Digital innovation profile: North Macedonia

Digital innovation ecosystem: Strategies and recommendations for accelerating digital transformation

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Acknowledgements

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Foreword: Minister of Information Society and Administration

In today's fast-paced digital age, a nation's ability to embrace and harness the power of technology can make all the difference. A nation's capability to innovate and adopt new technologies is critical to its economic success and global competitiveness. This National Digital Innovation Profile prepared by ITU provides a comprehensive look at the current state of the digital landscape and technology adoption in North Macedonia, exploring the latest trends, key players and innovative solutions shaping our country's future.

North Macedonia has recognized the potential of digital transformation and innovation, and this report has also served in shaping the new National ICT Strategy for the period 2023-2027.

With insights into challenges and opportunities facing the nation, the report is a valuable contribution and a must-read for anyone looking to understand the current state of our country's digital transformation, our innovation policies and the role it plays in driving economic growth and competitiveness through the ICT ecosystem.

Whether you are a policy-maker, business leader or tech enthusiast, this report provides valuable insights into the current state of the national digital landscape and its potential to shape the future. It provides constructive recommendations, roadmaps and comprehensive opportunities to strengthen capacities and accelerate digital transformation. With the ever-evolving digital landscape, it will be an essential tool for all key stakeholders of North Macedonia who are looking to stay ahead of the curve and be at the forefront of the national digital revolution.

I am grateful for the partnership with ITU and look forward to cooperating further in implementing our national digital agenda contained within the National ICT Strategy to accelerate the digital transformation of our economy.

Mr Azir Aliu
Minister of Information Society and Administration
Republic of North Macedonia

Foreword: International Telecommunication Union

Innovation and entrepreneurship are the engines of digital development, driving the creation of new technologies and the growth of new industries that improve our lives and connect us to new opportunities. In an age where technology is constantly evolving, it is more important than ever for governments to have a clear understanding of the digital ecosystem of their country in order to foster innovation and translate the results offered by innovation into meaningful benefits for its citizens.

The digital innovation profile conducted in partnership with the Ministry of Information Society and Administration (MISA) of North Macedonia provides a comprehensive overview of the ICT sector, its players and its trends. It aims to provide an accurate assessment of the country's ecosystem capacity and maturity to help local stakeholders navigate through the innovation landscape with a view to building a competitive, sustainable, ICT-enabled economy.

This report reflects the thorough research and engagement with local stakeholders in the field of innovation that includes one-on-one interviews and co-creation workshops. It is a tool that can help businesses assess their level of digital maturity and provides a clear picture of what is needed to foster innovation.

I want to thank all national stakeholders, particularly the MISA staff, who participated in the co-design of the assessment, and I hope this profile will serve as a valuable resource for policymakers, entrepreneurs, the private sector, and other stakeholders in North Macedonia. I am sure it will help to guide decision-making and investment in areas critical for growth and development.

I look forward to seeing the positive impact this digital innovation profile will have on the future of North Macedonia. ITU is ready to continue to offer support to North Macedonia in its next endeavours in this field.

Dr. Cosmas Luckyson Zavazava
Director, Telecommunication Development Bureau (BDT)
International Telecommunication union (ITU)

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1   Introduction

North Macedonia is embarking on a long-term development strategy known as the Smart Specialisation Strategy (S3). The Smart Specialisation process is led by the S3 working group, whose work is coordinated by the Ministry of Education and Science and the Ministry of the Economy. The same institutions will have an important role in implementing the Innovation Strategy for Smart Specialisation. The country has undertaken several efforts and continues to be on a path to support the ecosystem and reform related policies to accelerate digital transformation and the country's capacity to innovate. Various factors contribute to the performance of the ICT sector, including its innovativeness. The Ministry of Information Society and Administration (MISA) and the Fund for Innovation and Technology Development (FITD), jointly with ITU, commissioned this study to improve understanding of digital innovation in the ICT sector

Digital innovation profiles are an important element in the ITU series of snapshots of ICT-centric innovation ecosystems. Each profile assesses and summarizes the opportunities and challenges in a country's ICT ecosystem. The at-a-glance format of the report enables international comparisons and provides a measurement overview of an ecosystem capacity to accelerate digital transformation as well as its capability to integrate digital innovation into its national agenda. The Digital Innovation Profile is an accurate diagnosis of digital innovation ecosystem health to develop strategies and inform national policies for accelerating digital transformation.

Digital innovation profiles offer a rapid and straightforward means of analysing and optimizing an ICT ecosystem. This analysis then helps navigate through a country's fast-moving ICT/telecommunication landscape to enhance the competitiveness of the ICT sector and unlock the potential for a sustainable digital transformation to support the country's transition into a knowledge economy. Further collaboration with ITU can target specific engagements, including the implementation of appropriate, co-developed, bankable projects of high value in the national context.

All digital innovation profiles are developed by experts specially trained to apply the ITU Digital Innovation Framework. This framework features highly structured workshops and facilitated assessments, designed to build national capacity, enhance on-the-ground skills and powerfully accelerate digital transformation. The framework process equips ITU Member States with the tools to assess and monitor their ICT innovation ecosystems and produce evidence-based assessments and concrete recommendations to change the dynamics and propel the country towards digital transformation.

The analysis and the positions expressed in this report reflect the opinions and research of the national expert, working within the ITU Digital Innovation Framework process, and with guidance from the ITU-D Digital Innovation Ecosystems cluster.

2   Background and context

Table 1: Key indicators

Key indicators	
Population: 2 072 531	ITU Digital Development Dashboard (2021): • Population coverage by at least 4G mobile networks: 100% • Households with a computer at home: 80% • Fixed telephone subscriptions per 100 inhabitants: 20 • Fixed broadband basket as a % of GNI p.c: 3.5% • Individuals with advanced skills: 3%
Population density: 82 per km²	Global Innovation Index [2022]: 66/132
Gross national income per capita: USD 15 310.8	Global Entrepreneurship Index [2018]: 66/137
Region: Southeast Europe	Global Competitiveness Index [2019]: 82/141
	Ease of Doing Business [2020]: 17/190

The Republic of North Macedonia is a landlocked country on the Balkan Peninsula in southeast Europe. It borders on Kosovo to the northwest, Serbia to the north, Bulgaria to the east, Greece to the south, and Albania to the west. Since North Macedonia gained independence in 1991, it has seen dramatic improvements in its economy, and today it is classed as an upper-middle-income country.

North Macedonia boasts a high adult literacy rate (98 per cent according to World Bank data (2020). Despite improvements in the labour market in recent years, unemployment among youth (ages 15-24) remains severe (36.9 per cent in 2020, according to the World Bank). However, the overall unemployment rate reached a historical low (15.2 per cent) following an impressive rebound from the recession caused by the COVID-19 pandemic (Trading Economics, 2022).

The Education Strategy of the Republic of Macedonia 2018-2025 aims to improve the quality and relevance of education to society and the labour market and to develop core competencies, including critical thinking. In addition, it aims to provide supportive technologies to ensure appropriate learning environments, starting from early school years. Mandatory ICT subjects are taught in primary schools starting in third grade. Primary and secondary school teachers receive training in basic ICT skills, including integrating software solutions in interactive teaching. The recent pandemic accelerated digital learning with the development of e-classrooms on Eduino, a UNICEF-supported online learning platform. The government expanded the scope of this one-stop shop for educational content to cover beginner, primary and junior secondary education for all children aged 6 to 14. Based on the success of this platform, the Ministry of Education and Science now plans to promote Eduino as a new and sustainable tool to support remote learning whenever required (UNICEF, 2021).

The main contributions to the country's gross domestic product (GDP) in 2020 were from agriculture with 9 per cent, industry 22.6 per cent, and the service sector 57 per cent (Statistica, 2022). The service sector is dominated by banking, technology, insurance, transport, tourism, wholesale and retail trade, logistics and communications. The industry sector includes

automotive components, iron and steel, food, footwear, textiles, tobacco, construction, oil refining, chemicals and mining. Threats to economic stability include supply chain disruptions, rising inflation and wages, threats to political stability, and the ongoing energy crisis. Despite these challenges, GDP growth was 2.3 per cent in the fourth quarter of 2021 (Statistical Office, 2022), and the annual household income per capita reached a record high of USD 2 394.44 in December 2020 (CEIC, 2020). The prospects for economic growth in the medium-term are thus positive and income levels can be expected to increase further. Accession to the European Union (EU) remains a top political priority for North Macedonia, although challenges remain in the areas of innovation, education and infrastructure investment.

According to the European Commission, in North Macedonia small and medium-sized enterprises (SMEs) accounted for 65.7 per cent of added value and 73.5 per cent of employment in 2019, exceeding EU averages of 53.2 per cent and 65.0 per cent, respectively. However, SME productivity, defined as value added per person employed, was only EUR 10 900, compared to the EU average of EUR 42 600 (EU, 2021). Despite the work of the Fund for Innovation and Technology Development (FITD), established in December 2013 to encourage innovation by providing resources and finance to SMEs, access to finance, particularly angel investment and venture capital, remains a challenge. A further impediment to the ability of SMEs to do business is indicated by the country's score of 39 on the Corruption Perceptions Index (CPI), which suggests that the public sector will have to work to build up business trust (Transparency International, 2021).

To foster a competitive telecommunication market, North Macedonia has implemented the EU regulatory framework principles, established an independent regulator, and enacted new rules. The country's fixed telephony market has been liberalized since 2007 but remains dominated by MakTel. The mobile market is dominated by two network operators, MakTel and A1 Macedonia. In 2020, 81.4 per cent of the population had access to the Internet. The number of active mobile-broadband subscriptions per 100 inhabitants was 64.7, and the number of fixed broadband subscriptions per 100 inhabitants was 22.2 (ITU, 2021).

In 2021, North Macedonia ranked 59th on the Global Innovation Index of the World Intellectual Property Organization (WIPO). The latest data, for 2020, show 1 957 economically-active companies in the ICT industry, generating EUR 879.65 million in revenue. Fully 56 per cent of the companies are concentrated in the "Software and IT Services" subsegment, while 27 per cent are active in "ICT Trade and Manufacturing" (MASIT, 2020). In 2021 the ICT market contributed some 8 per cent to the total GDP of USD 12 billion.

The National ICT Strategy 2023-2027 maps well onto the dimensions used in the EU Digital Economy and Society Index (DESI), facilitating the alignment of the country's digital transformation with EU policies and directives. Goals and objectives have been established for connectivity, government infrastructure, and the centralization and streamlining of ICT and e-government services. The plan is now to set up an Agency for Digital Transformation to gradually consolidate assets and resources from the various ministries and organizations into a single entity that will be a cost-effective and efficient delivery mechanism. The 2022-2026 Accelerated Economic Growth Plan already includes a EUR 27 million hybrid investment fund focusing on start-ups and innovative companies.

3   Current landscape

Understanding the ecosystem assessment canvas

Figure 1: Ecosystem assessment canvas
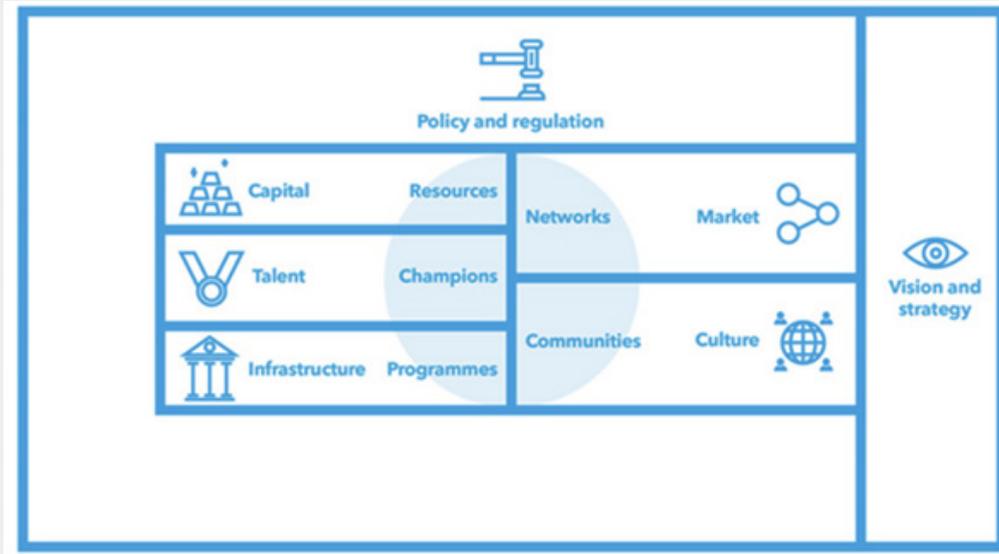
The ecosystem assessment canvas gives an overview of the seven components that make up the innovation ecosystem. It helps assess both the challenges and opportunities for the components essential to building a vibrant and innovative digital ecosystem.

Figure 2: Ecosystem assessment canvas and its related issues

Building on the ecosystem assessment canvas, the image above presents the main issues of an enabling environment that, if achieved, can accelerate digital transformation in the economy.

The following section provides insights into the current landscape of the ecosystem across the seven components, based on interviews and group discussions in co-creation workshops with local stakeholders and validated by secondary research and literature reviews.

3.1   Vision and strategy

- There is a national vision and strategy for digitalization, but more could be done to raise awareness and support implementation.
- There is agreement on main issues, but greater collaboration is needed to fully understand challenges.
- Strong collaboration exists between support organizations and members but there is limited cooperation across the ecosystem.
- Support for a shared vision is weak, but the Smart Specialisation Strategy aims to unite ecosystem players.

Need for one vision

The National ICT Strategy 2023-2027 sets out a vision for an agile digital future for North Macedonia that focuses on priority areas in the ICT sector to meet the society's growing connectivity needs, boost competitiveness, improve citizens' daily lives, and make businesses smarter. Prepared by MISA, this new strategy builds on the Open Data Strategy (2018-2020), the National Cyber Security Strategy (2018-2022), the Public Administration Reform Strategy (2018-2022), the National Operational Broadband Plan (2019-2029), and the Education Strategy (2018-2025). Although stakeholders are aware of the numerous strategies, confusion remains regarding their implementation. A clear vision and strategy for the entire digital innovation ecosystem is needed.

Agreement on issues

There is widespread agreement among stakeholders regarding problematic issues. They recognize the need to give more prominence to innovation, develop digital and entrepreneurial skills, create new programmes and improve access to finance. Talent acquisition and retention are challenges for all stakeholder groups, as globalization and the rapid adoption of remote working have caused salary expectations to increase dramatically. Unfortunately, a high rate of turnover in the ministry leadership over the last five years has resulted in inconsistent policies and widened gaps in understanding ecosystem challenges and stakeholder needs. It is understood that closer collaboration between the public and private sectors could help improve awareness of everyday issues. While the government has attempted to unite stakeholders through initiatives such as the Startup Council, more partnerships across the ecosystem are required to create synergies and solve common problems.

Ecosystem working together

Collaboration between stakeholders appears limited, with some groups working in silos. Some start-ups that operate internationally have little involvement in the domestic ecosystem as their focus is abroad. Still, some innovators are willing to teach and mentor the next generation of entrepreneurs. Support organizations such as Startup Macedonia and the Macedonian Chamber of Commerce for Information and Communication Technologies (MASIT) are best-connected, as they represent the views of their members and lobby the government on their behalf. However, a gap in industry and academic collaboration is slowing innovation and commercialization. Though examples of good practice exist in academia, there is a need for sustainable and institutional cooperation for research and development and for shaping study programmes to meet labour market needs.

