Digital innovation profile

North Macedonia

Digital innovation ecosystem: Strategies and recommendations for accelerating digital transformation

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Version 2.3

Acknowledgements

Disclaimer

Foreword by MISA

In today's fast-paced digital age, a nation's ability to embrace and harness the power of technology can make all the difference. 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 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 recognised the potential of digital transformation and innovation, and this report has also served in shaping the new National ICT Strategy for the period of 2023-2027.

With insights into challenges and opportunities facing the nation, this 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're 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 followed by constructive recommendations, roadmaps and comprehensive opportunities to strengthen capacities and accelerate digital transformation. With the ever-evolving digital landscape, this report is 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 looking forward in cooperating together further on in implementing our national digital agenda contained within the National ICT strategy to accelerate the digital transformation of our economy .

Mr. Admirim Aliti
Minister of Information Society and Administration
Republic of North Macedonia

Foreword by ITU

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 International Telecommunication Union (ITU) is the specialised United Nations agency addressing all the global challenges that cover information and communication technology matters (ICTs), and, within its mandate, supports Member States in fostering a more resilient and meaningful digital ecosystem with tools such as the Digital Innovation Profile, which provides a comprehensive overview of a country's ICT sector, its players and its trends.

The ITU, in cooperation with the Ministry of Information Society and Administration (MISA) has worked on the North Macedonian Digital Innovation Profile (DIP). This DIP aims to provide an accurate assessment of the country's ecosystem capacity and maturity to help MISA and the Macedonian stakeholders navigate through the innovation landscape with a view to build a competitive, sustainable, ICT-enabled economy. This work resulted in thorough research and engagement with the most relevant stakeholders of the country in the field of innovation, through one-on-one interviews and co-creation workshops.

The ITU has always been committed to ensuring that everyone can benefit from the opportunities that ICTs offer, and the DIP exactly plays a critical role towards this direction. Indeed, The DIP is a valuable tool for policymakers, regulators and other stakeholders who need to understand the ICT sector and its evolution in the country. It is a tool that can help businesses assess their level of digital maturity and provide a clear picture of what is needed to foster innovation.

I look forward to seeing what comes next in North Macedonia as a result of the North Macedonia DIP. The ITU Office for Europe and the Digital Innovation Ecosystems Thematic Priority of the ITU Telecommunication Development Bureau (BDT) are ready to continue to offer support to North Macedonia in its next endeavours in this field.

Yours Sincerely,
Dr Cosmas Zavazava
Director, Telecommunication Development Bureau
International Telecommunication Union

Process Summary

Digital Innovation Capacity

15+ development and tech indicators reviewed

Desktop Research

250+ country-specific documents reviewed

Stakeholder Identification

69 ecosystem stakeholders' roles analysed

Stakeholder Engagement

33 stakeholders directly engaged in activities

Co-Creation Workshops

2,500+ ideas captured through 3 workshops

National Stakeholders' Event

54 recommendations & best practices presented

Execution of Recommendations

$14.1 billion present-day GDP boosted

1. Introduction

North Macedonia is embarking on a long-term development strategy known as the Smart Specialisation Strategy. 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 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. To better understand the digital innovativeness of the ICT sector, the Ministry of Information Society and Administration and the Fund for Innovation and Technology Development (FITD), jointly with ITU, commissioned this study to better understand digital innovation.

Digital Innovation Profiles are an important element in the ITU series of snapshots of ICT-centric innovation ecosystems. Each profile assesses and summarises 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's 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 optimising 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 Members States with the tools to assess and monitor their ICT innovation ecosystems and offers evidence-based assessment 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
GNI per capita: $ 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 land-locked country in Southeast Europe and the Balkan peninsula, bordering Kosovo to the northwest, Serbia to the north, Bulgaria to the east, Greece to the south, and Albania to the west. Classed as an upper-middle-income country, it has dramatically improved its economy since gaining independence in 1991.

The country shows a high adult literacy rate (98%), according to World Bank data (2020). Despite the labour market improvements in recent years, youth unemployment (aged 15-24) was very high (36.9%) in 2020 (World Bank). However, overall unemployment rates (15.2%) reached a historical low 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 targets improvements in the quality and relevance of education to society and the labour market, and the development of core competencies, including critical thinking. In addition, it aims to provide supportive technologies to ensure appropriate learning environments, starting from early student years. Mandatory ICT subjects are taught from III Grade in primary schools. The country offers basic ICT training, including integrating software solutions in interactive teaching to primary and secondary school teachers. The recent pandemic accelerated

digital learning with the development of the e-Classrooms, building on a UNICEF-supported online learning platform called Eduino. The government expanded the scope of this one-stop-shop for educational content to cover lower primary, primary and lower-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).

In 2020, agriculture accounted for 9% of gross domestic product (GDP), industry contributed 22.6%, and the services sector 57% (Statistica, 2022). Dominant services in the country include banking, technology, insurance, transport, tourism, wholesale and retail trade, logistics and communications. The main industry sectors are car components, iron and steel, food, footwear, textiles, tobacco, construction, oil refining, chemical, and mining. However, economic stability is being threatened by supply chain disruptions, rising inflation and wages, weak political stability, and the ongoing energy crisis. Despite these, the GDP growth rate for Q4 in 2021 was 2.3% (Statistical Office, 2022) and the Annual Household Income per Capita reached a record high of USD 2,394.441 in December 2020 (CEIC, 2020). This indicates that mid-term economic growth is positive and expected to increase income levels further. Meanwhile, North Macedonia's accession to the European Union (EU) remains a top political priority, but the country still needs to solve several innovation, education and infrastructure investment challenges.

According to the European Commission in 2019, SMEs accounted for 65.7% of value-added and 73.5% of employment, exceeding EU averages of 53.2% and 65.0%, 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). It must be noted that, in December 2013, the Fund for Innovation and Technology Development (FITD) was established to encourage innovation by providing resources and finance to SMEs. However, access to finance, particularly angel investment and venture capital, still remains a challenge in the country. Meanwhile, the Corruption Perceptions Index (CPI) score of 39 indicates that the public sector still needs to win business trust, which could hamper SMEs' capacity to do business (Transparency International, 2021).

In an effort to provide for a competitive telecom market, North Macedonia has implemented the EU's regulatory framework principles, established an independent regulator, and set several provisions in place. The fixed telephony market has been liberalised since 2007, but remains dominated by MakTel. Broadly though, two mobile network operators — MakTel and A1 Macedonia — serve the mobile market in the country. In 2020, 81.4% 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 59 on the Global Innovation Index by the World Intellectual Property Organisation (WIPO). The latest data from 2020 shows that there were 1,957 economically-active companies in the ICT Industry, which generated EUR 879,65 million in revenue. As much as 56% of the total companies are concentrated within the "Software and IT Services" subsegment while 27% are into "ICT Trade and Manufacturing"

(MASIT, 2020). The same year, ICT market contributed about 8% to the total GDP of USD 12 billion.

It is worth noting that the National ICT Strategy 2023-2027 corresponds to the EU's Digital Economy and Society Index (DESI) dimensions to ensure the alignment of North Macedonia's digital transformation with EU policies and directives. Goals and objectives have been set for connectivity, government infrastructure, and the centralisation and streamlining of ICT and e-government services. The plan is now to establish a Agency for Digital Transformation to gradually consolidate assets and resources from the various ministries and organisations into a single entity to create a cost-effective and efficient delivery mechanism. Meanwhile, the *"2022-2026 Accelerated Economic Growth Plan"* includes a EUR 27 million hybrid investment fund that will focus on start-ups and innovative companies.

