and essential factor in North Macedonia's economy. Despite their importance, many of these businesses are not prepared for the comprehensive changes required for digital transformation. This challenge is acknowledged and addressed at the highest levels of national policy. The National Development Strategy (NDS) 2024–2044³¹ identifies a "Sustainable, Innovative and Competitive Economy" as a key strategic area, with digitalization serving as a central element and a fundamental prerequisite for progress across all sectors. This strategic alignment elevates digitalization from a mere technical issue to a core national priority tied to long-term economic prosperity and stability.

North Macedonia's government has recognized SME digitalization as a priority for competitiveness. The National Strategy for Small and Medium Enterprises (2018–2023) established a collaborative framework for public, private, and civil society support to SME development, with "dynamic entrepreneurship and the innovation ecosystem" as one of its

²⁸ State Statistical Office of the Republic of North Macedonia. *Average Monthly Net Wage Paid per Employee, January 2025 (Release No. 4.1.25.27)*. Skopje: State Statistical Office, February 2025. https://www.stat.gov.mk/pdf/2025/4.1.25.27_mk.pdf.

²⁹ **State Statistical Office of the Republic of North Macedonia.** *Job Vacancies, Fourth Quarter of 2024 (Release No. 2.1.25.02)*. Skopje: State Statistical Office, February 2025. https://www.stat.gov.mk/pdf/2025/2.1.25.02_mk.pdf.

³⁰ **Eurostat.** "Job Vacancy Statistics." *Eurostat Statistics Explained*. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Job_vacancy_statistics.

³¹ https://www.nrs.mk/content/NDS%206.11.2024_EN.pdf

three pillars. To implement SME policy, the Agency for Promotion of Entrepreneurship (APPRSM) was set up as a state institution in 2013. APPRSM oversees various initiatives providing innovation grants and even low-interest finance to encourage technological investments by SMEs. These efforts have coincided with a notable rise in SME innovativeness – the number of innovative SMEs in North Macedonia grew by 53% between 2014 and 2020³², indicating progress in digital transformation and capacity-building.

Despite the existence of the Ministry of Economy’s annual Programme for the Development of Entrepreneurship and Competitiveness of Small and Medium-Sized Enterprises, North Macedonia currently does not have an active SME strategy. The previous Strategy for the Development of Small and Medium-Sized Enterprises 2018–2023 has expired, while the forthcoming National SME Strategy 2025–2030 remains in draft form and is still awaiting official adoption. According to the draft National SME Strategy 2025–2030 (prepared in late 2024 but not yet adopted), the new framework places strong emphasis on digital transformation rather than only basic digitalization. The draft defines a dedicated priority area on the green and digital transition, and introduces several specific objectives that directly address SME digital upgrading. These include: establishing a regulatory framework to support digital transformation, promoting digital banking and e-commerce solutions, scaling-up programs to help SMEs integrate advanced technologies (AI, IoT, cloud), and continuing the digitalization of public services relevant to SMEs. Unlike the previous 2018–2023 strategy, which only indirectly touched upon digitalization within innovation and competitiveness, the new draft explicitly frames digital transformation as a central driver of SME competitiveness and market access. This shift indicates a more comprehensive approach, moving beyond e-services and basic ICT uptake toward structural integration of digital technologies into business models and value chains.

On the other hand, The Fund for Innovation and Technological Development (FITD) was created in 2013 as a state institution to drive innovation, strengthen competitiveness, and promote the digital transformation of SMEs in North Macedonia. Throughout its operation, FITD became the key public instrument for supporting startups, small and medium-sized enterprises, and research actors by offering grants, co-financing schemes, and collaborative programs that enabled businesses to develop new products, services, and technologies while building stronger innovation capacity. In 2025, the Government decided to rationalize and unify the institutional support for SMEs and innovation by merging FITD with the Agency for Entrepreneurship Promotion, resulting in the establishment of the Agency for Innovation, Scientific-Technological Development and Entrepreneurship. This newly formed body is intended to pool resources, streamline efforts, and provide a more comprehensive and coordinated framework for advancing entrepreneurship, innovation, and technological progress in the country.

³² https://www.itu.int/dms_pub/itu-d/opb/inno/D-INNO-PROFILE.NORTHMACEDONIA-2023-PDF-E.pdf#:~:text=regulatory%20changes%20involving%20SMEs,established

Furthermore, the former Ministry of Information Society and Administration was transformed into the Ministry for Digital Transformation in June 2024. In June 2025, this new ministry launched the ICT Development Strategy: SMART/MK 2030 strategy³³, a key document shaping the country's digital future. Through the strategy, the Government of North Macedonia positions SMEs as a central engine of the digital economy and broader socio-economic development. The document provides a detailed roadmap for overcoming structural challenges in digital transformation and ICT, aiming to secure accelerated digital progress across all sectors while fostering a favorable environment for innovation and competitiveness. Recognizing that SMEs are both the backbone of the economy and key drivers of digital uptake, the strategy introduces targeted instruments—such as vouchers, training, mentorship, financial incentives, and digital support platforms—to modernize business operations, stimulate innovation, and build a sustainable digital ecosystem aligned with European standards and global trends

The drive for digitalization is deeply intertwined with North Macedonia's ongoing EU accession process. Policy instruments are explicitly designed to align with European frameworks and standards, such as the NIS 2 Directive³⁴ and the Digital Services Act³⁵. The country is also a participant in the EU's Digital Europe Programme since 2023, which provides access to funding calls and enables the establishment of Digital Innovation Hubs, bringing the country's technological capabilities closer to the EU economy. This dual motivation—driven by both domestic economic needs and external EU integration requirements—shapes a policy framework that is more durable and less susceptible to political shifts. The success of these initiatives is therefore measured not only by internal economic metrics but also by the degree of convergence with EU norms, a unique form of dual accountability that characterizes the policy landscape of accession countries.

Program for Development of Entrepreneurship and Competitiveness of Small and Medium-Sized Enterprises

The Programme for the Development of Entrepreneurship and Competitiveness of Small and Medium-Sized Enterprises is an **annual policy instrument of the Ministry of Economy** that defines the government's priorities, measures, and budgetary allocations in support of the SME sector. Published each year in the Official Gazette and **operationalised through public calls and co-financing schemes**, the programme serves as a practical framework for enhancing entrepreneurship, strengthening competitiveness, and aligning national SME policies with broader European trends.

³³ Ministry for Digital Transformation of the Republic of North Macedonia. ICT Development Strategy: SMART/MK 2030 Strategy. Skopje: Government of the Republic of North Macedonia, 2025 - <https://mdt.gov.mk/en-GB/regulativa/strategija-za-razvoj-na-ikt-smart-mk-2030>

³⁴ <https://digital-strategy.ec.europa.eu/en/policies/nis2-directive>

³⁵ https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/digital-services-act_en

This programme by the Ministry of Economy has undergone a gradual but significant transformation over the past decade. Initially framed under the title *Programme for Competitiveness, Innovation and Entrepreneurship (KIP)*, the policy instrument largely emphasized broad measures of market competitiveness, innovation capacity, and general entrepreneurial support. Digitalisation, when present, was embedded indirectly within competitiveness or innovation-related initiatives, often without an explicit reference to digital transformation as a policy priority in its own right.

From 2022 onwards, the programme was restructured and renamed as the *Programme for the Development of Entrepreneurship and Competitiveness of Small and Medium-Sized Enterprises*. This change of title was more than symbolic: it reflected a deliberate policy decision to place small and medium-sized enterprises (SMEs) at the centre of economic programming and to acknowledge their dual role as both beneficiaries and drivers of competitiveness. The programme thus evolved from a broad competitiveness framework into a more SME-focused annual instrument, aligning with European Union practices and with the national policy commitment to strengthening the SME sector as the backbone of the economy.

Over the past eight years, the programme’s budget has moved through clear phases. It began at about €0.2 million in 2017, grew quickly to just under €0.9 million by 2019, eased to around €0.8 million in 2020, and then rose to roughly €1.1 million in 2021. Funding stayed close to €1.0 million in 2022 and 2023, reached about €1.3 million in 2024, and then fell sharply to around €0.3 million in 2025. Overall, the trend shows a period of growth and stability followed by a marked reduction in the most recent year.³⁶

Table 1: Subsidies for SME digital transformation

Instrument name	Subsidies for SME digital transformation
Duration	Ongoing – as of August 2025 call has not been launched.
Description of goals	The subject of measure 1 is subsidizing micro, small and medium-sized enterprises, which employ at least two people through co-financing of 40% of the proven costs, but not more than 150,000 denars(≈2500EUR) in total per applicant, made for the following purposes: <ul style="list-style-type: none"> - Development or procurement of digital solutions and technologies for the purpose of digital transformation of business processes or production and/or - Implementation, adaptation and integration of digital solutions and technologies

³⁶ Ministry of Economy (Republic of North Macedonia), “Sectoral Programs,” <https://www.economy.gov.mk/mk-MK/sektor-programi.nspx>

<p>Relevance to national and regional strategies</p>	<p>Directly advances national priorities for SME competitiveness and digital upgrading set out in current policy frameworks (e.g., the forthcoming National SME Strategy 2025–2030 and the Smart Specialisation Strategy), as well as ICT Development Strategy: SMART/MK 2030 Strategy and supports alignment with EU objectives on enterprise digitalisation and single-market readiness. Regionally, it complements Western Balkans efforts to build a common, innovation-friendly market and connects with Digital Europe/EDIH services available to SMEs, helping firms adopt concrete digital tools, raise productivity, meet quality and compliance standards, and improve their prospects for export and integration into European value chains.</p>
<p>Enhancing digitalisation of SMEs</p>	<p>Boosts SME digitalisation by co-financing 40% of costs (up to 150,000 MKD≈2.500EUR) for acquiring or developing digital tools and for their implementation/integration. This lowers entry costs and ensures real deployment across workflows (e.g., ERP/CRM, e-commerce, production IT/OT, cybersecurity). The cap and co-financing model widen uptake while keeping projects targeted and sustainable.</p>

Despite a substantial 76% reduction in the programme’s budget in 2025 compared with 2024, the 2025 edition for the first time treats digital transformation and digitalisation as a standalone priority, defining eligible actions as the “development or procurement of digital solutions and technologies for the digital transformation of business processes or production and/or the implementation, adaptation and integration of digital solutions and technologies.” By contrast, the 2024 programme—although much larger—addressed this area only partially, through support for opening online shops for women and, indirectly, through co-financing projects by foundations and associations that provided non-financial support to entrepreneurship and the competitiveness of SMEs. Even though the total allocation was reduced in 2025, yet the programme explicitly ring-fenced digitalisation so that approximately 29.8% of the entire envelope is now directly traceable to digital-transformation support for MSMEs. This is somewhat a progress since looking across the past eight years, references to digitalisation were uneven: in 2017 it was absent; in 2018 it appeared mainly through the lens of digital marketing; in 2019–2021 the focus shifted to introducing software solutions; and in 2023 the focus was the development/procurement or implementation, adaptation and integration of digital solutions and technologies among women entrepreneurs. More often, however, the programmes prioritised general investment in machinery and equipment and broader innovation measures—suggesting an emphasis on innovation and capital upgrades rather than targeted, end-to-end digital transformation.

Innovation and Digitalization Support Programs by the Fund for Innovation and Technology Development

One of the flagship instruments was the **Fund for Innovation and Technology Development (FITD)**, which serves as the government's main vehicle for boosting SME innovation and digital transformation. The Fund for Innovation and Technological Development (FITD) is the primary domestic institution for innovation, established with support from the World Bank. Its fundamental role is to provide seed financing and technical assistance to startups and SMEs at the early stages of development, helping them demonstrate their viability and attract private investors.

Through FITD, multiple grant schemes have been launched to spur technology adoption, product innovation, and startup growth:

- **Startup/Spin-off Grants:** Cover up to 85% of project costs (max €30,000) to develop new products/services (often digital or tech-based).
- **Commercialization Grants:** Co-fund bringing innovations to market (coverage and caps vary by firm size).
- **Technological Extension Grants:** Cover 50% of project costs (up to €500,000) to help established SMEs adopt advanced technologies and processes, improving their efficiency and competitiveness. This directly supports digitalization in manufacturing and operations.
- **Business Accelerator Support:** Funds up to 75% (max €500,000) to create accelerators that provide startups with space, mentorship, and investment opportunities

Western Balkans Innovation Vouchers

The **Western Balkans Innovation Vouchers** scheme was launched in April 2024 under the **POLICY ANSWERS project**, financed through Horizon Europe. It was conceived as a pilot instrument to address a long-standing weakness in the region: the limited cooperation between **small and medium-sized enterprises (SMEs)** and **public research institutions**. The measure provided small-scale financial support in the form of vouchers, designed to reduce the cost barrier for SMEs to access research services, and to encourage practical industry–academia collaboration.

The instrument targeted SMEs legally registered in one of the Western Balkan economies. Eligible applicants could receive a voucher of up to **€8,000 (excluding VAT)**, covering **80% of the service costs**, while the enterprise itself had to contribute the remaining **20%**. A central requirement was that the SME and the research provider had to be from **different Western Balkan economies**, thereby adding a regional integration dimension. This cross-border element distinguished the programme from similar voucher schemes in EU member states, which are often national in scope.

The programme supported activities such as feasibility studies, prototype development, technology validation, or proof-of-concept work. These services had to be delivered by accredited public research institutions, higher education institutions, or other eligible R&D organisations. By focusing on early-stage innovation services, the vouchers acted as a stimulus for SMEs that might not otherwise have engaged with research providers.

The total available budget amounted to **€240,000**, which made the measure relatively small compared to other EU or international funding facilities. Applications were open from **April to November 2024**, though some communications also cited **June 2024** as a closing date, suggesting phased deadlines. After administrative checks, proposals were evaluated according to four criteria: relevance to the call’s objectives, level of innovation, quality of the proposal, and potential contribution to the green or digital transition. Only the highest-ranked proposal per SME was financed, and successful projects were expected to complete activities within nine months of contract signing, with the possibility of a short extension.

Although limited in scope and funding, the Innovation Vouchers scheme served several policy purposes. It introduced a **light, low-barrier mechanism** for SMEs to experiment with research collaboration, often a first step towards more ambitious R&D projects. It also reinforced **regional cooperation** in line with EU integration priorities by requiring cross-border partnerships. Finally, it supported alignment with **smart specialisation strategies** and EU objectives on green and digital transitions.

Placed within the broader landscape of policy instruments in the Western Balkans, this measure complemented larger-scale schemes such as loans or blended finance from the **EBRD** or investment support through the **Western Balkans Investment Framework (WBIF)**. While those instruments aim to mobilize substantial resources for infrastructure or digitalisation, the voucher scheme targeted **micro-level interventions**. It provided practical, immediate support to SMEs and researchers to test ideas and build cooperation that could later feed into larger projects.

Table 2: Western Balkans Innovation Vouchers (A POLICY ANSWERS Pilot Programme)³⁷

Instrument name	Western Balkans Innovation Vouchers (WBIV)
Duration	Ongoing (Pilot Call in 2024) – Call launched Oct 2024 by FITD, with projects to be implemented 2024–2025.
Description of goals	This regional pilot programme aims to boost innovation and digital transformation in SMEs by fostering collaboration between small businesses and research institutions. Implemented under the EU-funded Policy ANSWERS project, its goal is to help SMEs access R&D expertise and innovative technologies (e.g. in digitalization or product development) from universities or labs. By using “innovation vouchers,” the instrument encourages SMEs to pursue research-based solutions and cross-border knowledge exchange in the Western Balkans, seeding longer-term partnerships and innovation capacity in the SME sector.

³⁷ “FITD Receives Leading Role in the New European Project ‘POLICY ANSWERS.’” Fund for Innovation and Technological Development (FITD), North Macedonia. <https://fitr.mk/en/fitd-receives-leading-role-in-the-new-european-project-policy-answers/>

Relevance to national and regional strategies	Aligns with North Macedonia’s innovation strategy and Smart Specialisation priorities by addressing SME innovation gaps and promoting industry–science links. Regionally, it supports the Common Regional Market agenda for the Western Balkans by enabling cross-border cooperation in research and innovation. The design draws on EU best practices in innovation voucher schemes, helping integrate Western Balkan SMEs into European innovation networks. It also complements EU integration goals by preparing local SMEs to participate in Horizon Europe and to upgrade technologically in line with EU market standards.
Enhancing digitalisation of SMEs	The innovation vouchers can be used by SMEs to acquire R&D services that often include digital innovation – for example, developing a new digital product prototype, improving a production process through automation, or accessing expertise in ICT solutions. By subsidizing collaboration with research providers, the scheme lowers the risk and cost for SMEs to experiment with new digital technologies or data-driven improvements. It effectively creates a mechanism for even small firms to test and adopt advanced digital innovations (such as in aggrotech, manufacturing, ICT, etc.) with guidance from scientists and engineers, thus embedding digital transformation in traditional industries.

Challenge: “With Digital Transformation to Innovation”

The **Fund for Innovation and Technological Development (FITR)**, in cooperation with Switzerland’s **Increasing Market Employability (IME) Programme** and the **INOFEIT Digital Innovation Hub (DIH)** network, launched the programme “**With Digital Transformation to Innovation**” to accelerate digital adoption among SMEs in the agriculture-food and tourism sectors. The call was designed as a response to persistent barriers to digitalisation, including limited financial resources, reluctance to invest in unfamiliar technologies, and the broader economic disruptions generated by the COVID-19 pandemic, the energy crisis, inflationary pressures, and supply chain volatility.

The programme combined **direct financial support to enterprises** with **ecosystem development measures** aimed at strengthening digital innovation hubs. These hubs were expected to provide diagnostic services, guidance on technology adoption, and ongoing support for digital transformation, thereby creating a more sustainable innovation infrastructure for SMEs in lagging sectors.

The total programme budget amounted to **approximately 18.45 million MKD (around €300,000)**, of which **about €200,000 was provided by FITR** and the remainder by Switzerland through IME. Funding support was calibrated according to enterprise size. **Micro and small enterprises** were eligible for grants covering up to **70% of eligible costs**,

while **medium-sized enterprises** could receive up to **50%**, in both cases capped at **1.845 million MKD (roughly €29,900)** per project. In addition, each selected SME was required to organise at least one **free training session for young people aged 15–25**, ensuring broader knowledge transfer and community benefit.

Altogether, **13 SMEs were supported** through this programme. The projects implemented focused on the **development, introduction, and maintenance of digital solutions** that enabled new or improved products, services, and processes. The scope of digitalisation measures was broad, ranging from artificial intelligence, virtual reality, and robotics to automation, Internet of Things (IoT) applications, and advanced web-based platforms.

The expected outcomes of the programme went beyond individual enterprise benefits. By supporting digitalisation, the initiative aimed to **increase competitiveness and productivity**, optimise production processes, reduce costs, improve procurement and supply chain management, and foster job creation in two critical sectors of the Macedonian economy. At the same time, it sought to enhance the overall **innovativeness of SMEs**, laying the groundwork for more resilient and future-ready businesses.

Table 3: Challenge: With Digital Transformation to Innovation³⁸

Instrument name	Challenge: With Digital Transformation to Innovation
Duration	The call for proposals closed in March 2023, with funded projects having a duration of up to 18 months.
Description of goals	The primary goal was to enhance the innovativeness, competitiveness, and productivity of Micro, Small, and Medium-sized Enterprises (MSMEs) operating in the agricultural-food and tourism sectors. This is achieved through the introduction of digital solutions that facilitate digital transformation within their operations. The instrument also aims to strengthen the capacities of digital innovation hubs, which are crucial components of the broader digital transformation ecosystem.
Relevance to national and regional strategies	This instrument directly aligns with national efforts to promote digital transformation and innovation, particularly within key economic sectors identified for growth. Furthermore, it is linked to the National Strategy for SMEs (in draft phase) and the ICT Development Strategy: SMART/MK 2030 Strategy by the Ministry for Digital Transformation. It is also closely linked with the broader objectives of the Swiss-funded Increasing Market Employability (IME) Programme, which focuses on job creation and income growth in the Sustainable Agribusiness and Sustainable Tourism sectors. The IME program explicitly integrates digitalization and

³⁸ “**With Digital Transformation to Innovation.**” *Fund for Innovation and Technological Development (FITD)*, North Macedonia. Published 2024 <https://fitr.mk/digitalna-transformacija/>.

	green transformation as transversal functions to help SMEs introduce new products and services, access new markets, and improve working conditions.
Enhancing digitalisation of SMEs	The instrument supports the development, implementation, and maintenance of digital solutions that drive digital transformation, leading to innovative products, processes, and services for participating companies. These digital solutions can encompass various advanced technologies, including artificial intelligence, virtual reality, automation, robotics, the Internet of Things, and web-based solutions, with other digital transformation solutions not being excluded. Through this support, companies were expected to digitize processes and services for improved planning and data-driven business decisions, accelerate the introduction of innovative offerings, optimize production for increased economies of scale, reduce production costs, enhance raw material procurement and supply chain efficiency, and create new job opportunities.

Skills Development and Innovation Support Project

The **Skills Development and Innovation Support Project**, financed with a **€17.7 million** loan from the **World Bank**, was implemented in North Macedonia through the Ministry of Education and Science. It had three overarching aims: improve transparency in higher education resource allocation, modernize secondary technical and vocational training, and—most relevant here—strengthen enterprise innovation and collaboration with research institutions.

The Fund for Innovation and Technological Development (FITD) was responsible for the third component—targeting innovation capacity building among enterprises and fostering linkages with research providers. Of the overall loan, approximately **€9.16 million** was assigned to this effort.

Within this component, two parallel strategies unfolded. First, FITD itself underwent institutional strengthening: it enhanced planning, strategy design, internal procedures, staff capacity, and communication efforts, and established an investment-selection committee with trained reviewers.

Second, the project deployed four **co-financed financial instruments** to support the private sector directly:

1. Grants for newly established start-ups and spin-offs.
2. Grants for commercialization of innovations.
3. Grants for establishing, operating, and investing in business-technological accelerators.

4. Grants for technological extension activities—helping firms develop or adopt new or improved products, processes, or technologies.

These instruments offered SMEs and start-ups a structured path—from early-stage innovation proof of concept, through development support, to acceleration and technology uptake.