Support for shared vision

Some entrepreneurial support networks provide feedback through consultation on national strategies and support policy recommendations. Although well aware of their own missions, many are unaware of how their efforts contribute to the national vision, about which there is little clarity. A Smart Specialisation Strategy makes it possible to address this problem, by identifying strategic intervention areas for the country and analysing economic strengths and potential. For its part, the European Union is providing significant support to North Macedonia for the implementation of the EU Green Deal. This requires that the strategy incorporate the Green Deal into national economic development policy. Broad stakeholder involvement and an Entrepreneurial Discovery Process (EDP) are also central to the development of the strategy. This process started in 2018 and has focused on institutional capacity-building, analysis of economic, scientific and innovation potential and dialogue with 30 stakeholders. With a launch initially planned for late 2022, this strategy is expected to provide a shared vision and clear direction. Above all, effective implementation will be critical to its success.

3.2   Infrastructure and programmes

- There is good access and availability of hard infrastructure, with the private sector leading the telecommunications sector.
- Soft infrastructure and programmes are available to support innovators, but the private sector needs to step up and invest in early-stage ideation.
- Infrastructure is concentrated in the nation's capital, limiting the inclusion of rural populations.
- ICT equipment is readily available, but firms need more education to benefit from technology.
- The country is competitive on the regional scale but more investment is required in capacity-building for growth.

Hard/ICT infrastructure

In 2020, North Macedonia had 64.7 active mobile-broadband subscriptions per 100 inhabitants, while the number of fixed broadband subscriptions per 100 inhabitants was 22.2. Coverage by a 3G network reached 99.9 per cent of the population, and 4G/LTE coverage was available to 99.5 per cent (ITU, 2021). The same year, Makedonski Telekom was providing fibre-optic access to 39 per cent of households. Two years later, in 2022, the telco launched the first commercial 5G network; it was planned to expand coverage from 15 to 26 cities by the end of 2022. The ICT infrastructure of North Macedonia benefits from a well-functioning electricity grid which uses fossil fuels, hydropower and electricity imports to meet domestic demand. The country has a ready supply of freshwater thanks to the natural basin in the Balkan Peninsula, and benefits from a well-developed road network.

The innovation ecosystem in the capital city is well served in terms of Internet connectivity, speed, and stability. However, North Macedonia lacks a cloud infrastructure. This is an issue for some start-ups, as renting cloud services can be expensive. Some stakeholders also believe that hard infrastructure provision in the public sector could be improved. The National Operational Broadband Plan (2019-2029) aims to address this, with the explicit goal of providing symmetrical Internet access at 1 Gbit/s or better to all public institutions (schools, universities, research centres and other education institutions, health-care facilities, ministries, courts, local government and other state authorities and bodies) by the end of 2029.

A project entitled "Improving the Quality of Data and Strengthening Policy-making in North Macedonia", launched in January 2022, aims to increase labour market participation by facilitating access to quality education and training, better matching skills with market demand, and establishing a modern, flexible, evidence-based social protection system built on data. A critical component of this project is developing and upgrading information management systems that the collection, storage, processing and exchange of relevant digital data in the educational, employment and social policy sectors.

Soft infrastructure and programmes to support innovators

Soft infrastructure is mainly provided by FITD, research institutions and foreign donors. In 2018, FITD signed financial aid agreements to open three business accelerators supporting more than 100 start-up companies. In addition, university faculties are providing hubs and incubation for their students. A good example is SEEUTechPark, a technology park located on South East European University campus in Tetovo, Macedonia. A large part of the soft infrastructure is funded by foreign donors, something that is considered to be unsustainable in the long term. Such programmes are popular, but accelerators are sometimes competing for the best innovators. More needs to be done to help generate a pipeline of relevant ideas, including hackathons and enterprise competitions. With limited programmes, the ecosystem needs to coordinate and streamline activities to ensure effective use of resources. As the ecosystem matures, the private sector will need to step up and support early-stage ideation. The Skopje Technology Park, which is under development, will benefit the ecosystem by attracting global technology companies, entrepreneurs and tech investors to use North Macedonia as a regional base.

Infrastructure distribution across the country

Both hard and soft ICT infrastructure are largely concentrated in Skopje, to the detriment of smaller cities and rural communities. Almost half of the start-up community is in the capital, and that is where business support and networking is concentrated. X Factor Accelerator aims to encourage regional entrepreneurship by moving the start-up scene beyond the capital to the town of Veles.

One-half of the population of North Macedonia lives in rural areas, and one-fifth makes its livelihood in agriculture. The Swedish Embassy in North Macedonia, through the Swedish International Development Cooperation Agency, supports market economy development through "We Effect", a project that focuses on promoting entrepreneurship, competitiveness and productivity, and on strengthening entrepreneurs in rural areas. Although it is a good step for the ecosystem, actors agree that stronger public-private partnerships are needed to bridge the urban rural divide at scale.

Access to ICT equipment and resources for companies

ICT equipment and resources are widely available and affordable for companies in the country. Stakeholders state that software is more straightforward to acquire than hardware. However, the biggest challenge is raising awareness of what is available and how this can enable productivity gains. Firms need more education to appreciate that technology can be a catalyst for innovation and economic growth.

Competitiveness

North Macedonia is perceived as competitive in ICT services in the western Balkans, and even has some globally competitive companies. The ICT sector benefits from a skilled workforce with excellent English language skills, a solid telecommunication infrastructure and low corporate tax. Historically, North Macedonia has built an ICT industry based on outsourcing and a cost-effective workforce. However, this is unviable in the long term as salaries are rising rapidly to meet global standards. To remain competitive, North Macedonia needs to invest in ICT infrastructure and digital skills education. The focus should be on reducing the brain drain, particularly for the skilled ICT workforce. To attract more young people to the sector, the government has been seeking to abolish personal income tax in the IT industry by 2023. In order to build competitiveness locally, the country needs to identify its strengths, focus on developing a knowledge-based economy and provide support to build capacity.

3.3   Talent and champions

- Solid communication skills have been demonstrated by some entrepreneurs, but more sales and business development expertise is needed to scale up innovation.
- Technical skills are present but there is not enough capacity to meet market demands.
- There are some good initiatives to inspire innovators but entrepreneurial education needs to start early in primary and secondary schools.
- Champions have been identified in the ecosystem, but more start-ups are needed as role models.

Soft skills

There is a perception that local talent has deficiencies in soft skills. It is true that most innovators come from technical backgrounds, and their technical proficiency needs to be complemented by sales and business management competencies as the start-up takes shape. A shortfall can lead to bottlenecks in commercializing and scaling their businesses. To address this gap, accelerators like Seavus are working with innovators to build presentation, negotiation and communication skills. In addition, academia, including the Faculty of Electrical Engineering and Information Technologies (FEEIT), Ss. Cyril and Methodius University, provides management courses for technical students. Successful innovators with solid communication skills are ready to mentor and transfer their knowledge. This should be encouraged and facilitated, helping create a pipeline of innovative ideas.

Technical skills

Technical skills, including programming and coding, clearly have a crucial role in the ecosystem. There is a ready supply of entry-level engineers, but more advanced skills, for example in artificial intelligence (AI) and robotics, are in short supply. Capacity is a problem in the country as there is insufficient technical talent to meet market needs. In 2019 there were 6 870 enrolled students in ICT-related programmes, 10 per cent of whom went on to graduate that year. The "Software and IT Services" subsegment is growing by some 1 200 positions per year, a clear indication that formal education is not fulfilling the market needs (MASIT, 2021)[1]. Competition for employees is fierce, and the brain drain is an issue. Many graduates are moving to more mature ecosystems in search of better opportunities and pay. In addition, a significant percentage of the skilled engineers are working remotely as freelancers, further depleting the local labour pool. Local

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[1]   https://masit.org.mk/wp-content/uploads/2020/09/masit_report_v1.00.pdf

start-ups and SMEs accordingly have difficulty recruiting engineers. In response, the government is offering ICT training subsidies for the unemployed, to help them transition into professional careers. Academics and informal education providers are also trying to quickly develop technical talent to fill the shortfall.

Skills moving to innovation

Stakeholders agree that the education system could do more to inspire young people to choose a career in innovative research. Some state that the school system is outdated and aims at replicating knowledge rather than focusing on developing transferable skills. Recently, entrepreneurship was included in North Macedonia's secondary education as a compulsory separate subject, and as a core subject in the primary school curriculum (EU Commission, 2022[2]). That is a positive step, but entrepreneurial education needs to be more holistically integrated into the curriculum to have a significant impact on career aspirations. Recognizing this challenge, Brainster, a private IT academy, has developed a free programme for high schools to foster critical thinking, initiative, and continuous improvement.

At the university level, tech faculties offer entrepreneurial courses, albeit as an elective. Recognizing the need for more cooperation between the academia and the industry, the FEEIT of Ss. Cyril and Methodius University has opened a Centre for Technology Transfer and Innovations (INNOFEIT). One aim is to give students practical experience in solving real-world problems. Nonetheless, university graduates tend to start work as developers or freelancers rather than entrepreneur-innovators. The Yes Foundation aims to stimulate the development of entrepreneurship and youth employment by strengthening skills and competencies for (self) employment, youth engagement, collaborative partnership programmes and leadership platforms for inducing change and advocacy. These are positive initiatives, but more stakeholder cooperation and support is needed to inspire young people to become innovators.

Champions leading and being recognised

Stakeholders recognise champions in most groups. In the public sector, FITD stands out as helping to kick-start the ecosystem by providing vital start-up funding and support. Ecosystem growth has been enabled by membership organizations, including MASIT and Startup Macedonia. Thanks to them, the innovation landscape has flourished over the last five years. However, there are few start-up champions to inspire the next generation of entrepreneurs. As the ecosystem matures, accelerators and academia must focus increasingly on building a stronger pipeline of innovators, from whom the future unicorns will emerge. In addition, more needs to be done to raise awareness of existing entrepreneurs and celebrate their success.

3.4   Capital and resources

- Established firms can access traditional lending but start-ups find it more challenging to secure finance.
- The government is the main provider of seed funding, but angel investment is not focused on the ICT sector or well developed.
- FITD programmes have demonstrated impressive results however more funding from the public sector is needed to build capacity.

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[2]   https://national-policies.eacea.ec.europa.eu/youthwiki/chapters/republic-of-north-macedonia/38-development-of-entrepreneurship-competence

- There is an array of international funding available, but several programmes are in the early stages of development and have yet to demonstrate tangible results.
- There is a successful record of foreign direct investment (FDI) but the government now needs to set a clear strategy and focus on developing the ICT sector.
- Innovation vouchers have increased scientific collaboration, but the government needs to increase research funding to stimulate technology transfer.
- Support networks are visible and active but greater collaboration is needed to maximize the limited resources of the ecosystem.

Availability of investment for the private sector

In the private sector, established local firms can access commercial loans from banks. For example, government-owned Development Bank of North Macedonia was established to be a reliable financial partner for micro, small and medium enterprises. The FITD financial instruments also support SMEs in developing business ideas and projects. However, fewer options are available to large multinational corporations, which therefore tend to auto-finance their R&D activities. Currently, the government is the leading funding provider for the ICT sector. For the ecosystem to develop, private investors will have to step in. Access to finance is one of the main weaknesses in the ecosystem, and a lack of private investment is hampering the country's digital competitiveness. More angel investment can be encouraged by creating financial incentives.

Availability of investment at all stages of the innovation journey for digital start-ups and SMEs

Start-ups rely heavily on FITD and Employment Service Agency grants to fund their early-stage ventures. Thus, unemployed people under 29 can access self-employment grants of EUR 5 000 individually or up to EUR 10 000 for two co-owners. FITD provides 90 per cent funding for projects up to EUR 40 000. However, competition for these grants is stiff, and concerns have been raised about their transparency and monitoring. Business angels are still at a rudimentary stage, and there is no explicit focus on digital innovation. Another source of seed funding is accelerators. For example, Business Accelerator UKIM (BAU) is an investment fund that features direct investment in selected companies as part of the portfolio. While venture capital (VC) is not available domestically, start-ups can access international VC funds such as South Central Ventures or the Western Balkans Private Equity Fund. The private equity market, too, is at a very early stage of development, with limited investment opportunities. To increase international investment in start-ups, more funding and support is necessary so as to stimulate early-stage ideation. Since the domestic start-up ecosystem is so recent, examples of start-ups that have passed through the daunting stage of development known as "the valley of death" remain few, making it difficult for stakeholders to identify local companies that have successfully made the transition to public listing.

Government funding

The overall value of innovation projects co-funded by FITD in 2015-2021 was EUR 88.25 million, with EUR 49.32 million (55 per cent) funding from FITD and EUR 38.93 million (45 per cent) from the companies themselves. The FITD project funding programmes have two sources: a Plan for Economic Growth from the Government of North Macedonia and a World Bank loan. In 2019-2020 beneficiaries showed revenue increasing by approximately 8 per cent, expenditure by 7 per cent, and profit by 21 per cent. This was in a context where the overall economy was

facing a GDP reduction estimated at 4.5 per cent (FITD, 2019[3]). This is an auspicious beginning, and the government should continue to invest in these programmes and build on best practices.

International funding

The European Union is the primary political and economic partner of North Macedonia, and its most important donor and investor. In February 2022 the European Commission unveiled a EUR 3.2 billion investment package to support 21 transport, digital, climate and energy projects in the western Balkans. This is the first major package of projects under the Economic and Investment Plan for the region. In subsequent years the EU aims to mobilize up to EUR 30 billion in investment, taking the form of grants, preferential loans and guarantees to help close the development gap between the EU and the western Balkans. The other key source of international funding is the World Bank, whose support of the domestic ICT sector benefits FITD programmes and the Smart Specialisation Strategy. Another domestic programme that was to become fully operational by the end of 2022 was the Green Financing Facility, intended to provide access to affordable green financing for SMEs. The USD 7.9 million received from the Joint SDG Fund will help establish the programme, the total budget of which with co-funding from the partners will reach USD 46.5 million. These programmes will have a far-reaching impact in the future.

Foreign direct investment

The Office of the Deputy Prime Minister for Economic Affairs coordinates foreign direct investment (FDI) activities supported by Invest North Macedonia, a government investment and export promotion agency. The government offers several incentives to attract foreign investors to Technological Industrial Development Zones, including a 10-year tax holiday, exemption from utility taxes, free connection to natural gas, water and sewage networks, and a 10 per cent return of investment cost. A significant barrier is regulatory complexity. Stakeholders cite the steady stream of regulatory and legislative changes and inconsistencies in the application of rules as creating an unpredictable business environment conducive to corruption. The government has taken steps to improve the investment environment, and North Macedonia was beginning to attract significant FDI. That changed with the pandemic, which saw FDI drop to an all-time low. Currently the manufacturing sector attracts the most FDI, ahead of financial and insurance activities. To attract investment in the ICT sector, the government has recently focused on providing a better environment for technology development. Combined with a clear strategy and focus, this should help to attract more foreign investors.

Availability for investment in research

In 2020 FITD, in cooperation with the Ministry of Education and Science through grant funding, awarded 34 innovation vouchers worth MKD 15 million to encourage the development of science. Ss. Cyril and Methodius University in Skopje received 23 vouchers; Goce Delchev University received 9 vouchers, and St. Clement of Ohrid University received 2. The purpose of the Innovation Vouchers is to encourage cooperation between companies and academic and scientific research institutions to implement innovation activities, which will increase the companies' competitiveness. Welcome though this scheme is, funding for academic research remains scarce. Most educational institutions find obtaining grants locally to be a challenge, so they end up turning to Horizon Europe and Erasmus to support their research. Thus, St. Paul the Apostle University is a partner in the Horizon 2020 project "smART soCIal media eCOsystem

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[3]   https://fitr.mk/wp-content/uploads/2021/12/FITR_REP_V1.00_EN.pdf

in a blockchaiN Federated environment (ARTICONF)". Research and innovation activities are devoted to developing a series of decentralized social network platforms that will be trustworthy, resilient and globally sustainable. Nonetheless, research and development expenditure in North Macedonia in 2020 totalled a mere 0.38 per cent of GDP (World Bank, 2022[4]). It is clear that the lack of government investment in research needs to be addressed.

