Republic of North Macedonia
Digital Development Country Profile

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As digital transformation is a complex and dynamic process, this document is treated as a living document that can be amended at any point in time depending on the availability of additional information. The comments and additional inputs should be sent to the ITU Office for Europe (EURregion@itu.int).

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1. Introduction

1.1 Background and context

Development through digital transformation is a complex issue and touches on many enablers, from broadband availability to policies and sectoral e-strategies, as well as specific programs fostering digital inclusion or the development of innovation communities.

Various independent research projects have been carried out by the ITU, other UN agencies and other stakeholders in understanding these enablers, their impact on countries, their gaps and opportunities. However, these studies may not reflect the inherent interdependencies among them. There is a need to provide a simple view and narrative about a country capacity to digitally transform and various components contributing to this process.

Digital development through digital transformation has become ever more important since the outbreak of the COVID-19 pandemic, and various UN agencies and other stakeholders have assisted countries in their respective capacities relying substantially on the digital component.

Extending the availability of products and services and empowering citizens, workers and students in their daily engagements and needs in times of lockdown have become clear priorities of all countries. The ability to leverage the progress made in the digital sphere has become an important factor in determining resilience during the COVID-19 crisis.

As the situation is developing into a new normal where “digital” is not only a solution to an emergency but a long-term investment against risk, it is necessary to unravel the various dimensions of digital development in different countries as ICTs become increasingly important for the achievement of the Sustainable Development Goals by 2030.

1.2 Objective of the Report

The aim of the Digital Development Country Profiles series is to provide a comparable analysis for priority countries of the European region, namely Albania, Bosnia and Herzegovina, Georgia, Moldova, Montenegro, North Macedonia, Serbia, and Ukraine.

The Report addresses digital transformation based on the various experiences of the ITU, the UN specialized agency for ICTs, and other UN system organizations, offering a broad overview of the activities and projects being implemented at the national level and in the wider region.

This report seeks to build a reference for discussions on digital development at the country level in North Macedonia. It will serve as a guide for future dialogue with country stakeholders and pave the way for increasing fit-for-purpose engagements of the UN system in the country. It will equip decision-makers at the national level and international stakeholders with an overview of the various components of digital development at the country level.

1.3 Methodology

The research has identified a *five-building-blocks framework* that analyses digital transformation from a variety of perspectives, enabling an understanding of how the various dimensions of digital development interact at the country level. Below is a summary of each building block and elaboration of how the particular dimension fits in the overall digital development scenario of the country.

1) Meaningful connectivity as a foundation for digital development and transformation: Robust ICT infrastructure represents a critical precondition for the transformation of a country. It provides the foundation for innovative services and economic activity to take place. With the Covid-19 pandemic, countries and communities lacking connectivity faced a greater disruption than those who did not, therefore raising the overall importance of reliable infrastructure and services that are available to all. ICT infrastructure needs to be evaluated based on several aspects critical to meaningful connectivity.

2) People-centric digital transformation: Developing digital skills and building human capacities to empower citizens, strengthen employability, and create new job opportunities is essential to match the needs of the gigabit society. The pandemic has exacerbated pre-existing inequalities, especially amongst refugees, migrants, persons with disabilities, women and girls. While connectivity is the backbone of digital transformation, adopting a people-centric digital transformation is vital to ensure that all members of society are not only connected, but meaningfully connected and thus fully enjoy the fruit of an ever-growing digital world. To this end, special emphasis should be given to bridging the digital divide and equipping all groups of society, including groups of people with specific needs, to take advantage of ICTs by enabling digital skills development.

3) Government-centric digital transformation: Access to government services by citizens enables productivity, transparency and equality in digital development. Ensuring that public services are delivered digitally is an important component of digital transformation, triggering a reduction in costs and bureaucracy and increasing efficiency. Governments also have an important role not only in promoting the right strategies collaboratively across various entities, but also in ensuring that public sector transformation becomes a catalyst for digital transformation in the wider economy.

4) Sector-centric digital transformation: Although the ICT sector is important in digital transformation, most economic benefits accumulate when ICTs are also used to transform other sectors. Agriculture and health are of high importance for Southeastern European countries in the scope of this study and play a key role in job creation and economic inclusion.