The project formally concluded around **April–June 2021**. Afterward, these support instruments were retained as part of FITD’s toolkit and continued to be financed from the Fund’s own budget

*Table 4 Skills Development and Innovation Support Project*³⁹

Instrument name	Fund for Innovation and Technology Development (FITD) Grants: Boosting Innovation and Competitiveness for Start-ups and MSMEs
Duration	The open calls were conducted between 2019 and 2024, with funded projects running for up to two years following the award of funding.
Description of goals	To boost innovation and competitiveness among SMEs and start-ups in North Macedonia. Promotes risk-taking, new product development, and adoption of advanced technologies to enhance productivity and bridge the gap between local and global industries. Aims to improve access to financial support for innovation and technological development and promote innovation activity.
Relevance to national and regional strategies	Aligns with the National Development Strategy (NDS) 2024-2044's vision of an economy based on knowledge, innovation, and digitalization, and the Smart Specialisation Strategy (S3-MK) which designates ICT as a core priority. Directly supports the objectives of the Smart Specialisation Strategy (S3-MK) by fostering innovation and knowledge-based transformation, particularly in priority domains like ICT. Aligns with national efforts to develop a vibrant digital economy and address talent scarcity.
Enhancing digitalisation of SMEs	Offers various grants (Start-up/Spin-off, Commercialization, Technological Extension, Business-Technological Accelerator) that directly support R&D, technology adoption, and the establishment of innovation ecosystems, thereby enhancing SME digitalisation. Offers four types of grants:

³⁹ Program for support through the "Skills Development and Innovation Support Project" financed through a loan from the World Bank - *Fund for Innovation and Technological Development*. Website. <https://fitr.mk/en/program-for-support-through-the-skills-development-and-innovation-support-project-financed-through-a-loan-from-the-world-bank/>.

- **Start-up and spin-off grants:** Cover up to 85% of project budget, max €30,000, supporting R&D for new products and services.
 - **Commercialization grants:** Help businesses bring innovations to market, with funding based on company size.
 - **Technological extension grants:** 50% project costs, up to €500,000, helping SMEs adopt innovative technologies and advanced processes.
 - **Business-technological accelerator grants:** Finance up to 75% of budget, max €500,000, to establish accelerators providing office space, mentorship, consulting, and investment opportunities for startups.
- Additional support:** Provides loans for Amazon Web Services (AWS) platform use (\$10k, \$25k, \$100k). Supports the development of a National Strategy for Artificial Intelligence.

Loan Instruments for Digital Transformation of SMEs

Ensuring access to finance is one of the most pressing challenges for small and medium-sized enterprises, especially when they need to invest in new technologies and digital transformation. Traditional financing channels often come with high costs, collateral requirements, or limited risk appetite from commercial banks, making it difficult for SMEs to secure resources for digital investments. To bridge this gap, dedicated loan products have been introduced at both the international and national level, designed to reduce financial barriers and encourage adoption of advanced technologies.

These instruments combine favorable credit conditions with complementary measures such as technical assistance, advisory support, or performance-based incentives. By doing so, they not only ease the initial financial burden but also ensure that SMEs receive guidance in implementing effective digital solutions. International partners like the European Bank for Reconstruction and Development (EBRD), in collaboration with the European Union, provide regional programmes that align with broader EU integration and competitiveness agendas. At the same time, national mechanisms, such as specialized credit lines introduced by the Development Bank of North Macedonia, target specific SME needs ranging from the purchase of smart machinery and IoT devices to financing software, cloud services, or digital marketing activities.

Together, these initiatives illustrate a policy shift towards blended finance solutions that couple loans with knowledge transfer and incentives, creating a more enabling environment for SMEs to accelerate their digital transformation, improve productivity, and strengthen their resilience in line with national and regional strategic priorities.

GoDigital in Western Balkans

The **Go Digital in the Western Balkans** programme, launched by the European Bank for Reconstruction and Development (EBRD) with strong EU backing, represents a major Transregional State of the Art Report

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regional initiative aimed at accelerating SME digitalisation. North Macedonia was the first country where the programme became operational, underscoring its importance for the country’s economic and digital transformation. The initiative provides **dedicated credit lines to SMEs** for investments in digital and automation technologies, blending affordable loans with **EU-funded technical assistance and performance-based incentives** through the Western Balkans Investment Framework (WBIF). This combined approach is intended to ease financial barriers, reduce upfront costs, and build capacity among SMEs for successfully adopting advanced digital solutions.

For North Macedonia, the programme is strategically aligned with national priorities for competitiveness and EU accession. It addresses structural weaknesses in SME financing by offering accessible instruments that directly support the uptake of new technologies and digital tools. Beyond enhancing productivity, the initiative integrates broader policy goals: **at least 50% of financed projects must involve green technologies**, while **30% of investments are directed to businesses outside Skopje**, thereby encouraging both sustainability and balanced regional development. Inclusivity is also a core component, with specific measures ensuring that **women-led SMEs** have equal access to financing opportunities.

While the programme is in its early stages and concrete outcome data is not yet available, its design reflects a comprehensive model of blended finance that combines international resources, donor incentives, and local implementation. For North Macedonia’s SME sector, Go Digital has the potential to become a transformative lever—strengthening competitiveness, expanding regional integration, and aligning the private sector more closely with the EU’s **green and digital transition agenda**.

Table 5: EBRD "Go Digital" Loan⁴⁰

Instrument name	EBRD "Go Digital" Loan
Duration	Ongoing (first loan launched March 2025)
Description of goals	To support SMEs in investing in digital and automation technologies, enhance competitiveness, facilitate alignment with EU standards, and promote access to finance for women-led businesses. The programme aims to drive innovation and sustainable growth by enabling SMEs to embrace advanced technologies and digitalisation to remain competitive.
Relevance to national and regional strategies	Aligns with national goals for economic competitiveness and EU integration by fostering technology adoption and productivity improvements. It supports the broader objective of strengthening SMEs’ resilience and competitiveness to advance North

⁴⁰ Pajic, Jelena. “EBRD and EU Support SME Digitalisation in North Macedonia with First-of-Its-Kind Loan.” *European Bank for Reconstruction and Development (EBRD)*, March 28, 2025. <https://www.ebrd.com/home/news-and-events/news/2025/ebrd-and-eu-support-sme-digitalisation-in--north-macedonia-with-.html>.

	Macedonia’s EU accession ambitions. It is closely linked to the National SME Strategy (in draft phase) and the ICT Development Strategy: SMART/MK 2030 Strategy by the Ministry for Digital Transformation. Regionally, the programme is part of the Western Balkans Investment Framework, contributing to the EU’s Global Gateway strategy to boost smart and digital growth in the Western Balkans.
Enhancing digitalisation of SMEs	Provides dedicated credit lines and technical assistance for digital and automation technology investments, directly addressing financial barriers to SME digitalisation. In practice, local banks (e.g. Sparkasse Bank Skopje) on-lend EBRD funds to SMEs for qualifying tech investments, coupled with EU-funded advisory services and performance-based cash-back incentives upon successful implementation. These incentives prioritize high-impact new technologies, reducing upfront costs and encouraging adoption of cutting-edge digital solutions.

Loans for digitalization and digital transformation by the Development Bank of North Macedonia

The **Development Bank of North Macedonia (DBNM)** offers a dedicated credit line through its intermediary lending framework to support SMEs in implementing digitalization and digital transformation initiatives. Designed to alleviate financial hurdles, this loan product provides highly favourable terms, with individual loan amounts ranging from **€5,000 up to €300,000** for fixed capital investments and up to **€100,000** for working capital needs. In terms of repayment, **fixed asset loans** come with a term of up to **8 years**, including a generous **12-month grace period**, while **working capital loans** are structured over **up to 5 years**, including a **6-month grace period**. The interest rate is capped at **2.9% per annum**, which stands out for its affordability and attractiveness to small and medium-sized enterprises.

Eligible beneficiaries include **micro, small, and medium-sized companies**, ensuring the instrument reaches businesses across the enterprise spectrum. The financing is flexible and tailored to diverse digital needs. For **fixed assets**, loans can be used to acquire modern production equipment featuring computerized or autonomous capacities, IoT devices (e.g., sensors, embedded systems, machine learning components), energy-efficiency solutions, new hardware, custom software development—including ERP and EDI systems—and even robotics and AI-driven machinery. On the **working capital** side, funds can cover digital marketing efforts, website creation and maintenance, subscriptions to ERP or EDI platforms, and cloud services.

This instrument reflects DBNM’s proactive role in the broader national agenda of **digital transformation**, aligning with government strategies such as the Export Promotion Strategy (2024–2027) and the priorities of the Ministry of Digital Transformation. Alongside other development bank products—like green financing and loans for women entrepreneurs—it

forms part of an integrated approach to stimulate innovation, productivity, and competitiveness across North Macedonia's SME sector.

Table 6: Loans for digitization and digital transformation⁴¹

Instrument name	Loans for digitization and digital transformation
Duration	Ongoing (launched March 2023)
Description of goals	Credit for Digitalisation and Digital Transformation – a specialized loan product by the Development Bank of North Macedonia (MBDP/DBNM), facilitated through intermediary banks. The loans for digitization and digital transformation were established in order to provide favourable credit support during the implementation of digitization and digital transformation projects.
Relevance to national and regional strategies	Supports the Strategy for Promotion of Exports (2024–2027) that includes credit facilitation for digitization, as well as the broader national Digital Transformation agenda under the Ministry of Digital Transformation stressed out in the ICT Development Strategy: SMART/MK 2030 Strategy.
Enhancing digitalisation of SMEs	Loans finance: — Smart production equipment with autonomous/digital features — IoT devices, embedded systems, sensors, energy-saving control units — New hardware and software purchases, IT licenses — Software upgrades for existing production lines.

Innovation and Green Transformation Facility

The **Innovation and Green Transformation Facility**, launched in **December 2024**, is a pivotal initiative under the **Western Balkans Investment Framework (WBIF)**, orchestrated by the **European Investment Bank (EIB)** to support innovation and green investments across the Western Balkans, including **North Macedonia**. This **blended-financing lending envelope**, totaling approximately **€187 million**, aims to provide medium- to long-term credit lines that bolster the **innovative, digital, and green transformation** of small and medium-sized enterprises (SMEs) and mid-cap companies.

Roughly **70%** of the facility’s investments are designated for **innovation-focused activities**—such as the development of new products, processes, or business models—while the remaining **30%** supports **climate mitigation and environmental sustainability projects**, especially in agriculture and related green sectors. Crucially, the initiative explicitly includes **digital transformation** support: it offers not only financing but also **technical assistance** to help firms identify and structure high-impact tech-enabled projects that boost competitiveness, exports, and alignment with EU standards.

⁴¹ “Loans for Digitization and Digital Transformation.” *Development Bank of North Macedonia (MBDP)*. March 2023. <https://www.mbdp.com.mk/en/Products/KreditiranjePrekuBankiProizvod/19>.

The facility emphasizes inclusivity and local capacity-building: a minimum of **80% of final beneficiaries** are expected to be SMEs, with the remainder being mid-cap enterprises. Additionally, it calls for empowering partner financial institutions, SMEs, and other intermediaries through advisory services that enhance digital and green investment readiness.

Deployment of these funds is expected to begin in **early 2026**, leveraging local commercial banking channels under the oversight of the EIB. By blending **loan financing, EU-backed grants or “cash-back” incentives**, and **technical advisory support**, the facility enables SMEs to overcome financial and structural barriers to adopting digital and environmentally sustainable solutions. Beyond SMEs themselves, the programme also supports **incubators, science/technology parks, and research centres**, thus fortifying the broader innovation ecosystem

Table 7: Innovation and Green Transformation Facility

Instrument name	Innovation and Green Transformation Facility
Duration	Approved in July 2025 launching early 2026
Description of goals	By offering local SMEs and Mid-Caps access to medium-to long-term funding, incentives and advisory support for their innovative, digital and green transformation, the operation will help strengthen these companies' competitiveness on the local and EU markets, stimulate exports and promote business expansion, sustainable growth and employment.
Relevance to national and regional strategies	Supports North Macedonia’s national priorities for SME competitiveness, digital transformation, and EU accession by financing innovation, digitalisation, and green projects in line with the Export Promotion Strategy (2024–2027) and the draft National SME Strategy 2025–2030. Regionally, it is embedded in the Western Balkans Investment Framework (WBIF) and acts as an implementation tool of the EU’s Green and Digital Transition agenda under the Global Gateway, while also advancing the Green Agenda for the Western Balkans to align the region with the European Green Deal.
Enhancing digitalisation of SMEs	Enhances the digitalization of SMEs by providing medium-to-long-term funding, incentives, and advisory support for their digital and innovative transformations. It offers various financial instruments, including loans, equity, and guarantees, to help businesses invest in new technologies, upgrade their operations, and adopt digital business models. In addition to financing, the facility provides advisory services and technical assistance, which helps SMEs with business planning and capacity building to ensure they are "investment ready" and can effectively implement digital solutions, thereby boosting their competitiveness and growth.

Other relevant EU Support Instruments

Digital Europe

Since **2023**, North Macedonia has been formally associated with the **Digital Europe Programme (DIGITAL)**, giving its institutions, SMEs, and public bodies access to one of the EU's flagship digital funding frameworks. The programme runs from **2021–2027** with a budget of **€7.588 billion** (some sources cite more than **€8.1 billion**, depending on the latest allocations) financed entirely by the **European Union**. Its purpose is to strategically invest in Europe's digital capacities and ensure that these technologies are widely deployed across the economy and society.

DIGITAL focuses on five priority areas: **supercomputing, artificial intelligence, cybersecurity, advanced digital skills, and the broad uptake of digital technologies** in both business and the public sector. By covering these areas, the programme aims not just to advance Europe's technological frontier but also to make digital transformation accessible and inclusive, particularly for SMEs and smaller economies like North Macedonia. Participation allows Macedonian companies, universities, research centres, and public agencies to apply for funding and take part in cross-border projects that develop and test new digital technologies, while also accessing training and infrastructure.

For North Macedonia, the programme directly supports the national digitalisation agenda and complements strategies for competitiveness, SME development, and EU integration. One of the programme's most practical tools for SMEs and public institutions is the network of **European Digital Innovation Hubs (EDIHs)**. These hubs serve as one-stop shops offering tailored services such as technology testing, training, financing advice, and networking. By 2024, **54,610 businesses and public sector entities** across participating countries had already benefited from such services, with a target of **287,400 by 2029**, reflecting the programme's scale and ambition.

The inclusion of North Macedonia ensures that local enterprises are no longer isolated from these opportunities. Through DIGITAL, Macedonian SMEs can adopt AI and automation, improve cybersecurity resilience, and gain access to high-performance computing capacity that would otherwise be unavailable to them. Moreover, the programme fosters skills development by offering training in advanced digital competencies, helping bridge the gap between technological availability and human capital.

In essence, the Digital Europe Programme positions North Macedonia within a European ecosystem of digital cooperation, providing funding, infrastructure, and expertise that strengthen the capacity of SMEs and public bodies to transform digitally, become more competitive, and align with EU standards for the green and digital transition.

Table 8: Digital Europe Programme⁴²

⁴² **"Digital Europe Programme"**. Ministry of Digital Transformation of the Republic of North Macedonia. 2025. <https://mdt.gov.mk/mk-MK/digitalna-evropa/povekje-informacii>.

Instrument name	<i>Digital Europe Programme (DEP): Accelerating Europe's Digital Transformation</i>
Duration	Ongoing. The program runs from 2021 to 2027. North Macedonia signed its association agreement in June 2023.
Description of goals	To accelerate Europe's digital transformation and economic recovery, supporting the EU's twin objectives of a green transition and comprehensive digital transformation, while bolstering the Union's resilience and strategic autonomy in the digital sphere. It provides funding for projects in key capacity areas: supercomputing, Artificial Intelligence (AI), cybersecurity, advanced digital skills, and ensuring a wide use of digital technologies across the economy and society, including semiconductors.
Relevance to national and regional strategies	Directly relevant to North Macedonia's national strategies as it reinforces policy priorities for SME competitiveness, innovation, and digital transformation outlined in the Export Promotion Strategy (2024–2027), the draft National SME Strategy 2025–2030 and the ICT Development Strategy: SMART/MK 2030 by the Ministry for Digital Transformation. By funding projects in AI, cybersecurity, advanced skills, and broad digital adoption, it supports the government's goals of boosting productivity and aligning with EU digital standards. At the regional level, the programme is embedded within the EU's Digital Transition agenda and contributes to the Green Agenda for the Western Balkans and the Global Gateway strategy, ensuring that North Macedonia's SMEs and institutions advance in step with regional digitalisation and sustainability priorities.
Enhancing digitalisation of SMEs	Enables businesses, public administrations, and other eligible organizations in North Macedonia to gain direct access to DEP calls for funding. This allows participation in projects that deploy digital technologies across the EU, particularly in areas like Artificial Intelligence and advanced digital skills. The program also permits the establishment of European Digital Innovation Hubs (EDIHs) within North Macedonia, such as INNOFEIT EDIH, which directly support SMEs and Public Sector Organizations (PSOs) in enhancing digital skills and competitiveness through technology adoption.

European Digital Innovation Hub

In **May 2025**, the **Centre for Technology Transfer and Innovation – INNOFEIT** at the Faculty of Electrical Engineering and Information Technologies, Ss. Cyril and Methodius University in Skopje (UKIM), in partnership with the **Fund for Innovation and Technological Development (FITD)**, signed a co-financing agreement to establish **INNOFEIT EDIH**, North Macedonia's first **European Digital Innovation Hub**. This initiative is co-funded by the Transregional State of the Art Report

January 2026

European Union’s Digital Europe Programme (2021–2027) and the **Government of North Macedonia** through FITD, securing national co-financing for the years **2025 and 2026**. The four-year programme is backed by a total budget of **€2 million**.

Designed to catalyze digital transformation across SMEs and public institutions, INNOFEIT EDIH offers a wide array of **technology-driven services**. These include access to “**Test Before Invest**” facilities where businesses can pilot advanced solutions risk-free; **training and skill development** in areas such as artificial intelligence, cybersecurity, and robotics; **consultation and funding support** for navigating grant opportunities and digital investment; and **networking and ecosystem building** through events and collaborative platforms.

Over the span of four years, the hub aims to deliver more than **300 free support services** to SMEs and public entities. These interventions focus on priority digital domains—**AI, cybersecurity, cloud computing, IoT, and business process digitalisation**—as well as specialized sectors like smart agriculture and Industry 4.0. While full outcomes are yet to manifest, results are expected to include improved digital maturity among hundreds of beneficiaries; increased adoption of cutting-edge technologies in traditional industries; and enhanced linkages between SMEs, academia, and technology ecosystems. The initiative will also track metrics related to new digital investments, enhanced processes, and competitiveness improvements.

INNOFEIT EDIH is not only a localized innovation resource but also a **national digital focal point**, solidifying North Macedonia’s participation in Europe’s broader digital and green transformation agenda. By bridging advanced tech infrastructure, expertise, and SME needs, it lays the foundation for more resilient, innovative, and competitive enterprises aligned with EU standards

Table 9: INNOFEIT – European Digital Innovation Hub (EDIH)⁴³

Instrument name	INNOFEIT EDIH - National Digital Transformation Hub for SMEs and Public Sector
Duration	Ongoing (2023–2027) – Project launched 2023; EU Digital Europe Programme funding secured for 4 years (co-financing agreement signed May 2025)
Description of goals	INNOFEIT EDIH is established as the country’s first European Digital Innovation Hub, aiming to accelerate the digital transformation of North Macedonian SMEs (and public institutions) by providing them access to expertise, facilities, and support services. The hub’s core objective is to enhance SME competitiveness through adoption of advanced digital technologies – such as AI, robotics, cloud computing, and

⁴³ “**INNOFEIT Signs Co-Financing Agreement for EDIH with FITD.**” *INNOFEIT News*, Faculty of Electrical Engineering and Information Technologies, Ss. Cyril and Methodius University, Skopje. Published May 7, 2025. <https://feit.ukim.edu.mk/en/news/innofeit-signs-co-financing-agreement-for-edih-with-fitd/>.

	cybersecurity tools – thereby fostering innovation and growth in the economy. Ultimately, it seeks to develop a sustainable, digitally-enabled business ecosystem and help align the country’s economy with EU digital and innovation standards
Relevance to national and regional strategies	This initiative directly supports the National ICT Strategy (2023–2027) and ICT Development Strategy: SMART/MK 2030 Strategy, as it builds critical innovation infrastructure for the country. It demonstrates the government’s commitment (with FITD co-financing) to digital innovation as a development priority. By being part of the EU’s network of EDIHs, INNOFEIT EDIH aligns North Macedonia with the EU’s Digital Europe Programme goals, facilitating technology transfer and SME digital upskilling in preparation for EU accession. It also dovetails with regional Western Balkans digital integration efforts by promoting best practices and knowledge exchange in digitalisation.
Enhancing digitalisation of SMEs	The hub offers an integrated suite of services to help SMEs “test before invest” in new technologies: access to labs and equipment for experimenting with digital solutions (allowing companies to pilot AI, IoT, automation tools, etc. before full investment). It provides training and digital skills development, including courses on AI, cybersecurity, robotics and other key tech areas. The EDIH also gives consulting on access to finance for digital projects (guiding SMEs to relevant grants or investors) and fosters networking via events and hackathons to connect enterprises with tech innovators. These mechanisms directly tackle knowledge and cost barriers, enabling more SMEs to adopt state-of-the-art digital technologies and processes.

Interreg VI-A IPA Bulgaria–North Macedonia Programme (2021–2027)

Beyond national strategies, **EU cross-border programmes provide SMEs in North Macedonia with important opportunities to access funding, networks, and markets.** A key example is the **Interreg VI-A IPA Bulgaria–North Macedonia 2021–2027 Programme**, which operates under the EU’s cohesion policy framework. Its territorial strategy is aligned with **EU Policy Objective 5: “Europe closer to citizens”**, seeking to reduce socio-economic disparities, strengthen regional competitiveness, and enhance integration across borders .

The programme’s **Priority 3 – Integrated Development of the Border Region** is particularly relevant for SMEs. Its **Specific Objective (SO1)** is to “increase the competitiveness of the local economy and improve the business environment” . This objective translates into a targeted package of measures:

- **Technological modernization** of SMEs, including upgrading production facilities and equipment;

- **Digitalisation support**, helping firms adopt new digital tools and processes to improve efficiency;
- **Green business practices**, integrating sustainability into business operations;
- **Skills development**, through training, mentoring, and knowledge transfer tailored to modern industries;
- **Market integration**, supporting cross-border partnerships, internationalisation, and value-chain participation .

From a financing perspective, the programme provides **investment grants ranging from €300,000 to €600,000 per project**, with SMEs eligible for **€100,000 to €300,000 each**, depending on the partnership structure . Funding is co-financed at **85% by the EU and 15% nationally**, and all support is governed by the **EU de minimis aid rule** (max. €300,000 per SME over three years) . Eligible SMEs must be legally registered in the programme area before end-2022, have at least 51% private capital, and operate in sectors such as **food processing, beverages, and textiles manufacturing** .

What makes this programme especially important for digital transformation is that it **links funding with cooperation**. SMEs are not only investing in equipment or digital tools, but also working in **cross-border partnerships** that expose them to new markets, networks, and knowledge flows. This **combination of financial support and collaboration** helps smaller firms overcome barriers that national programmes alone cannot address. By requiring that projects demonstrate cross-border impact, Interreg ensures that SMEs contribute to building a more integrated, innovative, and competitive regional economy.