Resources to build ecosystem supports

Business Accelerator UKIM (BAU), Seavus Accelerator and X Factor Accelerator are all able to invest in their communities, thanks to co-financing from FITD. Start-up finance can be structured as equity, debt, or a combination of both instruments. In addition to finance, accelerators provide other support too. An example is the national Scale-Readiness Programme led by Seavus Accelerator and Business Impact Lab, combining capacity-building with networking and matchmaking opportunities. Efforts are being made to map the support network but there is no central programme to coordinate efforts and collaboration at present. Such a programme would help to build capacity and make the most effective use of limited resources.

3.5   Market and networks

- The ecosystem of North Macedonia has several formal and informal networks, but online groups could be more active to stimulate innovation.
- Ecosystem mapping remains patchy; a full map of all players is needed to enhance stakeholder collaboration.
- A small domestic market offers opportunities to test ideas, but companies need to target foreign markets for growth.
- Trade flows are possible and encouraged, but more government support is needed to help ICT product exporters.

Formal associations

North Macedonia benefits from many well-developed and formal networks for the ICT sector, with solid connections to start-ups and established firms alike. The Macedonian Chamber of Commerce for Information and Communication Technologies (MASIT), a volunteer, non-profit chamber of commerce, is recognized as the voice of the ICT industry and seen as a champion for private firms. The Macedonian e-Commerce Association aims to create growth and success for the e-commerce sector. The ICT Association supports the development of ICTs through education, scientific research, and the application of innovative technologies. Startup Macedonia has played a pivotal role in creating a flourishing start-up scene in the country. Finally, Macedonia2025 is recognized for its role in improving the business environment and supporting the competitiveness of local companies. Informal networks are also a valuable part of the ecosystem. Groups with special interests, for example blockchain or crypto, share ideas and network in person and online. Finally, some online groups function primarily as a recruitment platform, rather than an exchange for innovative ideas.

Ecosystem mapping and collaborations

In recent years, various initiatives have attempted to map different parts of the digital ecosystem. Startup Macedonia has done this for business support organizations, while MASIT has produced a directory of ICT firms. In addition, the National Bank of North Macedonia has created a fintech

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[4]   https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS?locations=MK

map. The lack of a complete, up-to-date map providing an impartial overview of different players and their roles remains an obstacle to collaboration.

Public procurement and domestic ICT markets

North Macedonia has a small domestic market, with a population of only 2 million and comparatively low purchasing power. For this reason, despite the relatively large proportion that is between 15 and 64 years of age (70 per cent according to countrymeters, 2022[5]), demand for digital services remains modest. The domestic market is therefore significant primarily for the opportunities it offers to test ideas and business models; companies wishing to scale up their operations are obliged to tap into global markets. Already, most software development companies are creating applications for Western markets. These include digital services for banking, air traffic control, animation, cybersecurity and website development, among others.

One issue relates to trust and perception within the community – domestic consumers accept international brands more readily than local brands. North Macedonia still has some way to go to build a trusted reputation in domestic and international markets. Still, market opportunities exist within the country in public health and government services. The reformed Law on Public Procurement that came into effect on 1 April 2019 has seen notable efforts by the public sector to reform public procurement with improved transparency and a greater emphasis on quality and experience. However, most contracts go to large firms, bypassing start-ups and SMEs; no doubt a result of procurement criteria that place value on a company track record. To change this, the government will need to raise awareness of procurement opportunities and create initiatives to prioritize SMEs and start-ups.

Trade flows (import and export)

Ecosystem players report that importing ICT products and services is relatively inexpensive, easy and straightforward. However, some start-ups experience administrative barriers in sending and receiving payments abroad due to the absence of sophisticated international payment solutions such as PayPal. This has led to companies opening subsidiaries abroad to take payments, which diminishes the national tax base and hampers economic growth.

Software and IT services providers tend to be export-oriented. In 2019, the total value of ICT exports was calculated at 3.3 per cent share of the country's total exports (Invest North Macedonia, 2022[6]). Some stakeholders report that the export process can be difficult and time-consuming and look to the government to do more to help exporters. Efforts in this regard are indeed being undertaken. For example, Invest North Macedonia supports domestic companies participating in international fairs, trade shows and conferences.

3.6   Culture and communities

- Multiple communities and gatherings have been established across the ecosystem, but their outcomes need to be disseminated to maximize impact.
- Entrepreneurial culture is spreading slowly, but more successful role models are needed to inspire others to follow.
- Young people are more willing to take risks and start an enterprise than previous generations, but the stigma associated with failure is still a barrier.

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[5]   https://countrymeters.info/en/North_Macedonia
[6]   https://investnorthmacedonia.gov.mk/export-ICT/

- Women are represented in the ICT sector both as business founders and as employees, but more needs to be done to engage marginalized communities.

Communities and events

Multiple tech and entrepreneurial communities are well established and active within the ecosystem, prominent examples being Startup Macedonia, MASIT, Macedonia2025, Brainster and accelerators and universities serving as community leaders and networking facilitators. In 2022, the Macedonia2025 Summit, attended by 430 delegates, highlighted digitalization in the future of work, including women in science, technology, engineering and mathematics (STEM), and distinguished leadership in blockchain technologies. Another forum, Startup Weekend Skopje, was held for the first time in April 2022 at the University of Information Sciences and Technologies "St. Paul the Apostle". It encourages networking and exchanging ideas among aspiring entrepreneurs.

Some of the new events and forums billed as fostering innovation are viewed with scepticism by stakeholders. It will be important for them to provide participants with genuine networking opportunities and access to knowledge sharing and data, to have a tangible impact of innovation. Community leaders should disseminate event outcomes widely across the ecosystem to maximize engagement and impact.

Spread of entrepreneurial culture

An entrepreneurial culture is slowly spreading across North Macedonian society. Universities and accelerators are encouraging this career trend and reporting heightened interest among young people in joining the entrepreneurial wave in digital innovation. However, potential founders often lack the skills, knowledge and funding to start a business venture. Furthermore, the traditional mindset heavily favours employment over independence. Thus, a career in public administration is widely viewed as preferable to starting a venture of one's own. The lack of a mature ecosystem also means a lack of enough inspiring role models. This may be expected to change as successful start-ups change the dominant mindset and galvanize more young people into becoming entrepreneurs.

Attitudes towards risk and entrepreneurship

As mentioned earlier, young people in North Macedonia, full of entrepreneurial spirit and hope, are more willing to take risks than previous generations. However, few have the financial and other resources to sustain them during the initial phase, where setbacks are common. The prevailing culture tends to be risk-averse and failure is often stigmatized; that applies to the investment community, too, which favours established firms. For a more vibrant ecosystem, North Macedonia needs to cultivate an innovative, entrepreneurial culture by embracing start-up failure and developing a willingness to iterate and learn. While the country has a strong potential in the ICT sector, developing a sustainable entrepreneurial mindset will still take time.

Diversity and equality

The IT sector of North Macedonia is a leader in gender equality: women represent 33 per cent of its workforce, more than in most European countries (Meta.MK, 2022[7]). Similarly, one in

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[7] https://meta.mk/en/analysis-in-the-it-sector-in-north-macedonia-the-gap-between-men-and-women-almost-non-existent/

three start-ups has a female founder (Startup Macedonia, 2021[8]). While these statistics are encouraging, a persistent gender gap cannot be denied. The Macedonia Chapter of Women in Tech is helping women embrace technology through education, entrepreneurship, events and research. They aim to educate, equip and empower women and girls, providing free programming workshops and mentoring to help them acquire the skills they need to succeed in the ICT sector and prosper in STEM careers. This initiative is a positive step: more diverse teams, including women, are good for a vibrant digital ecosystem. As far as rural communities and people with disabilities are concerned, they are underrepresented in the digital ecosystem. In 2019 the Government introduced a new law on social protection to increase the inclusion of vulnerable citizens in the labour market and society generally. It is still too early to assess the effectiveness of this law. The ecosystem must continue to focus on inclusiveness and facilitate access to ICT opportunities in terms of education, employment and services for marginalized communities.

3.7   Policy and regulations

- Some ministries engage with innovation; however, more collaboration is needed across the public sector to stimulate ecosystem growth.
- The Startup Council has enabled connections across the ecosystem, but some ministries are still unevenly connected due to different mandates.
- Intellectual property policy is on par with EU countries, but awareness-raising and training are needed to promote its benefits.
- A legal framework for research activities exists, but there is a clear need to fund and support universities in tech transfer and commercialization of innovative research.
- The government has tried to strengthen the legislative and institutional framework relevant to ICT, but awareness and implementation remain an issue.
- The education policy supports ICT innovation and entrepreneurship; however, it has not yet produced the knowledge and skills needed by the digital economy.
- The rates of income tax, both private and business, are conducive, but a supportive framework for angel investment is now needed.
- Policies are in place to support SMEs with training and finance, but the lack of a well-established entrepreneurial culture limits growth.
- The Industrial Strategy focuses on enhancing the manufacturing sector competitiveness, but it has yet to demonstrate results.
- Innovative firms benefit from several trade agreements, but initiatives are needed to support ICT product exporters.

Public sector engagement with innovation

MISA is mandated to promote digital development at the country level. The Ministry engages with ICT innovation and entrepreneurship through the work of FITD. Stakeholders believe that the Fund has been crucial and a game changer for the IT industry. It has improved access to financial support for innovation and technological development, and even promoted and encouraged innovation activity in North Macedonia. As the implementation agency, FITD is active in the ecosystem and well connected to its start-up beneficiaries. Some stakeholders believe FITD plays an important leading role in the ecosystem and is open and flexible to change. However, actors state that other parts of public administration appear to be less

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[8]   https://fitr.mk/wp-content/uploads/2021/11/ECOSYSTEM-REPORT-2021-PDF-Web.pdf

engaged. The public sector cannot work in silos and needs to collaborate with the whole ecosystem to stimulate innovation and economic growth.

Public sector connections to the ecosystem

In 2021, the Government of North Macedonia established the National Startup Council. Its mission is to proactively and constructively work towards improvements in legislation and create more favourable conditions for start-up development. It is composed of representatives from government, chambers of commerce, foreign donors and organizations, investors and entrepreneurs, working together to position North Macedonia as a regional start-up hub. While it is too early to measure its impact, it represents a positive step forward for the ecosystem. Despite these efforts, some stakeholders feel that public sector connections are sporadic. The ministries appear unequally connected to other stakeholders in the digital ecosystem due to their respective mandates. While all policies and laws in North Macedonia go through a public consultation process, some ecosystem players criticize the current backlog and feel that policymakers may be trying to circumvent the process. Based on feedback from stakeholders, it is evident that the Government must communicate more proactively to build trust and ensure a two-way dialogue with domestic stakeholders.

Intellectual property policies

In the last 10 years, North Macedonia has adopted several measures to put in place intellectual property (IP) protection on a par with the EU. The country is a member of WIPO and the European Patent Organization (EPO). The main legislative tools are the Law on Copyright (and related rights) and the Law on Industrial Property. Some stakeholders agree that IP policy is moving in the right direction in supporting ICT innovation. However, the National Patent Register shows patent applications have remained relatively consistent in numbers over the last four years. Also, worldwide applications decreased to 47 in 2020 from a peak of 105 in 2017 (World Bank, 2020[9]). Thus, it is evident that more awareness-raising and training is needed on the benefits of IP protection.

Research and development policies

The Law on Scientific and Research Activity defines the legal framework for research activities in North Macedonia. R&D expenditures are already very low compared to EU countries, and they are decreasing further. This is a source of frustration and an obstacle to digital innovation. There is a clear need to support universities with tech transfer and motivate academics to commercialize research. government-funded postgraduate researchers collaborating with the ICT industry could be a catalyst. However, SMEs and large companies would need to understand the benefits as well. More generous public allocations for R&D and appropriate policy measures can start a virtuous circle of R&D investment by the research and business sectors.

ICT policies

The National ICT Strategy is the principal strategic document for the sector. It builds on other, better-known strategies, in particular the Open Data Strategy and the Broadband Strategy. The former was initially hailed as an opportunity to encourage the promotion and use of open data as a tool for innovation, growth and transparent governance; but it lapsed in 2020, unlamented.

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[9]   https://data.worldbank.org/indicator/IP.PAT.RESD?locations=MK

Although the government has tried to strengthen the legislative and institutional framework relevant to ICT, awareness and implementation remain problematic.

Education policies supporting ICT innovation and entrepreneurship

The country's Education Strategy recognizes the need to promote entrepreneurial learning, apply digital technology, and integrate ICT in teaching and learning in pre-primary, primary and secondary schools. While pupils in primary and secondary schools have universal access to personal computers, ICT use in education appears to be ineffective. Furthermore, entrepreneurial mindset are low among pupils and teachers in primary education. The emphasis that the Education Strategy places on digital literacy and wide use of ICT in education and training is at odds with the widespread perception that the quality of teaching and the curriculum are not up to the challenge, and indeed that the education system is the main contributing factor to the country's innovation gap. Despite the repeated efforts by the government to reform the education system, the knowledge and skills relevant to the country's twenty-first century economy and business sector remain elusive.

Finance policies

North Macedonia has a business-friendly tax policy, regulated by the Law on Personal Income Tax, Law on Compulsory Social Insurance Contributions, Law on Value Added Tax and Law on Profit Tax. A flat tax rate of 10 per cent applies to personal income and corporations. From a tax perspective, North Macedonia should be a favourable location for setting up a business. However, start-ups report difficulties with extended payment terms and advanced VAT payments. Furthermore, the system makes it difficult to raise equity capital or attract foreign angel investment. The government should make it easier to create special purpose vehicles (SPVs) to facilitate angel financing. A co-investment fund for business angels investing in ICT start-ups would help to provide vital seed capital. The government could also offer tax breaks and other incentives for start-ups in the ICT sector. Previously, the Government announced plans to abolish personal income tax for the IT sector entirely, in order to attract more talent into the digital ecosystem. This has not happened to date.

SME policies

The Entrepreneurship Support Agency of the Republic of North Macedonia (APPRSM) is a state institution established in 2013 to implement government policies for SMEs and programmes in support of entrepreneurship, competitiveness and innovation. Several initiatives exist to support SMEs, including innovation grants and low-interest credits to help with technological investment. Furthermore, to help improve SME competitiveness, the government enacted the National Small and Medium Enterprise Strategy (2018-2023), establishing a framework for the public, private and civil society actors to collaborate in supporting SME development and innovation. One of the three strategic pillars of the strategy is dynamic entrepreneurship and the innovation ecosystem. In 2020, consultations took place on creating an e-register of regulatory changes involving SMEs. According to the State Statistical Office, the number of innovative SMEs increased in North Macedonia by 53 per cent between 2014 and 2020, and ecosystem players began to recognize government efforts to support SME capacity-building. However, for SMEs to grow, there needs to be an enabling legal and regulatory environment, access to financial services, fair competition, and a well-established entrepreneurial culture for long-term sustainable gains.

Industrial policy

In 2018-2019 the Ministry of the Economy launched the National Industrial Strategy, focused on the manufacturing sector. The strategy has five pillars: (i) Strengthening manufacturing foundations; (ii) Improving productivity and facilitating innovation and technology transfer; (iii) Stimulating green industries and green manufacturing; (iv) Boosting export-oriented manufacturing; and (v) Building up a learning-oriented manufacturing sector. One of the main goals of the strategy is to reduce state subsidies for the manufacturing sector and create the right conditions to increase productivity and competitiveness. However, it is still too early to assess the impacts of this strategy. Other significant industrial policies include agriculture and tourism, which are major contributors to the economy. Stakeholders are aware of these industrial policies, which support ICT innovation. When the Smart Specialisation Strategy is launched, it will focus on the digitalization of key sectors, and hopefully lead to the eagerly anticipated results.