3. Current landscape

Understanding the Ecosystem Assessment Canvas

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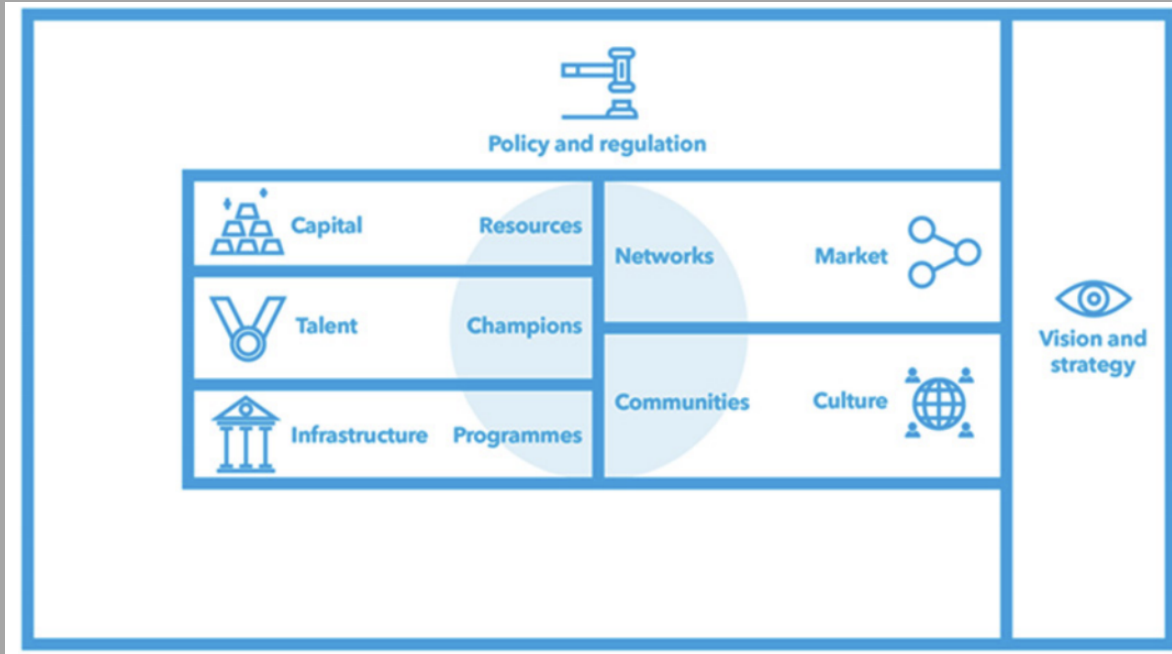
The Ecosystem Assessment Canvas offers an overview of the seven components that make up the innovation ecosystem. It helps assess both the challenges and opportunities for the components essential to building a vibrant and innovative digital ecosystem.

Figure 2: Ecosystem Assessment Canvas and its related issues

PILLARS	Vision & Strategy	Capital	Market	Infrastructure	Talent	Culture	Policy
ISSUES	Scope and objectives	Appropriate Demand side resources	Integration of economic sectors	Inclusive digital infrastructure	Talent appropriateness	Sustainable culture of entrepreneurship and innovation	Comprehensive and grassroots innovation policies & programs
				Resilient & secure broadband Infrastructure			
	Aligned Digital strategies	Continuum of Supply side resources	Market access domestic and international	Soft infrastructure	Champions	Communities	Legal frameworks

Building upon 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 of the chapter contains insights on the current landscape of the ecosystem, across the seven components, as gathered through interviews and group

discussions during the co-creation workshops with local stakeholders; and validated with the help of secondary research and review of relevant sources.

3.1   Vision and Strategy

- *There is a national vision and strategy for digitalisation, but more could be done to raise awareness and support implementation.*

- *There is common agreement on main issues, but greater collaboration is needed to fully understand challenges.*

- *Strong collaboration exists between support organisations and members but there is limited cooperation across the ecosystem.*

- *There seems to be a lack of support for a shared vision but the Smart Specialisation Strategy aims to unite ecosystem players.*

§ 1 Need for one vision

The North Macedonia National ICT Strategy 2023-2027 sets the vision for an agile digital future 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 the Ministry of Information Society and Administration, it 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 a clear vision and strategy for the entire digital innovation ecosystem. Many actors feel that strategies fall short due to a lack of concrete action and implementation.

§ 2 Agreement on issues

Stakeholders recognise existing issues, including the need to raise awareness of innovation, develop digital and entrepreneurial skills, and increase programmes and access to finance. Talent acquisition and retention are challenges for all stakeholder groups due to the high salary expectations caused by globalisation and the remote working trend. Due to several changes in leadership positions within the ministry over the last five years, there have been inconsistent policies and 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.

Collaboration between stakeholders appears limited, with some groups working in silos. Some start-ups that operate internationally have little involvement in the ecosystem as their focus is abroad. On the other hand, some innovators are willing to teach and mentor the next generation of entrepreneurs. Support organisations such as Startup Macedonia and MASIT are most well 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 commercialisation. Though examples of good practice exist across academia, there is a need for sustainable and institutional cooperation for research and development and for shaping study programmes to meet labour market needs.

§ 4 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. This is unsurprising given the general lack of clarity and awareness about the national vision. Having said that, attempts are being made to gain support for a shared vision through the creation of the Smart Specialisation Strategy, which identifies strategic intervention areas by analysing an economy's strengths and potential. Meanwhile, the European Union is providing significant support to North Macedonia for the implementation of the EU Green Deal. This requires a country-specific smart specialization strategy that would incorporate the EU Green Deal into the country's economic development approach. Smart Specialisation identifies strategic intervention areas by analysing an economy's strengths and potential. Broad stakeholder involvement and an Entrepreneurial Discovery Process (EDP) are 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. Expected to be launched in late 2022, this strategy should provide a shared vision and clear direction, but 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 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 in the region but more investment is required in capacity building for growth.*

§ 1 Hard/ICT infrastructure

In 2020, the number of active mobile-broadband subscriptions per 100 inhabitants in North Macedonia was 64.7%, while the number of fixed broadband subscriptions per 100 inhabitants was 22.2%. The country registered 99.9% of the population with 3G coverage and 99.5% with 4G/LTE coverage (ITU, 2021). The same year, Makedonski Telekom provided access to fibre-optic network to 39% of households in the country. Two years later, in 2022, the telco launched the first commercial 5G network, which is currently available in 15 cities and plans to cover 26 cities in total by the end of 2022. The ICT infrastructure of North Macedonia rests on well-distributed electricity power, which relies on fossil fuels and hydropower and is dependent on electricity imports to meet its domestic electricity demand. Further, freshwater resources are readily available due to the natural basin in the Balkans Peninsula and the country benefits from a well-developed road network.

Overall, ecosystem players in the capital city report good internet connectivity, speed, and stability. However, currently, in North Macedonia, there is no 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 and states that by the end of 2029, all public institutions (schools, universities, research centres and other education institutions, healthcare facilities, ministries, courts, local self-governments and other state authorities and bodies) will have symmetrical internet access with a speed of at least 1Gbps.

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

§ 2 Soft infrastructure & programmes to support innovators

Soft infrastructure is mainly provided by the FITD, research institutions and foreign donors. In 2018, the FITD signed financial aid agreements to open three business accelerators to support at least 100 start-up companies. In addition, university faculties are trying to provide hubs and incubation for their students. A good example is the SEEUTechPark, a technology park located on South East European University campus in Tetovo, Macedonia. Much of the soft infrastructure is funded by foreign donors. Ecosystem players believe this

is unsustainable in the long-term. Existing 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. Further, as the ecosystem matures, the private sector will need to step up and support early-stage ideation. The Skopje Technology Park, which is in development, will benefit the ecosystem by attracting global technology companies, entrepreneurs, and tech investors to use North Macedonia as a regional base.

§ 3 Infrastructure distribution across country

Both hard and soft infrastructure is largely concentrated in Skopje, limiting the inclusion of smaller cities and rural communities in the ICT ecosystem. Almost half the start-up community is in the capital, where most of the business support and networking happens. X Factor Accelerator aims to encourage regional entrepreneurship by moving the start-up scene outside the capital to the town of Veles. Meanwhile, agriculture in North Macedonia provides a livelihood for a fifth of the country's population, half of which lives in rural areas. 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 as well as strengthening entrepreneurs in rural areas. Although a good step for the ecosystem, actors agree that stronger public-private partnerships are needed to bridge the urban rural divide at scale.

§ 4 Access to ICT equipment and resources for companies

ICT equipment and resources are readily 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.

§ 5 Competitiveness

Currently, the ecosystem perceives that the country is competitive in ICT services in the West Balkans. Some companies in North Macedonia are also competing globally. The ICT sector benefits from a skilled workforce with excellent English language skills, solid telecommunications 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 placed on reducing brain drain, especially of the skilled workforce in the area of ICT. To attract more young people into the sector, the government

will look to abolish personal income tax in the IT industry by 2023. And 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 are needed to scale 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.*

§ 1 Soft skills

Generally, stakeholders describe local talents as lacking some soft skills. Most innovators come from technical backgrounds and demonstrate high proficiency in their ICT specialisms. However, once they start-up, they need to develop sales and business management competencies. Sometimes, this leads to bottlenecks in commercialising 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 for 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 to underpin the pipeline of innovative ideas.