Table 10: Cross-Border Cooperation (CBC) Programme Bulgaria–North Macedonia 2021–2027 – Priority 3: Integrated Development of the Border Region⁴⁴

Instrument name	Cross-Border Cooperation (CBC) Programme Bulgaria–North Macedonia 2021–2027 – Priority 3: Integrated Development of the Border Region
Duration	The programme runs throughout the 2021–2027 programming period. Priority 3 activities to support SMEs are expected to be implemented in multiple calls until 2027. Individual SME investment projects are eligible within cross-border partnerships, with implementation periods typically 12–24 months.
Description of goals	The measure seeks to increase the competitiveness of the local economy and improve the business environment in the cross-border region. It supports SMEs in modernisation, digitalisation, green transition, skills upgrading, and cross-border market integration. By fostering partnerships between Bulgarian and

⁴⁴ Interreg VI-A IPA Bulgaria–North Macedonia Programme. “Announcement: Open Call for Project Proposals for SMEs under Priority 3—Integrated Development of the Border Region.” Call No. 2021TC16IPCB006-2025-4. Programme website. June 4, 2025. <https://ipa-bgmk.mrrb.bg/index.php/en/node/249>.

	North Macedonian enterprises, the programme strengthens economic resilience, innovation capacity, and territorial cohesion.
Relevance to national and regional strategies	This programme contributes to North Macedonia’s national goals for SME competitiveness (linked to the forthcoming SME Strategy 2025–2030) and supports the ICT Development Strategy: SMART/MK 2030 objectives on digitalisation and green transition. Regionally, it is aligned with EU Cohesion Policy and IPA III priorities, and complements the EU Digital Decade 2030 targets by encouraging SME digitalisation, cross-border cooperation, and participation in regional value chains.
Enhancing digitalisation of SMEs	SMEs are eligible for investment grants of €100,000–€300,000 per partner, co-financed at 85% EU and 15% national. Support focuses on adoption of new technologies, digital tools, and innovation in production processes. By combining financing with mandatory cross-border partnerships, SMEs not only upgrade digitally but also gain exposure to new markets, practices, and knowledge flows. This accelerates digital transformation, increases competitiveness, and helps SMEs align with EU standards for innovation and sustainability.

ICT Development Strategy: SMART/MK 2030 Strategy

The **ICT Development Strategy: SMART/MK 2030** strategy is the most comprehensive and forward-looking policy document developed by the Government of North Macedonia in the field of digital transformation. It is designed as a **detailed roadmap** that addresses long-standing developmental challenges in information and communication technologies (ICT) and the wider digital ecosystem. Its overarching aim is to secure an **accelerated and inclusive digital development of all sectors**, thereby fostering a favorable environment for rapid socio-economic progress. In doing so, the strategy aligns North Macedonia with the European Union’s **Digital Decade 2030 targets** and the broader reform agenda tied to EU accession.

The document sets out four strategic pillars:

1. **ICT Infrastructure and Connectivity** – ensuring affordable, high-speed, and secure broadband for households, businesses, and institutions, including future readiness for 6G.
2. **Digital Competences and Inclusion** – building a digitally skilled population and workforce through education, training, and lifelong learning to reduce the digital divide.
3. **E-Governance** – strengthening efficiency, transparency, and accessibility of public services through interoperability, digital identity, and citizen-centered platforms.

4. **Businesses, Innovation, and New Technologies** – supporting the digital transformation of the private sector, advancing innovation ecosystems, and enabling the use of emerging technologies like artificial intelligence, cloud computing, and big

Within these pillars, **SMEs are explicitly recognized as a central driver of the digital economy**. Priority Area 4 directly addresses their transformation under the heading “*Бизниси, иновации и нови технологии*”. The strategy acknowledges that SMEs represent the backbone of the national economy and that their modernization is essential for improving competitiveness, productivity, and integration into European value chains.

Planned measures targeting SMEs include a structured mix of **policy instruments**:

- **Systematic support for digital transformation of SMEs** through advisory and technical assistance mechanisms.
- Creation of a **digital support portal** providing tools, resources, and information for SMEs embarking on digitalisation.
- **Training programmes and seminars** to strengthen SME digital skills.
- **Voucher schemes for digital services**, allowing SMEs to access consultancy and technical expertise.
- **Financial incentives** for investment in IT infrastructure and software solutions.
- **Specialised training on digital marketing and social media**, to expand SMEs’ market presence.
- **Mentorship programmes** to guide SMEs through the digitalisation process.

The measures planned from 2026 place SMEs at the center of digitalisation efforts in the national economy. The strategy aims to raise the digital maturity of SMEs through a combination of capacity-building activities and direct financial support. In this way, digital transformation is extended beyond large enterprises and the public sector to include the broader SME base, ensuring a more comprehensive impact across the economy.

Table 11: Systematic Support for Digital Transformation of SMEs (ICT Development Strategy: SMART/MK 2030)

Instrument name	Systematic support for Digital Transformation of SMEs
Duration	Deriving from the ICT Development Strategy: SMART/MK 2030 strategy the document plans this measure to start with activities from the first quarter of 2026 and most of the activities to end the fourth quarter of 2027.
Description of goals	This measure aims to raise the digital maturity of SMEs by combining advisory support, training, financial incentives, and access to resources. It is designed to make digitalisation tools and services more accessible to small businesses, enabling them to modernize operations, improve competitiveness, and integrate into EU and regional value chains.

Relevance to national and regional strategies	This measure is aligned with the ICT Development Strategy: SMART/MK 2030 strategy, which serves as the overarching national framework for digital transformation, and directly contributes to the EU’s Digital Decade 2030 objectives. It also complements the Government’s programmes for SME competitiveness and innovation, supporting the country’s EU accession priorities by closing the digitalisation gap between Macedonian SMEs and their EU counterparts.
Enhancing digitalisation of SMEs	<p>The measure introduces a portfolio of activities to support SMEs:</p> <ul style="list-style-type: none"> • Creation of a digital support portal to provide information, resources, and tools. • Training programmes and seminars to build SME digital skills. • Introduction of voucher schemes for digital services, allowing SMEs to access consultancy and technical expertise. • Financial support for IT infrastructure and software investments. • Specialised training in digital marketing and use of social media. • Support for local software solutions tailored to SMEs. • Structured mentorship programmes guiding SMEs through the transformation process. <p>Together, these activities aim to ensure that SMEs have both the knowledge and the resources to effectively implement digital solutions, making them active participants in the national digital economy.</p>

Table 12: Support for Ethical and Responsible Development of Artificial Intelligence in Startups and ICT Companies (ICT Development Strategy: SMART/MK 2030)

Instrument name	Support for Ethical and Responsible Development of Artificial Intelligence in Startups and ICT Companies
Duration	Deriving from the ICT Development Strategy: SMART/MK 2030 strategy the document plans this measure to start with activities from the first quarter of 2026 and most of the activities to end the fourth quarter of 2027.
Description of goals	The measure promotes the ethical and responsible development of artificial intelligence (AI) applications by startups and ICT companies. It aims to create a regulatory and operational environment where small enterprises can adopt and design AI solutions while respecting ethical standards, data protection, and international best practices.

Relevance to national and regional strategies	This measure is aligned with ICT Development Strategy: SMART/MK 2030, as well as the EU’s Artificial Intelligence Act and Digital Decade 2030 objectives. It also supports North Macedonia’s EU accession process by advancing compliance with EU rules on responsible technology use and contributes to positioning the national ICT sector within regional innovation networks.
Enhancing digitalisation of SMEs	By targeting startups and ICT companies (most of which fall under the SME category), the measure facilitates access to knowledge, guidance, and potential incentives for AI adoption and development. It supports SMEs in integrating advanced digital technologies into their business models, helping them move beyond basic digitalisation toward innovation-driven growth. This strengthens their competitiveness and prepares them for participation in EU and global digital markets.

2.2 General Assessment

North Macedonia recognized the importance of digitalisation early on, yet today the overall level of digital adoption among businesses – especially small and medium-sized enterprises (SMEs) – remains relatively low. North Macedonia has built a strong digital infrastructure, with internet penetration rising to 92% by 2025⁴⁵ and mobile networks offering near-ubiquitous 4G and expanding 5G coverage. Connectivity is fast and reliable, with mobile broadband speeds ranking competitively worldwide, while affordability is generally not a major barrier for households. However, this strong foundation reveals a digital paradox: despite advanced infrastructure, SME adoption of sophisticated digital technologies remains low, pointing to challenges in skills, managerial attitudes, and perceived value rather than access itself.⁴⁶

The country remains among the weakest in the region and EU when it comes to business digitalization. In 2022 the country ranked highest in the Western Balkans according to the Digital Economy and Society Index⁴⁷ in terms of broadband infrastructure

⁴⁵ State Statistical Office of the Republic of North Macedonia. *Information and Communication Technology Usage in Households and by Individuals, 2024*. Skopje. <https://www.stat.gov.mk/PrikaziSoopstenie.aspx?rbtxt=77>

⁴⁶ Business Confederation of Macedonia. *Enabling Environment for MSME digital transformation*. Skopje: Business Confederation of Macedonia, 2023. https://bcm.mk/wp-content/uploads/2024/08/Preview_Analysis-Full_Mk.pdf

⁴⁷ *Digital Economy Society Index: Western Balkans Report 2022*. Sarajevo: Regional Cooperation Council, 2022. <https://www.rcc.int/files/user/docs/43a521a624cf08523a2268a67a7be2ff.pdf>.

and ICT regulatory framework with a score of 3.3/5, however it ranked among the lowest in ICT adoption in the private sector, with only 1.5/5.

In terms of integration of digital technology by businesses, Macedonian companies significantly lag behind their EU and regional peers in using digital tools. The European Innovation Scoreboard 2025⁴⁸ shows that North Macedonia's overall digitalization performance is only at 14.4% of the EU average, ranking 35th. While investments in information technologies have increased, their performance remains low at 24.1% of the EU average. Similarly, Cloud Computing performance, despite a significant increase, ranks 35th with a score of 17.7% of the EU average. This suggests that while there is some movement towards digital investment, the depth and breadth of technology integration into core business processes are still limited.

Digitalisation progress in North Macedonia varies across sectors. Certain industries are markedly ahead in adopting digital tools: notably the financial sector, IT sector, as well as logistics and distribution companies are among the most digitalised. Banks and financial services firms, for example, have invested in online banking, digital payments, and IT security, driven by competition and global standards.⁴³ The domestic ICT industry itself is a growing bright spot – as of 2019, nearly 2,000 active tech companies were operating, especially in software and IT services. This tech sector has produced internationally competitive firms and contributes significantly to exports. Similarly, transport/logistics providers and large distributors have begun using digital platforms for tracking shipments, managing inventory, and online sales where applicable, keeping those segments more up-to-date. In contrast, traditional and smaller sectors lag behind in digitalisation. Manufacturing SMEs (e.g. in textiles or light industry), small retailers, agriculture and food producers, and local service businesses tend to use digital tools minimally. Many of these firms still rely on analog processes, paperwork, and in-person transactions. For instance, a strong services sector usually correlates with higher computer use, whereas a traditional manufacturing-oriented sector (like textiles) sees lower computer and internet use in daily operations.⁴⁹

In North Macedonia, micro and small enterprises are far less digitalised than medium and large firms. Smaller companies often have no dedicated IT staff and minimal online presence. Even in the tourism and hospitality sector – which has great potential to benefit from digital platforms – many providers only recently started adopting online booking or digital marketing. (Encouragingly, new initiatives aim to boost digital uptake in tourism,

⁴⁸ European Commission. *European Innovation Scoreboard 2025: Country Profile – North Macedonia*. Brussels: European Commission, 2025. https://ec.europa.eu/assets/rtd/eis/2025/ec_rtd_eis-country-profile-mk.pdf.

⁴⁹ **Macedonia2025**. *Digitalization and Digital Skills of Citizens and Businesses: State of Play*. Skopje, 2023. https://www.macedonia2025.com/wp-content/uploads/2023/03/State-of-play_Digitalization-and-digital-skills.pdf.

seeing it as a way to improve the travel experience and attract more visitors through modern services.

It's important to note that the abundant local IT talent is not yet fully tapped by traditional SMEs. Many Macedonian IT firms focus on outsourcing and foreign clients, rather than digitalising domestic businesses.⁴³ This means the know-how exists in the economy, but cross-sector collaboration has been limited. Bridging this gap – by connecting tech solution providers with manufacturers, farms, shops, etc. – is a key opportunity. Overall, North Macedonia has a two-speed digital economy: a few sectors and larger companies are approaching European standards of digitalisation, while a long tail of SMEs across various sectors are only beginning to adopt even basic digital tools. Addressing this imbalance will be crucial for inclusive growth, so that all sectors (from finance to farming) can reap the productivity benefits of the digital age.

North Macedonia has increasingly positioned the digital transformation of small and medium-sized enterprises (SMEs) as a central policy priority, framing it as a cornerstone for competitiveness, innovation, and alignment with EU integration goals.

In North Macedonia, the digital transformation of small and medium-sized enterprises (SMEs) has become a recognized political priority, gaining new momentum with the establishment of the Ministry of Digital Transformation in 2024. This institutional upgrade demonstrates a clear governmental commitment to accelerate the digital agenda and align the country with the EU's Digital Decade targets. Several national strategies reinforce this priority, including the ICT Strategy 2023–2027 and the Smart Specialisation Strategy 2023–2027, both of which emphasize SME competitiveness through digital and green transitions. The long-term National Development Strategy 2024–2044 further underlines digitalisation as a driver of innovation and sustainable economic growth.

A robust legal framework supports this agenda, particularly through the Law on Electronic Documents, Electronic Identification and Trust Services, which enables secure e-signatures and trust services, and the Law on Electronic Management, which ensures interoperability and access to e-services for businesses via the national portal. While these reforms bring the country closer to EU standards, gaps remain in areas such as e-invoicing, which is currently permitted but not mandatory, limiting the digitalisation of business transactions. To support SMEs directly, the government and its partners have launched a series of financial and technical measures. The Fund for Innovation and Technological Development (FITD) provides grant schemes that encourage companies to adopt new technologies and commercialise innovative solutions. However, a new law has been approved which dissolves both the Agency for Entrepreneurship Support and the Fund for Innovation and Technological Development to establish a unified Agency for Innovation, Scientific-Technological Development, and Entrepreneurship. This new institution, structured with enhanced staffing and financial resources, is intended to more effectively support innovation, entrepreneurship, and SME competitiveness in North Macedonia. Complementing this, the European Digital Innovation Hub INNOFEIT, established in 2025,

offers SMEs access to test-before-invest services, advisory support, training, and financing pathways. These instruments are reinforced by international financial partners: The European Bank for Reconstruction and Development has introduced targeted credit lines for SME digitalisation, while the Western Balkans Investment Framework’s “SMEs Go Digital” initiative provides blended finance to expand uptake beyond major urban centers.

2.3 Identification of Policy Challenges

The policy framework for SME digitalisation in North Macedonia is evolving, combining a set of broad strategies with more targeted financial and technical measures. On the one hand, **general instruments** create enabling conditions for digitalisation. These include the **ICT Development Strategy: SMART/MK 2030 strategy**, which provides a long-term vision and is aligned with EU Digital Decade targets; the **Digital Europe Programme**, which North Macedonia has joined to access EU-level initiatives; and the **INNOFEIT European Digital Innovation Hub (EDIH)**, which supports SMEs through services such as test-before-invest and digital skills training. These measures do not directly provide money to SMEs, but they build the infrastructure, competences, and institutional frameworks needed for digital transformation.

On the other hand, there are **specific instruments** that channel resources directly to SMEs. The **Ministry of Economy’s subsidy programme** offers co-financing for SMEs investing in digital tools, while the **Fund for Innovation and Technology Development (FITD)** has implemented grants and voucher schemes for digitalisation and innovation. Financial instruments such as the **Development Bank of North Macedonia’s credit line** and the **EBRD “Go Digital” programme** provide loans and blended finance that help SMEs overcome investment barriers. These measures target firms directly, with the aim of reducing costs, encouraging innovation, and providing access to external expertise.

Despite this mix, several challenges remain that undermine the effectiveness of the policy landscape.

Policy continuity and coordination

A major challenge for SME digitalisation in North Macedonia is the lack of policy continuity and coherence. The **Strategy for the Development of Small and Medium-Sized Enterprises 2018–2023** expired without a successor in place, and as of September 2025, the new **National SME Strategy 2025–2030** remains in draft form. This means that SMEs have operated without a formally adopted strategic framework for two years, and if adoption continues to be delayed, this gap could extend to nearly three years. This creates a policy vacuum during a period when digital transformation should be accelerating.

The **ICT Development Strategy: SMART/MK 2030 strategy** was adopted in September 2025. While it represents the most ambitious national vision for digital transformation, its SME-specific measures are not scheduled to begin until 2026 and run through 2027, with

other measures continuing up to 2030. As of September 2025, **no public budget allocations have been attached to these measures**. Although ministries and agencies are listed as responsible stakeholders, there is no financial framework to guarantee timely implementation. This raises concerns that, even if the strategy is formally adopted, execution may lag behind political commitments.

In parallel, the **Programme for the Development of Entrepreneurship and Competitiveness of Small and Medium-Sized Enterprises** (a Ministry of Economy’s annual programme) illustrates the instability of financial support. Between 2017 and 2024, the programme budget grew from approximately €0.2 million to a peak of €1.3 million in 2024, providing a relatively stable envelope for SME support. However, in 2025 the allocation was cut sharply to around €0.3 million — a **76% reduction compared to 2024**. This sudden contraction limited the number of firms that could be supported and undermined the programme’s capacity to meet growing SME demand for digitalisation support. Although the 2025 programme ring-fenced digitalisation for the first time as a dedicated priority (with about 29.8% of the envelope directly traceable to digital measures), the steep budget cut overshadowed this progress, leaving support fragmented and insufficient in scope.

The **Smart/MK strategy** itself acknowledges weaknesses in institutional coordination. Multiple ministries, agencies, and donor-funded programmes operate in parallel, often without a central mechanism to align priorities or harmonise instruments. Recent institutional changes, such as the merger of the Fund for Innovation and Technology Development (FITD) with the Agency for Entrepreneurship Promotion and the creation of the Ministry for Digital Transformation, were intended to streamline the system but have in practice introduced overlapping mandates and transitional uncertainty.

Taken together, these factors illustrate the risks of policy fragmentation: expired or draft strategies, unpredictable funding, and shifting institutional responsibilities. For SMEs, this means that support programmes are often short-lived, underfunded, or poorly connected to one another. For policymakers, it reduces the credibility of digitalisation commitments and hinders progress towards EU Digital Decade 2030 benchmarks, particularly the target that 90% of SMEs achieve at least basic digital intensity.

Access to finance and uptake of instruments

North Macedonia has put in place a set of funding channels—grants, subsidies, and loans—but their **scale, design, and maturity** still limit uptake and depth of transformation among SMEs.

On the **specific** side, the **Programme for the Development of Entrepreneurship and Competitiveness of Small and Medium-Sized Enterprises** co-finances digitalisation at **40% up to 150,000 MKD (≈€2,500)**. This lowers entry costs but is often insufficient for end-to-end transformation (e.g., full ERP/PLM rollouts, integration, and change management). The programme’s overall **budget volatility** compounds this: after peaking around **€1.3m in 2024**, it dropped to **~€0.3m in 2025**, sharply narrowing the number and ambition of

supported projects—even though 2025 ring-fenced a larger **share** for digitalisation than in 2024.

On the **innovation** track, FITD’s targeted calls catalysed promising pilots, but reach remained modest. For example, the 2023 “With Digital Transformation to Innovation” challenge funded **13 SMEs**, which was valuable for demonstration effects yet small relative to total demand.

On the **credit** side, the DBNM line (long tenors, grace periods, interest $\leq 2.9\%$, and eligibility for both fixed assets and working capital) and the **EBRD “Go Digital”** (blending loans with TA and performance incentives, launched locally in **March 2025**) are well-suited to bigger upgrades. However, collateral requirements, documentation burdens, and the early-stage rollout of these instruments mean that **effective uptake** still needs to build.

Another important issue is the uncertain funding of future measures under the **ICT Development Strategy: SMART/MK 2030**. While some measures in the strategy have indicative budgets attached, the **SME-specific measure M 4.1.1 “Systematic support for digital transformation of SMEs”** does **not** have any budget allocated as of September 2025, despite being scheduled to begin in 2026. This creates uncertainty for SMEs and reduces confidence that the planned support will be delivered on time and at the necessary scale. Without a publicly available financial framework, the risk remains that the measure’s implementation will be delayed or underfunded, further reinforcing SMEs’ dependence on internal funds and small-scale subsidies.

Furthermore, a significant gap exists between the available public and private financial support programmes and their actual utilisation by SMEs. This indicates that while resources exist, they are not effectively reaching the majority of businesses. A research study found that **92% of enterprises rely on their own internal funds** for digital transformation projects, pointing to a limited supply of, or inaccessibility to, external funding.

Taken together, these weaknesses constrain progress from “basic tools” to **advanced adoption** (cloud, AI, analytics) that EU-aligned policies expect. Even as **general enablers** like the Digital Europe Programme and EDIH aim to reduce knowledge and risk barriers, access-to-finance challenges remain a structural barrier to scaling SME digitalisation.

Skills and absorptive capacity

The third challenge is limited skills and absorptive capacity within SMEs. Many small firms lack employees with the necessary digital competences to implement and maintain new technologies. Managers may also be hesitant to invest in digitalisation if they are unsure of the return on investment or lack understanding of how to integrate digital tools into business models. Although training programmes and EDIH services are available, their scale is still

modest compared to the overall need. Without significant investment in digital skills, SMEs risk underutilising the support they receive through grants or loans.

Finance alone does not guarantee transformation; SMEs need **people and processes** able to absorb technology. Current data indicate that most MSMEs **did not allocate** funding for digital skills training in 2023, a majority of micro-firms **did not assess** their skill needs, and well over half **did not provide** any digital training—patterns that weaken implementation quality and the persistence of results. **Specific** instruments (MoE subsidies, FITD grants) can buy tools, but without managerial capability, process redesign, and internal champions, benefits remain shallow or short-lived. **General** enablers seek to fill this gap: **INNOFEIT EDIH**, co-financed via the Digital Europe Programme and the government, is set up for “test-before-invest,” advisory, and skills development across AI, cybersecurity, cloud, and IoT, with a plan to deliver **300+ services** over four years. This architecture is sound, but current **scale and coverage** are still catching up to need; many SMEs outside central hubs have limited access to hands-on diagnostics, tailored upskilling, and on-site integration support. Until short-cycle, **practical upskilling** is delivered more broadly—and linked tightly to funded projects—the risk remains that firms acquire software or equipment without transforming workflows, data practices, and decision-making. Smart/MK’s **general** pillar on competences acknowledges this, but without allocated budgets, it cannot yet guarantee the volume of training necessary to shift the needle nationally

However, these initiatives are still modest in scale compared to the overall SME population, and outreach beyond Skopje the capitol and other major centres remains limited. Without wider availability of short-cycle, practical upskilling opportunities — closely tied to funded projects — there is a high risk that SMEs will acquire software or equipment but fail to adapt business processes and staff competences to use them effectively. This slows down the pace of transformation and hinders progress towards the EU Digital Decade 2030 target that 80% of adults should have at least basic digital skills by 2030.