Trade policy

North Macedonia has entered into several free trade agreements (FTAs), notably the Central European Free Trade Agreement (CEFTA), to which it acceded in 2000. It also has FTAs with Turkey and Ukraine. In February 2001, North Macedonia signed a Stabilization and Association Agreement (SAA) with the EU. Generally, ecosystem players report that policies support the export of ICT services. At present, Invest North Macedonia is initializing the new Export Promotion Strategy, which should enable export companies to manage better and expand into new markets abroad.

4   Ecosystem challenges and opportunities

The three main ecosystems essential to North Macedonia's digital transformation journey are:

i)   the innovation ecosystem (universities, research institutes, and the public sector);
ii)   the entrepreneurial ecosystem (innovators and support organizations); and
iii)   the technological ecosystem (high tech, ICTs, technology business-to-business (B2B), and manufacturing companies).

Understanding the ICT-centric (digital) innovation ecosystem

The three ecosystems – innovation ecosystem, entrepreneurial ecosystem and technology ecosystem – are closely linked to developing a country's digital transformation landscape. At the intersection of the three ecosystems lies the ICT-centric innovation ecosystem, also referred to as the digital innovation ecosystem.

Figure 3: Engines of growth
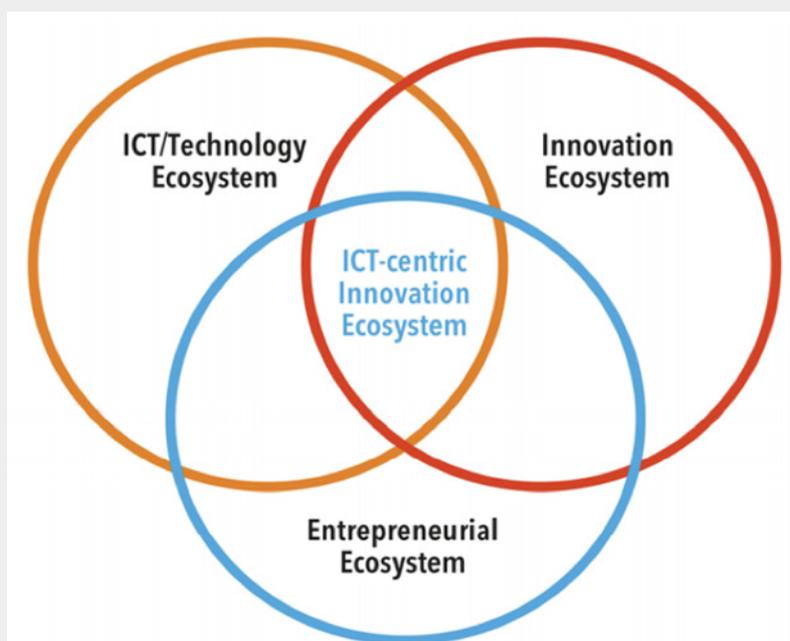
The following sections contain a brief analysis of each of the three ecosystems and ends with a macro level overview of the challenges and opportunities in each of them, as gathered through interviews and group discussions during the co-creation workshops with local stakeholders. Detailed analysis of the challenges has been presented in Chapter 3, while detailed recommendations are covered in Chapter 9 of this report.

4.1   Innovation ecosystem

The innovation ecosystem includes research institutes, universities, public sector entities such as national innovation agencies and public sector funding agencies, the private sector and other actors involved in commercialization. It plays an invaluable role in the national journey of innovation, especially in the launch of an innovation.

- The innovation ecosystem is at an early stage of development but is organized and supported by stakeholders.
- The innovation ecosystem is operational but not efficient as desired.
- New global partnerships are needed to transform accelerators into leading innovation centres.

Overview of actions in the innovation ecosystem

Despite being at an early stage of development, the national innovation ecosystem is organized and supported by stakeholders. The government set up FITD as a preliminary platform for innovation until such time as the private sector becomes competitive enough to lead. Despite this foundation, stakeholders continue to work in silos, rather than exploring the ecosystem potential. To mitigate this, the government must create awareness about and ensure efficient implementation of a digital transformation roadmap with a clear vision, strategy, and development of key initiatives.

Overview of challenges in the innovation ecosystem

FITD and science and research labs are prominent in North Macedonia. Private universities tend to engage in research activities more than public universities. An exception is Ss. Cyril and Methodius University in Skopje, a public university with its own capital research equipment. Most universities struggle to foster innovation, and the exchange between universities and industry is limited, reducing the scope for research to provide an impetus for digital innovation. At present, academia is not promoting the movement of optimal human capital into innovation and entrepreneurship. Hampered by a lack of research funding, the national innovation ecosystem, while operational, remains inefficient. The WIPO Global Innovation Index (GII) shows that North Macedonia produces fewer innovation outputs relative to its level of innovation investments. Moreover, the GII report (2021) highlights several areas of particular weakness, including industry-university R&D collaborations and innovation linkages.

Overview of opportunities in the innovation ecosystem

The public sector has successfully created an attractive business and regulatory environment. In 2020, North Macedonia was ranked 17th out of 190 countries in the Ease of Doing Business report. The country scored high for protecting minority investors and trading across borders. FITD is well-funded and provides appropriate programmes for innovation. Meanwhile, start-ups are moving through the development lifecycle but would benefit from more scale-up support. To address this, the government has funded three accelerators, but new global partnerships are needed to accelerate their transformation into leading innovation centres. Universities also have a key role to play in developing technological innovation, because they can offer various mechanisms to support ideas to market and adapt curricula. Finally, the private sector could encourage entrepreneurship to stimulate more internal innovation or provide incubation support for start-ups. The innovation ecosystem would benefit from stronger linkages, expanding research and development budgets, and developing national policies to fully leverage the benefits of digital technology.

4.2 Entrepreneurial ecosystem

The entrepreneurial ecosystem includes the entrepreneurs, their support systems, and the organizations that nurture business creation through the "valley of death" and subsequently accompany their growth into sustainable SMEs.

- The entrepreneurial ecosystem is small but growing, supported by various initiatives in Skopje.
- Start-up growth is limited by access to finance and intense competition for technical talent.
- North Macedonia offers start-ups the opportunity to test their ideas before scaling up abroad.

Overview of actions in the entrepreneur ecosystem

The entrepreneurial ecosystem is growing in North Macedonia, with a small tech start-up community supported by incubators and accelerators. Centralized in the capital, a range of initiatives nurture business ideas into start-ups and promote their growth into SMEs. Over the last five years, support organizations like Startup Macedonia have helped to build a more connected ecosystem to support this development. The Global Entrepreneurial Index (GEI) in 2018 ranked North Macedonia 66th out of 137 countries, suggesting that the country still has some way to go in allocating sufficient resources to promoting entrepreneurship.

Overview of challenges in the entrepreneur ecosystem

Start-up growth is restricted by a lack of access to finance and intense competition for technical talent. Lack of capital sometimes requires start-ups to move their IP outside the ecosystem to satisfy international investors. This slows ecosystem development within North Macedonia, as innovation and scarce talent are lost. Promising technology start-ups sometimes fail to make the leap across the "valley of death" for reasons that include lack of a market or of a high-growth business model. This is an area where universities and support organizations could play a more proactive role. Closer collaboration with entrepreneurs would stimulate innovation by building firms that deliver novel solutions.

Overview of opportunities in the entrepreneur ecosystem

The modest size of the domestic market means that North Macedonian start-ups can limit their risks by testing their ideas before scaling up abroad. With sufficient pre-seed capital, entrepreneurs benefit from relatively low start-up costs and can create minimal viable products (MVPs) relatively quickly and easily. Early-stage business support is also available and accessible. Currently, the main bottleneck is at the pre-idea stage, as more needs to be done to encourage people to join the entrepreneurial ecosystem. To enable this, support institutions need to create an entrepreneurial culture by sharing fundamental values such as risk-taking, an appreciation for failure, and a willingness to iterate and learn.

4.3 Technology ecosystem

The technology ecosystem includes high-growth technology companies, equipment manufacturers, systems integrators, companies in the ICT sector and B2B technology platforms supporting SMEs, among others. The development of the technology ecosystem is essential to

a country's ability to benefit from technological innovation and create high-growth industries and jobs.

- The technology ecosystem is fast-growing and ecosystem players are well-connected.
- Competition for scarce digital talent is the biggest challenge facing all stakeholders.
- The modern digital telecommunication networks and the Technological Industrial Development Zones should be leveraged to attract more foreign investment.

Overview of actions in the technology ecosystem

The technology ecosystem comprises 1 957 economically-active ICT companies, divided into five subsegments: software and IT services, telecommunication, ICT manufacturing, ICT trade and other IT services (MASIT, 2020[10]). The dominant segment is Software and IT Services, employing about 8 500 individuals (MASIT, 2020[11]). Several large ICT businesses, such as Microsoft, Cisco, Oracle, Dell, Compaq, Hewlett Packard, IBM, Sun Microsystems, Apple, and Lotus, are present in the country via branch offices, distributors, dealers, resellers, solution providers and business partners (Invest North Macedonia, 2022[12]). The ICT sector is the fastest growing in the country, and MASIT has played a key role in connecting stakeholders in this ecosystem.

Overview of challenges in the technology ecosystem

As the technology ecosystem grows, the biggest challenge faced by all stakeholders is the competition for digital talent. According to Invest North Macedonia, in 2020 more than 1 300 Macedonian students graduated in computer science, software development, foreign languages and mathematics, while another 1 800 graduated in economics and business administration. However, local companies seeking to hire them must compete with global players that offer attractive remote working remuneration packages. The small talent pool is further eroded by graduates leaving for more mature ecosystems. Organizations such as Brainster, an international edtech organization, and accredited higher education institutions are trying to fill this gap. Brainster has already helped more than 10 000 individuals from four countries to succeed in digital careers. To adapt efficiently to ever-changing labour market needs, a proactive involvement on behalf of the government, businesses and citizens is critical. Companies, through training and upskilling, must actively and continually support their existing workforce to keep up with the introduction of new technologies and business models.

Overview of opportunities in the technology ecosystem

A significant strength of the technology ecosystem lies in the modern digital telecommunication networks. The Macedonian telecommunication sector is the most liberalized in the region. The country's excellent Internet access has positively contributed to a favourable business climate. In addition, the Technological Industrial Development Zones (TIDZs) provide facilities for highly productive, clean manufacturing activities and new technology development. To achieve a mature technology ecosystem, the government should play on these strengths, consider investing in cloud infrastructure, and attract technology companies facing regulatory and bureaucratic restrictions in other countries.

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[10] https://masit.org.mk/wp-content/uploads/2020/09/masit_report_v1.00.pdf
[11] https://masit.org.mk/wp-content/uploads/2020/09/masit_report_v1.00.pdf
[12] https://investnorthmacedonia.gov.mk/invest-ICT/

4.4 Macro challenges

At a macro level, the three ecosystems face some common challenges:

1. A lack of a shared vision leads to unclear roles and misalignment of stakeholders in developing their innovation ecosystem.
2. Limited financial resources hamper growth of local digital start-ups and makes commercialization of academic research and private sector-led innovation more difficult.
3. Access to suitable human capital is challenging for all ecosystems as they compete to recruit the best talent.
4. The low level of understanding of ICT among citizens constrains the potential of the local market and the prospects for growth of the talent pool.

5 Stakeholders

Understanding the stakeholders

Collaboration between key actors in the innovation ecosystem is the foundation of the assessment process and drives the actions taken to build the ecosystem.

An important part of the country review is thus finding ways of identifying and engaging with these stakeholders.

Table 2 lists the many stakeholders who contributed to this analysis, grouped into entrepreneurs, the finance sector, entrepreneurial support networks, the private sector, academia and the public sector. Stakeholders who were interviewed and participated in co-creation workshops are marked as "interviewed".

Table 2: Key stakeholders in the ecosystem

	Stakeholders
Entrepreneurs	• AirCare • AREL NEUROMARKETING (interviewed) • Brainster (interviewed) • Claxi • CodeWell (interviewed) • Dark-1 (interviewed) • Elevate Global • Howitzer • Stornest • Synapse Aviation • Vision Dynamix (interviewed)
Entrepreneurial support networks	• Association of Business Women • Business Impact Lab • CEED Hub Skopje • Chamber of Commerce for Information Communication Technologies MASIT (interviewed) • Economic Chamber of Macedonia • Macedonia2025 (interviewed) • NewMan's Business Accelerator (interviewed) • Seavus Accelerator (interviewed) • Startup Macedonia (interviewed) • Swiss Entrepreneurship Programme (Swiss EP) • UNDP North Macedonia Accelerator Lab • X Factor Accelerator • Youth Entrepreneurial Service (YES) Foundation (interviewed)

Table 2: Key stakeholders in the ecosystem (continued)

	Stakeholders
Finance	• Association of Business Angels (interviewed) • Business Accelerator UKIM (interviewed) • CEED Macedonia Business Angels Club • Crimson Capital (interviewed) • Development Bank of North Macedonia • FITD (interviewed) • National Bank of the Republic of North Macedonia (interviewed) • SEAF Macedonia Fund • Silk Road Bank • South Central Ventures • Western Balkans Private Equity Fund
Private sector	• A1 Macedonia (interviewed) • Apple • Compaq • Cisco • Dell • Endava (interviewed) • Hewlett Packard • IBM • Lotus • Makedonski Telekom (interviewed) • Microsoft • Musala Soft (interviewed) • Oracle • Piksel LTD (interviewed) • Scalefocus • Seavus • Sun Microsystems
Academia	• Computer Science Department, South East European University (interviewed) • Faculty of Applied IT, Machine Intelligence and Robotics, APPLIED IT, University of Information Science and Technology "St. Paul the Apostle" (interviewed) • Faculty of Computer Science and Engineering, Ss. Cyril and Methodius University (interviewed) • Faculty of Information and Communication Sciences, University of Information Science and Technology "St. Paul the Apostle" (interviewed) • Goce Delčev University of Štip • INNOFEIT, Ss. Cyril and Methodius University (interviewed) • Mother Teresa University (interviewed) • St. Clement of Ohrid University • University American College Skopje (interviewed)

Table 2: Key stakeholders in the ecosystem (continued)

	Stakeholders
Public sector	- Agency for Promotion of Entrepreneurship (APERM) - Agency for Promotion and Support of Tourism - Employment Service Agency - Invest North Macedonia - Ministry of Agriculture, Forestry and Water Economy - Ministry of the Economy (interviewed) - Ministry of Education and Science (interviewed) - Ministry of Environment and Physical Planning - Ministry of Finance (interviewed) - Ministry of Information Society and Administration (interviewed) - Ministry of Labour and Social Policy - National Agency for European Educational Programmes and Mobility (interviewed) - Office of the Deputy Prime Minister for Economic Affairs

6 Ecosystem maturity map

Understanding the ecosystem maturity map

The ecosystem maturity map, also referred to as the innovation journey map, highlights the work that needs to be done in the ecosystem to harness innovation on a transformative journey from pre-ideation to high growth. It describes stakeholder roles and actions in support of entrepreneurs and innovators at each stage of the start-up lifecycle. The colour coding identifies areas that are well-supported (green), inadequate (yellow) and missing or weak (red).

The heatmap of stakeholders in the ecosystem and the current status of their jobs-to-be-done is based on interviews and group discussions in co-creation workshops with local stakeholders and validated by secondary research and literature reviews.

It must be understood that the innovation lifecycle or entrepreneurial journey is not linear. Instead, it is made up of a series of jobs-to-be-done across different stages of the cycles. In the pre-ideation stage, key actors plant the seeds of support in the innovation ecosystem. In the ideation stage, innovations are developed but have not yet been incorporated as businesses. In the start-up stage, innovations evolve from concepts into businesses. The valley of death is a challenging stage of development where entrepreneurs need strong support to survive. In the SME stage, the velocity of start-up growth increases as they expand rapidly into established businesses, reach steady-state, or exit through buyouts or initial public offerings (IPOs).