5) Digital-centric innovation ecosystem: Creating an enabling environment supporting digital innovation is essential to accelerate digital transformation in a country. The ability to digitally innovate domestically is also considered a sign of maturity which leverages all four dimensions addressed previously. Without entrepreneurship-driven innovation, economic opportunities remain unexplored and the global competitiveness of countries in an increasingly digital landscape is put at risk. Through strong digital innovation ecosystems, countries can benefit from increased productivity, economic growth and

employment opportunities that catalyze digital transformation and ensure that long-term digital development has a positive impact on the country's broader economic development.

The country profiles benefited from secondary research information, including various ITU publications, activities, and statistics, as well as additional research. In addition, content from other stakeholders' publications and deliverables was taken into account. Each piece of content is presented using the context of the relevant building block under which the information has been inserted, and therefore adopts one of the 5 perspectives of digital transformation.

2. Country Profile – Republic of North Macedonia

2.1 Building Block 1 - Meaningful connectivity as foundation for digital transformation

As stressed in the introduction, broadband development is of primary importance and remains a prerequisite to ensure digital development. It is the backbone for every aspect of the economy acting as a fundamental enabler for businesses, consumers and citizens. Access to the next generation of infrastructure (fixed, mobile, wireless, satellite) at an affordable price is a key prerequisite for advancing sustainable development.

This section will provide a general overview of i) connectivity indicators for North Macedonia, to position the country in a European and global context, and will then dive into ii) the market environment; iii) current trends in access, affordability and use; iv) latest developments in connectivity policy and regulation; v) 5G development; and vi) infrastructure cybersecurity.

2.1.1 General overview on connectivity indicators

According to the latest ITU data, 81.4% of people in the Republic of North Macedonia used the Internet in 2020. The number of active mobile-broadband subscriptions per 100 inhabitants was 64.7% in 2020, while the number of fixed broadband subscriptions per 100 inhabitants was 22.2%. In 2020, North Macedonia registered 99.9%[1] of the population with 3G coverage and 99.5% with 4G/LTE coverage.[2] Broadband adoption is increasing as the government continues to promote the development of digital infrastructure. In 2020, the share of households in North Macedonia that have fixed broadband internet access reached 82.8%. Although the country's broadband network coverage is comparable to the EU average, the availability of ultra-fast (download speed greater than 100 Mbps) Internet coverage in 2018 was 43.8%, which is less than the EU average of 58% for the same period. In 2020, new data show that

[1] ITU World Telecommunication/ICT Indicators for 2020

[2] ITU World Telecommunication/ICT Indicators Database (June 2020), latest data for 2019

government efforts are paying off as ultra-fast internet coverage reached 63.1%[3], whereas take-up remains relatively low.

Table 1 below summarizes a set of ITU indicators that embed North Macedonia in a European and Global context with regards to telecommunications and internet indicators. While on many fronts, North Macedonia finds itself well above World averages, there remains a non-negligible gap between the country and Europe region averages (encompassing 46 countries of Europe region[4]).

Moreover, Table 2 shows that positive developments in the mobile markets have not been matched by high increase in the use of fixed services or overall use of the internet by the population, suggesting that there is great potential over the next 10 years to ensure that all citizens and businesses leverage connectivity and contribute to a growing digital economy in the country.

Table 1. Key Telecommunications & Internet Indicators in North Macedonia in comparison to the European and World average

Key Indicator (2019)	North Macedonia	Europe	World
Fixed telephone subs per 100 inhabitants	19.2	31.3	16.9
Mobile cellular subs per 100 inhabitants	92.2	120.8	112.1
Active mobile broadband per 100 inhabitants	64.9	99.4	77.8
3G coverage (% of population)	99.9	98.7	93.5
LTE/WiMAX coverage (% of population)	99.5	97.0	85.8
Individuals using internet (%)	79.2	82.2	52.0
Households with a computer (%)	69.5	71.8	40.4
Households with internet access (%)	79.3	84.9	60.7
Fix broadband subs per 100 inhabitants	21.8	33.0	16.5
Fix broadband subs by speed, % distribution:			
256 kbit/s to 2 Mbit/s	0.8	0.7	2.6
2 to 10 Mbit/s	16.0	10.2	8.0
10 Mbit/s	83.3	88.9	89.4