Public sector demand, infrastructure, and ecosystem development

A key barrier to SME digitalisation in North Macedonia is the limited role of the **public sector as a driver of demand**. At present, procurement rules are not adapted to encourage the uptake of innovative solutions from startups and SMEs, meaning that many local ICT firms do not see the state as a potential client. This reduces opportunities for SMEs to test, validate, and scale their products within the domestic market. Open data access is also incomplete, which restricts SMEs from building new services on top of government datasets. The **ICT Development Strategy: SMART/MK 2030 strategy** includes measures on e-government, interoperability, and open data, but as of September 2025 no public budgets have been allocated to these measures. Without stronger public demand signals and transparent data frameworks, the innovation ecosystem cannot fully support SME digitalisation.

Infrastructure gaps add a further layer to this challenge. The **National Operational Broadband Plan 2019–2029** sets ambitious goals for nationwide gigabit broadband and 5G

deployment, but implementation is still uneven. SMEs in rural and underserved regions continue to face connectivity problems, which limits their ability to adopt advanced solutions such as cloud services, remote collaboration platforms, e-commerce, and IoT applications. These disparities create a dual-speed economy where SMEs in urban centres, particularly Skopje, gain earlier access to digital opportunities, while those in other parts of the country risk falling behind. This undermines both competitiveness and territorial cohesion, and slows alignment with the EU Digital Decade 2030 target of universal gigabit connectivity and 5G coverage.

Finally, the wider **digital ecosystem suffers from interoperability and governance shortcomings**. National e-government systems are not yet fully aligned with EU interoperability standards, which weakens trust in digital public services and reduces their usability for businesses. Incomplete integration across ministries and agencies also raises transaction costs for SMEs and limits efficiency gains. The absence of strong interoperability frameworks prevents spillover benefits from public sector digitalisation into the private sector, where SMEs could otherwise benefit from simpler regulatory processes, streamlined data exchange, and new market opportunities. Strengthening ecosystem governance is essential if SMEs are to play a central role in the digital economy, and it directly connects to the EU Digital Decade objectives of ensuring that 100% of key public services are available online and interoperable across borders.

Table 12: Policy challenges

2.3.1. Policy continuity and coordination	
Title of the Challenge	Description of the challenge
C1: Outdated Strategic documents	Existing policies are often not sufficiently differentiated to address the diverse needs within the SME sector, particularly for micro-businesses and firms in different economic sectors. For micro-businesses, a significant barrier is a lack of appropriate financing options, as financial institutions are hesitant to lend for smaller, risky projects in low-margin industries. This challenge is more pronounced for smaller players with limited financial resources. The SME Strategy 2018–2023 has expired, and as of September 2025 the new National SME Strategy 2025–2030 remains in draft form. This leaves SMEs without an adopted strategic framework for nearly two years, and if adoption slips into 2026, the gap will extend to three years. The ICT Development Strategy: SMART/MK 2030 strategy was in draft form in September 2025. While SME-specific measures (M 4.1.1 “Systematic support for digital transformation of SMEs”) are scheduled to start in 2026, no public budget has been allocated to them. This creates uncertainty about whether implementation will start on time.

C2: Institutional and Regulatory Hurdles	The effectiveness of digitalization policies is often undermined by broader institutional and regulatory issues within the country's business environment. Key barriers to private sector growth include a large informal economy, weak governance, and weak enforcement of competition policy. Furthermore, a lack of compliance with EU regulations creates confusion for businesses and can limit North Macedonia's ability to participate in the EU's digital single market. ⁵⁰
C3: Fragmented Institutional Coordination and Frequent Restructuring	North Macedonia's digitalisation and innovation ecosystem remains hindered by fragmented institutional coordination and repeated restructuring of support bodies. Multiple actors—including ministries, agencies, and donor programmes—operate in parallel without a central mechanism to align efforts, leaving support networks only partially mapped and difficult for SMEs to navigate. ⁵¹ Recent reforms, such as the merger of the Fund for Innovation and Technological Development (FITD) with the Agency for Entrepreneurship into the new Agency for Innovation, Scientific-Technological Development, and Entrepreneurship, were designed to streamline support but have also introduced transitional uncertainty, overlapping mandates, and temporary disruptions. This environment creates duplication of initiatives, limited visibility of resources, and weak collaboration between the public and private sectors, ultimately reducing the coherence and effectiveness of policies aimed at SME digital transformation.
2.3.2. Access to finance and uptake of instruments	
Title of the Challenge	Description of the challenge
C4: Policy-to-SME Disconnect	A significant gap exists between the available public and private financial support programs and their actual utilization by SMEs. This indicates that while resources exist, they are not effectively reaching the majority of businesses. A research study ⁵² found that the majority of enterprises (92%) rely on their own internal

⁵⁰ *North Macedonia Diagnostic*. London: European Bank for Reconstruction and Development, 2019. https://www.ebrd.com/content/dam/ebd_dxp/assets/pdfs/country-strategies/north-macedonia/North-Macedonia-Private-Sector-Diagnostic.pdf.

⁵¹ **International Telecommunication Union (ITU)**. *Digital Innovation Profile: North Macedonia – Digital Innovation Ecosystem: Strategies and Recommendations for Accelerating Digital Transformation*. Geneva: ITU Telecommunication Development Bureau, 2023. <https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/2023/Digital%20Innovation%20Profile%20-%20North%20Macedonia.pdf>.

⁵² *Improving the Competitiveness of Micro, Small and Medium-Sized Enterprises through Digital Transformation in North Macedonia*. Skopje: Strategic Development Centre, July 2024. <https://sdc.com.mk/wp-content/uploads/2024/07/POLICY2.pdf>.

	funds for digital transformation projects, pointing to a limited supply or inaccessibility of external funding.
C5: Budget volatility in government programmes	The Programme for the Development of Entrepreneurship and Competitiveness of SMEs peaked at ~€1.3m in 2024 but dropped sharply to ~€0.3m in 2025. Even though a larger share of the 2025 budget was earmarked for digitalisation, the overall reduction undermined predictability and limited the number of SMEs supported.
C6: Scale of financial support	MoE subsidies (40% up to €2,500) are too modest to support advanced digitalisation. FITD calls have funded only a small number of SMEs (e.g., 13 firms in the 2023 “With Digital Transformation to Innovation” challenge).
C7: Early-stage loan instruments	The DBNM credit line and the EBRD “Go Digital” programme provide favourable terms but remain new, with uptake constrained by collateral and documentation requirements.
2.3.3. Skills and absorptive capacity	
Title of the Challenge	Description of the challenge
C8: Skills Development Deficit	There is a widespread lack of digital expertise within the SME workforce and a failure of the current system to adequately address this skills gap. 63 percent of MSMEs have not allocated funds for digital skills training in 2023. 60 percent of micro-enterprises did not assess the digital skills needs of their employees, and 58 percent did not provide any training for digital skills development. The primary barriers to further training are the direct costs and the logistical problem of employee absence from work. ⁵³
C9: Limited scale of interventions	While Smart/MK and INNOFEIT EDIH (Digital Europe Programme) include training and advisory services, their scale remains modest relative to the total SME population, and outreach beyond Skopje is limited.
2.3.4. Public sector demand, infrastructure, and ecosystem development	
Title of the Challenge	Description of the challenge
C10: Uneven Digital Infrastructure and Interoperability Gaps	The National Operational Broadband Plan (2019–2029) and related strategies aim to deliver gigabit-level broadband and 5G access across the country, yet full deployment remains incomplete. SMEs in rural and underserved areas continue to face connectivity barriers, limiting their ability to adopt cloud services, remote collaboration tools, and e-commerce platforms. Moreover, national e-government systems still fall

⁵³ Business Confederation of Macedonia. Enabling Environment for MSE digital transformation. Skopje: Business Confederation of Macedonia, 2023. https://bcm.mk/wp-content/uploads/2024/08/Preview_Analysis-Full_Mk.pdf

	short of full alignment with EU interoperability standards, impacting service efficiency and user confidence among businesses. ⁵⁴
C11: Weak demand-side role of public sector	Public procurement is not adapted to innovative SME solutions, and open data access remains incomplete. Startups and ICT SMEs therefore lack domestic demand opportunities.
C12: Interoperability and governance gaps	E-government systems are not fully interoperable or aligned with EU standards, raising transaction costs for SMEs and reducing trust in digital public services. Spillover effects from public digitalisation into the private sector are limited.

2.4 Regional Competitiveness

North Macedonia's commitment to digital transformation, driven by its aspiration for closer alignment with European Union standards, has emerged as a central pillar of its economic strategy. The country's private sector, overwhelmingly dominated by small and medium-sized enterprises (SMEs), is positioned at the nexus of this transformation. A comprehensive analysis of the economic, social, and innovation dimensions reveals a nuanced picture of progress and persistent challenges.

Economically, the country has achieved consistent growth in GDP per capita and established a highly profitable and fast-growing information and communication technology (ICT) sector. SMEs account for over 73% of total employment and contribute more than 65% of the total value added, highlighting their critical role in the economy. However, a significant productivity gap exists between Macedonian SMEs and their EU counterparts. This divergence can be largely attributed to an uneven pace of digitalization, where a highly skilled, well-compensated ICT sector coexists with a broader business landscape struggling to adopt digital tools and processes. This disparity is further amplified by a profound national skills gap, which creates a competitive wage premium for ICT professionals that many SMEs cannot afford.

Socially, North Macedonia has successfully built a robust digital infrastructure, with widespread internet connectivity. Yet, a significant portion of the population lacks the basic digital skills to leverage this access for personal or professional advancement. This disconnect between infrastructure and competence creates a risk of social exclusion, particularly for older and vulnerable populations. Similarly, while the government has prioritized the digitalization of public services, their low adoption rate reflects a broader issue of public trust in state institutions, a legacy of historical governance challenges.

⁵⁴ **European Commission.** *Commission Staff Working Document: North Macedonia 2024 Report. SWD (2024) 693 final.* Brussels: European Commission, 30 October 2024.
https://enlargement.ec.europa.eu/document/download/5f0c9185-ce46-46fc-bf44-82318ab47e88_en?filename=North+Macedonia+Report+2024.pdf.

From an innovation perspective, North Macedonia is classified as an "Emerging Innovator," demonstrating strong, long-term progress in its innovation performance. However, a detailed examination reveals a critical inefficiency: the country produces less innovation outputs relative to its level of innovation investments. This suggests that its innovation model is one of digital adaptation—adopting and applying existing technologies to improve efficiency—rather than one of digital creation, which involves developing new-to-market products and services.

a) Economic

North Macedonia's economic landscape presents a mixed picture of gradual progress amid persistent structural challenges. The country's nominal GDP reached USD 16.7 billion in 2024, translating to a GDP per capita of USD 9,100, which remains below the global average of approx. USD 13,600. This economic positioning reflects the ongoing development trajectory of a country that continues to bridge the gap between its post-socialist heritage and modern market economy aspirations.

North Macedonia's labor market showed signs of improvement in 2024, with the employment rate rising to 45.8%. However, this **still lags considerably behind the EU-27 average** of 75.8%. Overall unemployment fell to 12.4%, while joblessness among individuals with higher education decreased sharply by 15.4% compared to the previous year. Despite this progress, **youth unemployment** (ages 15–24) **remains elevated at 29%**. In total, the labor force in 2024 counted 792,779 people, of whom 688,296 were employed. Unemployment remains persistently high at through a figure that may be inflated due to the **substantial informal economy**, estimated to constitute between 20 and 45 percent of GDP. This shadow economy presents both a challenge and an opportunity for digitalization efforts, as formal digital systems could potentially capture and legitimize economic activities currently operating outside official channels.

In January 2025, the **average net monthly salary** in North Macedonia stood at 43,050 denars, or roughly €730. Despite steady wage growth, this remains well below the averages in neighboring countries—€923 in Bulgaria, €1,318 in Croatia, and €1,225 in Greece. The **Information and Communication sector recorded the highest earnings**, with salaries reaching about 78,000 denars (**€1,300**).

This **gap between overall national wages and ICT-sector salaries** highlights a structural challenge for the economy. On the one hand, the high pay in ICT acts as a strong pull factor, attracting and retaining skilled professionals. On the other hand, most SMEs cannot match these salary levels, limiting their ability to recruit and keep the digital talent needed for transformation. As a result, a dual economy risks emerging: a small group of competitive, digitalized firms capable of offering high wages, and a much larger base of traditional SMEs that lag behind due to limited resources and human capital.

The issue, therefore, is not a lack of awareness or willingness **among SMEs** to embrace digitalization, but rather the **imbalance in resources and workforce capabilities**. Bridging

this gap is essential if North Macedonia is to enhance productivity, raise wage levels, and move closer to European Union standards.

As of 2023 **North Macedonia's economy is dominated by Micro, Small, and Medium-sized Enterprises (MSMEs)**, which made up **98.5% of all registered businesses** and were responsible for **over half of the country's employment (54.8%)**. The country's 68,004 active businesses generated a total turnover of 2.08 trillion denars and a value added of 445 billion denars. Within the Skopje region, the business environment in 2023 was primarily composed of micro-enterprises. Of the 28,531 businesses in the area, the vast majority (88.4%) were micro-enterprises with fewer than 10 employees. Small businesses accounted for 8.7% of the total, while medium-sized enterprises made up 2.3%.

The institutional response to SME digitalization challenges has been robust and strategically focused. The European Bank for Reconstruction and Development (EBRD) and European Union have launched pioneering loan programs specifically designed to support SME digitalization, representing first-of-its-kind initiatives aimed at boosting competitiveness through innovation, sustainability, and inclusivity. This financial infrastructure creates the necessary foundation for SMEs to invest in digital technologies and transform their operational capabilities.

b) Social:

The social dimension of SME digitalization in North Macedonia operates within the broader context of regional development patterns. **Standards of living** across Western Balkan economies, including North Macedonia, **remain substantially below those of OECD and European Union countries**, though the developmental gap is gradually narrowing. This closing gap suggests that **systematic efforts, including SME digitalization initiatives, are contributing to improved socioeconomic conditions**.

North Macedonia has made significant strides in providing digital access to its population. **Approximately 80% of the population is connected to the internet, and the country ranks 30th globally for mobile broadband speeds**. This advanced digital infrastructure is a key strength and a foundational element for a digital society. Despite this widespread connectivity, a significant digital divide persists, not in access, but in competence. According to the UNDP's Digital Readiness Assessment, North Macedonia faces a considerable digital skills gap compared to the European Union. **Only 32% of its population has basic or intermediate digital skills**, far below the EU average of 56%. Even more concerning, **just 3% possess advanced digital competencies. This skills' gap disproportionately affects older and vulnerable populations**, who are at risk of being left behind by the digital transformation. The most profound social challenge, therefore, is not a lack of digital "hardware" but a deficiency in the human "software" needed to leverage this technology. **The internet is accessible, but for a large segment of the population, it is not an effective tool for social or economic advancement due to a lack of foundational skills**.

This disconnect suggests that digitalization, if not managed inclusively, can be a basis for social exclusion. While it offers the potential for equal opportunities, its benefits will not be universally shared unless concerted efforts are made to improve digital literacy among all citizens, particularly those in marginalized groups. The path forward requires a policy shift from merely building infrastructure to investing in human capital, ensuring that all citizens can participate meaningfully in the digital economy and society.

c) Innovation:

North Macedonia is categorized as an "**Emerging Innovator**" according to the **European Innovation Scoreboard (EIS) 2025**⁵⁵. The country's performance, however, **is below the average of its peer group**, at 40.0% of the EU average in 2025, and it ranks **34th among EU and neighbouring countries**. The country has shown a positive trend over the long term, with its score increasing by 9.2 percentage points since 2018, but it also experienced a **slight decline of 0.8 percentage points from 2024 to 2025**. This finding seems to contradict the claim of "the fastest growth (+11.7 points)" as a non-EU country in the 2024 report. This apparent contradiction is likely due to methodological or data differences, but it highlights that **while North Macedonia has demonstrated strong, long-term progress, its path is not linear and is subject to recent fluctuations**.

According to the Scoreboard **the country performs well in non-R&D innovation expenditures**, which demonstrates a high propensity for firms to adopt existing technologies and a notable increase in high-tech exports. It has also shown strong growth in its share of foreign doctorate students, a positive sign for human capital development.

On the other hand, **the country performs poorly in areas related to R&D and finance**. Venture capital expenditures are low, and there is a significant **lack of direct government support for business R&D**. Furthermore, **the country ranks at the bottom for sales of new-to-market and new-to-firm innovations**, indicating a critical gap in converting innovation activities into commercially successful products.

Another perspective similar to this is the **Global Innovation Index (GII) Perspective**⁵⁶. The Global Innovation Index (GII) 2024 offers a complementary perspective, **ranking North Macedonia 58th among 133 economies**. A key finding of the GII report is that **the country "produces less innovation outputs relative to its level of innovation investments"**. This is evidenced by its higher rank in innovation inputs (60th) than in innovation outputs (63rd). This is arguably the most significant observation regarding North Macedonia's innovation ecosystem. **The country is capable of investing in the foundations of innovation** (such as

⁵⁵ European Commission. European Innovation Scoreboard 2025: Country Profile — North Macedonia. Brussels: Directorate-General for Research and Innovation; Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, 2025. https://ec.europa.eu/assets/rtd/eis/2025/ec_rtd_eis-country-profile-mk.pdf

⁵⁶ World Intellectual Property Organization. *Global Innovation Index 2024: North Macedonia*. Geneva: WIPO, 2024. <https://www.wipo.int/edocs/gii-ranking/2024/mk.pdf>

infrastructure (ranking 43rd), business sophistication (52nd), and attracting foreign direct investment), **but it struggles to convert these investments into high-value outcomes** like patents, creative outputs, or new-to-market products. This is further substantiated by its low scores in venture capital and sales of new innovations, as noted in the EIS report.

The country's innovation model appears to be one of **digital adaptation rather than digital creation**. Macedonian firms are successfully adopting digital tools to streamline their existing operations and processes, leading to improvements in efficiency and productivity. This is reflected in the strong performance in non-R&D innovation expenditures and high-tech exports, which often involve manufacturing of components rather than the creation of new products. To ascend the global innovation ladder, North Macedonia must shift its focus from merely absorbing and applying existing technologies to fostering an ecosystem that can conceive, develop, and commercialize new, proprietary innovations that are unique to the market.

2.5 Good Practices and Recommendations

Since 2020, North Macedonia has launched a coordinated set of policies and programs to accelerate the digital transformation of its small and medium enterprises (SMEs). These efforts include public grants, innovation hubs, strategic roadmaps, and blended finance models co-developed with international partners.

This brief synthesizes the most effective practices and draws actionable lessons for national policymakers and international stakeholders seeking to promote SME digitalisation.

Table 6: Good practices

Title of the Good Practice	GP Description
<p>GP 1: Merging the Fund for Innovation and Technology Development (FITD) and the Agency for Entrepreneurship into the Agency for Innovation, Scientific and Technological Development and Entrepreneurship (INOVA)</p>	<p>The transition from the Fund for Innovation and Technological Development (FITD) to the newly established Agency for Innovation, Scientific and Technological Development and Entrepreneurship (INOVA) represents a significant institutional reform aimed at improving the governance and delivery of innovation and SME support policies in North Macedonia. The merger integrates the functions of FITD and the Agency for Promotion of Entrepreneurship (APPRM) into a unified structure designed to streamline services, eliminate duplication, and ensure a more coherent policy framework for innovation, entrepreneurship, and digital transformation. Previously, the innovation ecosystem was characterised by fragmented mandates, limited inter-institutional coordination, and overlapping financial instruments that often resulted in inconsistent or delayed support to SMEs. This institutional dispersion hindered long-term strategic</p>

	<p>planning, especially in areas such as digital transformation, where coordinated support between innovation finance, technology adoption, and entrepreneurship development was essential.</p> <p>With the establishment of INOVA, the government has committed to creating a single entry point for SMEs, startups, and research actors to access innovation financing, digitalisation support, and advisory services. The new agency promises stronger alignment between science, technology, and enterprise policies, as well as the introduction of improved quality control, monitoring mechanisms, and professionalised management practices. It is also expected to modernise the legal and policy base for innovation, promote digital and green transitions, and establish new infrastructure such as a national science and technology park.</p>
<p>GP 2: Establishment of the Ministry of Digital Transformation (MDT)</p>	<p>North Macedonia’s Ministry of Information Society and Administration (MISA) was reorganised in 2024–2025 into the dedicated Ministry of Digital Transformation (MDT), as part of a broader government restructuring that separated digital policy from public-administration reform and transferred staff and functions accordingly. This created a clear, single policy owner for digital development, while a separate Ministry of Public Administration took over administrative-reform functions.</p> <p>Positioned as the government’s central body for digital development, MDT’s mission and portfolio now explicitly cover nationwide digital policy, digital skills, cybersecurity and data protection coordination, and the rollout of secure, efficient e-services for citizens and businesses—including platforms such as the national e-services portal (uslugi.gov.mk), the interoperability platform, and the government-wide electronic document management system (eDMS). This consolidation addresses previous fragmentation by unifying strategic direction and delivery capacity for digital tools that lower administrative burdens and transaction costs for SMEs (e.g., fully online procedures, interoperable registries, and secure data exchange).</p> <p>Independent assessments note MDT’s coordinating role for service digitalisation and highlight capacity gaps that the reorganisation is designed to remedy (governance, resources, implementation pace). As a good practice for SME digital-transformation policy, the re-scoped ministry strengthens accountability and alignment with EU digital</p>

	<p>priorities, links horizontal enablers (interoperability, eID, secure data flows) with front-end services used by firms, and provides a clearer interface for donor and EU programmes (e.g., Digital Europe) to support SME uptake of digital tools.</p>
<p>GP 3: Strategy for ICT Development SMART/MK 2030</p>	<p>The transition from the Ministry for Information Society and Administration (MISA) to the Ministry for Digital Transformation (MDT) inherently represents a policy good practice, as it signals a shift from a passive, administrative focus to an active, economic mandate. While the prior ministry often focused on establishing the "Information Society"—meaning basic infrastructure, access, and inward-facing e-government for state efficiency—it frequently lacked the strategic mechanisms necessary to accelerate private sector change. The "Strategy for ICT Development: SMART/MK 2030" is a good practice precisely because it embodies this new, outward-looking approach, serving as a comprehensive roadmap that directly addresses the needs of SMEs. Unlike older, more general strategies, SMART/MK 2030 employs a targeted "push-and-pull" mechanism: it pushes SMEs toward digitalization through specific, measurable targets in Pillar 4, such as aiming for over 70% of SMEs to reach a basic level of digital maturity and encouraging the adoption of advanced technologies like AI and Big Data. This level of detailed, private-sector-focused ambition ensures that subsidies and policies are aimed at modernization, not just maintenance. Simultaneously, the strategy pulls the market by investing heavily in the digital ecosystem, specifically through Pillar 2, which targets 70% of the population possessing basic digital skills. By increasing national digital literacy and building a simplified, secure e-governance platform (Pillar 3), the strategy lowers the external barriers (skills gap, administrative friction) for SMEs, making digital investment a more logical and profitable business decision. This integrated, outcome-driven, and long-term vision makes SMART/MK 2030 a gold standard for national digital transformation policy.</p>
<p>GP 4: Grants by the Fund for Innovation and Technological Development</p>	<p>Co-Financed Innovation Grants - The core initiative involves offering competitive grants and financial support through a public-private co-investment model, operational since 2014 and significantly intensified in the 2020s. This scheme provides funding to SMEs and start-ups for implementing innovative projects, adopting new technologies, and deploying digital solutions. Specifically, the Fund for Innovation and Technology Development (FITD) offers grants</p>