There is a need for a comprehensive understanding of how ecosystem actors can work together to implement national development priorities within the maturity ecosystem of digital innovation. Initiatives that are constructed in silos might lead to duplication of efforts and wasted resources.

The ecosystem maturity map in North Macedonia shows an ecosystem at an early stage. Profiling key stakeholder actions is necessary to accelerate digital transformation.

Table 3: Stakeholders and their roles in the ecosystem

Actors	Cycle stage				
	PRE-IDEA	IDEATION	START-UP	THE "VALLEY OF DEATH"	SME
Entrepreneurs	Entrepreneurial Interest	Engage with Problems	Develop Business Models	Build Collaboration	Expand
Finance	Research Funding	Seed Funding	Angel Investment	Venture Capital	Business Finance and Loans
Entrepreneurial support networks	Entrepreneurial Events	Hackathons and competitions	Co-Working and Support	Incubators and Accelerators	Business Association
Private sector	Success Stories	Research Programmes	Lab Programmes	B2B and Support Services	Skill Training Programmes
Academia	Community of Entrepreneurs	Basic Research	Spin-Off	Soft Skill Trainings	Human Capital
Public sector	Vision and Strategy	IP and R&D Support	Tax Support	Public Procurement	Trade Policy

6.1   Entrepreneurs

- Entrepreneurial culture and interest are slowly growing in North Macedonia, but fear of failure and risk aversion are barriers.
- Innovators generally target global markets and do not focus on solving local societal issues.
- Entrepreneurial education at primary, secondary and tertiary levels is underdeveloped, so founders do not have the skills to create strong business models to scale up.
- Entrepreneurs are keen to support one another, but limited knowledge and experience mean few companies successfully cross the valley of death.
- The lack of buyouts and IPOs means most start-ups cannot exit or expand into high-growth SMEs.

6.2   Finance

- Limited funding for innovators to research digital innovation or support technology transfer means good ideas often do not get off the ground.
- Government grants are available for early-stage ideas to develop into start-ups, but there are few high-growth success stories.
- Angel investment is underdeveloped and does not focus on digital technologies, so companies must bootstrap to survive.

- Venture capital is unavailable within the local ecosystem, so innovators need to secure finance from international sources.
- Well-established SMEs and large companies can access loans from commercial banks, which are inaccessible for start-ups.

6.3   Entrepreneurial support networks

- Public and private-sector actors organize gatherings to connect and inspire innovators, but more start-ups need to attend for the ecosystem to benefit.
- Annual start-up weekends enable innovators to validate their ideas with peers and mentors.
- Co-working spaces and soft infrastructure in Skopje allow innovators to share resources, but less so outside the capital.
- Incubators and accelerators are prominent and offer well-structured programmes to support and guide start-ups.
- Well-established chambers and associations in the ICT space advocate and support businesses, but these tend to champion larger firms.

6.4   Private sector

- Successful entrepreneurs are beginning to emerge and gain recognition in the ecosystem, helping to inspire and motivate young innovators. However, more success stories are needed to accelerate start-up creation.
- Large blue-chip foreign companies are engaged in funding research to support internal innovation, but local SMEs rarely invest their own resources.
- Very few private firms encourage intrapreneurship or offer the incubation of innovation projects on their premises.
- In collaboration with accelerators and support organizations, private companies provide mentoring and support to start-ups.
- Large private-sector employers have established soft skill training for new recruits and digital skill upskilling for the workforce.

6.5   Academia

- Some universities offer well-equipped spaces dedicated to innovation and entrepreneurship and access to accelerators and science and technology parks.
- Basic research leading to practical innovation is missing, limiting IP generation. However, some universities have made efforts to set up tech transfer facilities.
- University spinouts are rare as there are limited frameworks and incentives to support their establishment.
- Universities have introduced optional entrepreneurship modules to technical courses to help innovators create start-ups.
- Graduates are not always adequately prepared for the labour market, so employers have to invest in industry-ready skill training.

6.6   Public sector

- The Government of North Macedonia has produced various strategies that impact the ICT ecosystem. However, stakeholders remain unclear about the overarching vision.
- Local funding for academic research is scarce, leading to few innovations and registrations for patent protection.

- North Macedonia has a favourable tax regime in principle, but targeted incentives for ICT and entrepreneurship are lacking.
- Public procurement offers few opportunities for innovative start-ups, as established businesses tend to win most tenders.
- International trade is supported through legislation and robust trade agreements.

7   Relevant practices

During the assessment process, the following practices were identified as noteworthy and potentially positive for the ecosystem. As the next step in this process, an in-depth collaborative analysis could lead to the recognition of champions and good practices throughout the ecosystem.

Brainster

Brainster is an international edtech organization and accredited higher education institution that offers high-quality education. It helps people future-proof their careers by learning emerging technical skills and relevant twenty-first-century competencies. Through carefully-planned educational products, programmes, accredited undergraduate and postgraduate studies, executive education, courses, bootcamps, employment partners, real-world projects, industry experts and professors, the platform has helped more than 10 000 individuals from four countries succeed in well-paid jobs.

The Centre for Technology Transfer and Innovations (INNOFEIT)

The Faculty of Electrical Engineering and Information Technologies (FEEIT) of Ss. Cyril and Methodius University in Skopje opened the Centre for Technology Transfer and Innovations (INNOFEIT) to bridge the gap between academic education and practical expertise and prepare its students for coping with the industrial challenges ahead. INNOFEIT is a hub for interaction among FEEIT staff, FEEIT students and industrial partners that fosters connections and transfer of technology as well as innovative ideas that can aid the economic growth of the sector and the society. INNOFEIT is a co-founder of the Accelerator UKIM and has been selected by the European Investment Bank (EIB) as a candidate to become a centre of excellence in its fields of interest.

The Fund for Innovation and Technology Development (FITD)

FITD was set up in 2013 to encourage innovation by providing funding to build a competitive knowledge-based economy. It is a leading government institution that supports start-ups and innovative companies. The financial instruments of the Fund have so far allocated EUR 86 million to co-finance 686 projects, of which 326 are start-ups founded by young people. It also provides nearly EUR 1.5 million to support three accelerators: X Factor, Seavus Accelerator and Business-Technology Accelerator UKIM.

Macedonian Chamber of Commerce for Information and Communication Technologies (MASIT)

MASIT is a volunteer, non-profit chamber of commerce. It is the voice and resource of a competitive ICT sector, supporting an innovation-driven economy and a key contributor to the nation's prosperity. Founded in 2000, it now represents more than 50 per cent of the companies in the ICT sector. Its vision is to be the enabler for the growth of ICT businesses in North Macedonia, their recognition and image domestically and abroad, and enriching the prosperity of North Macedonia and its economy by having a stronger, organized, and progressive ICT industry.

National Startup Council

The Startup Council was created by FITD in response to an identified need for formal representation of the start-up community in creating and adopting national policies for the growth and development of the start-up ecosystem. The Startup Council, in cooperation with representatives from the government, chambers of commerce, foreign donors and organizations, as well as investors and entrepreneurs, made a detailed analysis of the current situation and needs for the faster transformation of the country's start-up ecosystem, with a single goal–positioning the Republic of North Macedonia as a start-up hub for the region.

Startup Macedonia

Startup Macedonia is a grassroots umbrella association created in 2016 by a group of start-up enthusiasts, founders, experts and investors. Their goal is to connect the start-up community through a data-driven approach and help create a favourable work environment for start-ups and scale-ups in the country. The association organizes events including Startup Europe Week, Product Hunt Meetup, TechCrunch Meetup, Global Entrepreneurship Week (since 2018) and Womenpreneurs Balkans Bootcamp. In addition, Startup Macedonia launched the first national data-driven start-up ecosystem platform, used by more than 145 start-ups and 35 organizations. The platform allows users to find relevant information for their stage of development, enabling them to progress more efficiently.

8   Perspectives on national priorities

Understanding the national vision and key strategies

A clear vision for digital transformation, shared at a community or national level, results in synergizing the resources and efforts towards one shared objective. It is important to understand that the digital economy is a product or outcome of digital transformation in a country. Stakeholder visions and strategies can be aligned with this goal, tearing down legacy silos and enabling a collective understanding of gaps and opportunities. This alignment will lead to the creation of a cohesive common agenda.

Most countries have established their national vision for a digital economy, based on national or international narratives such as the Sustainable Development Goals (SDGs), smart cities, smart societies and the creative economy. The national vision is essential to have a common language among stakeholders to avoid miscommunication or misleading information. Most countries are also enacting various strategies, including digital economy strategies, to achieve the vision. However, the needed enablers in many cases are not present to a sufficient degree, especially with regard to how ICT can drive this acceleration.

Table 4: Digital transformation strategies towards the national vision

National vision
To create an agile digital future that focuses on priority areas in the ICT sector to meet growing connectivity needs, boost competitiveness and make the daily life of citizens and businesses smarter.

Digital transformation strategies
The development of digital strategies to accelerate digital transformation and benefit populations is based on: • Strategies to drive the transformation in the public sector or to enable access to efficient public services for the private sector (such as transparency, e-governance, laws and regulations, one-stop services and e-citizens). • Strategies to help achieve social goals that promote inclusion and diversity (such as education and health). • Strategies to benefit key economic sectors vital to employment and inclusion (such as agriculture, tourism). • Strategies to promote environmental sustainability through green energy, smart grids and the like.

Political	Social	Economic	Environmental

Table 4: Digital transformation strategies towards the national vision (continued)

Strategic thrust 2: Centralization and streamlining of ICT and e-government services: establishing a centralized digital agency to consolidate all government ICT assets and resources in order to create a cost-effective government ICT service delivery mechanism. **Strategic thrust 6:** Expansion of digital services: initiating and driving activities for new digital services.	**Strategic thrust 1:** Improving connectivity and government infrastructure: speeding up the deployment of ICT infrastructure to support securely connected people, businesses and government. **Strategic thrust 3a:** Improving digital skills: providing a national framework for digital skills empowerment consistent with EU and international initiatives. **Strategic thrust 5:** Data protection: supporting implementation of the new law on personal data protection, through facilitating negotiations between major stakeholders.	**Strategic thrust 3b:** Fostering economic development: creating a favourable environment for an innovative, entrepreneurial and vibrant ICT Sector. **Strategic thrust 4:** Strengthening research, development and innovation: increasing R&D spending of public funds and private investments.	**Strategic thrust 7**: Advancing the environment for societal benefit: managing the use of ICT to minimize possible damage to the natural environment of North Macedonia.

Chapter 9 presents recommendations to support North Macedonia and its vision. These recommendations are targeted towards strengthening the country's executive programmes and related strategies to achieve the digital economy vision and mission. These recommendations include specific new measures, policies and initiatives to fulfil the national ambition.

9   Recommendations

Understanding the strategic priority matrix

Identifying the most critical needs and solving them within resources in an ecosystem is an important consideration. Without prioritisation and proper planning, success can be limited. Developing the capabilities of an ecosystem requires an agreement from stakeholders on key recommendations and key performance indicators to monitor them.

The strategic priority matrix identifies actions, programmes, policies and initiatives that must be in place to unlock the key enablers necessary for digital transformation.

The strategic priority matrix helps to develop a high-priority roadmap that amplifies the ecosystem good practices and fills in the gaps identified. This tool allows stakeholders to identify actions that need to be taken to support the ecosystem and propose missing elements as new complementary actions for the organic development of the ecosystem. The actions proposed need to be aligned with North Macedonia's national strategies and should facilitate ICT policies and programmes to be upgraded. All stakeholders should agree on the priorities.

Figure 4: Strategic priority matrix

INNOVATION DYNAMICS	INNOVATION CAPACITY	INNOVATION OF KEY SECTORS
Policies and programmes to help guide innovation dynamics	Actions that equip innovators with the right tools, skills, space and know-how to succeed	Actions that seek to integrate digital innovation in non-ICT sectors and boost competitiveness
ECOSYSTEM RESEARCH	**ECOSYSTEM KNOWLEDGE SHARING**	**ECOSYSTEM PARTNERSHIP & GOVERNANCE**
Actions and platforms providing research insight about the ecosystem, including stakeholders and existing resource mapping	Knowledge sharing actions and platforms to accelerate commitment and collaboration of stakeholders	Actions and platforms for enabling access to resources and networks for the ecosystem projects

The opportunities presented for the ecosystem in this chapter have been arrived at through group discussions with local stakeholders in co-creation workshops and supported with detailed complementary information in the detailed Appendix 1.

There are three main strategies for developing the ecosystem. These focus on actions that enhance the nurturing environment and concentrate the ecosystem on key sectors:

- innovation dynamics;
- innovation capacity;
- innovation in key sectors.

Three additional cross-cutting strategies help mature the ecosystem through actions that strengthen knowledge and linkages within the ecosystem:

- ecosystem research;
- ecosystem knowledge sharing;
- ecosystem partnership.

The following table lays out key recommendations for each of the six strategic priorities, which will help to develop and mature the ecosystem and achieve the national ambition of digital transformation. The table has been organized into short-term, medium-term and long-term recommendations based on the efforts and resources required to achieve them.

Table 5: Ecosystem strategies and recommendations

Ecosystem strategies and recommendations			
Strategic priorities	Time-frame		
	Short term (year one)	Medium term (year two)	Long term (year three onwards)
Innovation dynamics	ID1: Revise finance policies to de-risk traditional investment.	ID4: Revise strategies, policies and regulations to nurture new investment funds focused on ICT innovation.	ID9: Develop a structured framework to attract FDI to the ICT innovation sector.
	ID2: Establish a vision and clear strategies to foster digital innovation entrepreneurship in key non-ICT sectors i.e. agriculture, tourism and ICT.	ID5: Expand and enhance the Innovation Voucher scheme for SMEs and start-ups to accelerate ICT research in academia.	ID10: Create programmes to strengthen support for innovation and IP for the digital sector.
	ID3: Develop a programme to promote the emergence of local digital players and "Made in North Macedonia" ICT products and services.	ID6: Develop a programme to support and strengthen the angel investment network.	ID11: Revise strategies, policies and regulations to align the education curriculum to industry and future needs.
		ID7: Establish an operational framework to integrate and interconnect ministries and departments to strengthen e-governance.	ID12: Revise laws and frameworks to support tax exemptions or relaxation for digital enterprises (start-ups and SMEs).
		ID8: Revise customs policy and procedures to facilitate ICT hardware exports.	

Table 5: Ecosystem strategies and recommendations (continued)

Ecosystem strategies and recommendations			
Strategic priorities	Time-frame		
	Short term (year one)	Medium term (year two)	Long term (year three onwards)
Innovation capacity	IC1: Develop flexible soft infrastructures to support innovators and talents across the country.	IC4: Develop incentives to create a (virtual or physical) technology park for the digital sector.	IC7: Strengthen a national capacity development and incubation programme for digital innovators. Leverage the existing capacity of associations and networks for ICT.
	IC2: Strengthen and promote programmes to develop digital skills in SMEs.	IC5: Develop a sustainable funding mechanism for ecosystem programmes promoting digital entrepreneurship and innovation.	IC8: Develop a programme to promote digital innovation and intrapreneurship in the public sector.
	IC3: Create a roadmap of projects to develop talent education and development.	IC6: Establish an SME internship programme for all business and technology-based degrees to develop practical soft skills and technical skills.	
Innovation in key sectors	IS1: Develop a programme for digital innovators to unlock opportunities in disadvantaged communities.	IS2: Develop an agile procurement programme especially for start-ups/ SMEs to have the ability to test their ideas, validate their market opportunities and grow into viable businesses.	IS4: Identify and promote thematic areas based on key sectors to incentivize start-ups to solve local problems.
		IS3: Develop a programme to identify and pilot existing research or innovations in key sectors.	IS5: Promote a brand image for the country internationally to support domestic markets.
			IS6: Develop a programme to support the export of "Made in North Macedonia" ICT products and services to regional and international markets.
Ecosystem research	ER1: Develop a programme to identify and share knowledge about the opportunities and challenges of the digital economy.	ER2: Develop a digital innovation ecosystem map including all stakeholders, products and services, resources, opportunities and activities.	E3: Develop a one-stop shop platform with products and services to accelerate the commercialization of ideas to market, connecting academia, the private sector and government.
Ecosystem knowledge sharing	EK1: Develop a globally-accepted innovation forum to support events, conferences and seminars for innovators, start-ups and SMEs throughout the country.	EK2: Develop a knowledge platform with products and services to accelerate the spread of entrepreneurial culture and the use of technology.	EK3: Develop a programme to leverage the diaspora knowledge, experience, resources and network to support local innovators.