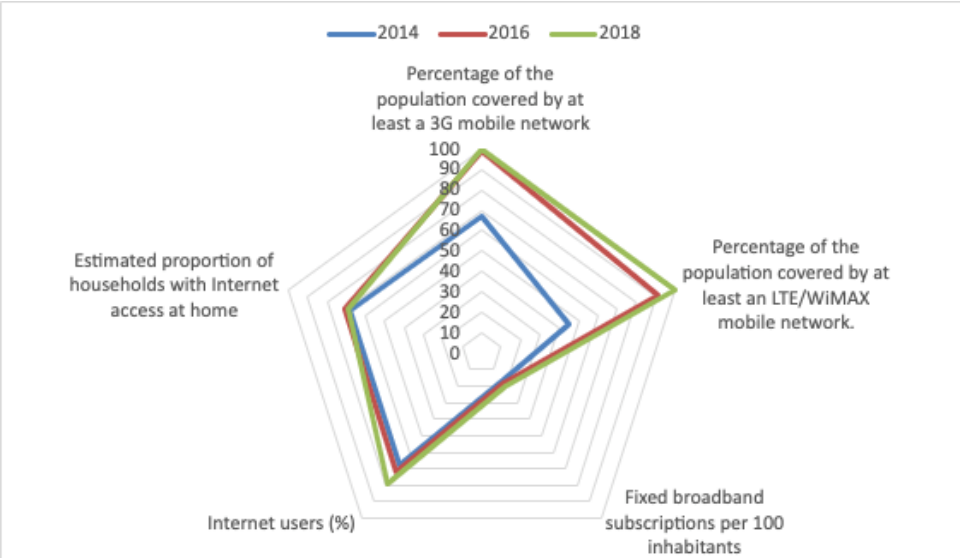
Figure 1 below shows a comparison of basic indicators of ICT-access in North Macedonia, during the year 2014, 2016 and 2018.[5]

Figure 1. The basic indicators of ICT-access and usage in North Macedonia (ITU WTI Database)

[3] Republic of North Macedonia Broadband Competence office third Report for broadband development in the country and implementation of National Operational Broadband Plan (March 2021), p.7,8

[4] https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Pages/MemberCountriesinEurope.aspx

[5] ITU-FAO "Status of Digital Agriculture in 18 Countries of Europe and Central Asia" (2020) - https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Events/2020/Series%20of%20Webinars/20-00244_Status_digital_Agriculture-revFAOV4.0-MASTER-FILE-20-JUNE_REVIEW-



2.1.2 Market environment

According to the ITU *Measuring Information Society Report 2018*, North Macedonia has undertaken important steps towards a competitive and modern telecommunication market, and appropriate strategies are in place to further develop North Macedonia into a highly connected country.[7] Key institutions that are enabling the digital transformation from a telecommunications standpoint are the Ministry of Information Society and Administration, which has a mandate to promote digital development at the country level and the Agency for Electronic Communications (AEK), which has a mandate to regulate the telecommunication market and create an enabling environment for development of telecommunication based on competition.

The telecommunication sector includes two operators from the mobile segment: Makedonski Telekom (MakTel), which has been part of Deutsche Telekom since 2001, and is the market leader, and One.Vip, formed by a merger between ONE (owned by Telekom Slovenije Group) and Vip (owned by Telekom Austria Group) Fixed mobile operators include the incumbent operator Makedonski Telekom AD Skopje, which dominates the market with an almost 40 per cent share of the fixed-broadband access market. The value chain is, however, rich in competition with many other operators focusing on cable services and fixed wireless access.

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[6] ITU-FAO "Status of Digital Agriculture in 18 Countries of Europe and Central Asia" (2020) - https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Events/2020/Series%20of%20Webinars/20-00244_Status_digital_Agriculture-revFAOV4.0-MASTER-FILE-20-JUNE_REVIEW-FAO_PL_print%20(002).pdf

[7] https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2018/MISR-2018-Vol-2-E.pdf, p. 134.

2.1.3 Meaningful connectivity in the regional context

Meaningful connectivity depends on a variety of factors. The most important are *availability* and *affordability*. These are also the strongest determinants of another factor of connectivity, *uptake*. Looking more in depth at these three dimensions, the ITU report on Connectivity in 9 non-EU countries of Europe region, prepared in the context of the ITU Regional Forum for Europe on Meaningful Connectivity held on 8 and 9 March 2021,[8] shows that North Macedonia is relatively well positioned, if compared to regional peers.