	<p>that match firms’ own investments, covering costs for areas like R&D, technology equipment, and software to boost their overall productivity and competitiveness. Over more than a decade, this effort has yielded substantial results: over 1,100 projects have been supported with a total investment of €138 million, comprising approximately €86 million in public funds from FITD and €52 million co-invested by the participating companies. This injection of capital has successfully cultivated an innovation culture, preparing firms for the global marketplace and resulting in a notable 12-place improvement in North Macedonia's Global Innovation Index ranking in 2023. A key success indicator is the growth of several tech start-ups that were initially supported by FITD before going on to attract private venture capital.</p> <p>The "Digital Transformation to Innovation" initiative - is a targeted, sector-specific public call launched by the Fund for Innovations and Technological Development (FITR) on December 29, 2022, to spur competitiveness and innovation among Small and Medium Enterprises (SMEs) in the agri-food and tourism sectors. Co-designed and executed in partnership with the Swiss-funded IME Program (which contributes 6.15 million denars) and the INOFEIT Digital Innovation Hub (DIH), the program provides competitive financial support for adopting digital solutions such as precision farming, e-commerce, and digital marketing tools. This support is structured as a co-investment, offering grants of up to 50% of a project's total budget (up to 1.845 million denars for medium enterprises), requiring the company to match the investment. The challenge was strategically developed in the wake of the COVID-19 and energy crises to help traditionally low-digitalized sectors align with European Green Deal and Digital Compass objectives. While the program leverages proven models to upgrade dozens of SMEs and strengthen the capacity of local digital innovation hubs, its sector-specific pilot nature limits its immediate scope. Future success will depend on the effective implementation of these changes—potentially through post-grant mentoring via the hubs—and the subsequent expansion and institutionalization of these digitalization incentives into broader national programs.</p>
<p>GP5: EBRD–EU “Go Digital in Western Balkans” Programme</p>	<p>The EBRD–EU “Go Digital in Western Balkans” Programme is a regional, ongoing initiative launched in 2025 that utilizes a blended finance model to drive the digital and green transition of SMEs. Implemented through the European Bank</p>

	<p>for Reconstruction and Development (EBRD), the EU's Western Balkans Investment Framework (WBIF), and local partner banks like Sparkasse and NLB, the program provides dedicated credit lines combined with grants and advisory services. In North Macedonia, SMEs can access earmarked loans to purchase advanced digital and automation technologies and software. Upon successful implementation, firms receive a cash-back grant of approximately 10%, along with EU-funded technical assistance for project design. A key requirement is that at least 50% of the investment must involve "green" technology, linking digitalization with sustainability goals. Since its launch, the program has allocated credit lines totaling €4 million through Sparkasse Bank and €2 million through NLB Bank. Although initial uptake is modest, the program provides SMEs with a crucial incentive to lower the cost of digital upgrades and is expected to boost firm productivity and compliance with EU market standards. However, its current reach is limited by the number of participating banks and initial credit volume, and many micro or informally-run businesses may face difficulties meeting standard bank lending criteria, suggesting a need for increased scale and potentially simpler application processes to maximize its impact.</p>
<p>GP 6: Initiatives by Business Support Organizations</p>	<p>The collective activity of business support organizations in North Macedonia constitutes a strong example of good practice for SME digital transformation policies, as it establishes a layered support structure that complements national strategy with practical, hands-on, and financially supported implementation. This approach systematically addresses the key barriers of skills, strategy, and financing, moving SMEs from digital awareness to operational digital maturity.</p> <p>The initial phase of this good practice involves strategic diagnosis and planning, often subsidized to encourage participation. For example, the ICT Chamber of Commerce (MASIT) implemented a digital transformation support project, funded by the Ministry of Economy's 2019 program. This initiative's design—which involved a free online self-assessment tool and the provision of 30 expert analysis vouchers—was a low-cost, high-impact model for helping SMEs across key sectors like tourism, agriculture, and manufacturing to evaluate their current state and define their</p>

digital priorities between December 2019 and March 2020. This resulted in over 30 SMEs obtaining tailored diagnostics and strategic plans, a foundational indicator of commitment to structured transformation.

Building on this diagnostic foundation, organizations also provide intensive resources for implementation and sustained growth. The Center for Digital Transformation (GoDigital) focuses on mobilizing both financial and consulting expertise. It provides successful SMEs with co-financing vouchers ranging from €6,000 to €10,000 to fund the implementation of their digital strategies and connects businesses with local solutions through a dedicated Digital Products Catalog. Furthermore, the center forges partnerships, such as with VISA, to distribute free digital tools to micro-companies, demonstrating a segmented approach to support based on business size and need. Concurrently, the Association for E-commerce (AETM) targets the operational side, offering specialized training that is directly tied to market activation. Its success is evidenced by tangible indicators like supporting the launch of over 60 new e-stores, which represents a shift from theoretical knowledge to active participation in the digital economy. Finally, the ecosystem is strengthened by organizations dedicated to policy alignment and regional integration. The Business Confederation of North Macedonia (BCNM) actively participates in international projects like DIGITRANS (ADRION Regional Policies for Digital Transformation of SMEs). BCNM's engagement aims to improve regional strategic frameworks by utilizing a quadruple helix model (connecting industry, academia, government, and civil society) to foster transregional cooperation and knowledge exchange. This work ensures that domestic support mechanisms are aligned with European standards and address broader regional innovation gaps, providing a critical policy superstructure that enhances the overall effectiveness and replicability of the grassroots initiatives.

Recommendations

To consolidate recent gains, North Macedonia should prioritize scaling proven instruments, improving program coordination, and ensuring broader access to digitalization support.

The Fund for Innovation and Technology Development (FITD) has been a central tool for supporting innovation and digital transformation among SMEs in North Macedonia, offering

both valuable results and important lessons for improvement. Its co-financing model successfully mobilized over €138 million in combined public and private investment, supporting more than 1,100 projects and helping catalyze a generation of start-ups and youth-led innovation. Early on, FITD was celebrated as a pioneering initiative in the Western Balkans, recognized for shifting public funding toward high-value entrepreneurship. Yet as the fund expanded, it suffered from mission drift, weakened oversight, and allegations of political favouritism - culminating in an internal audit that exposed over €3 million in misused funds and triggered government-led restructuring. While FITD's model remains sound in principle - blending public grants with private risk - it is now clear that such instruments demand strong governance, transparency, and regular course correction to sustain legitimacy. Looking forward, any successor institution must retain the fund's catalytic function but with **tighter safeguards, clearer targeting, and stronger outreach to traditional, rural, and micro-enterprises that have historically struggled to access support**. Rebuilding credibility will be as important as renewing impact.

Another key priority for advancing SME digital transformation in North Macedonia is the **better integration of support services, financing instruments, and technical assistance** into a coherent, accessible system. While programs such as the Fund for Innovation and Technology Development (FITD), the European Digital Innovation Hub (EDIH), and EBRD-backed credit lines each offer valuable resources, SMEs often struggle to navigate them independently. This fragmentation leads to missed opportunities, administrative fatigue, and slower uptake—particularly among smaller firms with limited capacity to manage multiple applications and actors.

The recent launch of **INOVA**, a newly formed agency emerging from the merger of FITD and the Agency for Entrepreneurship Support, represents a promising step toward addressing this gap. With a mandate to unify innovation, entrepreneurship, and technology support under one institutional roof, INOVA has the potential to streamline services, coordinate funding and advisory tracks, and offer SMEs a single point of entry to digital and innovation-related assistance. If properly implemented, INOVA could serve as the coordinating backbone for bundled support pathways, starting with a digital readiness assessment (e.g., via EDIH or an affiliated diagnostic tool), followed by tailored referrals to grants, subsidized loans, mentoring, and digital solution providers.

Such an integrated model would reduce administrative burden, align incentives across institutions, and help ensure that SMEs move from interest to actual implementation more efficiently. It would also improve public resource allocation by linking diagnostics with measurable outcomes and enabling cross-institutional data sharing. For INOVA to fulfill this role effectively, it will need **clear operational protocols, digital infrastructure for case tracking, and strong inter-ministerial coordination—particularly with the Ministries of Economy, Digital Transformation, and Education**. Done well, it could become a flagship example of how to embed coherence and efficiency into the architecture of SME support in a digital age. The newly established Ministry of Digital Transformation (2024) presents a unique opportunity to strengthen coordination across institutions. It should assume a

leading role in tracking and evaluating the digital maturity of SMEs by developing a clear set of outcome-based indicators, such as the percentage of SMEs using digital platforms, customer relationship management (CRM) systems, cloud services, or e-commerce. Public dashboards showing progress by region and sector would improve accountability and guide targeting.

The **SMART MK2030** strategy is a key milestone in North Macedonia's digital policy landscape, setting out a broad vision aligned with the EU's Digital Decade goals. However, the strategy was long in the making, with years of consultation and drafting contributing to delays in aligning public programs around a shared digital agenda. By the end of 2025, although the strategy is formally in place and the Ministry for Digital Transformation has been established to support its rollout, many of its concrete measures—particularly those aimed at accelerating digital transformation in SMEs - still lack clear budget allocations. This absence of financial specification makes it difficult to assess the feasibility, scale, and prioritization of proposed actions, and weakens the strategy's utility as a tool for mobilizing domestic and international support. For SMART MK2030 to move from vision to execution, it will be essential that **all SME-targeted measures are backed by transparent, dedicated funding commitments and publicly available implementation plans.**

While the **Go Digital in the Western Balkans** program offers an innovative model for blended finance—combining loans, grant incentives, and technical assistance—it currently reaches only a limited segment of North Macedonia's SME landscape. The scale remains constrained by the small number of participating banks and the modest initial volume of on-lending, which limits visibility and uptake across sectors. To unlock broader impact, the program should prioritize expanding its network of partner financial institutions and increasing the available credit envelope, with particular attention to underserved regions and industries. Additionally, some microenterprises and informally operated businesses continue to face difficulties in accessing commercial lending due to collateral requirements or limited financial histories. To address this, the program should consider simplifying application procedures, offering smaller ticket-size products, and introducing complementary guarantee mechanisms to lower the entry threshold for higher-risk but high-potential digital investments. As the program matures, rigorous monitoring of outcomes—such as increases in productivity, digital tool adoption, and business formalization—will be essential not only to justify scaling but also to build a robust evidence base for the future of blended finance in SME digital transformation.

North Macedonia's experience shows that **empowering business support organizations can significantly enhance the reach and effectiveness of SME digital transformation policies.** Initiatives like MASIT's subsidized diagnostics, GoDigital's co-financing vouchers and vendor networks, and AETM's e-commerce activation programs demonstrate how these actors can translate strategy into action through tailored, hands-on support. Their ability to segment services by firm size and readiness, mobilize private partnerships, and link local efforts to regional frameworks (e.g. BCNM's DIGITRANS) makes them valuable delivery partners. To maximize impact, policymakers should integrate such

intermediaries into national programs with clear funding streams, shared targets, and platforms for coordination.

Lastly, **addressing the digital skills gap must become a core pillar of economic policy.** While current initiatives have targeted tech startups and youth employment, there remains a shortage of digitally fluent workers across sectors. Embedding digital skills training into active labor market policies, vocational education, and SME development programs would help both firms and workers adapt to the demands of the modern economy.

North Macedonia’s progress in institutional reform, digital policy development, and ecosystem-driven support for SMEs offers several transferable models that could benefit peer economies in the Western Balkans and beyond. A key recommendation is to promote structured transregional learning through formal cooperation platforms that emphasize institutional design and operational integration. For example, the consolidation of overlapping support functions into the newly established agency INOVA—merging FITD and the Agency for Entrepreneurship—can serve as a model for other countries seeking to streamline fragmented innovation ecosystems. Regional exchange on the formation, governance, and rollout of such unified institutions could help partner governments avoid duplication, build trust with SME stakeholders, and increase the coherence of innovation and digitalisation policy. Similarly, the Ministry of Digital Transformation’s creation as a single policy anchor for e-services, interoperability, and digital skills could be replicated by other governments seeking to align horizontal digital enablers with SME support delivery.

In addition, targeted transregional programs should emphasize the role of intermediary actors, such as business support organizations (BSOs), in bridging top-down strategies with SME-level impact. North Macedonia’s layered ecosystem shows how BSOs can deliver tailored diagnostics, mobilize blended financing, and activate digital marketplaces. Regional replication would benefit from shared diagnostic tools, pooled vendor platforms, and joint voucher schemes that lower costs and expand reach. Moreover, aligning donor-funded digitalization pilots across multiple countries with common reporting metrics and evaluation frameworks would enhance comparability, accelerate scaling, and ensure that successful models do not remain siloed within national borders. Ultimately, transregional transfer must be backed by institutional mandates, peer-to-peer mechanisms, and donor coordination that transforms isolated good practices into systemic improvements across the region.

2.6 Data Infrastructure

Available Data and Analytical Sources

North Macedonia’s policy ecosystem benefits from a range of data sources that provide partial insights into the digitalisation and competitiveness of its SME sector. Official statistics from the State Statistical Office (SSO) form the foundation, capturing basic enterprise indicators such as broadband access, computer usage, and firm size. For

instance, 98.9% of enterprises with 10 or more employees had internet access in 2024, and SMEs account for 98.5% of all firms, 54.8% of employment, and 46.8% of value added. Yet these statistics largely reflect infrastructure and structural characteristics—they do not capture transformation or competitiveness outcomes.

Complementary qualitative and survey-based inputs have been produced through strategic documents and donor programs. The National SME Strategy 2018–2023 and the SMART Specialisation Strategy included digitalisation as cross-cutting goals. The SMART MK2030 strategy, while forward-looking, sets a target of 70% SME digital maturity but provides no baseline measurement or budgeted measures for SME digitalisation. Likewise, the forthcoming ICT Strategy MK2030 acknowledges the relevance of SME support but does not include allocated funds or specified programs to deliver it. Business support actors, such as the GoDigital Center, EDIH-INNOFEIT, and the Association for E-Commerce (AETM), provide their own implementation data—such as number of digital diagnostics conducted, e-commerce stores launched, or vouchers distributed. International indices, including the Global Innovation Index and the upcoming 2024 OECD SME Policy Index, offer benchmarking opportunities. These have noted North Macedonia’s modest gains in digital infrastructure and startup support.

Notably, the Business Confederation of North Macedonia (BCNM) has played a leading role in evidence production. In 2022, BCNM published a comprehensive analysis of the enabling environment for SME digital transformation, identifying ecosystem assets, gaps in services, and alignment needs with EU standards. A follow-up study in 2023 expanded on these findings, including SME perspectives from across sectors and regions. It remains one of the most systematic assessments to date. However, while such studies provide valuable qualitative depth, they remain non-governmental and episodic. There is no centralized national body mandated to consolidate these findings or issue regular reports on SME digitalisation status.

Missing Data, Gaps in Monitoring, and Structural Blind Spots

Despite this diversity of inputs, North Macedonia lacks key elements required for robust and policy-relevant tracking of SME digitalisation. First and foremost, there is no national digital maturity baseline or index for SMEs. While organizations like EDIH and MASIT conduct diagnostics, these are limited in scope and frequency. There is no data on the adoption of advanced technologies like cloud computing, CRM, ERP systems, cybersecurity protocols, or AI-based tools across different SME segments. Similarly, there is no longitudinal data capturing how digital adoption affects competitiveness—such as productivity, export readiness, innovation output, or firm survival.

Institutional monitoring remains heavily output-focused and siloed. Ministries and implementing agencies (e.g., Ministry of Economy, Ministry for Digital Transformation, FITD, and INOVA) typically report on the number of beneficiaries reached or activities implemented. Yet they do not report on whether key performance indicators (KPIs) from

annual programs are achieved—a critical weakness in accountability. Where KPIs do exist, they are often vague, not disaggregated by sector or region, and not publicly monitored. This undermines the ability to evaluate policy performance or adjust interventions based on results.

Another serious gap is the lack of disaggregated and inclusive data. There is insufficient visibility into how digitalisation varies across firm size (particularly for microenterprises), sectors (e.g. agriculture, tourism, retail), regions (especially outside Skopje), or ownership profiles (e.g. gender). Without such segmentation, policy instruments risk overlooking marginalized or underserved segments, including rural SMEs or informal enterprises.

Finally, the data produced from programs—particularly donor-funded projects—is not systematically integrated into national databases or used for policymaking. Institutions lack a shared monitoring and evaluation (M&E) framework or interoperable data platforms. Even highly structured programs like the Go Digital blended finance line or FITD grants have no standardized system to track firm outcomes over time. As such, there is no way to assess whether investments in digitalisation translate into sustained competitiveness gains or whether they reach their intended audiences.

Implications and Recommendations

These data gaps have direct implications for the credibility and effectiveness of digital transformation policy. Without a shared set of indicators, consistent impact tracking, or publicly available reporting on results, strategies like SMART MK2030 or the ICT Strategy 2030 risk becoming aspirational rather than actionable. Furthermore, the absence of outcome-level measurement makes it impossible to justify program scale-up, align funding with proven approaches, or course-correct when programs underperform.

To address these challenges, North Macedonia should prioritize the development of a national SME digital maturity survey, administered on a recurring basis (every 2–3 years), with coverage across sectors, regions, and business types. It should be supported by a cross-institutional KPI framework aligned with national strategies and embedded in annual program reporting. Ministries should be required to report on outcome KPIs, not just activities or disbursements. Finally, the government should establish an annual public report or observatory to consolidate SME digitalisation data—building on the analytical precedent set by BCNM and enabling better coordination, transparency, and regional learning.

3. Summary

North Macedonia, a landlocked upper-middle-income country in Southeast Europe, is an **official EU candidate** whose development agenda is strongly guided by **European integration**. This direction is embedded in the **National Development Strategy (NDS) 2024–2044** and supported by **IPA III** and other EU instruments. **Digitalisation** is recognized as a key enabler of competitiveness, sustainability, and inclusion. The economy, valued at **€15–16 billion in 2025**, is driven by **manufacturing (30.4% of GDP)**, trade, and construction,

with **MSMEs making up 98.5%** of all enterprises and employing over half of the workforce, though productivity remains far below EU levels. The **ICT sector** continues to expand (2.5–8% annually), employing nearly **24,000 people** and generating **€1.655 billion in revenues** in 2024. Digital adoption is widespread, with **98.9% of firms** having internet access and **99.3% using computers**, though advanced e-commerce and automation remain uneven.

In education, **52,316 students** were enrolled in 2023/2024 (a 2.8% decline), with **women comprising 58.7%** and **78% attending public universities**. **Tertiary attainment (37.7%)** among 25–34-year-olds is rising but below the EU average. Despite relatively strong adult learning participation, **only 32% of the population has basic digital skills**, contributing to the skills gap in SMEs. The **National ICT Strategy 2023–2027**, **EMIS**, and expanded **dual VET programs** (covering 84% of VET schools) aim to bridge this gap and better align education with labor market needs.

The **labor market** shows steady recovery but still trails EU standards: the **employment rate reached 45.8%** in 2024 versus the **EU average of 75.8%**, while **unemployment fell to 12.4%**. Youth unemployment remains high at **29%**, though graduate unemployment dropped by **15.4%**. The **average monthly wage** in 2025 stood at **€730**, below Bulgaria (€923), Croatia (€1,318), and Greece (€1,225). The **ICT sector offers the highest pay**—around **78,000 denars (€1,300)**—far above the national average, while hospitality remains lowest at **€450**. The **job vacancy rate (1.93%)** is below the euro area’s 2.4%, with strong demand in **hospitality (3.47%)** and moderate in **ICT (1.71%)**, reflecting stable but non-saturated digital labor demand.

Small and medium-sized enterprises (SMEs) are the **backbone of North Macedonia’s economy**, yet many remain **unprepared for full digital transformation**. Recognizing this, the government has elevated **digitalisation to a national priority** through the **National Development Strategy (NDS) 2024–2044**, which identifies a “*Sustainable, Innovative and Competitive Economy*” as a core pillar. The **National SME Strategy 2018–2023** established early frameworks for innovation and entrepreneurship, supported by the **Agency for Promotion of Entrepreneurship (APPRSM)** and **FITD**, both instrumental in financing SME innovation—contributing to a **53% increase in innovative SMEs between 2014 and 2020**. However, the 2018–2023 strategy has expired, and the **draft National SME Strategy 2025–2030**, pending adoption, introduces a stronger focus on **digital and green transformation**, including objectives for **AI, IoT, cloud adoption, digital banking, e-commerce, and public e-services**. In 2025, institutional reform merged **FITD and APPRSM** into the **Agency for Innovation, Scientific-Technological Development and Entrepreneurship**, creating a unified body to coordinate SME and innovation policy. Parallely, the **Ministry for Digital Transformation**, established in 2024, launched the **ICT Development Strategy: SMART/MK 2030** strategy, positioning SMEs as the **central engine of the digital economy**. The strategy promotes **vouchers, training, mentorship, and financial incentives** to accelerate technological upgrading and competitiveness. Aligned with the **EU’s Digital Europe Programme** and frameworks like the **NIS 2 Directive** and **Digital Services Act**, North Macedonia’s SME digitalisation agenda reflects a **dual drive for EU convergence and**

sustainable domestic growth, ensuring coherence with European standards while reinforcing national resilience and innovation capacity.

The **Programme for the Development of Entrepreneurship and Competitiveness of SMEs**, managed annually by the **Ministry of Economy**, defines national priorities and funding for SME growth and innovation. Since its **restructuring in 2022**, it has placed SMEs at the centre of economic policy, aligning with **EU frameworks**. The budget grew from **€0.2 million in 2017** to **€1.3 million in 2024**, before dropping to **€0.3 million in 2025**—a **76% decrease**. Despite this, the **2025 programme marks a breakthrough**, making **digital transformation a standalone priority** through the measure “**Subsidies for SME digital transformation**,” which co-finances **40% of costs (up to €2,500)** for acquiring or integrating digital technologies. Around **30% of the 2025 budget** is now dedicated to SME digitalisation, directly supporting the **ICT Development Strategy: SMART/MK 2030** strategy and forthcoming **National SME Strategy 2025–2030**, helping firms adopt practical digital tools and improve competitiveness within **EU value chains**.