§ 2 Technical skills

Technical skills, including programming and coding, are evident in the ecosystem. Most actors report entry-level engineers are available, however, more advanced skills — such as artificial intelligence (AI) and robotics — are in short supply. Capacity is a problem in the country as there is insufficient technical talent to meet the market's needs. In 2019 there were 6,870 enrolled students in ICT-related programmes. Of them, 10% or 685 graduated in the same year. The growth of "Software and IT Services" is on average 1,200 per year,

directly suggesting that formal education is not fulfilling the market needs ([1]MASIT, 2021). Competition for employees is fierce, and 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 as freelancers remotely, further depleting the local labour pool. For this reason, local start-ups and SMEs are struggling to hire engineers. To mitigate this, the government is offering ICT training subsidies to 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.

§ 3 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 actors state that the school system is outdated and based on replicating knowledge rather than focusing on developing transferable skills. More recently, entrepreneurship was included in North Macedonia's secondary education as a compulsory separate subject and in primary education, added to six core subjects to integrate it in the curricula ([2]EU Commission, 2022). A positive step, but entrepreneurial education needs to be more holistically integrated into the curriculum to have a significant impact on career aspirations. Recognising this challenge, Brainster, a private IT academy, has developed a free programme for high schools to build critical thinking, self-initiative, and continuous improvement.

At university level, tech faculties offer entrepreneurial courses, but they are not mandatory. Having recognised the need for more cooperation between the academia and the industry, the FEEIT, Ss. Cyril and Methodius University, opened the Centre for Technology Transfer and Innovations (INNOFEIT). One aim is to give students practical experience in solving real world problems. However, the majority of university graduates, across the country, still tend to start work as developers or freelancers rather than set up their own innovative firms. 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.

§ 4 Champions leading and being recognised

Stakeholders recognise champions in most groups. In the public sector, the 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 organisations, including MASIT and Startup Macedonia. Thanks to these organisations, the innovation landscape has flourished over the last five years. However, currently, the ecosystem lacks start-up champions to inspire the next generation of entrepreneurs. As the ecosystem matures, accelerators and

[1] https://masit.org.mk/wp-content/uploads/2020/09/masit_report_v1.00.pdf
[2] https://national-policies.eacea.ec.europa.eu/youthwiki/chapters/republic-of-north-macedonia/38-development-of-entrepreneurship-competence

academia must amplify their support to create a stronger pipeline of innovators, some of whom can grow into unicorns. In addition, more needs to be done to raise awareness of and celebrate the success of existing entrepreneurs.

3.4 Capital and Resources

- *Established firms can access traditional lending but securing finance is more challenging for start-ups.*

- *The government is the main provider of seed funding, but angel investment is not focused on the ICT sector or well developed.*

- *The FITD programmes have demonstrated impressive results however more funding from the public sector is needed to build capacity.*

- *There is an array of international funding available, but several programmes are in the early stages of development and yet to demonstrate tangible results.*

- *There is a successful record of FDI but the government now needs 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 maximise the ecosystem's limited resources.*

§

1 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 partner for financial support of micro, small and medium enterprises in the country. In addition, the FITD's financial instruments offer SMEs the opportunity for financial support for developing business ideas and projects. However, large multi-national corporations in the ecosystem tend to invest their own internal funds in R&D due to the lack of options available. Currently, the government is the leading funding provider for the ICT sector, but private investors must step in for the ecosystem to develop. 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 offering attractive financial incentives.

§ 2 Availability of investment at all stages of the innovation journey for digital startups and SMEs

Start-ups rely on the FITD and Employment Service Agency grants to fund their early-stage ventures. Unemployed people under 29 can access self-employment grants of EUR 5,000 individually or up to EUR 10,000 for two co-owners. The FITD provides 90% funding for projects up to the value of EUR 40,000. However, there is tough competition for these grants, and some stakeholders have raised concerns about their transparency and monitoring. While business angels exist within the country, this mechanism is not well developed or explicitly focused on digital innovation. Accelerators, too, provide seed funding. For example, Business Accelerator UKIM (BAU) is an investment fund and offers direct investment in selected companies in their portfolio. However, venture capital (VC) is not available in the ecosystem, but start-ups can access international VC funds such as South Central Ventures or the Western Balkans Private Equity Fund. The private equity market in North Macedonia is at a very early stage of development, and there is currently limited investment opportunity. To increase international investments in start-ups more funding and support is necessary to stimulate early-stage ideation. Since the start-up ecosystem is young in the country, few start-ups have had sufficient time to scale the valley of death. Therefore, stakeholders cannot identify any local companies that have gone public or entered the stock market.

§ 3 Government funding

The total value of innovation projects co-funded by the FITD between 2015 – 2021 was EUR 88.25 million. From this value, EUR 49.32 million (55%) was co-funded by FITD, while EUR 38.93 million (45%) was provided by 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. Companies that received funding between 2019-2020 show a revenue increase of approximately 8%, a 7% increase in expenditure, and 21% more profit, compared to the entire economy, which decreased by -4.5% ([3]FITD, 2019). These figures are promising, and the government should continue to invest in these programmes and amplify best practices.

§ 4 International funding

The EU is North Macedonia's primary political and economic partner and its most significant donor and investor. In February 2022, the European Commission unveiled a substantial EUR 3.2 billion investment package to support 21 transport, digital, climate and energy connectivity projects in the Western Balkans. This is the first major package of projects under the Economic and Investment Plan for the Western Balkans. Over subsequent years, the EU aims to mobilise up to EUR 30 billion of investments through grants, preferential loans and guarantees to help close the development gap between the EU and the West Balkans. The other key source of international funding is the World Bank, which provides

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

funding for the ICT sector in the country, including FITD programmes and the Smart Specialisation Strategy. Another programme to become fully operational by the end of 2022, North Macedonia's Green Financing Facility, will provide access to affordable green financing for SMEs. The USD 7.9 million received from the Joint SDG Fund will help establish the programme, worth a combined USD 46.5M, including co-funding from the partners. These programmes will have a far reaching impact in the future.

§ 5 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 into the Technological Industrial Development Zones, including a 10-year tax holiday, exemption from paying utility taxes, free connection to natural gas, water and sewage networks, and a 10% return of investment cost. However, the country's overall regulatory environment remains complex. Stakeholders state that frequent regulatory and legislative changes and inconsistent interpretation of the rules create an unpredictable business environment conducive to corruption. The government has taken steps to improve the investment environment, and North Macedonia has attracted significant FDI in the past. Still, the pandemic saw FDI drop to an all-time low. The manufacturing sector attracts the most FDI, ahead of financial and insurance activities. To attract investment into the ICT sector, the government has recently focused on providing a better environment for technology development. Together, with a clear strategy and focus, this should help to attract more foreign investors.

§ 6 Availability for investment in research

In 2020, the 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. The Ss. Cyril and Methodius University in Skopje received 23 vouchers; nine vouchers were awarded to the Goce Delchev University, and two to the St. Clement of Ohrid University. 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. Although a good step forward, funding for academic research is still scarce in the ecosystem. Most educational institutions state that it is challenging to obtain grants locally and they need to apply to Horizon Europe and Erasmus to support their research. St. Paul The Apostle University, for example, is a partner in the Horizon 2020 project "smART soCial media eCOsystem in a blockchaiN Federated environment (ARTICONF)". Research and innovation activities are devoted to developing a series of trustworthy, resilient and globally sustainable decentralised social network platforms. However, the overall, research and development expenditure in North Macedonia in 2020 was a mere 0.38% of GDP ([4]World

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

Bank, 2022). It is clear that the lack of government investment in research needs to be addressed.

§ 7 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, for example, the Macedonian Scale-Readiness Programme led by Seavus Accelerator and Business Impact Lab. This programme combines capacity building with networking and matchmaking opportunities. Efforts are being made to map the support network but currently, there is no central programme to coordinate efforts and collaboration. A central programme would help to build capacity and make the most effective use of limited resources.