Table 5: Ecosystem strategies and recommendations (continued)

Ecosystem strategies and recommendations			
Strategic priorities	Time-frame		
	Short term (year one)	Medium term (year two)	Long term (year three onwards)
Ecosystem partnership and governance	EP1: Develop a Regional Innovation Centre to strengthen governance and the capacity to develop, monitor and implement flagship projects with strategic partnerships.	EP3: Develop flagship projects in key sectors of manufacturing, agriculture and tourism.	EP4: Develop flagship projects in the public sector.
	EP2: Create a platform to promote partnership and collaboration and transfer of technology between the public and private sector in the tertiary sector.		

10   Next steps

Decisive and active interventions can help transform an ICT ecosystem, making it more innovative and a true driver of accelerated digital expansion in all aspects of society – with real gains in public, professional and personal lives.

Stakeholders, based on co-creation and ecosystem priorities, shared recommendations that have helped conceptualise the following priority projects.

The value of this assessment – which identifies the main obstacles and catalysts that already exist in the ecosystem – is to provide the ideal platform for the launch and development of high-impact flagship projects. Each of these projects, designed to be of unique relevance to the country, would help accelerate digital transformation.

This digital innovation profile provides a valuable first glimpse of both the ecosystem and the existing practices. The profile is designed to raise awareness about the local challenges and opportunities and engage all stakeholders in implementing flagship projects – which can foster an enabling environment for the ICT-centric innovation ecosystem – to unleash the full potential of North Macedonia, and ultimately help bridge the innovation gap.

A roadmap has been co-created with a wide pool of domestic stakeholders. Recommendations based on country-level evidence are aimed at integrating the stakeholders and their actions into a collaborative and knowledge-driven ecosystem that works towards the common goals and catalyses digital transformation in the country.

As a next step, further engagement is needed to design, implement, monitor and evaluate each item in the roadmap. ITU can also provide North Macedonia with an extracted view of the top six priorities as an overview of the immediate tasks at hand, which can be viewed as the minimum job to be done to steer change in the ecosystem. ITU can further support the country in building institutional capacity and building governance systems to take the roadmap forward and guide its execution in a continued effort to improve and accelerate the digital innovation ecosystem in North Macedonia.

Appendices

Appendix 1: Detailed recommendations and roadmap

These recommendations are inspired by the co-creation workshops in which all stakeholders participated. ITU can help you convert each of these recommendations into concrete projects with clear strategies and key performance indicators (KPIs) to accelerate the ecosystem.

Table 6: Detailed roadmap for ecosystem strategies and recommendations

| Strategic priorities | Ecosystem strategies and recommendations roadmap | | | | | | |
	Opportunity	Opportunity brief	Product or service to develop	Ecosystem outcomes	National outcomes	Champions	Good practice
	Opportunities to address a particular ecosystem challenge	*Challenge explanation, analysis of the risk of the opportunity, as well as benefits users gain from using product or service*	*Proposed solutions to the ecosystem challenge that meet the needs of users*	*How will one know the ecosystem challenge is solved; what will be measured*	*The key performance indicators as established by the country*	*Core stakeholders with high power and interest to be involved in this opportunity*	*Good practices nationally and internationally to inform the course of action*
Innovation dynamics 1	Revise finance policies to de-risk traditional investment.	Local investors/funders and international donors are risk averse and prefer to see some level of commitment and profitable to incentivise investments in tech projects without bearing full risks.	A set of policies to allow for a guarantee fund that enables traditional financial structures to bring financial support to the digital sector.	Number of policies allow for a guarantee fund. Number of investments made in start-ups and SMEs by international donors, local investors and funders.	Strategic thrust 3b: Fostering economic development. Strategic thrust 4: Strengthening research, development and innovation.	The National Bank Ministry of the Economy Association of Business Angels Ministry of Information Society and Administration	Venture Capital Investment Guarantee programme by OSEO (France)

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	Ecosystem strategies and recommendations roadmap						
Strategic priorities	Opportunity	Opportunity brief	Product or service to develop	Ecosystem outcomes	National outcomes	Champions	Good practice
Innovation dynamics 2	Establish a vision and clear strategies to foster digital innovation entrepreneurship in key non-ICT sectors i.e. agriculture, tourism and ICT.	There is a need to stimulate entrepreneurship and support infrastructure for growing sectors such as ICT, agriculture and tourism, through new investments, and incubation spaces.	Strategies to set up support spaces (incubators, accelerators) and funding for non-ICT entrepreneurs.	Number of non-ICT entrepreneurs, start-ups and SMEs engaged in digital innovation. Number of policies and strategies targeting the inclusion of non-ICT entrepreneurs in digital innovation. Number of funds available to non-ICT firms.	Strategic thrust 3b: Fostering economic development: Strategic thrust 7: Advancing the environment for societal benefit:	Ministry of Agriculture, Forestry and Water Economy Ministry of the Economy Ministry of Environment and Physical Planning Ministry of Information Society and Administration Agency for Promotion and Support of Tourism	
Innovation dynamics 3	ID3: Develop a programme to promote the emergence of local digital players and "Made in North Macedonia" ICT products and services.	There is a need to raise awareness of local success stories to change mindsets and inspire potential entrepreneurs.	A programme to support and promote local digital players.	Number of "Made in North Macedonia'" brand ambassadors. Number of local firms engaging with the programme.	Strategic thrust 3b: Fostering economic development: Strategic thrust 7: Advancing the environment for societal benefit:	Macedonia2025 MASIT Startup Macedonia Entrepreneurship Support Agency of the Republic of North Macedonia	

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	Ecosystem strategies and recommendations roadmap					
Strategic priorities	Opportunity	Opportunity brief	Product or service to develop	Ecosystem outcomes	National outcomes	Champions	Good practice
Innovation dynamics 4	Revise strategies, policies and regulations to nurture new investment funds focused on ICT innovation.	There is a need to create new investment funds at all stages of the innovation journey, particularly among angel investment groups and venture capital.	A revision of strategies to incentivize and redirect the social corporate responsibility of operators, banks and other international private actors to support digital SMEs and start-ups.	Number of new investment funds accessible to digital innovation start-ups and SMEs. Number of new funds distributed to digital innovation start-ups and SMEs.	Strategic thrust 3b: Fostering economic development: Strategic thrust 4: Strengthening research, development and innovation. Strategic thrust 7: Advancing the environment for societal benefit:	Ministry of the Economy Ministry of Information Society and Administration MASIT Fund for Innovation & Technology Development	

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	Ecosystem strategies and recommendations roadmap					
Strategic priorities	Opportunity	Opportunity brief	Product or service to develop	Ecosystem outcomes	National outcomes	Champions	Good practice
Innovation dynamics 5	Expand and enhance the Innovation Voucher scheme for SMEs and start-ups to accelerate ICT research in academia.	SMEs and start-ups need incentives and support to have technology as a key driver of operations and management; feel safe around those technologies and easily access them.	An enhanced programme to educate and allow start-ups and SMEs to experiment with technologies in their daily operations and management, either part or fully funded.	Number of start-ups and SMEs incorporating technology and digital tools in their daily operations and management.	Strategic thrust 3b: Fostering economic development: Strategic thrust 4: Strengthening research, development and innovation.	Entrepreneurship Support Agency of the Republic of North Macedonia South East European University University of Information Science and Technology "St. Paul the Apostle" Ss. Cyril and Methodius University American College Skopje Mother Teresa University Fund for Innovation & Technology Development	

(continued)

	Ecosystem strategies and recommendations roadmap					
Strategic priorities	Opportunity	Opportunity brief	Product or service to develop	Ecosystem outcomes	National outcomes	Champions	Good practice
Innovation dynamics 6	Develop a programme to support and strengthen the angel investment network.	Angel investments are rare and not specifically focused on digital innovation. This funding is essential to enable innovators to grow their businesses and contribute to the local innovation ecosystem.	A programme to support angel investors, including training and introductions to local entrepreneurs. Financial incentives to make angel investing an attractive proposition.	Number of business angels on the programme. Number of angel investments made in start-ups.	Strategic thrust 3b: Fostering economic development: Strategic thrust 4: Strengthening research, development and innovation.	Angel Investment Network Startup Macedonia Fund for Innovation & Technology Development MASIT	Seed Enterprise Investment Scheme (UK)

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	Ecosystem strategies and recommendations roadmap						
Strategic priorities	Opportunity	Opportunity brief	Product or service to develop	Ecosystem outcomes	National outcomes	Champions	Good practice
Innovation dynamics 7	Establish an operational framework to integrate and interconnect ministries and departments to strengthen e-governance.	Effective ICT usage by the government would enhance and facilitate government services, exchange of information, communication transactions and integration of various stand-alone systems and services.	Strategies to enhance ICT usage across all of the government administration, including training and awareness-raising among all employees.	Number of government services effectively using ICT. Number of initiatives to integrate systems and services across government departments.	Strategic thrust 1: Improving connectivity and government infrastructure. Strategic thrust 2: Centralization and streamlining of ICT and e-government services. Strategic thrust 6: Expansion of digital services	Ministry of Agriculture, Forestry and Water Economy; Ministry of the Economy; Ministry of Education and Science; Ministry of Environment and Physical Planning; Ministry of Finance; Ministry of Information Society and Administration; Ministry of Labour and Social Policy	

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	Ecosystem strategies and recommendations roadmap						
Strategic priorities	Opportunity	Opportunity brief	Product or service to develop	Ecosystem outcomes	National outcomes	Champions	Good practice
Innovation dynamics 8	Revise customs policy and procedures to facilitate ICT hardware exports.	Policies for export need to focus on ICT services and products and harmonize with regional regulations to extend the digital economy regionally and globally.	A revision of the policies and strategies to support the export of domestic ICT products.	Number of policies and strategies in place to enhance the export of ICT products. Number of policies harmonized with regional regulations. Number of ICT products exported.	Strategic thrust 3b: Fostering economic development	Office of the Deputy Prime Minister for Economic Affairs Invest North Macedonia Ministry of the Economy	
Innovation dynamics 9	Develop a structured framework to attract FDI to the ICT innovation sector.	The digital innovation ecosystem lacks a clear foreign direct investment policy and supportive framework.	A structured policy framework to attract FDI that targets companies that plan to establish innovation centres focused on developing products and not outsourcing.	Number of policies and strategies to attract foreign direct investment. Number of foreign direct investments distributed.	Strategic thrust 3b: Fostering economic development Strategic thrust 4: Strengthening research, development and innovation	Office of the Deputy Prime Minister for Economic Affairs Invest North Macedonia Fund for Innovation & Technology Development Ministry of Information Society and Administration	Foreign Direct Investment Flows to ICT Sector (Belarus)

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	Ecosystem strategies and recommendations roadmap					
Strategic priorities	Opportunity	Opportunity brief	Product or service to develop	Ecosystem outcomes	National outcomes	Champions	Good practice
Innovation dynamics 10	Create programmes to strengthen support for innovation and IP for the digital sector.	Lack of awareness and understanding of the benefits of registering IP remains prohibitive for many innovators.	An awareness-raising and training programme for innovators around the benefits of IP protection.	Number of start-ups and SMEs registered on IP education programmes. Number of IPs registered locally by digital start-ups and SMEs.	Strategic thrust 4: Strengthening research, development and innovation	State Office of Industrial Property of the Republic of North Macedonia Ministry of Information Society and Administration Fund for Innovation & Technology Development	

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	Ecosystem strategies and recommendations roadmap					
Strategic priorities	Opportunity	Opportunity brief	Product or service to develop	Ecosystem outcomes	National outcomes	Champions	Good practice
Innovation dynamics 11	Revise strategies, policies and regulations to align the education curriculum to industry and future needs.	North Macedonia needs a project roadmap to build ICT skills of the future, to include ICT in formal and non-formal education, and to develop digital education content.	A revision of strategies, policies and regulations to align the education curriculum to industry and future needs.	Number of strategies to build ICT skills needed for the industry. Number of strategies to include ICT in formal and non-formal education settings. Number of strategies to develop and use digital content in formal and non-formal education settings.	Strategic thrust 3a: Improving digital skills	Ministry of Education and Science Ministry of Information Society and Administration University of Information Science and Technology "St. Paul the Apostle" Ss. Cyril and Methodius University University American College Skopje Mother Teresa University	

(continued)

		Ecosystem strategies and recommendations roadmap					
Strategic priorities	Opportunity	Opportunity brief	Product or service to develop	Ecosystem outcomes	National outcomes	Champions	Good practice
Innovation dynamics 12	Revise laws and frameworks to support tax exemptions or relaxation for digital enterprises (start-ups and SMEs).	The country has a low level of entrepreneurial culture and interest. Laws need to encourage and support individuals to start-up companies. In addition, SMEs need support to scale, and tax savings can be reinvested in growth.	A revised law to support tax exemptions for digital enterprises and SMEs.	Number of new digital start-ups registered. Revenue growth of SMEs.	Strategic thrust 3b: Fostering economic development	Ministry of Information Society and Administration Ministry of the Economy	
Innovation capacity 1	Develop flexible soft infrastructures to support innovators and talents across the country.	The country needs more well-equipped incubation, labs, research centres and spaces to inspire talents, and solve local problems, assist in times of experimentation and learning, and keep the momentum for development going.	A programme for the development of flexible soft infrastructures to support innovators across the country.	Number of soft infrastructures across the country. Number of participants for each of these soft infrastructures.	Strategic thrust 3a: Improving digital skills Strategic thrust 3b: Fostering economic development	Entrepreneurship Support Agency of the Republic of North Macedonia Fund for Innovation & Technology Development Ministry of Information Society and Administration	

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	Ecosystem strategies and recommendations roadmap						
Strategic priorities	Opportunity	Opportunity brief	Product or service to develop	Ecosystem outcomes	National outcomes	Champions	Good practice
Innovation capacity 2	Strengthen and promote programmes to develop digital skills in SMEs.	SMEs need to understand and embrace ICT in order to remain competitive and grow and navigate the valley of death.	A programme to assess current provision and uptake. Revise the current programmes and create a marketing campaign to attract more SMEs.	Number of SME beneficiaries on programmes. Revenue growth of SMEs.	Strategic thrust 3a: Improving digital skills Strategic thrust 3b: Fostering economic development	Entrepreneurship Support Agency of the Republic of North Macedonia Fund for Innovation & Technology Development	
Innovation capacity 3	Create a road-map of projects to develop talent education and development.	The country needs programmatic frameworks to educate talent and the workforce for ICT skills and entrepreneurship in primary, secondary and tertiary education to accelerate the digital transformation.	A programme to develop a clear roadmap of projects for talent education and development.	Number of projects developed and implemented to educate talent.	Strategic thrust 3a: Improving digital skills	Ministry of Education and Science Ministry of Information Society and Administration	Unified Strategy for Education and Science (2017-2020) (Georgia)