The **ICT Development Strategy: SMART/MK 2030 Strategy** is North Macedonia’s **flagship roadmap for digital transformation**, aligning national priorities with the **EU’s Digital Decade 2030** and the country’s **EU accession agenda**. Built around four pillars—**ICT infrastructure, digital competences and inclusion, e-governance, and business innovation and new technologies**—the strategy positions **SMEs as the core drivers** of the digital economy. It introduces a broad support framework starting in **2026**, including **advisory services, training programmes, voucher schemes, digital support portals, financial incentives, and mentorship initiatives** to raise SME digital maturity and competitiveness. A key measure promotes the **ethical and responsible use of artificial intelligence (AI)** among startups and ICT firms, ensuring alignment with the **EU AI Act** and international standards. Overall, Smart/MK seeks to create an **inclusive, innovation-driven digital ecosystem**, enabling SMEs to integrate into **EU value chains**, adopt advanced technologies, and contribute to sustainable economic growth.

The **Fund for Innovation and Technological Development (FITD)** was North Macedonia’s main instrument for **boosting SME innovation and digitalisation**, offering **grants, co-financing, and technical support** for startups and enterprises. Its schemes—such as **Startup/Spin-off, Commercialization, Technological Extension, and Accelerator Grants**—help firms adopt advanced technologies and bring innovations to market. Recent initiatives include the **Western Balkans Innovation Vouchers (2024)**, offering **€8,000 cross-border R&D vouchers** to SMEs for collaboration with research institutions, and the **Challenge “With Digital Transformation to Innovation” (2023)**, co-funded by **Switzerland’s IME and INOFEIT DIH**, which supported **13 SMEs** in agri-food and tourism with up to **€29,900** for digital projects (AI, IoT, robotics). The **Skills Development and Innovation Support Project**, backed by a **€17.7 million World Bank loan**, strengthened FITD’s institutional capacity and embedded these grant schemes as permanent tools for innovation.

North Macedonia has developed several **loan instruments** to help SMEs overcome financing barriers to digital transformation. The **EBRD’s “Go Digital in the Western Balkans”** (2025) provides **affordable credit lines, EU-funded assistance, and incentives** for investments in automation and digital technologies, prioritizing green, regional, and women-led projects. The **Development Bank of North Macedonia** offers loans of **€5,000–€300,000 at 2.9% interest**, financing **IoT, robotics, software, and cloud solutions**. Regionally, the **EIB’s Innovation and Green Transformation Facility** (2026) allocates **€187 million** to support **innovation, digitalisation, and green projects** through long-term blended finance. Together, these instruments combine **low-cost financing and advisory support** to accelerate SME digitalisation and align with the **ICT Development Strategy: SMART/MK 2030** and **EU integration** goals.

Since **2023**, North Macedonia has been **formally associated with the EU’s Digital Europe Programme (DEP)**, gaining access to funding for **AI, cybersecurity, supercomputing, advanced digital skills, and broad digital adoption**. This participation enables SMEs, universities, and public institutions to join **EU-wide projects** and benefit from **European Digital Innovation Hubs (EDIHs)**. The country’s first, **INNOFEIT EDIH**, launched in **2025** with a **€2 million budget** co-financed by the **EU and FITD**, provides SMEs and public bodies with **“Test Before Invest” facilities, AI and cybersecurity training, and consulting on digital investments**. Parallely, the **Interreg VI-A IPA Bulgaria–North Macedonia Programme (2021–2027)** strengthens **cross-border SME competitiveness** through **€100,000–€300,000 grants** for **digitalisation, technological modernisation, and market integration**. Collectively, these EU instruments embed North Macedonia in the **European digital ecosystem**, enhancing **SME innovation, skills, and competitiveness** while aligning national priorities with the **EU Digital Decade 2030** and **ICT Development Strategy: SMART/MK 2030** strategies.

North Macedonia’s policy framework for SME digitalisation combines **broad strategic enablers**—such as the *ICT Development Strategy: SMART/MK 2030 Strategy*, participation in the *Digital Europe Programme*, and the establishment of *INNOFEIT EDIH*—with **targeted financial instruments** like *FITD grants, MoE subsidy schemes, and DBNM/EBRD blended loans*. While this mix provides a solid foundation, its impact is constrained by **policy discontinuity, limited coordination, and volatile funding**. The expiry of the SME Strategy 2018–2023, delays in adopting the 2025–2030 successor, and the absence of budgeted measures under Smart/MK create uncertainty and hinder progress toward EU Digital Decade goals. Institutional overlap and frequent restructuring further weaken coherence, while most SMEs continue to self-finance digital projects due to low awareness, complex procedures, and insufficient loan uptake.

Beyond financing, **digital skills shortages, limited absorptive capacity, and weak public-sector demand** remain critical bottlenecks. Many SMEs lack trained personnel and managerial know-how to integrate new technologies effectively, and available upskilling initiatives—though promising—are small-scale and concentrated in urban areas. Public procurement rarely stimulates innovation, and connectivity gaps outside Skopje limit

technology adoption. Collectively, these issues risk widening the divide between advanced and lagging firms. Addressing them requires adopting and funding the new SME Strategy, expanding SME-oriented finance and training, improving coordination, and using public-sector digitalisation and procurement as a driver for innovation—key steps to align with **EU Digital Decade 2030** and build a **competitive, inclusive digital economy**.

Regarding the **data infrastructure for assessing SME digital transformation**, North Macedonia relies on a mix of national and international sources. The State Statistical Office (SSO) provides official enterprise data and ICT usage statistics, complemented by Eurostat indicators and analyses by bodies like the World Bank, EBRD, and OECD. These sources offer valuable benchmarks (e.g. the UNDP digital readiness assessment and EU’s SME reports provide insight into connectivity and skills levels). However, the report notes significant **data gaps** that constrain a quality regional evaluation of SME digitalisation. There is limited granular data at the regional level and a lack of comprehensive impact assessments of specific digital support programs. For instance, there is insufficient longitudinal data tracking SMEs’ digital skills development and scarce statistics on barriers (such as how many SMEs attempt to access support and why some fail). These deficiencies make it difficult to fully gauge progress and pinpoint needs in each region. The **key finding** is that strengthening the data infrastructure – by collecting more detailed regional metrics, evaluating program outcomes, and monitoring SME digital readiness over time – is crucial for informed policy-making. Filling these data gaps would enable authorities to **better target interventions** and measure the success of digital transformation initiatives, ensuring North Macedonia’s SMEs can fully thrive in the digital era while advancing the country’s EU accession goals.

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State of the Art Report, Montenegro

1. Regional Background Information

1.1. Introduction

Purpose and Context

Montenegro is a small Balkan country located in Southeast Europe, strategically positioned on the Adriatic coast. With a population of approximately 623,000-626,000 inhabitants (2024), it represents one of the smallest economies in the region, yet demonstrates significant potential for digital transformation and innovation-driven growth. Montenegro declared independence in 2006 and has since pursued European Union membership, aligning its policies and strategies with EU frameworks and accession requirements.

The country's geographic position, combined with its open economy and euro adoption, creates unique opportunities and challenges. Montenegro shares borders with Croatia, Bosnia and Herzegovina, Serbia, Kosovo, and Albania, positioning it as a bridge between the Western Balkans and the EU. Its 293 km Adriatic coastline has historically made tourism a cornerstone of the economy, but the country is increasingly diversifying toward knowledge-based services, particularly ICT.

Governance Structure

Montenegro operates as a parliamentary republic with a multi-level governance system:

National level: Central government with ministries responsible for economy, digital transformation, education, science and innovation

Municipal level: 25 municipalities with varying degrees of autonomy and development capacity

Thematic agencies: Specialized bodies for investment promotion, innovation, employment, and statistics

This relatively centralized structure facilitates coordinated policy implementation, though regional disparities between coastal and northern municipalities remain significant.

EU Integration Path

Montenegro has been an official EU candidate country since 2010 and opened accession negotiations in 2012. As of 2025, it has provisionally closed several negotiation chapters and is considered one of the frontrunners among Western Balkan countries. EU integration profoundly shapes Montenegro's policy landscape, particularly in areas of:

- Digital transformation and innovation policy
- Public administration reform
- Rule of law and anti-corruption measures
- Economic competitiveness and business environment improvements

The alignment with EU digital agendas (Digital Europe Programme, Digital Decade targets) provides both a framework and impetus for Montenegro's digitalisation efforts, particularly for SMEs.

Strategic Positioning

Within the national and regional context, Montenegro positions itself as:

- A **tourism leader** in the Adriatic and Western Balkans
- An **emerging ICT hub** with growing software development and digital services exports
- A **digital infrastructure pioneer** with among the highest broadband penetration rates in Southeast Europe
- A **smart specialization adopter**, being the first non-EU country to develop and implement an S3 strategy

This positioning is increasingly critical as Montenegro seeks to diversify its economy beyond tourism and leverage its educated workforce and connectivity advantages to attract knowledge-intensive investments.

1.2. Economic Profile of the Region

General Economic Overview

Montenegro's economy is characterized as small, open, and highly service-oriented. Key macroeconomic indicators for 2023-2024 include:

- **GDP (current prices):** Approximately €6.96 billion (2023), reaching ~€7.5 billion (2024 estimate)
- **GDP per capita:** €11,000-11,500 (2023), approximately \$12,942 (2024)
- **Real GDP growth:** +6.3% (2023), slowing to +3.0% (2024), with IMF projections of +3.2% (2025)
- **Inflation rate:** Peaked at 8.6% (2022), moderated to 3.4% (2024), projected at 3.3% (2025)
- **Public debt:** Reduced to approximately 60% of GDP (2023) following fiscal consolidation efforts

The economy remains heavily dependent on services, which account for approximately 75% of GDP. Tourism alone contributes 25-30% of GDP, making Montenegro particularly vulnerable to external shocks (as evidenced by the -15.3% GDP contraction in 2020 during COVID-19). Industry contributes roughly 18% and agriculture about 4% of GDP.

Montenegro uses the euro unilaterally (not part of the Eurozone) and maintains strong trade ties with EU countries, which absorb the majority of exports.

Trade and Investment Patterns

According to the Chamber of Commerce data for 2024, Montenegro's foreign trade showed the following patterns:

- **Imports:** €4.068 billion (January-December 2024), +6.8% year-on-year
- **Exports:** €615 million (January-December 2024), -8.8% year-on-year
- **Trade deficit:** €3.453 billion, with export coverage of imports at only 15.1%

Main import partners:

- Serbia (49%)
- China (17%)
- Germany (12%)
- Italy (10%)
- Greece (6%)

Main export destinations:

- Serbia (46%)
- Bosnia and Herzegovina (30%)
- Switzerland (8%)
- Slovenia (6%)
- Kosovo (5%)

Foreign Direct Investment (FDI) - 2024:

- **Total FDI inflow:** €889.8 million (+3.2% vs 2023)
- **Total FDI outflow:** €399.9 million (-6.7%)
- **Net FDI:** €490 million (+13%)

Sectoral structure of FDI:

- Real estate investments: 51%
- Intercompany debt: 33%
- Investments in companies and banks: 13%
- Other: 3%

Role of SMEs in the Economy

Small and medium-sized enterprises form the backbone of Montenegro's economy.

According to MONSTAT data for 2024:

- **Total registered businesses:** 54,094 active enterprises
- **Ownership structure:** 99.5% privately owned
- **SME dominance:** SMEs account for over 99% of all businesses
- **Employment contribution:** SMEs employ approximately 70% of the workforce

- **Revenue generation:** SMEs contribute approximately 65% of total business revenues

Key sectors by number of enterprises:

- Wholesale and retail trade: ~27%
- Construction: ~12%
- Accommodation and food services: ~10%
- Professional, scientific and technical activities: ~8%
- Manufacturing: ~6%

The SME sector remains characterized by predominantly micro-enterprises (0-9 employees), with limited representation in medium-sized categories, indicating structural weaknesses in scaling and growth capacity.

ICT Sector Overview

Montenegro's ICT sector has emerged as one of the fastest-growing components of the economy. According to 2023 industry analyses:

- **Number of ICT companies:** ~2,860 (25% increase from 2022)
- **Employment:** ~9,590 people (24% growth year-on-year)
- **Sector revenue:** €705.1 million (+18% growth)
- **GDP contribution:** Approximately 11% of GDP (up from ~10% in 2022)
- **Employment share:** ~2.75% of total employment
- **Export contribution:** ICT services account for approximately 25% of Montenegro's total exports, reflecting a tenfold increase over the past decade

This rapid growth positions ICT as a strategic priority for economic diversification and innovation. The sector benefits from a young, educated, multilingual workforce; competitive labor costs compared to EU markets; strong digital infrastructure and connectivity; growing startup ecosystem and innovation support mechanisms; and proximity to EU markets with time zone advantages for nearshoring.

Digital Maturity of the Economy

Montenegro demonstrates relatively advanced digital infrastructure and adoption compared to Western Balkan peers:

Connectivity Indicators:

- Internet penetration: ~88-90% of population (2022-2023)
- Household internet access: 81% of households
- Fixed broadband penetration: 96% of households (among highest in region)
- Fiber-to-the-home (FTTH) coverage: 67% of homes (above EU average)
- Ultra-fast broadband (≥ 100 Mbps): ~40% of households
- Mobile broadband subscriptions: 103-216 per 100 people

- 5G coverage: ~79% of population (2023)
- 3G coverage: 98% of territory
- 4G/LTE coverage: ~87% of population

Digital Economy and Society Index (DESI) Performance:

Montenegro scored 35.1 points in the Western Balkans DESI 2022 assessment, leading all WB6 countries (average: 29.7) but remaining below the EU average (52.3). Key sub-scores:

- Connectivity: 10.4 (above WB average)
- Human capital/digital skills: Below EU benchmarks
- Use of internet services: Strong adoption
- Integration of digital technology (businesses): Moderate
- Digital public services: 5.8 (low; WB avg ~8.0, EU avg ~16.8)

Despite strong connectivity foundations, significant gaps remain in advanced digital technology adoption by businesses, digital skills development, and comprehensive e-government service delivery.

1.3. HR Profile of the Region

Population and Demographic Trends

Montenegro's population stands at approximately 623,000-626,000 (2024 estimates), making it one of Europe's smallest countries by population. Key demographic characteristics include:

- **Population growth rate:** Modest positive growth driven primarily by immigration
- **Urbanization rate:** Approximately 67% (2023), concentrated in coastal areas and Nikšić
- **Median age:** Rising, reflecting regional aging trends
- **Life expectancy:** Among the higher rates in the Western Balkans
- **Emigration pressures:** Brain drain remains significant, particularly among educated youth
- Educational Attainment and Structure

Montenegro has made notable progress in education outcomes:

- **Tertiary education attainment:** The share of adults (25-64) with tertiary education has increased by approximately 36 percentage points since 2017
- **Literacy rate:** Effectively 100% (universal primary education)
- **School enrollment:** High rates at primary and secondary levels
- **Vocational education:** Significant VET sector presence, though curriculum alignment with labor market needs remains challenging

The education system includes primary education (9 years, compulsory), secondary education (general, vocational, mixed programs), higher education centered on the University of Montenegro (19 faculties, 15,000-20,000 students), and growing but underdeveloped lifelong learning opportunities.

Higher Education and Research Capacity

Research and Development (R&D) Capacity:

- R&D expenditure: ~0.19% of GDP (2021), among the lowest in Europe
- R&D spending composition: Predominantly public/government funded
- Research personnel: Limited, with many researchers holding part-time positions
- Scientific output: Modest but growing international scientific collaboration

The low R&D investment reflects Montenegro's development stage and limited private sector R&D activity, representing a critical constraint on innovation capacity.

Digital Skills and ICT Competencies

Montenegro shows mixed performance on digital skills indicators:

Population-level digital skills:

- Adults with at least basic digital skills: ~47% (2021), highest in Western Balkans but below EU average of ~53.9%
- Basic digital content creation skills: 81% (2021)
- Overall digital skill improvement: +6.2 percentage points since 2017

ICT specialists in workforce:

- Share of ICT specialists: Only ~32.4% of EU average
- ICT graduates: Limited pipeline from higher education
- Gender gap: Significant underrepresentation of women in ICT fields

The digital skills gap - particularly shortage of qualified ICT professionals - represents a major constraint on sectoral growth and digital transformation of traditional industries. Despite strong demand (24% ICT employment growth), domestic supply of skilled professionals cannot meet market needs.

Labor Market Characteristics and Employment Structure

Montenegro's labor market showed significant tightening in 2023-2024:

Employment Indicators (2024):

- Average number of employed persons: 257,390 (+5.3% vs 2023)
- Employment rate: Approximately 56-58.7% of working-age population

- Activity rate: ~66.5%
- Unemployment rate: 11.36% (December 2024), down from 13.95% (2023)
- Registered unemployed: 33,037 persons (-17.3% year-on-year)

Top Employment Sectors (2024):

- Wholesale and retail trade: 50,394 (20%)
- Accommodation and food services: 26,797 (10%)
- State administration and defense: 23,241 (9%)
- Health and social protection: 19,604 (8%)
- Construction: 17,794 (7%)

Wages and Income Levels

Wage indicators for 2024 show steady improvement:

- **Average gross monthly wage:** 1,083 EUR (+9.7% vs 2023)
- **Average net monthly wage:** 876 EUR (+10.6%)
- **December 2024 wages:** 1,205 EUR gross, 1,012 EUR net (record highs)
- **Minimum wage:** Approximately 600 EUR (2024)

ICT sector wages are significantly higher than average, typically ranging €1,500–€2,500+ for developers and specialists, reflecting high demand and competition.

1.4. Socioeconomic Conditions and Employment Opportunities

Income Distribution and Living Standards

Montenegro demonstrates moderate income levels by Western Balkan standards but remains significantly below EU averages:

- **GDP per capita (PPP):** Approximately 50-55% of EU average
- **At-risk-of-poverty rate:** Estimated 20-25% of population
- **Social protection:** Basic welfare system in place but coverage and adequacy concerns persist

Living standards vary considerably between coastal urban areas (higher incomes), the capital region (diverse economy), and northern municipalities (lower incomes, limited opportunities, higher poverty rates).

Employment Opportunities by Sector

Expanding sectors (hiring actively in 2024):

- Tourism and hospitality
- ICT and digital services

- Construction
- Professional services
- Retail and wholesale trade

Declining or stagnant sectors:

- Traditional manufacturing
- Agriculture
- Energy sector

Skills Demand and Mismatch

Key skills in demand: Digital/ICT skills (software development, cybersecurity, data analytics), foreign languages (especially English), tourism services, construction trades, professional services.

Skills gaps: Advanced digital skills (AI, machine learning, blockchain), managerial competencies, green skills, innovation skills.
Entrepreneurship and Business Environment

Strengths:

- Streamlined business registration
- Low corporate tax rate (9%)
- Free trade agreements
- Growing startup ecosystem

Weaknesses:

- Access to finance challenging
- Limited venture capital
- Complex regulatory environment in some sectors
- Corruption and rule-of-law concerns
- Small domestic market

Banking Sector Performance (2024):

- Total assets: €7.25 billion (+7.7%)
- Net loans: €4.5 billion (+13.3%)
- Total new lending: €1.87 billion (+23.4%)

Despite banking sector liquidity, SMEs still report challenges accessing affordable financing for innovation investments.

2. Analysis and Assessment of Policy Instruments

2.1. Policy Instruments

Montenegro has developed a comprehensive policy framework to support digital transformation, innovation, and economic competitiveness.

Smart Specialisation Strategy of Montenegro 2019-2024

Duration: 2019-2024 (currently under revision)

Managing Authority: Ministry of Education, Science and Innovation

Description: Montenegro became the first non-EU country to adopt a Smart Specialisation Strategy (S3), developed with EU Joint Research Centre support through an Entrepreneurial Discovery Process.

Priority Domains:

1. Sustainable agriculture and food value chain
2. Sustainable and health tourism
3. Energy and sustainable environment
4. ICT (horizontal priority - cross-cutting enabler)

Key Measures:

- Innovation Fund establishment (operational since September 2021)
- Grant schemes for R&D projects, startup support, cluster development
- Science and Technology Park (completed 2023)
- Support for university-business collaboration
- Competitive calls for collaborative R&D projects

Funding: Over €120 million allocated through S3-aligned programs by early 2023

Results:

- 100+ innovation projects funded
- Growing startup ecosystem, particularly in ICT
- Enhanced international cooperation (Horizon, Interreg)
- Increased public-private collaboration in R&D

Challenges:

- Limited monitoring and evaluation framework
- Modest private sector R&D investment
- Coordination challenges across ministries
- Need for stronger education-priority sector linkages
- Digital Transformation Strategy of Montenegro 2022-2026

Duration: 2022-2026

Managing Authority: Ministry of Public Administration, Digital Society and Media

Vision: "Montenegro as a digitally developed country"

Strategic Goals:

- Enhance institutional and societal capacity for digital transformation

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- Strengthen digital skills and ICT sector competitiveness

Priority Areas (Seven Pillars):

- Broadband infrastructure
- e-Government
- e-Health
- e-Education
- e-Inclusion
- ICT industry development
- R&D and innovation in ICT

Key Measures for SME Digitalisation:

- Digital skills training programs
- e-Business support (advisory services, grants for digital tools)
- Digital public services for business
- Broadband expansion to all regions
- Cybersecurity awareness and support
- Innovation grants

Results to Date (2024):

- Near-universal basic broadband access achieved
- eUprava portal with 100+ digital services
- eID and digital signature infrastructure deployed
- FTTH coverage reached 67% of homes
- 5G spectrum auctioned, rollout beginning
- Growing e-commerce and digital business tools uptake

Challenges:

- Implementation coordination across ministries
- Insufficient monitoring with measurable KPIs
- Advanced digital skills remain scarce
- Rural-urban digital divide persists
- Limited integration with business competitiveness strategies
- Innovation Fund of Montenegro

Duration: Established September 2021, ongoing

Managing Authority: Innovation Fund of Montenegro (autonomous agency)

Objectives:

- Provide financial support for innovation projects
- Support startup creation, growth, and scaling
- Foster university-business collaboration

- Strengthen innovation ecosystem
- Attract private sector investment in R&D

Funding Instruments:

- Innovation vouchers: €5,000-€15,000
- Startup support grants: €20,000-€50,000
- Collaborative R&D grants: €50,000-€200,000
- Scale-up support: Larger grants and co-investment
- Infrastructure grants: Labs, equipment, maker spaces

Budget: Initial €10 million capitalization; annual €5-10 million operating budget

Results (2021-2024):

- 100+ innovation projects funded
- 50+ startups supported
- 30+ university-business collaborations
- 200+ high-skill jobs created/retained
- €3-5 million private co-investment leveraged

Challenges:

- Limited scale relative to demand
- Complex application processes
- Limited follow-on funding (scaling gap)
- Capacity constraints in monitoring

Other Key Policy Instruments

Industrial Policy 2019-2023: Promotes innovation and Industry 4.0, supports business environment improvements and SME capabilities.