3.5 Market and Networks

- *North Macedonia's ecosystem has several formal and informal networks, but online groups could be more active to stimulate innovation.*

- *Ecosystem mapping exists in part, but 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.*

§ 1 Formal associations

North Macedonia enjoys many well-developed and formal networks for the ICT sector with solid connections to start-ups and established firms. Recognised as the voice of the ICT industry, the Macedonian Chamber of Information and Communication Technologies (MASIT), a volunteer, non-profit chamber of commerce, is seen as a champion for private firms. Other players include the Association of e-Commerce, which aims to create growth and success for the e-commerce sector. In addition, the ICT Association supports the development of ICT through education, scientific research, and the application of innovative technologies. In terms of start-ups, Startup Macedonia has played a pivotal role in creating a flourishing start-up scene in the country. Finally, most stakeholders recognise the efforts of Macedonia2025 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 like Blockchain or Crypto get together to share ideas and network in person and online. However, some online groups are not that active and use the platform mainly as a recruitment tool rather than to share ideas that stimulate innovation.

§ 2 Ecosystem mapping and collaborations

Over the past couple of years, various initiatives have attempted to map parts of the digital ecosystem. Startup Macedonia has identified business support organisations, whilst MASIT has produced a directory of ICT firms. In addition, the National Bank of North Macedonia has created a fintech map. However, most actors are unaware of an entire, up-to-date map, which has led to a lack of awareness and understanding of each other's roles. Inclusive discussions and mapping led by a reliable, unbiased owner would enable greater collaboration across the ecosystem.

§ 3 Public Procurement and domestic ICT markets

North Macedonia has a small domestic market with a population of only two million, but 70% of consumers are between 15 and 64 years old ([5]countrymeters, 2022). Although a substantial section of the population are of working age, demand for digital services is still limited due to the market size and purchasing power. For this reason, the local market offers mainly an opportunity to test ideas and business models, and companies must focus on tapping into global markets to scale. Already, most software development companies are creating applications for western markets. These include digital services for banking, air traffic control, digital animation, cybersecurity, and website development, among others. Another issue is about trust and perception among the community — domestic consumers more readily accept international rather than local brands. North Macedonia still has some way to go to build a trusted international reputation in domestic and foreign markets. Having said that, market opportunities exist within the country in public health and government services. The reformed Law on Public Procurement entered into force on 1 April 2019 and regulated public procurements in North Macedonia. Since then, the public sector has made notable efforts to reform public procurement by improving transparency and putting more weight on quality and experience. However, large firms still win most contracts, with start-ups and SMEs missing out. Ecosystem actors believe procurement criteria often favour large established firms with track records. It appears that there is still room for improvement. To address this, the government must raise awareness of procurement opportunities and create initiatives to prioritise SMEs and start-ups.

§ 4 Trade Flows (Import and Export)

Ecosystem players report importing ICT products and services as relatively inexpensive, easy, and straightforward. However, some start-ups experience administration barriers in sending and receiving payments abroad due to the absence of sophisticated international

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[5] https://countrymeters.info/en/North_Macedonia

payment solutions such as Paypal. This has led to companies opening subsidiaries abroad to take payments, contributing to tax avoidance and slowing economic growth back home. Most software and IT services companies in the country are export-oriented. In 2019, the total value of ICT exports was calculated at 3.3% share of the country's total exports ([6]Invest North Macedonia, 2022). Some stakeholders report that the export process can be difficult and time-consuming and the government could do more to help ICT product exporters. And there are some efforts in this regard. For example, Invest North Macedonia supports domestic companies to participate in international fairs, trade shows and conferences.

3.6   Culture and Communities

- *Multiple communities and gatherings are established across the ecosystem, but their outcomes need to be disseminated to maximise 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.*

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

§ 1 Communities and Events

Multiple tech and entrepreneurial communities are well established and active within the ecosystem. Actors recognise Startup Macedonia, MASIT, Macedonia2025, Brainster and several accelerators and universities as community leaders that facilitate connections across the ecosystem. In 2022, the Macedonia2025 Summit, attended by 430 delegates, highlighted digitalisation in the future of work, including women in STEM, and the power of outstanding leadership in blockchain technologies. Another annual event is Startup Weekend Skopje, which encourages networking and exchanging ideas among aspiring entrepreneurs in the country. The first edition of Startup Weekend, outside the capital in Ohrid, was held in April 2022 at the University of Information Sciences and Technologies "St. Paul the Apostle". Events fostering innovation are happening on a very regular basis. However, stakeholders believe that some events lack genuine networking opportunities or access to knowledge sharing and data. Furthermore, the tangible impact of innovation events seems unclear. Community leaders should disseminate event outcomes widely across the ecosystem to maximise engagement and impact.

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[6] https://investnorthmacedonia.gov.mk/export-ict/

§ 2 Spread of entrepreneurial culture

An entrepreneurial culture is slowly spreading across North Macedonian society. Universities and accelerators are encouraging this career trend and report more young people are interested in joining the entrepreneurship wave in digital innovation. However, potential founders often lack the skills, knowledge, and funding to start a business venture. Furthermore, the traditional mindset of finding employment rather than becoming a business founder remains strongly engraved in the culture. Stakeholders agree that most people still seek a career in public administration as a safer option than starting a venture of their own. Further, due to the immaturity of the ecosystem, there are low numbers of successful role models to inspire others to follow in their path. However, sharing start-up success stories could help galvanise more young people to become entrepreneurs.

§ 3 Attitudes towards risk and entrepreneurship

As mentioned previously, full of entrepreneurial spirit and hope, young people in North Macedonia are more willing to take risks than previous generations. Whilst this is true, few can start again if they fail the first time due to a lack of resources and funds. Unfortunately, actors believe that people tend to be risk-averse in society, and failure is often stigmatised. The investment community demonstrates similar attitudes and prefers to fund more established firms. To create 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.

§ 4 Diversity and equality

In North Macedonia, the IT sector shows the strongest evidence for gender equality, with women representing 33% of the workforce, which is higher than most European countries ([7]Meta.MK, 2022). Furthermore, one in three start-ups has a female founder ([8]Startup Macedonia, 2021). These are encouraging statistics, but a gender gap still exists in the country. The Macedonia Chapter of Women in Tech is helping more women embrace technology through education, entrepreneurship, events, and research. They aim to educate, equip and empower women and girls with the necessary skills to succeed in the ICT sector and STEM careers by providing free programming workshops and mentoring. This initiative is a positive step as more women, and diverse teams will help create a vibrant digital ecosystem. As far as rural communities and people with disabilities are concerned, they are underrepresented in the digital ecosystem. To address this, the government introduced a new law on Social Protection in 2019 to increase the inclusion of vulnerable citizens into society and the labour market. However, at this stage, it is still too early to assess the effectiveness of this law. It is crucial for the ecosystem to bear these marginalised

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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/

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

communities in mind and facilitate their access to ICT opportunities in terms of education, employment, and services.

3.7   Policy and Regulation

- *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 unequally 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 commercialisation of innovative research.*

- *The Government of North Macedonia 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.*

- *North Macedonia has a favourable tax rate for citizens and businesses, but a supportive framework is now needed for angel investment.*

- *Supportive policies are in place to assist 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's competitiveness, but it has yet to demonstrate results.*

- *Innovative firms benefit from several trade agreements, but initiatives are needed to support ICT product exporters.*

§ 1 Public sector engagement with innovation

The Ministry of Information Society and Administration is mandated to promote digital development at the country level. The Ministry engages with ICT innovation and entrepreneurship through the work of the 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, the

FITD is active in the ecosystem and well connected to its start-up beneficiaries. Some stakeholders believe the 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 engaged. The public sector cannot work in silos and needs to collaborate with the whole ecosystem to stimulate innovation and economic growth.

§ 2 Public sector connections to ecosystem

In 2021, the Government of North Macedonia established the National Startup Council. Its mission is to pro-actively and constructively influence improvements in legislation and create more favourable conditions for start-up development in the country. Representatives from the government, chambers of commerce, foreign donors and organisations, investors and entrepreneurs are working together to position North Macedonia as a regional start-up hub. It is still too early to measure its impact, but it is a positive progression 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 criticise the current backlog and feel that policymakers may be trying to avoid this process. Based on the feedback from stakeholders, it is evident that the government must communicate more proactively to build trust and ensure a two-way dialogue with local stakeholders.

§ 3 Intellectual Property Policies

In the last 10 years, North Macedonia has undertaken several measures to achieve intellectual property (IP) protection on par with the EU. The country is a member of the World Intellectual Property Organisation (WIPO) and the European Patent Organisation. The two primary laws regulating this field 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 ([9]The World Bank, 2020). Thus, it is evident that more awareness-raising and trainings are needed to promote the benefits of IP protection to all stakeholders.