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Ecosystem strategies and recommendations roadmap							
Strategic priorities	Opportunity	Opportunity brief	Product or service to develop	Ecosystem outcomes	National outcomes	Champions	Good practice
Innovation capacity 4	Develop incentives to create a (virtual or physical) technology park for the digital sector.	The ecosystem needs to create technology parks to nurture and connect champions at all levels of the innovation journey and include technology communities, investors, and women.	An incentive programme to create technology parks for the digital sector across the country.	Number of virtual or physical technology parks.	Strategic thrust 3a: Improving digital skills. Strategic thrust 3b: Fostering economic development.	Entrepreneurship Support Agency of the Republic of North Macedonia. Ministry of Information Society and Administration. Ministry of the Economy. Fund for Innovation & Technology Development	Digital Hub Initiative (De-Hub) (Germany)
Innovation capacity 5	Develop a sustainable funding mechanism for ecosystem programmes promoting digital entrepreneurship and innovation.	The ecosystem needs adequate and sustainable financial resources, mapping and practices to fund entrepreneurship at all stages of the innovation journey.	A programme to develop a sustainable funding mechanism for ecosystem programmes promoting digital entrepreneurship and innovation.	A mapping of all sustainable financial resources and best practices. Number of sustainable financial resources available to the ecosystem.	Strategic thrust 4: Strengthening research, development and innovation	Ministry of the Economy. Fund for Innovation & Technology Development	Innovation Fund (Serbia)

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	Ecosystem strategies and recommendations roadmap						
Strategic priorities	Opportunity	Opportunity brief	Product or service to develop	Ecosystem outcomes	National outcomes	Champions	Good practice
Innovation capacity 6	Establish an SME internship programme for all business and technology-based degrees to develop practical soft skills and technical skills.	University graduates need 21st-century skills to be labour market ready. Internships give students exposure to work environments to develop these.	An SME internship programme for all business and technology-based degrees across the country.	Number of programmes. Number of internship opportunities and student uptake.	Strategic thrust 3a: Improving digital skills Strategic thrust 3b: Fostering economic development	Ministry of Education and Science University of Information Science and Technology "St. Paul the Apostle" Ss. Cyril and Methodius University American College Skopje Mother Teresa University	Aston University Placement Scheme (UK)
Innovation capacity 7	Strengthen a national capacity development and incubation programme for digital innovators. Leverage the existing capacity of associations and networks for ICT.	Incubators need to be available and accessible to encourage innovators to start new ventures. In addition, they help to reduce risk and fear of failure.	A national capacity and development programme for digital innovators.	Number of incubators. Number of start-ups using services.	Strategic thrust 3a: Improving digital skills Strategic thrust 3b: Fostering economic development	Entrepreneurship Support Agency of the Republic of North Macedonia MASIT	

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	Ecosystem strategies and recommendations roadmap						
Strategic priorities	Opportunity	Opportunity brief	Product or service to develop	Ecosystem outcomes	National outcomes	Champions	Good practice
Innovation capacity 8	Develop a programme to promote digital innovation and intrapreneurship in the public sector.	Intrapreneurship can help to drive innovation and create champions within the public sector.	A programme to promote digital innovation and intrapreneurship.	Number of internal innovation projects.	Strategic thrust 4: Strengthening research, development and innovation	Ministry of Information Society and Administration	
Innovation in key sectors 1	Develop a programme for digital innovators to unlock opportunities in disadvantaged communities.	The ecosystem needs to harness the talent in disadvantaged communities such as people with disabilities, older people, and rural communities.	A programme for digital innovators to unlock opportunities in disadvantaged communities.	Number of communities included and active in digital innovations.	Strategic thrust 3a: Improving digital skills Strategic thrust 3b: Fostering economic development	Ministry of Information Society and Administration Ministry of Education and Science	Government Digital Inclusion Strategy 2014 (United Kingdom)

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	Ecosystem strategies and recommendations roadmap						
Strategic priorities	Opportunity	Opportunity brief	Product or service to develop	Ecosystem outcomes	National outcomes	Champions	Good practice
Innovation in key sectors 2	Develop an agile procurement programme especially for start-ups/ SMEs to have the ability to test their ideas, validate their market opportunities and grow into viable businesses.	The ecosystem needs an agile procurement process, revisited documentation prerequisites, besides more awareness and education to allow for start-ups to gain greater access to public procurement contract opportunities.	An agile procurement programme for start-ups/ SMEs to have the ability to test their ideas, validate their market opportunities and grow into viable businesses.	Number of revised procurement processes. Number of revisited documentation prerequisites. Number of awareness and education sessions for start-ups and SMEs. Number of start-ups and SMEs applying for public procurement contracts. Number of start-ups and SMEs gaining public procurement contracts.	Strategic thrust 3b: Fostering economic development Strategic thrust 6: Expansion of digital services	Ministry of Information Society and Administration Ministry of Finance	e-Albania Initiative (Albania)

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	Ecosystem strategies and recommendations roadmap						
Strategic priorities	Opportunity	Opportunity brief	Product or service to develop	Ecosystem outcomes	National outcomes	Champions	Good practice
Innovation in key sectors 3	Develop a programme to identify and pilot existing research or innovations in key sectors.	The ecosystem lacks a shared understanding of existing research in key sectors. Innovations in key sectors can be developed and exploited to create opportunities and enable ecosystem growth.	A programme to pilot existing research in key sectors.	Number of innovation pilots across non-ICT sectors in the economy.	Strategic thrust 4: Strengthening research, development and innovation	Ministry of Agriculture, Forestry and Water Economy; Ministry of the Economy; Ministry of Education and Science; Ministry of Environment and Physical Planning; Ministry of Information Society and Administration	
Innovation in key sectors 4	Identify and promote thematic areas based on key sectors to incentivize start-ups to solve local problems.	The ecosystem lacks a structured environment for exploring and experimenting in thematic areas based on key sectors.	A programme to support local talents to understand local problems and unlock domestic market opportunities across sectors.	Number of structured environments to access domestic market opportunities. Number of unlocked domestic market opportunities.	Strategic thrust 3b: Fostering economic development; Strategic thrust 4: Strengthening research, development and innovation; Strategic thrust 6: Expansion of digital services	Ministry of the Economy; Ministry of Agriculture, Forestry and Water Economy; Agency for Promotion and Support of Tourism; Fund for Innovation & Technology Development	

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	Ecosystem strategies and recommendations roadmap						
Strategic priorities	Opportunity	Opportunity brief	Product or service to develop	Ecosystem outcomes	National outcomes	Champions	Good practice
Innovation in key sectors 5	Promote a brand image for the country internationally to support domestic markets.	To compete globally, the country needs to enhance its reputation and brand.	Establish a "Made in North Macedonia" label that attributes a value to social contribution for any business based on a contribution to flagship initiatives in the digital sector.	Number of "Made in North Macedonia" products and services. Value of ICT exports.	Strategic thrust 3b: Fostering economic development	Office of the Deputy Prime Minister for Economic Affairs Invest North Macedonia Ministry of Information Society and Administration	
Ecosystem research 1	Develop a programme to identify and share knowledge about the opportunities and challenges of the digital economy.	The ecosystem needs better systems to identify and share problems, and economic opportunity areas for funding opportunities, high-quality research and development, culture of collaboration, and idea commercialization.	A programme to identify and share knowledge about the opportunities and challenges of the digital economy.	Number of opportunities and ideas identified, shared, and commercialized Number of funding opportunities, partnerships, and IP created as a result of identified opportunities and ideas.	Strategic thrust 3b: Fostering economic development Strategic thrust 4: Strengthening research, development and innovation	Macedonia2025 Startup Macedonia MASIT Fund for Innovation & Technology Development Ministry of Information Society and Administration	

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	Ecosystem strategies and recommendations roadmap						
Strategic priorities	Opportunity	Opportunity brief	Product or service to develop	Ecosystem outcomes	National outcomes	Champions	Good practice
Ecosystem research 2	Develop a digital innovation ecosystem map including all stakeholders, products and services, resources, opportunities and activities.	The ecosystem needs to understand its current strengths and gaps to maximize the use of the scarce resource, improve efficiencies and build on its strengths.	A digital innovation ecosystem map with a reliable, unbiased owner that is updated monthly, with input from all stakeholders.	Number of opportunities identified and collaborations.	Strategic thrust 3b: Fostering economic development: Strategic thrust 4: Strengthening research, development and innovation	MASIT Fund for Innovation & Technology Development Macedonia2025 Startup Macedonia Ministry of Information Society and Administration	
Ecosystem research 3	Develop a one-stop shop platform with products and services to accelerate the commercialization of ideas to market, connecting academia, the private sector and government.	The ecosystem needs to further democratize access to resources, information regarding stakeholders, transformative impact, activities, and opportunities to commercialize ideas in high-growth markets.	A one-stop shop platform with products and services to accelerate the commercialization of ideas to market.	Number of ideas commercialized through access to the one-stop shop platform.	Strategic thrust 3b: Fostering economic development Strategic thrust 4: Strengthening research, development and innovation	Ministry of Information Society and Administration	The Challenge-Driven Innovation Programme by VINNOVA (Sweden)

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	Ecosystem strategies and recommendations roadmap						
Strategic priorities	Opportunity	Opportunity brief	Product or service to develop	Ecosystem outcomes	National outcomes	Champions	Good practice
Ecosystem knowledge sharing 1	Develop a globally-accepted innovation forum to support events, conferences and seminars for innovators, start-ups and SMEs throughout the country.	The ecosystem is punctuated with a few events, but very few of them recognize high achievers or trigger partnership opportunities.	A globally-accepted innovation forum.	Number of stakeholders and visitors to the innovation forum annually.	Strategic thrust 3b: Fostering economic development Strategic thrust 4: Strengthening research, development and innovation	MASIT Startup Macedonia Macedonia2025 Fund for Innovation & Technology Development Ministry of Information Society and Administration	
Ecosystem knowledge sharing 2	Develop a knowledge platform with products and services to accelerate the spread of entrepreneurial culture and the use of technology.	The ecosystem needs to ensure all citizens have an awareness and sufficient information about the potential of digital innovation and its benefits for all, export possibilities, ecosystem developments and technology decision-making.	A knowledge platform with products and services to accelerate the spread of entrepreneurial culture and the use of technology.	Number of digital products and services available for citizens.	Strategic thrust 3b: Fostering economic development Strategic thrust 4: Strengthening research, development and innovation	Ministry of Information Society and Administration	

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	Ecosystem strategies and recommendations roadmap						
Strategic priorities	Opportunity	Opportunity brief	Product or service to develop	Ecosystem outcomes	National outcomes	Champions	Good practice
Ecosystem knowledge sharing 3	Develop a programme to leverage the diaspora knowledge, experience, resources and network to support local innovators.	The ecosystem needs to leverage the value that the country's global diaspora can offer as a way to mitigate the brain drain.	A programme to leverage the diaspora knowledge, experience, resources and network to support local innovators.	Number of diaspora citizens involved in the local ecosystem.	Strategic thrust 3b: Fostering economic development Strategic thrust 4: Strengthening research, development and innovation	Entrepreneurship Support Agency of the Republic of North Macedonia	

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	Ecosystem strategies and recommendations roadmap					
Strategic priorities	Opportunity	Opportunity brief	Product or service to develop	Ecosystem outcomes	National outcomes	Champions	Good practice
Ecosystem partnership and governance 1	Develop a Regional Innovation Centre to strengthen governance and the capacity to develop, monitor and implement flagship projects with strategic partnerships.	The ecosystem needs effective, accountable leadership to align common understanding and concerted digital innovation efforts around a clear plan of implemented strategies. It also requires an effective communication mechanism between all stakeholders for policy creation and implementation to foster trust-based collaborations, synergies, and awareness of how stakeholder actions can affect others in the ecosystem.	A regional innovation centre to strengthen governance and the capacity to develop, monitor and implement flagship projects with strategic partnership.	Number of implemented policies through the regional innovation centre.

Number of digital innovation collaborations, partnerships and projects created through the DTEA. | Strategic thrust 3b: Fostering economic development

Strategic thrust 4: Strengthening research, development and innovation | Ministry of Information Society and Administration.

Entrepreneurship Support Agency of the Republic of North Macedonia

Ministry of the Economy | |

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	Ecosystem strategies and recommendations roadmap						
Strategic priorities	Opportunity	Opportunity brief	Product or service to develop	Ecosystem outcomes	National outcomes	Champions	Good practice
Ecosystem partnership and governance 2	Create a platform to promote partnership and collaboration and transfer of technology between the public and private sector in the tertiary sector.	The ecosystem needs to work together to ensure that tertiary education is aligned to the needs of the labour market and digital innovation ecosystem. Partnership between both private and public sector employers can inform curricula and further support internship opportunities as well as support the commercialization of research.	A platform to promote partnership and collaboration between the public and private sector in the tertiary sector.	Number of private and public sector collaborations with the tertiary sector. Number of internship opportunities. Number of collaborative research projects.	Strategic thrust 4: Strengthening research, development and innovation Strategic thrust 6: Expansion of digital services	Ministry of Education and Science Ministry of Information Society and Administration	
Ecosystem partnership and governance 3	Develop flagship projects in key sectors of manufacturing, agriculture and tourism.	The ecosystem needs to engage stakeholders earlier in the project process cycle to ensure the continuity of digital transformation initiatives after government changes for the manufacturing, agriculture and tourism sectors.	A programme to develop digital innovation flagship projects in the key sectors: manufacturing, agriculture and tourism.	Number of projects in the manufacturing, agriculture and tourism sectors. Number of stakeholders involved in the projects.	Strategic thrust 3b: Fostering economic development Strategic thrust 4: Strengthening research, development and innovation	Ministry of Agriculture, Forestry and Water Economy Ministry of the Economy Ministry of Information Society and Administration Fund for Innovation & Technology Development	The Digital New Deal (South Korea)

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	Ecosystem strategies and recommendations roadmap					
Strategic priorities	Opportunity	Opportunity brief	Product or service to develop	Ecosystem outcomes	National outcomes	Champions	Good practice
Ecosystem partnership and governance 4	Develop flagship projects in the public sector.	The ecosystem needs to engage stakeholders earlier in the project process cycle to ensure the continuity of digital transformation initiatives after government changes for the public sector.	A programme to develop digital innovation flagship projects in the key sector: the public sector.	Number of projects in the public sector. Number of stakeholders involved in the public sector projects.	Strategic thrust 1: Improving connectivity and government infrastructure Strategic thrust 2: Centralization and streamlining of ICT and e-government services Strategic thrust 5: Data Protection Strategic thrust 7: Advancing the environment for societal benefit	Ministry of Information Society and Administration	The Digital New Deal (South Korea)

Appendix 2: Governance framework

Understanding the governance framework

A governance framework is required for the body responsible for the stewardship and accountability of the country's digital transformation journey, with clear-sighted counsel on strategic direction and alignment to its vision, values and purpose.

A governance framework is a guidance system consisting of standard management practices tailored to a standard project or an organization. It is a mechanism used by the board, management, and operational employees to translate the elements of governance and policies into practices, procedures and job responsibilities within the governance infrastructure. The framework should lead to a clear understanding and overview of expectations, values, objectives, methods and reporting requirements as they apply to all participants.

A strong governance framework can help an organization achieve accountability, authority and sound decision-making. Conversely, a weak governance framework can lead to a breakdown in the stages of the investment process and affect overall economic growth. In practice, governance usually comes down to striking a balance among conflicting needs and goals, which arise in various areas for many reasons.

Figure 5: Governance framework

Terms of reference

MISA, in close consultation with the SIGMA expert and in line with European Union requests for reforms in public administration and the organizational structures of ministries, established the Agency for Digital Transformation in September 2022. The new agency is aimed at supporting North Macedonia's digital vision within the Ministry strategy. Core members of the agency

include the Deputy Prime Minister for Good Governance, the Minister of Information Society and Administration, the Minister of Finance and others, including MASIT and other key stakeholders.