SME Development Strategy 2018-2022: Recognizes "digital business transformation" as priority; includes training programs and grants for ICT adoption.

Digital Education Strategy 2022-2027: Integrates ICT into primary, secondary, and vocational education; develops digital competencies.

Public Administration Reform Strategy 2022-2026: Modernizes public administration through e-government, digital-by-default principle.

Cybersecurity Strategy 2022-2026: Addresses security needs, harmonizes with EU frameworks (NIS Directive, GDPR).

2.2. General Assessment

Overall Policy Framework Strengths

Montenegro has developed a **comprehensive and well-structured policy framework** demonstrating:

1. **Strategic Vision and EU Alignment:** First non-EU country to adopt S3; all strategies align with EU digital agendas and accession requirements
2. **Comprehensive Coverage:** Full spectrum of digital transformation addressed (infrastructure, skills, innovation, public services, business support, cybersecurity)
3. **Stakeholder Engagement:** Entrepreneurial Discovery Process involved broad consultations
4. **Institutional Infrastructure:** Dedicated implementation bodies created (Innovation Fund, Science and Technology Park)
5. **Infrastructure Achievements:** Highest connectivity metrics in Western Balkans; near-universal broadband; 67% FTTH coverage exceeds EU average

Implementation Progress and Outcomes

Digital Infrastructure:

- Met EU 2025 broadband targets early
- 5G spectrum auctioned

E-Government:

- eUprava portal with 100+ services
- eID deployed

Innovation Support:

- Innovation Fund funding 100+ projects
- Science and Technology Park operational

ICT Sector Growth:

- 25% company increase, 24% employment growth
- Now ~11% of GDP

Education and Skills:

- Tertiary attainment +36 percentage points since 2017

Policy Framework Limitations and Weaknesses

1. **Monitoring, Evaluation, and Data Gaps:** Lack of specific, measurable targets; poor digital inclusion tracking; few rigorous evaluations
2. **Coordination Challenges:** Inter-ministerial coordination ad hoc; municipalities have limited implementation capacity
3. **Funding and Sustainability:** Public R&D investment (~0.19% GDP) among Europe's lowest; heavy reliance on EU funding
4. **Skills and Capacity Gaps:** ICT specialist shortage (32% of EU density); severe shortages in AI, data science, cybersecurity

5. **SME Reach and Inclusiveness:** Programs often don't reach micro-enterprises and rural SMEs
6. **Green-Digital Integration Weakness:** Concrete measures and budgets lacking for twin transition

Alignment with EU Digital Decade 2030

Montenegro aligns conceptually but significant gaps remain:

- 80% population with basic digital skills: Montenegro at 47% - **significant gap**
- 20M ICT specialists: Montenegro at ~32% of EU density - **severe shortage**
- 75% businesses using cloud/AI/big data: Estimated 20-30% in Montenegro - **major gap**
- 100% gigabit connectivity: ~40% with ≥100 Mbps - **improving but not universal**
- 100% online public services: ~100 services available but uptake varies - **adoption gap**

Summary Assessment

Montenegro has built strong strategic foundations with clear vision, comprehensive policies, and significant infrastructure investments. The country is a regional leader in connectivity with notable e-government and ICT sector progress.

However, implementation challenges persist: limited funding and capacity, weak monitoring, skills shortages, and difficulty reaching micro-enterprises. The private sector remains underdeveloped in R&D, and the education system struggles to supply needed workforce.

2.3. Identification of Policy Challenges

Challenge 1: Digital Skills and Workforce Shortage

Description: Only 47% of adults have basic digital skills (vs 54% EU average). Severe shortage of ICT specialists (~32% of EU density). Critical gaps in advanced competencies: AI, data science, cybersecurity, software architecture. Education system slow to adapt curricula to labor market needs. Limited lifelong learning and reskilling opportunities. Brain drain of skilled ICT professionals to EU markets exacerbates shortages.

Impact: Directly constrains ICT sector growth, limits SME digital transformation capacity, reduces competitiveness in knowledge-intensive sectors, undermines all digital transformation strategies. Despite 24% ICT employment growth, domestic supply cannot meet market needs.

Linkage to Strategies: Gap between Digital Education Strategy and labor market needs. Lifelong learning underemphasized. Skills development insufficiently integrated with S3 priority sectors.

Challenge 2: Weak Monitoring and Evaluation Framework

Description: Strategies lack comprehensive KPIs for measuring outcomes and impact. Limited disaggregated data on e-commerce growth, digital trade, SME digital maturity, innovation commercialization. Absence of unified digital transformation dashboard. Difficult to assess which programs work effectively and justify continued investment. Mid-term S3 review highlighted need for stronger performance metrics.

Impact: Weakens accountability for all implementation programs. Prevents evidence-based policy adjustments. Makes it impossible to demonstrate ROI and secure continued funding. Limits learning from implementation experience.

Linkage to Strategies: Undermines all policy instruments by preventing effective performance assessment. Conflicts with EU accession requirements for results-oriented programming. Reduces credibility with stakeholders and international partners.

Challenge 3: Limited Reach to Micro-Enterprises and Rural SMEs

Description: Support programs designed primarily for medium-sized, urban, tech-oriented firms. Micro-enterprises (0-9 employees, majority of businesses) face barriers: complexity of applications, co-financing requirements, lack of awareness. Rural SMEs have limited access to advisory services, training, and broadband quality. Traditional sectors (agriculture, crafts, small tourism) underrepresented in innovation programs. Geographic concentration of support in Podgorica and coastal areas.

Impact: Creates digital divide within business community. Majority of businesses (99% micro-enterprises) unable to benefit from public support. Regional disparities deepen. Economic diversification goals undermined. Social inclusion objectives not met.

Linkage to Strategies: Conflicts with SME Development Strategy goal of supporting 99% of businesses. Fails Digital Strategy's e-inclusion pillar. Undermines S3's inclusive development objective. Contradicts Public Administration Reform goal of reducing administrative burden.

Challenge 4: Low Private Sector R&D Investment and Weak Innovation Culture

Description: Business R&D spending extremely low (~0.1% of GDP vs 1.5% EU average). Weak culture of innovation in established companies. Limited commercialization of university research outputs. University-industry collaboration mechanisms underdeveloped. SMEs often lack awareness of innovation benefits or capacity to manage R&D projects. Venture capital and angel investment ecosystem minimal.

Impact: Limits effectiveness of S3 and Innovation Fund in achieving innovation-driven growth. Prevents Montenegro from moving up value chains. Reduces competitiveness and productivity gains. Creates dependency on public funding for innovation. Constrains high-value job creation.

Linkage to Strategies: Directly undermines S3's core objective of innovation-driven competitiveness. Limits Industrial Policy's modernization goals. Reduces return on

investment in research infrastructure (Science Park, university facilities). Weakens Montenegro's position in EU accession negotiations (Chapters 20 and 25).

Challenge 5: Inter-Ministerial and Multi-Level Coordination Deficits

Description: Digital transformation cuts across ministries (Public Admin, Economy, Education, Health) but coordination remains informal. No permanent inter-ministerial body with authority and resources for implementation oversight. National-municipal linkages weak; local governments lack capacity and guidance. Fragmented delivery of business support across multiple agencies (Innovation Fund, Directorate for SMEs, Investment Fund, Chamber of Commerce).

Impact: Creates policy incoherence and implementation gaps. Leads to duplication of efforts and inefficient resource use. Confuses beneficiaries facing multiple, overlapping programs. Reduces effectiveness of all strategies. Hampers integrated approaches (e.g., green-digital transition).

Linkage to Strategies: Undermines Public Administration Reform Strategy's efficiency objectives. Reduces coherence between Digital Strategy, S3, and sectoral policies. Weakens Smart Specialisation's governance framework. Prevents effective implementation of cross-cutting priorities like ICT as horizontal enabler.

2.4. Regional Competitiveness

Economic Competitiveness Performance

Strengths:

- Digital infrastructure: Regional leader (96% household broadband, 67% FTTH coverage)
- ICT sector dynamism: Fastest-growing sector (25% company growth, 24% employment growth)
- Tourism brand: Established Mediterranean destination
- Strategic location: Adriatic access, proximity to EU markets
- Euro adoption: Currency stability
- Open economy: High trade-to-GDP ratio

Weaknesses:

- Small market size: Population 623k limits demand and economies of scale
- High trade deficit: 85% import coverage (€3.45B deficit, 2024)
- Low value-added: Economy concentrated in low-productivity services
- Brain drain: Emigration of skilled workers
- Rule of law concerns: Corruption perceptions deter investors
- Informal economy: Estimated ~30% of GDP
- Infrastructure gaps: Transport connectivity below EU standards

Digital Economy and Society Index (DESI) – WB 2022

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Montenegro: 35.1 points (WB6 avg: 29.7, EU: 52.3)

Dimension	Montenegro	WB6 Avg	EU Avg	Assessment
Connectivity	10.4	~9.0	~12.5	Strong - regional leader
Human Capital	~7.5	~6.5	~11.0	Moderate - skills gaps
Internet Use	~8.0	~7.0	~10.5	Good - high adoption
Digital Technology Integration	~4.4	~4.0	~9.5	Weak - SME adoption low
Digital Public Services	5.8	~8.0	~16.8	Very weak - major gap

Innovation Performance - European Innovation Scoreboard 2024

Classification: "Emerging Innovator" at ~47.5% of EU average

Relative Strengths:

- Environment-related technologies (above EU average)
- SMEs introducing product innovations (strong)
- SMEs introducing business process innovations (strong)
- International scientific co-publications (growing)

Relative Weaknesses:

- R&D expenditure in public sector (0.19% GDP vs ~0.7% EU)
- Venture capital expenditures (near zero vs ~0.12% GDP EU)
- Government support of business R&D (very low)
- Private sector R&D spending (~0.1% GDP vs ~1.5% EU)

GDP Per Capita and Productivity

- **GDP per capita (PPP):** Approximately 50-55% of EU average (~\$12,942 nominal 2024)
- **Labor productivity:** Estimated 45-50% of EU average
- **Productivity growth:** Positive but insufficient to rapidly close gap

Productivity constrained by low technology investment, skills mismatches, informal economy, small firm size, and weak management practices.

Regional Position in Western Balkans

Advantages:

- Highest digital infrastructure quality
- Strongest tourism brand
- Smallest but most open economy facilitating reforms
- EU accession progress ahead of most peers
- Stable currency (euro adoption)

Disadvantages:

- Smallest market (less attractive for FDI)
- Highest wages (eroding cost advantage)
- Limited industrial base
- Resource constraints (smallest public budget)
- Competitiveness Summary

Montenegro's competitiveness rests on:

- ✓ Digital infrastructure leadership
- ✓ Growing ICT sector with export success
- ✓ Established tourism brand
- ✓ Strategic location
- ✓ EU integration momentum
- ✓ Young, educated, multilingual workforce

But faces constraints from:

- X Small market size
- X Skills shortages in advanced digital competencies
- X Low R&D investment
- X Trade deficit and limited export diversification
- X Brain drain
- X Rule of law concerns
- X Fiscal limitations

Digital transformation is essential for Montenegro to move up value chains, overcome size constraints through global digital market access, attract and retain talent, diversify beyond tourism, and bridge productivity gap with EU.

2.5. Good Practices and Recommendations

Five Major Good Practices

GP1: First Non-EU Country to Adopt Smart Specialisation Strategy (2019)

Description: Montenegro pioneered Smart Specialisation outside the EU, working with the European Commission's Joint Research Centre to develop its S3 2019-2024, demonstrating policy innovation leadership and commitment to evidence-based, focused innovation policy.

Why it works:

- Brought international expertise and methodologies
- Conducted genuine Entrepreneurial Discovery Process with broad stakeholder engagement

- Identified realistic priority domains based on comparative advantages
- Created framework for concentrating limited resources
- Positioned Montenegro favorably for EU accession and funding

Results:

- Structured innovation policy framework established
- Innovation Fund created and operational
- Over €120 million mobilized for S3-aligned programs
- International recognition and cooperation opportunities
- Template for other Western Balkan countries

Transferability: High - applicable to other small economies and candidate countries. EDP methodology proven effective. Demonstrates value of international technical assistance.

GP2: Rapid Broadband Infrastructure Deployment

Description: Montenegro achieved near-universal broadband access and highest connectivity metrics in Western Balkans through strategic investments, public-private partnerships, and regulatory incentives.

Key elements:

- Universal Service Obligation requiring operators to extend networks
- State co-financing for rural and underserved areas
- Competitive market with multiple operators driving expansion
- Fiber-to-the-home prioritization (67% coverage, above EU average)
- Spectrum allocation strategy enabling 4G/5G rollout

Results:

- 96% household broadband access
- 40% with ultra-fast (≥100 Mbps) broadband
- 216 mobile broadband subscriptions per 100 people (regional leadership)
- Foundation for digital economy development
- Improved quality of life during COVID remote work/education

Transferability: High - applicable to other small countries and regions. Demonstrates PPP effectiveness. Shows importance of regulatory framework alongside investment.

GP3: Innovation Fund as One-Stop-Shop for Innovation Support

Description: The Innovation Fund (established 2021) consolidates various innovation support instruments under single institution, simplifying access for entrepreneurs and enabling coordinated implementation.

Services provided:

- Innovation vouchers for SME-university collaboration
- Startup grants for early-stage companies
- Collaborative R&D project funding
- Scale-up support for growth-stage firms
- Capacity building for innovation ecosystem actors

Why it works:

- **Simplified access:** Single point of contact reduces confusion
- **Flexible instruments:** Portfolio approach serves different innovation stages
- **Professional management:** Dedicated staff with expertise
- **Transparent processes:** Clear criteria and online application systems
- **Ecosystem building:** Beyond financing, provides networking and mentoring

Results (2021-2024):

- 100+ innovation projects funded
- 50+ startups supported
- 30+ university-business collaborations
- 200+ high-skill jobs created/retained
- €3-5 million private co-investment leveraged

Transferability: High - one-stop-shop model proven effective internationally. Requires sustained political and financial commitment. Benefits from EU and international technical support.

GP4: eUprava Portal - Integrated E-Government Platform

Description: Montenegro's eUprava (eGovernment) portal consolidates 100+ digital public services in single online platform with unified authentication (eID) and user-friendly interface.

Key features:

- Business registration and licensing online
- Tax filing and payment (ePorezi)
- Social security and health insurance submissions
- Certificate requests (birth, residence, criminal record, etc.)
- Digital signature and eID infrastructure
- Mobile app for on-the-go access

Why it works:

- **User-centered design:** Focus on citizen/business needs rather than government structure
- **Interoperability:** Backend connections between government databases
- **Single sign-on:** eID eliminates need for multiple credentials

- **Continuous improvement:** Regular addition of new services based on demand
- **Multi-channel:** Online, mobile, in-person kiosks for accessibility

Results:

- Significant reduction in administrative burden for businesses
- Time savings for citizens (no need to visit multiple offices)
- Improved transparency and reduced corruption opportunities
- Foundation for data-driven policymaking
- International recognition (eGovernment awards, positive DESI assessments)

Transferability: Very high - model successfully replicated in many countries. Requires significant upfront investment and sustained commitment. Benefits from learning from international best practices (Estonia, UK, Singapore).

GP5: Entrepreneurial Discovery Process for S3 Development

Description: Multi-stakeholder consultation methodology used to identify Montenegro's smart specialization priorities through evidence-based dialogue between government, business, academia, and civil society.

Process elements:

- Working groups for each potential priority domain
- Data analysis of economic structure, capabilities, and market opportunities
- Stakeholder workshops and surveys
- Pilot projects to test ideas
- Iterative refinement based on feedback
- Formalization in strategy document with action plans

Why it works:

- **Bottom-up input:** Priorities emerge from stakeholder knowledge, not government decree
- **Evidence-based:** Combines quantitative data with qualitative insights
- **Ownership:** Participants invested in implementation
- **Realistic:** Focuses on areas with existing capabilities and credible growth paths
- **Flexible:** Allows for adjustments as circumstances change

Results:

- Strong consensus on final priority domains
- Identification of specific niche opportunities (organic food, health tourism, ICT for agrifood)
- Network formation among previously disconnected actors
- Mobilization of stakeholders for implementation

Transferability: Very high – EDP methodology proven globally. EU provides support and guidance for candidate countries. Requires skilled facilitation and political commitment to genuine consultation.

Five Major Recommendations

R1: Establish Comprehensive Monitoring and Evaluation Framework

Rationale: Lack of robust KPIs and impact assessment undermines evidence-based policymaking and accountability.

Key Actions:

- Develop **Digital Transformation Dashboard** consolidating data from all strategies and programs
- Define **SMART indicators** (Specific, Measurable, Achievable, Relevant, Time-bound) for each policy goal
- Implement **annual progress reports** with quantitative and qualitative assessments
- Conduct **independent mid-term evaluations** of strategies with external expert input
- Establish **feedback mechanisms** linking monitoring findings to policy adjustments
- Invest in **data collection infrastructure** to fill gaps in SME digital maturity, e-commerce, innovation outcomes
- Publish **open data** on program performance for transparency

Implementation:

- Assign lead role to Government Office for Strategic Planning or dedicated Digital Transformation Coordination Unit
- Allocate adequate budget for data systems, surveys, evaluations (€500,000-€1M annually)
- Build capacity in government agencies for M&E practices
- Partner with EU (IPA III funding), World Bank, or OECD for technical assistance

Expected Impact: Evidence-based policy adjustments, improved accountability, better resource allocation, demonstration of ROI to secure continued funding, enhanced credibility with stakeholders and international partners.

R2: Massively Scale Up Digital Skills Development at All Levels

Rationale: Skills shortage is the most critical bottleneck constraining digital transformation success.

Key Actions:

Formal education:

- **Expand ICT education** in secondary schools (coding, computational thinking, digital citizenship)

- **Increase STEM university capacity**, particularly computer science, data science, software engineering
- **Develop short-cycle credentials** (6-12 month intensive programs) for rapid reskilling
- **Promote dual education** models with industry internships
- **Target women and underrepresented groups** for STEM participation (scholarships, mentorship)

Lifelong learning:

- **Massively expand Digital Academy** model to general population beyond civil servants
- **Subsidized training vouchers** (€500-€2,000) for SME employees to acquire digital skills
- **Recognize non-formal learning** through micro-credentials and certification
- **Partner with industry** for specialized training (vendor certifications, bootcamps)
- **Regional training centers** to reach rural areas

Advanced skills:

- **Attract diaspora experts** for short-term teaching assignments and mentoring
- **International partnerships** with leading universities for faculty exchange and curriculum development
- **Centers of excellence** in priority technologies (AI, cybersecurity, data science)
- **Support professional communities** and knowledge-sharing platforms

Implementation:

- Reallocate significant portion of education budget toward digital skills (€10-15M annually)
- Leverage EU IPA III and Digital Europe Programme funding
- Private sector co-financing for industry-relevant training
- Establish dedicated Digital Skills Fund with multi-year commitments

Expected Impact: Double the number of ICT specialists within 5 years, increase basic digital skills to 60%+ of adults, reduce skills mismatch, enhance competitiveness, reduce brain drain.

R3: Create Simplified SME Digitalisation Support Program with Regional Reach

Rationale: Current programs don't effectively reach micro-enterprises, rural SMEs, and traditional sectors.

Program Design:

Tiered support matched to enterprise size and digital maturity:

- **Level 1** (Digital Basics): Micro-grants €1,000–€5,000 for website, social media, basic e-commerce. Target: 500 micro-enterprises annually
- **Level 2** (Digital Operations): Grants €5,000–€25,000 for ERP/CRM, cloud services, digital marketing. Target: 300 SMEs annually
- **Level 3** (Digital Transformation): Grants €25,000–€100,000 for comprehensive digitalization projects. Target: 100 SMEs annually

Key features:

- **Simplified applications:** Short online forms (maximum 5 pages), minimal documentation, fast decisions (30 days maximum)
- **Advisory services included:** Mandatory consultancy to help SMEs develop digital plans (€2,000–€5,000 per beneficiary)
- **Sector-specific modules:** Tailored support for agriculture, tourism, crafts, manufacturing
- **Regional outreach:** Mobile advisory teams visiting municipalities quarterly
- **Co-financing rates:** Higher for micro-enterprises (70-80%), lower for larger SMEs (40-50%)

Implementation:

- Assign management to Directorate for SME Development or Innovation Fund
- Partner with Chamber of Commerce, municipalities, and clusters for delivery
- Budget: €8-10 million annually (EU IPA + national co-financing)
- Establish regional support centers in 5 locations (Podgorica, Nikšić, Bijelo Polje, Bar, Herceg Novi)

Expected Impact: 800-900 SMEs supported annually, increased digital adoption rates from 20% to 40% within 3 years, regional disparities reduced, traditional sectors modernized, job creation and productivity gains.

R4: Develop Integrated Green-Digital Transition Strategy

Rationale: Current strategies treat environmental sustainability and digitalization separately, missing synergies and EU Green Deal alignment.

Key Actions:

Twin transition roadmap identifying intersections:

- Smart agriculture (precision farming, IoT sensors, data analytics for resource optimization)
- Renewable energy optimization (smart grids, AI for demand forecasting)
- Circular economy platforms (blockchain for traceability, digital marketplaces for secondary materials)
- Green ICT (data center energy efficiency, e-waste management, ICT sector carbon footprint reduction)
- Smart cities (energy management systems, intelligent transport, environmental monitoring)

Green ICT policies:

- Data center energy efficiency standards (PUE < 1.5 by 2030)
- E-waste management system (collection, recycling, extended producer responsibility)
- ICT sector carbon footprint measurement and reduction targets (carbon neutral by 2040)
- Green public procurement requirements for ICT equipment

Digital for green initiatives:

- IoT for environmental monitoring (air quality, water quality, biodiversity)
- AI for resource optimization (energy, water, materials)
- Blockchain for circular economy traceability (materials passports)
- Digital twins for infrastructure planning (buildings, transport, utilities)

Implementation:

- Establish joint working group from Ministry of Public Admin (digital), Ministry of Economy (energy), and Ministry of Spatial Planning (environment)
- Align with EU Green Deal and Green Agenda for Western Balkans
- Budget: €5-7M annually from EU Climate and Energy funds, IPA III, national budget
- Develop Green-Digital Innovation Call through Innovation Fund (€2M annually)

Expected Impact: Reduced environmental footprint of digital sector, accelerated green transition through digital tools, positioning for EU Green Deal funding, new business opportunities in green tech, alignment with global sustainability trends.

R5: Enhance Inter-Ministerial Coordination Through Permanent Digital Transformation Council

Rationale: Fragmented responsibilities undermine policy coherence and efficient implementation.