§ 4 Research and Development Policies

The Law on Scientific and Research Activity defines the legal framework for research activities in North Macedonia. Current R&D expenditures are very low compared to EU countries, and there is a declining trend in R&D investment. Ecosystem actors are frustrated by these declining funds and affirm considerable room for improvement. It is understood

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

that a lack of investment and support is hampering digital innovation. There is a clear need to support universities in tech transfer and motivate academics to commercialise research. Government funded PhD researchers collaborating with the ICT industry could be a catalyst. However, SMEs and large companies would need to understand the benefits as well. Overall, greater budget allocation for R&D and creating policy measures would help stimulate higher investments in research activities by the research and business sectors.

§ 5 ICT Policies

The National ICT Strategy is the principal strategic document for the sector and builds on several related strategies. Most stakeholders are unaware of this strategy but recognise the Open Data and Broadband strategies. The Open Data Strategy aimed to encourage the promotion and use of open data as an effective tool for innovation, growth and transparent governance. However, this policy expired in 2020, and stakeholders are yet to see visible results. Although the Government of North Macedonia has tried to strengthen the legislative and institutional framework relevant to ICT, awareness and implementation remain an issue.

§ 6 Education policies supporting ICT Innovation and Entrepreneurship

The country's Education Strategy recognises the need to promote entrepreneurial learning, apply digital technology, and integrate ICT in teaching and learning in pre-primary, primary and secondary schools. Even though all primary and secondary schools have personal computers available for all their pupils, ICT use in education appears ineffective. Furthermore, entrepreneurial skills are low among pupils and teachers in primary education. A key priority of the Education Strategy is to ensure digital literacy and wide use of ICT in education and training. However, stakeholders still view the quality of teaching and the curriculum as a major challenge. According to ecosystem actors, the education system is the main contributing factor to the innovation gap in the country. Although the government has made valiant efforts to reform the education system over the years, it still does not provide the knowledge and skills relevant to the country's 21st century economy and business sector.

§ 7 Finance Policies

North Macedonia has an attractive 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. Citizens benefit from a personal income tax rate of 10%, whilst businesses pay corporation tax at the same rate. From a tax perspective, North Macedonia is a favourable location to set up a business. Despite this, some start-ups report that they struggle due to extended payment terms and advanced VAT payments. In addition, it is difficult for them to raise equity capital as the present system is complex and does not support foreign angels to invest. The government should ease the procedure for creating SPVs (special purpose

vehicles) where the business angels can join their finance and invest through a SPV. A co-investment fund for business angels investing in ICT start-ups would help to provide vital seed capital. In addition, the government could offer tax breaks and incentives for start-ups in the ICT sector. Previously, the government had plans to abolish personal income tax for the IT sector to attract more digital talent into the ecosystem. However, this intention has not yet materialised into action.

§ 8 SMEs Policies

The Entrepreneurship Support Agency of the Republic of Northern Macedonia (APPRSM) is a state institution, established in 2013, to implement government policies for SMEs and programmes adopted by the government to support 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 on creating an e-register of regulatory changes involving SMEs took place. According to the State Statistical Office, the number of innovative SMEs increased in North Macedonia by 53% from 2014-2020, and ecosystem players began to recognise 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.

§ 9 Industrial Policies

The Ministry of Economy launched the National Industrial Strategy in 2018-2019, focused on the manufacturing sector, based on 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 manufacturing sector. One of the strategy's main goals is to reduce state subsidies for the manufacturing sector and create the right conditions to increase the productivity and competitiveness of manufacturers. 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 are supporting ICT innovation. Furthermore, when launched, the Smart Specialisation Strategy will focus on the digitalisation of key sectors; and it will be interesting to see its results

§ 10 Trade Policies

North Macedonia benefits from several free trade agreements (FTAs) since becoming a member of the Central European Trade Agreement (CEFTA) in 2000. The country has additional 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 initialising 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 organisations); 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
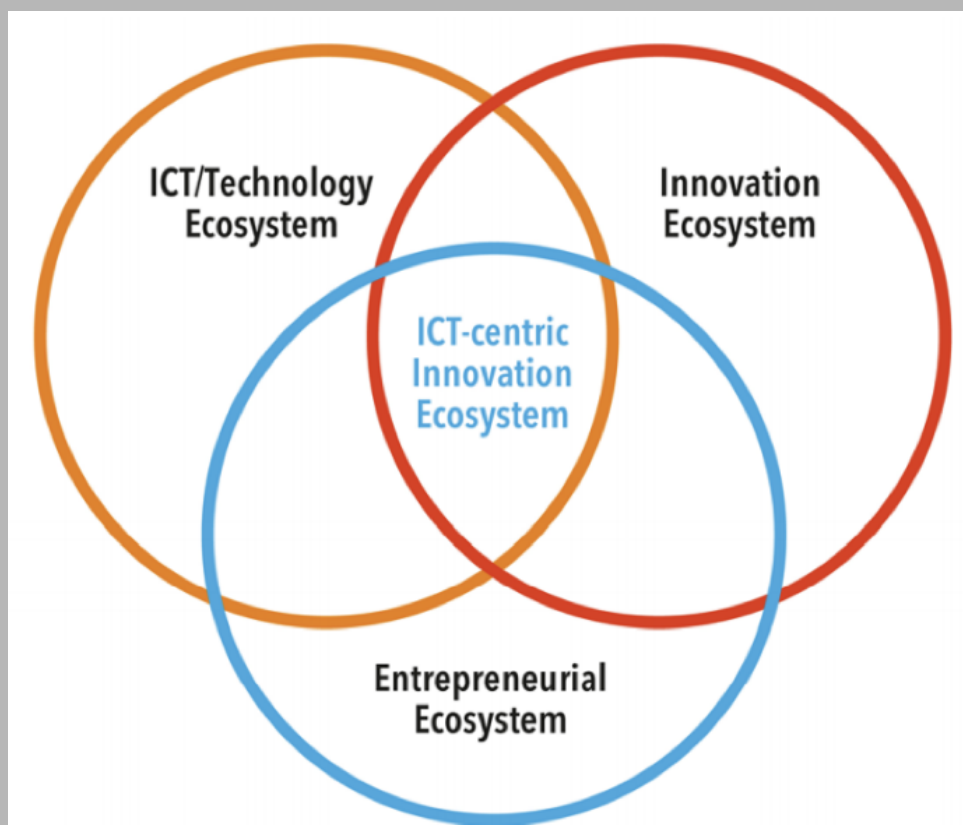
The following sections contain a brief analysis of each of the three ecosystems, and ends with a macro overview of the challenges and opportunities in the three interconnected ecosystems, as gathered through interviews and group discussions during the co-creation workshops with local stakeholders. Detailed analysis of the challenges has been presented under Chapter 3 (Current Landscape) while detailed recommendations are covered in Chapter 9 of this report.

4.1   Innovation ecosystem

The Innovation Ecosystem — including research institutes, universities and public sector entities such as national innovation agencies and public sector funding, and private sector and other actors involved in commercialisation — 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 organised 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.*

§ 1 Overview of actions in the Innovation Ecosystem

Despite being at an early stage of development, the National Innovation Ecosystem is organised and supported by stakeholders. The government formed the FITD to provide the preliminary platform for innovation until the private sector becomes competitive enough to lead. Although the government has built the cornerstones, stakeholders appear to work in silos limiting their knowledge of the ecosystem's 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.

§ 2 Overview of challenges in the Innovation Ecosystem

The FITD and science and research labs are prominent in North Macedonia. Private universities tend to engage more in research activities than public universities. An exception is the Ss. Cyril and Methodius University in Skopje, a public university with its own capital research equipment. However, universities are generally struggling to foster innovation, and the exchange between universities and industry is limited, reducing digital innovation from research. Currently, academia is not creating optimal human capital to make its way into innovation and entrepreneurship. Hampered by a lack of research funding, it appears that the national innovation ecosystem is operational but not efficient. The WIPO Global Innovation Index (GII) states that North Macedonia produces less innovation outputs relative

to its level of innovation investments. Moreover, the GII report (2021) confirms several weaknesses, including industry-university R&D collaborations and innovation linkages.

§ 3 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 17 out of 190 countries in the Ease of Doing Business report. The country scored highly for protecting minority investors and trading across borders. The FITD has been 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 must also play a key role in developing technological innovations because they can offer various mechanisms to support ideas to market and adapt curricula. The private sector could encourage intrapreneurship 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 grasp digital technology benefits fully.

4.2   Entrepreneurial ecosystem

The Entrepreneurial Ecosystem includes entrepreneurs, their support systems and organisations that initially nurture business creation through the "valley of death" and subsequently their growth into sustainable SMEs.