There is also a need within the country for a national-level agency or authority that can oversee the digital transformation journey across stakeholder groups and sectors, especially once the Smart Specialisation Strategy is launched and rolled out. The following terms of reference suggest structures and details that can be adopted to strengthen the Agency for Digital Transformation and/or create a new national authority. The proposal gives a broad outline to help conceptualize and realize the foundation and ambit of work for the proposed mew authority. National decision-makers can review the options and elaborate on them to create a framework and guidelines suitable for the needs of the country.

Board: The board is responsible for conceptualizing – and advising management on – the processes, policies and strategies on governance under the Smart Specialisation Strategy.

The board will provide management with guidance and direction in the following areas:

- the organization alignment and its progress towards its goal of creating an agile digital future focusing on priority areas in the ICT sector
- performance oversight
- protection of the organization best interests
- ensuring the organization financial sustainability
- reviewing digital innovation strategies and policies of the organization.

Management: The management acts as the secretariat, and is responsible for the governance processes, their workings and their results.

The management will provide support for the following activities:

- fostering the long-term success of the country's digital transformation strategy
- understanding stakeholder expectations, needs, concerns, interests and desires, and ensuring they occupy a central place
- planning and approving budgets and expenditures
- reviewing policies, strategies and SOPs.

Operation: The operational staff is those people who will execute the mandate, process and strategies.

The operational staff will:

- plan and execute actions towards the mandate
- work in accordance with the vision
- plan and execute the operational strategies and standard operating procedure (sop)
- execute and deliver on monitoring and evaluation responsibilities
- devise the rules of procedure to be followed by the organization
- identify policies and plans to steer the country towards the vision.

Mandate: The mandate sets out what the authority should work towards. It is bound up with a conception of the future of the country. It also provides direction to everyone in the organization as they focus their efforts on achieving the mandate.

Possible elements of the mandate:

- accelerating the country's movement towards digital transformation
- achieving competitiveness of key economic sectors
- integration of ICT in all key economic sectors
- improving the quality of local talent
- furthering the interests of the country
- promoting the interests of stakeholders
- enhancing the country's image in the digital sphere
- integration of ICT at all levels of governance
- building trust and confidence between stakeholders
- ensuring accountability and transparency in the functioning of the authority.

Legal basis: This means the establishment, execution and validation of the governance framework in a legally binding way.

The legal basis may be defined by:

- a duly empowered commission or other group
- a competent authority
- a consensus of the executive

Values: This includes the core ethics and overarching principles governing the action of the authority. They shape its business governance, its philosophy, and its expectations of the people who work for it.

Core values may include:

- accountability
- inclusiveness
- fairness
- transparency
- responsibility
- environmental awareness
- ethical behaviour.

Method of procedure: These are the rules and guidelines that ensure the smooth functioning of the proposed body.

In the present case, the Method or rules of procedure could include some or all of the following:

- The board will be chaired by the Ministry of Information Society and Administration.
- The board shall meet quarterly.
- The board will hold at least three meeting(s) in person every year, unless national or global circumstances force otherwise.
- The board shall maintain a quorum of 75 per cent of its membership to hold any meeting.
- The proposed authority will report to the Office of the Prime Minister and publish its report at least once a year.
- The three levels of governance will record details of all meetings. It will also share the minutes after every meeting and before the next meeting.
- Except as otherwise stated in these terms of reference, the board shall determine its own procedures.
- The board shall reach decisions by a simple majority of voting on the issues in question.

- If a member of the board finds themselves in a conflict of interest, they shall immediately disclose that to the chair.
- The board must endeavour to align its activities to ensure alignment with the national vision.
- The government shall provide secretariat and administrative support to the proposed body.
- The board should review and make recommendations on its TOR every few years.
- The management and operational staff may require the services of technical experts in order to discharge its mandate.

Policies: Policies in the governance framework refer to the internal policies that ensure the smooth and fair functioning of the proposed body.

This proposed authority could be governed by internal policies on:

- procurement
- human resource
- finance
- code of conduct and ethics
- ICT and communication

Operational strategies and SOPs: Operations or operational strategy refers to a system of decisions that shapes all long-term operational capabilities and their offering to the overall achievement of a strategy. A SOP is a set of detailed work instructions that describe each step of a process within the organization. It aims to increase efficiency and deliver consistent outcomes while also ensuring compliance with operational practices. In a governance framework, these will thus include decisions and instructions for the management and the Staff to execute the strategy.

Some strategies to include:

- The National ICT Strategy
- The Education Strategy
- The National Small and Medium Enterprise Strategy

Some procedures and systems include:

- Budget approval flow
- Procurement workflow
- Communication development workflow

Monitoring and evaluation: This refers to a set of audit activities that help monitor the proposed body's progress towards its goals, and revise or alter its direction through management in light of changing circumstances.

The organization's progress can be measured against a set of key performance indicators through:

- audits of policies
- audits of values
- audits of operational strategy
- audits of finance
- audits of communication strategy

- audits of procurement.

Overall composition: The board shall comprise: (i) Four executive members, namely the chair, deputy chair, managing partner and the chief risk officer from the Office of the Prime Minister, the Ministry of Information Society and Administration and the Ministry of the Economy (ii) Up to two members who are nominated by the executive members from the Ministry of Finance and the Ministry of Education and Science and unanimously voted for by the executive members. Efforts must be made to ensure at least five stakeholder groups are represented from among the following: the public sector, private sector, academia, finance, entrepreneurial support network and entrepreneurs. No stakeholder group should be overrepresented or underrepresented. Deliberate efforts must be made to bring in gender equality.

The management shall comprise invited members from industry and the public sector who have been actively involved in the country's journey towards digital transformation. This includes the Agency for Promotion of Entrepreneurship and the Ministry of Information Society and Administration. Efforts must be made that no stakeholder group is overrepresented.

The operational staff should comprise members from the key agencies or departments within the country that are responsible for steering the country towards its vision, addressing enabling sectors of the economy. Efforts must be made to bring together representation for stakeholder groups from across the public sector, private sector, academia, finance, entrepreneurial support network and entrepreneurs. Deliberate efforts must be made to bring in gender equality.

- Establishing a Digital Transformation Centre (Refer to recommendation #EP1 under Appendix 1), can support the board and management in filling in the missing layer of operations.
- The Digital Transformation Centre can act as a secretariat within the governing body that develops all digital projects and initiatives to traverse the roadmap for digital transformation.
- The Centre should also be tasked with the responsibility to coordinate with all relevant stakeholders – FITD, MASIT, Macedonia2025, Invest North Macedonia and StartUp Macedonia plus other entrepreneurial support networks – to build synergies and align on projects and initiatives towards the country's digital transformation journey.
- The Centre, which fulfils the responsibilities of the operations layer, can also have task forces or committees under it to focus on different thematic areas or industries.

Appendix 3: Good practices

Good practice

To develop the recommendations, it is necessary to draw inspiration from good practices used in other ecosystems without necessarily copying them.

Good practice has been tested to produce an impact, based on evidence and positive results and which can be scaled up and replicated. Good practice is needed to help develop flagship projects, to benchmark the strengths and weaknesses of a practice, and to initiate evidence-based policy or programme development. Good practice allows actors to effortlessly add value to initiatives in their ecosystems. However, good practice should not be reproduced "as is", because every ecosystem and every project is different.

ITU has developed a database of good practices, a framework to better develop these recommendations in a country's ecosystem. For more information, please see: innovation.itu.int or contact: innovation@itu.int.

1. The Venture Capital Guarantee programme of OSEO (France): The OSEO mission is to support growth and innovation among enterprises through assistance and provide financial support to French SMEs in various phases of their life cycle: start-up, innovation, development, business transfer/buy-out.

2. The Digital Export Development Strategy (Hungary): The overall objective of the Digital Export Development Strategy is to intensify the growth of digital product exports to develop strong digitalization knowledge in Hungary.

3. Vinnova Voucher Programme (Sweden): This agency aims to build the innovation capacity of Sweden with the objective to contribute to the country's sustainable growth and position Sweden as an innovative force.

4. The Digital New Deal (South Korea): The Digital New Deal is a national innovation project to overcome the economic crisis caused by COVID-19 and accelerate digital transformation to boost national and industrial competitiveness.

5. Foreign Direct Investment Flows to ICT Sector (Belarus): In the 2010s, when Belarus set on a path of private sector liberalization, FDI inflows fluctuated from USD 1.3 to 2 billion per year. Since 2016, most FDI inflows have come into finance, ICT, wholesale trade, transportation, and the timber sectors.

6. Open Data Strategy 2017 (Belgium): The Open Data Strategy is the national strategy for opening up and sharing data and services in the Belgian regions. The regional platforms aim to meet the needs of both users and data producers, allowing them to open up and freely re-use the data and services available for the regions.

7. Digital Hub Initiative (De-Hub) (Germany): The Digital Hub Initiative, launched by the Federal Ministry for Economic Affairs and Energy, seeks to support the establishment of digital hubs in Germany.

8. Last Mile Connectivity Program (Kenya): The Last Mile Connectivity Program (LMCP) aims to ensure everyone has access to electricity by 2020. People who do not have access to electricity cannot achieve the same standard of living as the households that do, and they have limited access to economic opportunities. The project thus focuses on rural areas and slums where connectivity is poor.

9. Innovation Fund Serbia: The vision of the Fund is to, as a pivotal state actor in the development of the innovation system of Serbia, contribute to the country's economic growth by supporting innovation, strengthening the link between science and economy,

establishing new and strengthening existing companies with innovative potential, through various financial instruments.

10. Unified Strategy for Education and Science (2017-2020) (Georgia): The Ministry of Education and Science of Georgia has developed a new unified strategy for education and science for 2017-2021. The strategy includes all areas of education and science: early/preschool education of children, secondary, vocational and higher education, adult education, science and research.

11. Industry 4.0 Pilot Factories Programme (Austria): Plattform Industrie 4.0 (PI4.0) of Austria started in 2014 on the initiative of the Austrian Ministry of Transport, Innovation and Technology. The platform acts as an observatory, network and strategic advisory body that creates working groups, strategies, focus areas, and case studies on industry 4.0 topics.

12. Government Digital Inclusion Strategy 2014 (United Kingdom): This strategy sets out the 10 actions that government and partners from the public, private and voluntary sectors will take to reduce digital exclusion. This means helping people become capable of using and benefiting from the Internet.

13. TEKES/Business (Finland): Business Finland is the Finnish government organization for innovation funding and trade, travel and investment promotion. Business Finland has 600 experts working in 40 offices globally and 16 regional offices around Finland. Business Finland is part of the Team Finland network.

14. e-Albania Initiative (Albania): The e-Albania initiative is designed as a portal through which citizens can access information and receive e-services from state institutions.

15. The Challenge-Driven Innovation Programme by VINNOVA (Sweden): The Vinnova vision is that the Challenge-Driven Innovation programme will be a powerful tool for developing new sustainable solutions with an international luminosity that meet important challenges identified in the framework of Agenda 2030.

16. UKE Innovation (Poland): Stimulating innovation, optimization of knowledge and technology flow between start-ups, academia, government authorities and ICT companies were the topics of a workshop organized by UKE and ITU during the WSIS Forum 2017 in Geneva.

17. Seed Enterprise Investment Scheme (UK): SEIS is designed to help a company raise money when it's starting to trade. It does this by offering tax reliefs to individual investors who buy new shares in a company.

18. Aston University Placement Scheme (UK): This scheme encourages every student to take a placement year to boost their employability as part of their degree

Appendix 4: Methodology

This study was carried out using a global comparative framework developed by ITU for the diagnosis and development of ecosystems centred on ICTs. The analysis of a country consists of five steps. The aim is to reduce the disparities in digital innovation using a practical kit to strengthen ICT-centric ecosystems that allow defining of common objectives, diagnosing the ecosystem, formulating recommendations, setting up an implementation framework and proposing a monitoring and evaluation method.

The toolkit for strengthening ICT-centric ecosystems is available here: bit.ly/DIPpolicykit.

Building on the ITU innovation toolkit series, another toolkit shares more insights on how stakeholders can undertake rapid ecosystem diagnosis, establish key recommendations, and develop flagship projects that effectively nurture ICT-centric innovation within their digital ecosystems.

The toolkit for developing sustainable ICT-centric projects is available here: bit.ly/DIPtoolkit.

Appendix 5: Key words and definitions

Key word	Definition
Vision	The vision defines an ideal to be achieved after a given time. Its objective is to mobilize the stakeholders for its realization while giving the necessary direction to obtain the desired situation.
Strategies	A strategy defines the main axes to be developed in order to obtain the objectives and results towards the vision. The transformation of value chains for each sector with the contribution of digital technology is one of the major research objectives. The strategies should also define the roles and responsibilities of non-digital actors and how their contributions reinforce the defined objectives or sub-objectives. Four pillars of strategies are proposed for sustainable development: political, social, economic, and environmental. For each strategy to be developed, it is recommended to develop a theory of change that unites and measures the actors' contributions.
Dynamics of innovation (ID) with digital technology	Measures that allow innovation to exist. They support the general environment for innovation. A dynamic innovation environment needs a coherent regulatory and organizational framework that guides, encourages and fosters a culture of innovation, mindset, projects and programmes.
Capacity for innovation (IC) with digital	Measures that make it possible to have sufficiently developed infrastructures and talents within the ecosystem, which will be conducive to digital transformation. They give innovators the tools, skills, spaces and know-how they need to be successful.
Innovation in key sectors (IS) with the contribution of digital	Measures that integrate innovation in key sectors, so that start-ups and SMEs can unleash their full potential and expand beyond their niche, making transformation in other sectors possible.
Research in the digital ecosystem (ER)	Measures and mechanisms to search for information on the ecosystem, in particular the mapping of actors and existing resources.
Knowledge sharing in the digital ecosystem (EK)	Mechanisms and measures to share knowledge to accelerate the mobilization and collaboration of stakeholders.
Partnership and governance in the digital ecosystem (EP)	Measures and mechanisms allowing access to resources and networks, to develop a public-private partnership model, to focus actors on ecosystem projects.
Digital economy	Digital economy refers to a broad range of economic activities that use digitized information and knowledge as key factors of production.
Digital transformation	Digital transformation is the integration of digital technology into all areas of operations, fundamentally changing how you deliver services and value to citizens and customers.

(continued)

Key word	Definition
Theory of change and indicator development	Measures and mechanisms allowing access to resources and networks, to develop a public-private partnership model, to focus actors on ecosystem projects.
Unicorn	A unicorn is a privately held start-up company whose valuation is over $1 billion.
Valley of death	A post-ideation period when innovators need significant investments and a lot of support, and the risk of business failure is high.

Appendix 6: Abbreviations

Key Word	Definition
AI	Artificial Intelligence
BAU	Business Accelerator UKIM
CPI	Corruption Perceptions Index
EIB	European Investment Bank
EU	European Union
EUR	Euro
FDI	Foreign Direct Investment
FEEIT	Faculty for Electrical Engineering and Information Technologies
FTA	Free Trade Agreement
FITD	Fund for Innovation and Technology Development
GDP	Gross Domestic Product
GII	Global Innovation Index
ICT	Information and Communication Technologies
IP	Intellectual Property
IPO	Initial Public Offering
INNOFEIT	Centre for Technology Transfer and Innovations
MASIT	Macedonian Chamber of Information and Communication Technologies
M&E	Monitoring and Evaluation
MKD	Macedonian Denar
TOR	Terms of Reference
R&D	Research and Development
SDG	Sustainable Development Goals
SME	Small and Medium Enterprises
SOPs	Standard Operating Procedure
SPV	Special Purpose Vehicle
TIDZ	Technological Industrial Development Zones
UNDP	United Nations Development Programme
VAT	Value-added Tax
VC	Venture Capital
WIPO	World Intellectual Property Organization

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