Key Actions:

Establish permanent Digital Transformation Council at government level:

- **Mandate:** Oversee implementation of all digital transformation strategies, ensure policy coherence, resolve inter-ministerial conflicts, approve major digital initiatives
- **Composition:** Chaired by Prime Minister or Deputy PM, members include ministers of Public Admin, Economy, Education, Health, plus heads of key agencies (MONSTAT, Innovation Fund, Investment Fund)
- **Meeting frequency:** Quarterly meetings minimum, ad hoc as needed
- **Decision-making authority:** Binding decisions on resource allocation, policy priorities, program approvals

Coordination unit:

- Small secretariat (5-7 staff) supporting the Council
- Functions: Policy analysis, monitoring and reporting, stakeholder engagement, international cooperation coordination
- Technical expertise in digital transformation, innovation policy, project management

Integrated action plans:

- Single consolidated action plan replacing separate ministerial actions
- Cross-cutting initiatives clearly identified and resourced
- Joint performance indicators across ministries

Shared KPI dashboard:

- All ministries reporting against common digital transformation indicators
- Real-time or quarterly updates
- Public web interface for transparency

Municipal engagement framework:

- Formal mechanisms for local government input
- Capacity building programs for municipal staff
- Clear division of responsibilities between national and local levels

Implementation:

- Government decision establishing Council with legal mandate and budget
- Budget: €300,000-€500,000 annually for secretariat operations
- EU twinning project with Estonia, Denmark, or other e-government leaders
- Develop inter-ministerial coordination protocols and procedures

Expected Impact: Improved policy coherence, reduced duplication and gaps, efficient resource utilization, faster decision-making, better stakeholder experience, enhanced credibility of digital transformation efforts, stronger basis for EU accession negotiations.

2.6. Data Infrastructure

Five Major Gaps and Challenges

Gap 1: SME Digital Maturity Data Vacuum

Description: No systematic assessment of SME digital capabilities, technology adoption, or transformation progress. Difficult to target support programs or measure their impact. Cannot benchmark Montenegro's SME digitalization against EU or regional peers. Limits evidence-based policy design.

Impact: Support programs designed without clear understanding of needs. Unable to track progress toward Digital Decade targets. Difficult to demonstrate program effectiveness. Policy decisions based on anecdotal evidence rather than data.

Gap 2: Fragmentation and Data Silos

Description: Data scattered across multiple institutions with no central repository. Incompatible systems and data formats. Limited data sharing between agencies due to legal, technical, and cultural barriers. No unified identifier linking individuals/businesses across databases.

Impact: Prevents integrated analysis of digital transformation progress. Limits implementation of "once-only" principle in e-government. Reduces efficiency of policy coordination. Hampers research and evaluation efforts.

Gap 3: Innovation Ecosystem Data Deficits

Description: R&D spending data exists but often delayed, incomplete private sector reporting. Innovation outputs (patents, trademarks) tracked but commercialization and economic impact not measured. No comprehensive database of university-business partnerships and knowledge transfer. Startup ecosystem informally tracked, no official statistics. Technology diffusion across sectors and regions unmeasured.

Impact: Cannot assess effectiveness of Innovation Fund and S3 investments. Difficult to identify successful innovation models for replication. Limits ability to attract international innovation partnerships. Prevents evidence-based refinement of innovation policies.

Gap 4: Digital Economy Indicators Scarcity

Description: Limited data on online sales, digital trade, cross-border digital services. Platform economy (gig work, digital marketplaces) not systematically tracked. ICT sector statistics available but detailed subsector analysis lacking. Digital skills tracked through point-in-time surveys but no longitudinal workforce evolution data.

Impact: Cannot measure digital economy's true contribution to GDP and employment. Difficult to assess competitiveness in digital services. Limits ability to identify emerging opportunities and threats. Prevents effective monitoring of Digital Strategy implementation.

Gap 5: Geographic Granularity and Real-Time Data Limitations

Description: Most data reported at national level. Municipal-level data limited, particularly for innovation, digital adoption, skills. Cannot identify spatial patterns or target interventions geographically. Official statistics often released quarterly or annually with

delays. Insufficient for agile policymaking and crisis response. Minimal integration of big data sources (mobile network analytics, satellite imagery, web scraping).

Impact: Rural-urban digital divide documented anecdotally but not quantified systematically. Regional development programs lack data for targeting. Cannot respond quickly to economic changes. Missing opportunities for real-time policy monitoring and adjustment.

Opportunities and Recommendations for Data Infrastructure

SHORT-TERM (1-2 years) - Three Major Opportunities

Opportunity 1: Conduct Comprehensive SME Digital Maturity Assessment

Rationale: Establishes baseline for policy targeting and impact measurement. Enables international benchmarking. Identifies specific needs by sector, size, and region.

Recommended Actions:

- Partner with EU (EU4DigitalSME model) or OECD to develop standardized survey methodology
- Survey representative sample of 1,000-1,500 SMEs across all sectors and regions
- Measure: digital infrastructure access/quality, technology adoption (e-commerce, cloud, ERP/CRM, cybersecurity), digital skills of employees, barriers to digitalization, investment plans
- Use international classification frameworks (e.g., Digital Intensity Index) enabling EU comparison
- Repeat assessment biennially for trend analysis

Implementation: Budget €150,000-€200,000 for survey design, data collection, analysis. Partner with MONSTAT for execution. Commission research institutions for specialized analysis. Publish results openly with interactive data visualizations.

Expected Outcomes: Clear understanding of SME digitalization status, evidence-based targeting of support programs, baseline for measuring Digital Strategy impact, international comparability, stakeholder awareness of digital gaps and opportunities.

Opportunity 2: Develop National Digital Transformation Dashboard

Rationale: Consolidates fragmented monitoring into single coherent system. Improves transparency and accountability. Enables real-time tracking of progress toward EU Digital Decade targets.

Recommended Actions:

- Identify 30-40 core indicators across all digital strategies (S3, Digital Strategy, SME Strategy, Education Strategy)
- Align with EU Digital Decade KPIs and DESI methodology for comparability
- Establish data feeds from all relevant sources (MONSTAT, ministries, Innovation Fund, regulatory agencies)
- Develop public web-based dashboard with visualizations (time series, geographic maps, sector breakdowns)
- Include target values and traffic light indicators (green/yellow/red progress status)
- Update quarterly with annual comprehensive reports

Implementation: Budget €100,000-€150,000 for platform development. Assign responsibility to Government Office for Strategic Planning or dedicated unit. Use open-source dashboard tools (e.g., Tableau Public, Power BI). Ensure mobile-responsive design.

Expected Outcomes: Unified view of digital transformation progress, improved coordination across ministries, enhanced public awareness, evidence for policy adjustments, demonstration of achievements to EU and donors, foundation for adaptive management.

Opportunity 3: Establish Open Data Portal with Priority Datasets

Rationale: Increases transparency, enables researcher and civil society analysis, supports innovation, aligns with EU Open Data Directive.

Recommended Actions:

- Government commitment to "open-by-default" principle for non-sensitive public data
- Identify priority datasets for initial publication:
 - Business demographics (number, size, sector distribution by municipality)
 - Broadband coverage and quality maps
 - Education enrollment and graduation by field of study
 - Innovation Fund projects and beneficiaries (aggregated)
 - Public procurement data
 - E-government service usage statistics
- Publish in machine-readable formats (CSV, JSON, XML) with open licenses
- Develop APIs for programmatic access
- Provide comprehensive metadata and documentation
- Establish regular update schedules

Implementation: Budget €80,000-€120,000 for portal development and initial data preparation. Use existing open-source platforms (CKAN, DKAN). Assign responsibility to Ministry of Public Administration with MONSTAT support. Conduct training for government agencies on data preparation and publication.

Expected Outcomes: 50+ priority datasets published in year 1, growing to 200+ by year 3. Increased use by researchers, journalists, businesses for analysis. Enhanced government transparency. Foundation for data-driven innovation in private sector. Compliance with EU accession requirements.

MEDIUM-TERM (3-5 years) - Three Major Opportunities

Opportunity 1: Create National Innovation Data Observatory

Rationale: Addresses critical gap in understanding innovation ecosystem performance. Enables evidence-based refinement of S3 and innovation policies. Supports international cooperation and benchmarking.

Recommended Actions:

- Establish centralized platform tracking: R&D expenditure (public and private by sector), patents and trademarks, startup creation and survival rates, university-business collaboration projects, innovation outcomes (new products/services, exports), participation in international programs (Horizon Europe, EIT)
- Conduct regular surveys of innovation ecosystem actors (annual startup survey, biennial R&D survey, innovation intermediary mapping)
- Link data sources: business registry, tax records, education records, Innovation Fund database, intellectual property office, customs
- Develop innovation scorecards comparable to EU Innovation Scoreboard with Montenegro-specific indicators
- Geographic mapping of innovation activity (clusters, hotspots)

Implementation: Budget €300,000-€400,000 for platform development and initial 3 years operation. House within Innovation Fund or create dedicated unit. Partner with universities for research capacity. Collaborate with JRC for methodology alignment. Secure EU funding (Horizon Europe, IPA III).

Expected Outcomes: Comprehensive innovation statistics published annually, clear view of innovation system strengths and weaknesses, evidence-based S3 revision, enhanced international cooperation, ability to track ROI on innovation investments, identification of emerging technologies and opportunities.

Opportunity 2: Implement Skills Supply-Demand Matching System

Rationale: Addresses disconnect between education system outputs and labor market needs. Enables proactive skills development aligned with economic priorities. Supports both job seekers and employers.

Recommended Actions:

- Develop real-time labor market intelligence platform combining: Employment Agency vacancy and placement data, online job posting scraping and analysis, employer skills demand surveys (quarterly pulse surveys), education enrollment and graduation data, sectoral growth projections
- Implement digital skills taxonomy aligned with EU frameworks: DigComp, e-CF, sector-specific competency frameworks
- Develop forecasting models for future skills needs: scenario-based projections (3, 5, 10 year horizons), alignment with S3 priority sectors, integration with demographic trends
- Create public interfaces for different users: job seekers (skills gap analysis, training recommendations, career pathways), employers (talent pool insights, skills availability by region), education institutions (curriculum adjustment guidance, enrollment planning), policymakers (skills development priorities, investment decisions)

Implementation: Budget €250,000-€350,000 for platform development and 3-year operation. Lead by Employment Agency in partnership with Ministry of Education and MONSTAT. Use AI/machine learning for job posting analysis. Integrate with education management systems. Partner with ETF (European Training Foundation) for methodology.

Expected Outcomes: Reduced skills mismatch, education programs aligned with labor market needs, faster job placement, informed career choices by students, evidence-based skills policy, reduced unemployment duration, enhanced competitiveness through better workforce planning.

Opportunity 3: Develop Administrative Data Integration Platform

Rationale: Enables comprehensive longitudinal analysis of businesses, individuals, and innovation pathways. Supports evidence-based policymaking while respecting privacy. Foundation for advanced analytics and AI applications.

Recommended Actions:

- Create secure data warehouse linking key administrative databases: business registry, tax administration, social security, education records, innovation support, health insurance, customs, permits/licenses
- Implement unique identifiers for individuals and businesses enabling cross-database linkage
- Establish strict privacy safeguards: anonymization and pseudonymization protocols, role-based access controls, audit trails for all data access, GDPR compliance verification, ethics committee oversight
- Develop research access protocols: approved researchers can access anonymized microdata, secure data lab environment, research proposals evaluated for public interest, publication of aggregate findings

- Enable longitudinal analysis: business lifecycle (from startup to growth/exit), skills development pathways (education → employment → training), innovation impact (grants → outputs → economic outcomes), sectoral transitions and workforce mobility

Implementation: Budget €400,000-€600,000 for platform development and initial 3 years operation. Lead by MONSTAT with Ministry of Public Administration support. Require legal amendments enabling data sharing for statistical/research purposes. Partner with international statistical offices (Statistics Norway, Statistics Netherlands). Establish Data Access Committee with representatives from government, academia, civil society.

Expected Outcomes: Rich evidence base for policy evaluation, ability to conduct rigorous impact assessments, identification of causal relationships (e.g., training → productivity), reduced survey burden on businesses/citizens, international research collaboration, enhanced reputation for data-driven governance.

LONG-TERM (5+ years) - Three Major Opportunities

Opportunity 1: Establish National Data Space for Innovation

Rationale: Aligns with EU Data Strategy and data spaces concept. Creates competitive advantage through data-driven innovation. Enables new business models and services. Positions Montenegro as regional data hub.

Recommended Actions:

- Develop secure, federated infrastructure enabling data sharing among businesses, researchers, government while maintaining data sovereignty
- Implement sector-specific data spaces: manufacturing (machine data, supply chain, quality metrics), agriculture (farm data, weather, soil conditions, market prices), health (anonymized health records), tourism (visitor patterns, preferences, feedback), smart cities (mobility, energy, environment)
- Establish data governance framework: clear rules on data ownership, access rights, usage terms, incentives for data sharing, standards for data quality and interoperability, privacy-preserving technologies
- Create data marketplace where businesses can securely share/trade data
- Support data-driven innovation: startups building services on data spaces, AI/machine learning applications, new business models leveraging combined datasets

Implementation: Budget €1-2 million over 5 years for infrastructure, governance, pilot projects. Lead by Ministry of Public Administration with Innovation Fund support. Partner with EU on Horizon Europe data space projects. Leverage private sector expertise. Start with 2-3 pilot sectors before full rollout.

Expected Outcomes: Montenegro recognized as regional data innovation leader, new data-driven businesses and services created, enhanced competitiveness through better decision-making, attraction of data-intensive investments, contribution to EU data spaces, foundation for AI economy.

Opportunity 2: Implement Predictive Analytics for Policy

Rationale: Shifts from reactive to proactive policymaking. Enables scenario planning and impact forecasting. Optimizes resource allocation. Demonstrates advanced governance capacity.

Recommended Actions:

- Develop machine learning models forecasting: economic trends (GDP, employment, trade) by sector and region, skills needs evolution, innovation opportunities (emerging technologies, market gaps), digital adoption trajectories, social impacts (inequality, inclusion, regional disparities)
- Implement scenario analysis tools for policy design: "what-if" simulations of policy interventions, cost-benefit analysis with uncertainty quantification, multi-criteria optimization, stakeholder impact assessment
- Create real-time policy impact monitoring: automated data feeds from administrative systems, early warning indicators for policy course corrections, A/B testing of policy variants where feasible, continuous learning and model refinement
- Establish Policy Analytics Unit: team of data scientists, economists, policy analysts, embedded in Government Office or Prime Minister's office, serving all ministries

Implementation: Budget €500,000-€800,000 for initial 3 years (staff, tools, training). Recruit 3-5 data scientists with policy expertise. Partner with universities for research collaboration. Use open-source tools (Python, R, cloud computing). Pilot with 2-3 high-priority policy areas before expanding.

Expected Outcomes: More effective policies with better-anticipated impacts, reduced policy failures through simulation testing, optimized budget allocation, faster adaptation to changing conditions, enhanced government credibility, model for other Western Balkan countries.

Opportunity 3: Deploy Big Data and AI Analytics Ecosystem

Rationale: Leverages emerging data sources for richer, real-time insights. Positions Montenegro at forefront of data innovation. Creates new capabilities for economic monitoring and policy analysis.

Recommended Actions:

- Implement mobile network data analytics: partnership with telecom operators for anonymized, aggregated mobility data, real-time economic activity monitoring

(commuting patterns, tourism flows), regional development indicators, crisis response capabilities

- Deploy satellite imagery analysis: infrastructure development monitoring (construction activity, network expansion), agricultural productivity assessment, environmental monitoring (deforestation, coastal development, pollution), urban planning support
- Establish web scraping operations: real-time price monitoring (inflation signals), employment trends from job portals, business activity indicators, sentiment analysis from social media and news
- Develop AI-powered analytics: natural language processing for policy document analysis, computer vision for infrastructure assessment, anomaly detection for fraud prevention, chatbots for citizen services
- Create Ethical AI framework: guidelines for responsible AI use in government, algorithmic transparency and explainability requirements, bias detection and mitigation protocols, public consultation on AI applications

Implementation: Budget €600,000-€1 million over 5 years for technology, partnerships, capacity building. Establish Data Innovation Lab within MONSTAT or as dedicated unit. Partner with telecom operators, space agencies (Copernicus program), technology companies. Build internal AI expertise. Start with pilot projects before scaling.

Expected Outcomes: Real-time economic monitoring capabilities, early warning systems for economic shocks, richer evidence base for regional development policy, environmental compliance monitoring, reduced data collection costs through automation, demonstration of cutting-edge governance capacity, attraction of tech talent and investment.

3. Summary

Montenegro, a small open economy of approximately 623,000 people, has positioned itself as a digital transformation leader in the Western Balkans. With GDP of ~€7 billion (2024) and steady growth (~3% in 2024, projected 3.2% in 2025), the country demonstrates economic resilience despite challenges including high trade deficits and tourism dependency.

Regional Background Key Findings

- **Economic Structure:** Services-dominated (75% of GDP), with tourism contributing 25-30%. ICT sector emerges as fastest-growing component, now ~11% of GDP and 25% of exports
- **Trade Performance:** Significant deficit (€3.45 billion, 2024) with only 15.1% import coverage. Concentrated trade partners (Serbia 46-49%)
- **SME Sector:** 99% of businesses, employing ~70% of workforce. Predominantly micro-enterprises facing limited access to finance and digital transformation support

- **Labor Market:** Improved employment (56-59%) and declining unemployment (11.4%), but youth unemployment elevated and skills mismatches persist
- **Human Capital:** Tertiary education attainment growing (+36 points since 2017), but digital skills gap significant. Only 47% possess basic digital skills (vs 54% EU), ICT specialists at 32% of EU density

Digital Infrastructure Excellence

Montenegro leads the Western Balkans in connectivity:

- 96% household broadband access
- 67% fiber-to-home coverage (above EU average)
- 216 mobile broadband subscriptions per 100 people (regional high)
- 88-90% internet penetration
- 5G rollout underway (79% population coverage)

This infrastructure provides strong foundation for digital economy development.

Policy Instruments Assessment

Montenegro has developed comprehensive, well-aligned policy framework:

Smart Specialisation Strategy 2019-2024:

- First non-EU country to adopt S3, demonstrating policy leadership
- Three vertical priorities (sustainable agriculture/food, sustainable tourism, energy/environment) plus horizontal ICT priority
- Innovation Fund established (2021) funding 100+ projects
- Over €120 million mobilized for S3-aligned programs

Digital Transformation Strategy 2022-2026:

- Comprehensive framework covering infrastructure, e-government, e-health, e-education, e-inclusion, ICT industry, R&D
- eUprava portal operational with 100+ digital services
- eID and digital signature infrastructure deployed
- Strong alignment with EU Digital Agenda and accession requirements

Implementation Progress:

- Near-universal broadband achieved early
- E-government services expanding steadily
- Science and Technology Park operational (2023)
- ICT sector growing 25% annually (companies), 24% (employment)
- Five Critical Challenges Identified

Digital Skills and Workforce Shortage: Only 47% basic digital skills, severe ICT specialist shortage (~32% of EU density), critical gaps in advanced competencies

Weak Monitoring & Evaluation: Lack of comprehensive KPIs, impact assessment, disaggregated data limits evidence-based policymaking

Limited SME Program Reach: Micro-enterprises, rural SMEs, traditional sectors underserved by existing support

Low Private R&D Investment: Business R&D at ~0.1% GDP (vs 1.5% EU) limits innovation capacity

Inter-Ministerial Coordination Deficits: Weak coordination causing fragmentation and implementation gaps

Regional Competitiveness

DESI Western Balkans Performance: Montenegro scores 35.1 (WB6 avg: 29.7, EU: 52.3)

- Connectivity: Strong (10.4) - regional leader
- Human Capital: Moderate (~7.5) - skills gaps
- Internet Use: Good (~8.0) - high adoption
- Digital Technology Integration: Weak (4.4) - low SME adoption
- Digital Public Services: Very weak (5.8 vs 8.0 WB, 16.8 EU)

Innovation Performance: "Emerging Innovator" at ~47.5% of EU average

Five Major Good Practices

- **First non-EU S3 adoption** - policy innovation leadership
- **Rapid broadband deployment** - PPP and strategic investment model
- **Innovation Fund one-stop-shop** - simplified, professional support
- **eUprava integrated platform** - user-centered e-government
- **Entrepreneurial Discovery Process** - effective stakeholder engagement

Five Major Recommendations

- **Establish comprehensive M&E framework** with digital dashboard, KPIs, impact assessments
- **Massively scale digital skills development** across education, lifelong learning, advanced specializations
- **Create simplified SME digitalisation support program** with tiered approach, advisory services, regional reach
- **Develop integrated green-digital strategy** addressing twin transition synergies
- **Enhance inter-ministerial coordination** via permanent Digital Transformation Council

Data Infrastructure Development

Transregional State of the Art Report

January 2026

Five Major Gaps Identified:

- SME digital maturity data vacuum
- Fragmentation and data silos
- Innovation ecosystem data deficits
- Digital economy indicators scarcity
- Geographic granularity and real-time data limitations

Opportunities by Timeline:

Short-term (1-2 years):

- Conduct comprehensive SME digital maturity assessment
- Develop national digital transformation dashboard
- Establish open data portal with priority datasets

Medium-term (3-5 years):

- Create national innovation data observatory
- Implement skills supply-demand matching system
- Develop administrative data integration platform

Long-term (5+ years):

- Establish national data space for innovation
- Implement predictive analytics for policy
- Deploy big data and AI analytics ecosystem

Outlook and Conclusions

Montenegro has built **strong strategic foundations** for digital transformation with clear vision, comprehensive policies, and leading regional infrastructure. The **ICT sector's rapid growth** and **e-government progress** demonstrate implementation success. However, **critical gaps remain** in skills supply, private sector innovation, SME support reach, and coordination mechanisms.

The country's **small size** both constrains (limited market, fiscal capacity) and enables (policy agility, potential consensus). **EU candidate status** provides access to pre-accession funds and frameworks but requires sustained reform momentum.

Success depends on:

- Scaling investments in human capital development
- Strengthening implementation capacity at all governance levels
- Ensuring inclusiveness so benefits reach all regions, sectors, and populations
- Deepening stakeholder engagement beyond initial consultations
- Integrating green and digital transitions systematically
- Building robust monitoring and adaptive management systems

If Montenegro sustains political commitment, mobilizes adequate resources, and executes effectively, it can leverage its digital foundations to transition toward a **knowledge-intensive, competitive, sustainable economy** integrated into European innovation ecosystems. The **policy framework is sound**; now implementation quality and scale will determine outcomes.

Digital transformation is not just modernization strategy but **essential pathway** for a small open economy to overcome size limitations through global digital market access and high value-added specialization.

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This document has been produced with the financial assistance of the European Union. The content of the document is the sole responsibility of the DIGITRANS Project Lead Partner and can under no circumstances be regarded as reflecting the position of the European Union and/or IPA ADRION programme authorities.