- *The Entrepreneurial Ecosystem is small but growing, supported by various initiatives in Skopje.*

- *Start-up growth is restricted 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.*

§ 1 Overview of actions in the Entrepreneur Ecosystem

Characterised by a small tech start-up community and supported by incubators and accelerators, the Entrepreneurial Ecosystem is growing in North Macedonia. Centralised in the capital, a range of initiatives nurture business ideas into start-ups and promote the growth of start-ups into SMEs. Over the last five years, support organisations like Startup Macedonia have helped to build a more connected ecosystem to support start-up development. The Global Entrepreneurial Index (GEI) in 2018 ranked North Macedonia 66

out of 137 countries, which suggests the country still has some way to go in allocating sufficient resources to promoting entrepreneurship.

§ 2 Overview of challenges in the Entrepreneur Ecosystem

Start-up growth is restricted by 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 is lost. Often, technology start-ups that have the potential to become high-growth companies do not cross the "valley of death" because of the lack of a market or high-growth business model. Here, universities and support organisations could play a more proactive role. Closer collaboration with entrepreneurs would stimulate innovation by building firms that deliver novel solutions.

§ 3 Overview of opportunities in the Entrepreneur Ecosystem

Although a small domestic market, North Macedonia offers start-ups the opportunity to test their ideas before scaling up abroad. With sufficient availability of 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, their equipment manufacturers, systems integrators, companies in the ICT sectors 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 telecommunications networks and Technological–Industrial Development Zones should be leveraged to attract more foreign investment.*

§ 1 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 ([10]MASIT, 2020). The most dominant segment is Software and IT Services, employing about 8,500 individuals ([11]MASIT, 2020). 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 ([12]Invest North Macedonia, 2022). The ICT sector is the fastest growing in the country, and MASIT has played a key role in connecting stakeholders in this ecosystem.

§ 2 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, 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 in 2020. However, global players compete with local companies by offering attractive remote working remuneration packages. Further, the small talent pool is being eroded by graduates, leaving for more mature ecosystems. Organisations such as Brainster, an international edtech organisation, 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.

§ 3 Overview of opportunities in the Technology Ecosystem

A significant strength of the Technology Ecosystem lies in the modern digital telecommunications networks. The Macedonian telecommunications sector is the most liberalised 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 affect local digital start-up growth, commercialisation of academic research, and private sector-led innovation.

3. Access to appropriate human capital is challenging for all ecosystems as they compete against each other to recruit the best talent.

4. The low level of understanding of ICT amongst citizens impacts local market potential and talent pool growth.

5. Stakeholders

<u>Understanding the stakeholders</u>

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

As such, being able to identify and engage with these stakeholders is an important part of the country review.

Table 2 lists the many stakeholders who contributed to this analysis and 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 actors stakeholders in the ecosystem

	Stakeholders (in alphabetical order)
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	• Business Impact Lab • CEED Hub Skopje • NewMan's Business Accelerator [Interviewed] • Macedonia2025 [Interviewed] • The Association of Business Women • The Chamber of Commerce for Information Communication Technologies MASIT [Interviewed] • The Economic Chamber of Macedonia • The UNDP North Macedonia Accelerator Lab • Seavus Accelerator [Interviewed] • Startup Macedonia [Interviewed] • Swiss Entrepreneurship Program (Swiss EP) • Youth Entrepreneurial Service (YES) Foundation [Interviewed] • X Factor Accelerator

Finance	- Association of Business Angels [Interviewed] - Business Accelerator UKIM [Interviewed] - CEED Macedonia Business Angels Club - Crimson Capital [Interviewed] - Development Bank of North Macedonia - Fund for Innovation and Technology Development [Interviewed] - SEAF Macedonia Fund - Silk Road Bank - South Central Ventures - The National Bank of the Republic of North Macedonia [Interviewed] - 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, The University of Information Science and Technology "St. Paul the Apostle" [Interviewed] - Faculty of Computer Science and Engineering, The Ss. Cyril and Methodius University [Interviewed] - Faculty of Information and Communication Sciences, University of Information Science and Technology "St. Paul the Apostle" [Interviewed] - INNOFEIT, The Ss. Cyril and Methodius University [Interviewed] - The Goce Delčev University of Štip - The St. Clement of Ohrid University - The University American College Skopje [Interviewed] - Mother Teresa University [Interviewed]

Public sector	• Agency for Promotion of Entrepreneurship (APERM) • Invest North Macedonia • Ministry of Agriculture, Forestry and Water Economy • Ministry of 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] • The Agency for Promotion and Support of Tourism • The Employment Service Agency of the Republic of North Macedonia • The Office of the Deputy Prime Minister for Economic Affairs

6. Ecosystem Maturity Map

<u>Understanding the Ecosystem Maturity Map</u>

The Ecosystem Maturity Map, also referred to as the Innovation Journey Map, highlights the work that needs to be done within 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 has been arrived at through interviews and group discussions during the co-creation workshops with local stakeholders; and validated with the help of secondary research and review of relevant sources.

It must be understood that the innovation lifecycle or the 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 buy-outs 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 in an early stage. Profiling key stakeholder actions are necessary to accelerate digital transformation.

Table 3: Stakeholders and their roles in the ecosystem

Actors	Cycle Stage				
	PRE-IDEA	IDEATION	STARTUP	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 & Support Services	Skill Training Programmes
Academia	Community of Entrepreneurs	Basic Research	Spin Offs	Soft Skill Trainings	Human Capital
Public Sector	Vision and Strategy	IP & 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 cross the valley of death.

- The lack of buyouts and IPOs means most start-ups cannot expand into high-growth SMEs.

6.2 Finance

- Limited funding exists for innovators to research digital innovation or support technology transfer, meaning 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 organise gatherings to connect and inspire innovators, but more start-ups need to attend for the ecosystem to benefit.

- Annual Startup weekends enable innovators to validate their ideas with peers and mentors.

- Co-working spaces and soft infrastructure enable innovators to share resources in Skopje, but this is limited 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 organisations, 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 existing 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 non-compulsory entrepreneurship modules to technical courses to help innovators create start-ups.

- Graduates are not yet labour market ready, leading to employers having to invest in 21st-century 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 for all sectors, but there are no exemptions for ICT or to support entrepreneurship.

- Public procurement offers few opportunities for innovative start-ups as established businesses tend to win most tenders.

- The government supports international trade with relevant laws 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.

[Brianster](#)

Brainster is an international edtech organisation and accredited higher education institution that offers high-quality education. It helps people future-proof their careers by learning technical skills and relevant 21st-century competencies. Brainster's vision is to support digital transformation globally while creating a better future for people during that process. Through superior 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), Ss. Cyril and Methodius University in Skopje opened the Centre for Technology Transfer and Innovations (INNOFEIT), to close 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 novel innovative ideas that can aid the economic growth of the sector and the society. INNOFEIT is a co-founder of the Accelerator UKIM and a selected candidate by the European Investment Bank (EIB) to become a Centre-of-Excellence in its fields of interest.

[The Fund for Innovation and Technology Development (FITD)](#)

Founded in 2013, FITD was set up to encourage innovations by providing funding to build a competitive knowledge-based economy. It is a leading government institution that supports start-ups and innovative companies in the Republic of North Macedonia. Currently, the Fund, through its financial instruments, co-finances 686 projects with a joint investment of 86 million euros, of which, 326 are start-ups founded by young people. With almost EUR 1.5 million, the Fund supports the development of three accelerators in the country: X Factor, Seavus Accelerator and Business-Technology Accelerator UKIM.

[Macedonian Chamber of Information and Communication Technologies (MASIT)](#)

The Macedonian Chamber of Information and Communication Technologies (MASIT) is a volunteer, non-profit chamber of commerce. MASIT 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% of the companies in the ICT sector. Its vision is to be the enabler for the growth of Macedonian

ICT businesses, their recognition and image domestically and abroad, and enriching the Macedonian prosperity and economy by having a stronger, organised, and progressive ICT industry.

National Startup Council

The National Startup Council was initiated by the Fund for Innovation and Technological Development (FITD), after identifying the 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 organisations, as well as investors and entrepreneurs, made a detailed analysis of the current situation and needs for the faster transformation of the Macedonian 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 Macedonian start-up enthusiasts, founders, experts, and investors. Their goal is to connect the North Macedonian 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 organises multiple events, including Startup Europe Week, Product Hunt Meetup, TechCrunch Meetup, Global Entrepreneurship Week since 2018, 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 organisations. 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 synergising 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. Towards this goal, all stakeholder visions and strategies can be aligned, including those of previously siloed stakeholders, thus 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 their 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 their national vision. However, very often, the enablers needed are missing or are insufficient, 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 the society's 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: ● Digital innovation strategies to drive digital 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). ● Digital innovation strategies to help achieve social goals that promote inclusion and diversity (such as education and health). ● Digital innovation strategies to benefit key economic sectors vital to employment and inclusion in a country (such as agriculture, tourism or any sector). ● Digital innovation strategies to promote environmental sustainability through consideration of areas like green energy and smart grids.

Political	Social	Economic	Environmental

Strategic Thrust 2: Centralisation and Streamlining of ICT and e-Government Services: Establishing a centralised 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 of 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 minimise 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 North Macedonia's executive programmes and related strategies to achieve the digital economy vision and mission. These recommendations include specific new measures, policies and initiatives that can propel North Macedonia towards its 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 the country'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 Actions and platforms providing research insight about the ecosystem, including stakeholders and existing resource mapping	**ECOSYSTEM KNOWLEDGE SHARING** Knowledge sharing actions and platforms to accelerate commitment and collaboration of stakeholders	**ECOSYSTEM PARTNERSHIP & GOVERNANCE** 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 during the co-creation workshops; and supported with complimentary and relevant information in the detailed annexure.

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 of Key Sectors

Three additional cross-cutting strategies help mature the ecosystem through actions that strengthen the knowledge and linkages within the ecosystem:
• Ecosystem Research
• Ecosystem Knowledge Sharing
• Ecosystem Partnership

The following table lays out key recommendations, using the six strategic priorities, which will help to develop and mature the ecosystem to achieve the national ambition of digital transformation. The table has been organised 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	Timeframe		
	Short-term (Year I)	Medium-term (Year II)	Long-term (Year III 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 foreign direct investment to the ICT innovation sector.
	ID2: Establish a vision and clear strategies to foster digital innovation entrepreneurship in non-ICT key 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 intellectual property 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/frameworks to support tax exemptions/relaxation for digital enterprises (start-ups and SMEs).

		ID8: Revise customs policy and procedures to facilitate ICT hardware exports.	
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 and technical skills.	
Innovation of 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 incentivise 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 commercialisation 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, resource and network to support local innovators.
Ecosystem Partnership and Governance	EP1: Develop a Regional Innovation Centre to strengthen the 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 stakeholders in the country, and the recommendations offered in this DIP are based on country-level evidence. The recommendations offered will assist North Macedonia in integrating the stakeholders and their actions into a collaborative and knowledge-driven ecosystem that is working together towards the common goals to catalyse digital transformation in the country.

As a next step, further engagement is needed to design, implement, monitor and evaluate each item in the roadmap. The 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. Towards this, the ITU can also 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. The ITU can help you convert each of these recommendations into concrete projects with clear strategies and KPIs to accelerate the ecosystem.

Table 6: Details roadmap for ecosystem strategies and recommendations

Ecosystem Strategies and Recommendations Roadmap							
Strategic Priorities	Opportunity *Opportunities to address a particular ecosystem challenge*	Opportunity Brief *Challenge explanation, analysis of the risk of the opportunity, as well as benefits users gain from using product or service.*	Product or service to develop *Proposed solutions to the ecosystem challenge that meet the needs of users*	Ecosystem outcomes *How will one know the ecosystem challenge is solved; what will be measured*	National outcomes *The Key Performance Indicators as established by the country*	Champions *Core stakeholders with high power and interest to be involved in this opportunity*	Good Practice *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	A set of policies to allow for a guarantee fund that enables traditional financial structures to bring	Number of policies allow for a guarantee fund.	Strategic Thrust 3b: Fostering Economic Development. Strategic Thrust 4: Strengthening	The National Bank Ministry of Economy	The Venture Capital Guarantee programme of OSEO (France)

		of commitment and profitable result due to lack of the right incentives to invest in tech projects without bearing full risks.	financial support to the digital sector.	Number of investments made in startups and SMEs by international donors, local investors and funders.	Research, Development and Innovation.	Association of Business Angels Ministry of Information Society and Administration	
Innovation Dynamics 2:	Establish a vision and clear strategies to foster digital innovation entrepreneurship in non-ICT key 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 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 Northern Macedonia	
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 incentivise 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 Economy Ministry of Information Society and Administration MASIT Fund for Innovation & Technology Development	
Innovation Dynamics 5	Expand and enhance the Innovation Voucher scheme for SMEs	SMEs and start-ups need incentives and support to have technology as	An enhanced programme to educate and allow start-ups and SMEs	Number of start-ups and SMEs incorporating technology and	Strategic Thrust 3b: Fostering Economic Development:	Entrepreneurship Support Agency of the Republic of	

	and startups to accelerate ICT research in academia.	a key driver of operations and management; feel safe around those technologies and easily access them.	to experiment with technologies in their daily operations and management, either part or fully funded.	digital tools in their daily operations and management.	Strategic Thrust 4: Strengthening Research, Development and Innovation.	Northern Macedonia South East European University University of Information Science and Technology "St. Paul the Apostle" Ss. Cyril and Methodius University University American College Skopje Mother Teresa University Fund for Innovation & Technology Development	
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	A programme to support angel investors, including training and introductions to local entrepreneurs.	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,	Angel Investment Network Startup Macedonia Fund for Innovation & Technology Development	Seed Enterprise Investment Scheme (UK)

		their businesses and contribute to the local innovation ecosystem.	Financial incentives to make angel investing an attractive proposition.		Development and Innovation.	MASIT	
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 standalone systems and services.	Strategies to enhance ICT usage across all of the government administration, including training and awareness raising amongst 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: Centralisation and Streamlining of ICT and e-Government Services Strategic Thrust 6: Expansion of Digital Services	Ministry of Agriculture, Forestry and Water Economy Ministry of 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	

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 harmonise 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 harmonised 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 Economy	
Innovation Dynamics 9:	Develop a structured framework to attract foreign direct investment 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)

Innovation Dynamics 10:	Create programmes to strengthen support for innovation and intellectual property for the digital sector.	Lack of awareness and understanding of the benefits of registering intellectual property remains prohibitive for many innovators.	An awareness raising and training programme for innovators around the benefits of intellectual property protection.	Number of startups and SMEs registered on IP education programmes. Number of IPs registered locally by digital startups 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	
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	
Innovation Dynamics 12:	Revise laws/frameworks to support tax exemptions/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 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	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 Northern Macedonia Fund for Innovation & Technology Development	

	and learning, and keep the momentum for development going.				Ministry of Information Society and Administration	
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 Northern Macedonia Fund for Innovation & Technology Development	
Innovation Capacity 3	Create a roadmap 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	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)

		digital transformation.					
Innovation Capacity 4	Develop incentives to create a (virtual or physical) technology park for the digital sector across the country.	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 Northern Macedonia Ministry of Information Society and Administration Ministry of 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 programs 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 Economy Fund for Innovation & Technology Development	Innovation Fund (Serbia)

Innovation Capacity 6	Establish an SME internship programme for all business and technology-based degrees to develop practical soft 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 University of Information Science and Technology "St. Paul the Apostle" Ss. Cyril and Methodius University 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 Northern Macedonia MASIT	

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 of 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)
Innovation of Key Sectors 2	Develop 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.	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	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	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)

		contract opportunities.		for public procurement contracts. Number of start-ups and SMEs gaining public procurement contracts.			
Innovation of 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 Economy Ministry of Education and Science Ministry of Environment and Physical Planning Ministry of Information Society and Administration	
Innovation of Key Sectors 4	Identify and promote thematic areas based on key sectors to incentivise start-ups	The ecosystem lacks a structured environment for exploring and experimenting in thematic areas	A programme to support local talents to understand local problems and unlock domestic	Number of structured environments to access domestic market opportunities.	Strategic Thrust 3b: Fostering Economic Development Strategic Thrust 4: Strengthening	Ministry of Economy Ministry of Agriculture, Forestry and Water Economy	

	to solve local problems.	based on key sectors.	market opportunities across sectors.	Number of unlocked domestic market opportunities.	Research, Development and Innovation Strategic Thrust 6: Expansion of Digital Services	Agency for Promotion and Support of Tourism Fund for Innovation & Technology Development	
Innovation of 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	A programme to identify and share knowledge about the opportunities and challenges of the digital economy.	Number of opportunities and ideas identified, shared, and commercialised Number of funding opportunities, partnerships, and intellectual property created as a result of identified	Strategic Thrust 3b: Fostering Economic Development Strategic Thrust 4: Strengthening Research, Development and Innovation	Macedonia2025 Startup Macedonia MASIT Fund for Innovation & Technology Development	

		development, culture of collaboration, and idea commercialisation.		opportunities and ideas.		Ministry of Information Society and Administration	
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 maximise 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 commercialisation of ideas to market, connecting academia, the	The ecosystem needs to further democratise access to resources, information regarding stakeholders, transformative impact, activities, and opportunities to commercialise	A one-stop-shop platform with products and services to accelerate the commercialisation of ideas to market.	Number of ideas commercialised 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)

	private sector and government.	ideas in high-growth markets.				
Ecosystem Knowledge Sharing 1	Develop a globally-acceptable 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 recognise 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	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	

		technology decision-making.				
Ecosystem Knowledge Sharing 3	Develop a programme to leverage the diaspora knowledge, experience, resource 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, resource 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 Northern Macedonia
Ecosystem Partnership and Governance 1	Develop a Regional Innovation Centre to strengthen the 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	A Regional Innovation Centre to strengthen the 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 Northern Macedonia Ministry of Economy

		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.					
Ecosystem Partnership and Governance 2	Create a platform to promote partnership and collaboration and transfer of technologies 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 curricular and further support internship opportunities as	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	

		well as support the commercialisation of research.					
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 Economy Ministry of Information Society and Administration Fund for Innovation & Technology Development	The Digital New Deal (South Korea)
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	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: Centralisation and Streamlining of ICT and e-Government Services	Ministry of Information Society and Administration	The Digital New Deal (South Korea)

		changes for the public sector.			Strategic Thrust 5: Data Protection Strategic Thrust 7: Advancing the Environment for Societal Benefit		

APPENDIX 2: Governance framework

Understanding the Governance Framework

The Governance Framework helps create an efficient framework for a body that governs 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 composed of standard management practices, designed to suit a project or an organisation. It is a mechanism used by the board and management, as well as those at the operational level, to translate the elements of the governance and policies into practices, procedures, and job responsibilities within the governance infrastructure. The framework provides a clear understanding and oversight of each other's expectations, values, objectives, values, methods, and reporting requirements.

A strong governance framework is built to guide an organisation in how it can achieve accountability, authority and sound decision-making. By contrast, a weak governance framework can cause 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

The following Terms of Reference (TOR) suggest structures and details for a proposed authority that can be established in North Macedonia to oversee the country's digital transformation journey, especially once the Smart Specialisation Strategy is launched and rolled out. The TOR suggested below offers an indicative view to help understand and realise the foundation and ambit of work for the proposed authority. North Macedonia and its relevant authorities can choose from the suggestions offered and add to them to create the appropriate framework and guidelines to best suit the needs of the country.

MISA — in alignment with the SIGMA expert and the requests of the EU for reforms in public administration and organisational structures of ministries — established the Agency for Digital Transformation within its strategy in September 2022. The newly formed agency is aimed at supporting North Macedonia's digital vision. 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 the MASIT and other key stakeholders. We propose the following recommendations to support and strengthen this newly created agency. We understand the agency already has certain mechanisms, structures operations in place and can choose to adopt the following where appropriate.

Board: The Board is responsible for understanding—and advising management on—the processes, policies and strategies through which governance occurs within North Macedonia's Smart Specialisation Strategy.

The Board will:
- *Provide guidance and direction towards the organisation's alignment and progress towards its goal to create an agile digital future focusing on priority areas in the ICT sector*
- *Provide guidance and direction towards establishing standards of organisational conduct across the public and private sectors*
- *Provide guidance and direction towards oversight of all organisational performance*
- *Provide guidance and direction towards protecting the best interests of the organisation*
- *Provide guidance and direction towards ensuring the financial sustainability of the organisation*
- *Provide guidance and direction towards reviewing digital innovation strategies and policies of the organisation*

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

The Management will:
- *Provide support to foster the long-term success of the country's digital transformation strategy.*

- *Provide support to understand and position at the centre the knowledge of stakeholder expectations, needs, concerns, interests and wants*
- *Provide support to plan and approve budgets and expenditures*
- *Provide support to review policies, strategies and SoPs.*

Operation: The Operation is composed of people who will execute the mandate, process and strategies.

Members of the Operation will:
- *Plan and execute actions towards the mandate*
- *Work in accordance with the vision*
- *Plan and execute the operational strategies and SOP*
- *Execute and deliver on M&E responsibilities*
- *Devise the method to be followed by the organisation*
- *Identify policies and plans to steer the country towards the vision*

Mandate: Mandate describes what the authority aspires for. It serves as a north star pointing to the future state. It also provides direction to everyone in the organisation as they focus their efforts on achieving the mandate.

The Mandate may be towards:
- *Accelerating the growth of the country towards digital transformation*
- *Achieving competitiveness of key economic sectors*
- *Integration of ICT in all key economic sectors*
- *Improving the quality of local talent available in the country*
- *Preserving the best 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*

Legal Basis: Legal Basis refers to the establishment, execution and validation of the governance framework in a legally binding way.

The Legal basis could be through:
- *Creation of a commission or a working group*
- *Signature of a relevant authority*

Values: Values describe the core ethics or overarching principles by which the authority will abide. They might involve principles that govern the business, its philosophy, or how it expects the people who work for it to act.

The following Values of working will be adhered to:
- *Accountability*

- *Inclusivity*
- *Fairness*
- *Transparency*
- *Responsibility*
- *Environmental Awareness*
- *Ethical Behaviour*

Method: Method refers to various processes and guidelines that ensure the smooth functioning of the governance body.

In this case, the Method could include:
- *The Board will be chaired by the Ministry of Information Society and Administration.*
- *The members of Governance 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% of its membership to hold any meeting.*
- *The organisation 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 with a conflict of interest, they shall immediately disclose 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 governance body.*
- *The Board should review and make recommendations on its TOR every few years.*
- *The Management and Operations bodies 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 governance body.

This proposed authority could be be governed by the internal Policies of:
- *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 standard operating procedure (SOP) is a set of detailed work instructions that describe each step of a process within the organisation. 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 operation 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 & Evaluation: M&E refers to a set of audit activities that help monitor the organisation's progress towards its goals, and revise or alter its direction through management in light of changing circumstances.

The organisation'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, Ministry of Information Society and Administration and Ministry of the Economy (ii) Up to two Members who are nominated by the Executive Members from the Ministry of Finance and 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 the Public Sector, Private Sector, Academia, Finance, Entrepreneurial Support Network, and Entrepreneurs. Efforts must be made that no stakeholder group is overrepresented or underrepresented. Conscious effort must also be made to bring in gender equality.*

The Management shall comprise invited members from the industry and 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 Operation 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 across the Public Sector, Private Sector, Academia, Finance, Entrepreneurial Support Network, and Entrepreneurs. Conscious effort must also 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.
>
> A good practice is a tested practice that produces 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):** OSEO's 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 digitalisation knowledge in Hungary.

3. **Vinnova Voucher Programme (Sweden):** This agency aims to build Sweden's innovation capacity 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 liberalisation, 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 Serbia's innovation system, 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):](#) Georgia's Ministry of Education and Science 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):](#) Austria's national Plattform Industrie 4.0 (PI4.0) started in 2014 upon the Austrian Ministry of Transport, Innovation and Technology initiative. 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 organisation for innovation funding and trade, travel and investment promotion. Business Finland's 600 experts work 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):](#) Vinnova's 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, optimisation of knowledge and technology flow between start-ups, academia, government authorities and ICT companies were the topics of a workshop organised 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, which aim 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 ITU's 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

Table 7: Key words and definitions

Key Word	Definition
Vision	The vision defines an ideal to be achieved after a given time. Its objective is to mobilise the stakeholders for its realisation 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 organisational 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 startups 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 mobilisation 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 digitised 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.
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 startup 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: Acronyms and abbreviations

Table 8: Nomenclature of abbreviations

Key Word	Definition
AI	Artificial Intelligence
BAU	Business Accelerator UKIM
CPI	Corruption Perceptions Index
EBI	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	The 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	The United Nations Development Programme
VAT	Value added tax
VC	Venture Capital

WIPO	World Intellectual Property Organisation	