In terms of *availability of connectivity*, North Macedonia is at the forefront in two out of three indicators:

- Percentage of the population covered by at least an LTE/WiMAX mobile network: North Macedonia is second (only preceded by Georgia) among the 9 countries with 99.5% of the population covered by 4G/LTE services, up from 70% in 2015.
- Estimated proportion of households with Internet access at home: according to the latest available data (2018), almost 80% of households in North Macedonia are connected to the Internet, a figure which places the country just below Serbia and Turkey in the comparison with regional peers. Notably this figure has gone up from just under 70% of households covered in 2017. Moreover, it is important to note that the EU-27 average for this indicator remains higher, at 86.6% for 2019.
- Number of fiber connections per 100 inhabitants: on this particular indicator, North Macedonia is lagging behind regional peers, being the country with the lowest score of 3.2 FTTH subscriptions per 100 inhabitants in 2019, compared to an EU-27 average of 8.7.

With regards to the *affordability* dimension, North Macedonia faces a more challenging situation than many peers in the region. In 2020, the mobile-data basket cost was 1.6% of GNI per capita for a monthly allowance of 1.5 Gb, while the European region's average was 0.5%. In the same year, the fixed-broadband basket cost was 3.3% of GNI per capita for a 5Gb Internet data cap, compared to an average of 1.2% of monthly GNI per capita for Europe region as a whole[9]. Particularly for fixed broadband prices, North Macedonia finds itself well above the 2% of GNI per capita mark indicated by the Broadband Commission as a threshold for affordability, suggesting that action might be needed to address this issue. Moreover, these gaps in terms of affordability suggest an increased inequality in access to ICTs and connectivity and therefore indicate potential for a widened digital divide between low- and high-income settings that have been exacerbated over the course of 2021.

Finally, when it comes to *connectivity uptake*, North Macedonia is positioned in the middle in comparison to regional peers:

[8] https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Pages/Events/2021/MC/Default.aspx

[9] https://www.itu.int/en/ITU-D/Statistics/Dashboards/Pages/IPB.aspx

- Fixed broadband subscriptions per 100 inhabitants: North Macedonia has 21.8 subscriptions per 100 inhabitants compared to an EU-27 average of 34.3. It is fourth out of the nine countries in scope of the study.
- Active mobile-broadband subscriptions per 100 inhabitants: the country has 64.9 subscriptions per 100 inhabitants compared to an EU-27 average of 108.8. North Macedonia ranks fifth out of the nine countries in scope of the study.
- Estimated proportion of households with a computer: with almost 70% of households estimated to be in possession of a computer at home, North Macedonia is a leader in the region, just behind Serbia, and not far from the EU-27 average of 80.5.
- Proportion of individuals who used a computer (from any location) in the last 12 Months and Internet users (as per cent of the population): for both indicators, North Macedonia is a leader among peers and not far from EU-27 averages in 2019, signaling that the role of ICTs in society is more prominent than in other countries.

2.1.4 Connectivity policies and regulations

In light of the above, it is fair to state that North Macedonia is on a good track toward digital infrastructure development. This is further reinforced by the strategic approach of the country to policy and regulation in the field of connectivity.

In this context, in 2019 the government adopted the National Operational Broadband Plan for 2019-2029 (NOBP)[10], an important milestone for digital development in the country and a strategic document that aligns the country with EU policies, targets and requirements. Some of the long-term targets of the document are:

- By the end of 2029, at least 50% of the total number of household subscriber contracts across the country are for internet access of at least 100 Mbps.
- By the end of 2029, all households will have affordable opportunity to access a network that allows for a download speed of at least 100 Mbps, with a possibility to upgrade to Gigabit speed.
- By the end of 2029, all public institutions (schools, universities, research centers and other education institutions, healthcare facilities, ministries, courts, local self-governments and other state authorities and bodies) have symmetrical internet access with a speed of at least 1Gbps.

In addition, the NOBP states clearly that decision making towards these objectives should be based on evidence from national broadband mapping as well on the expected investments by telecom operators in the near future. This reinforces the importance of broadband mapping and its role in decision making in North Macedonia, as highlighted in the ITU paper on Broadband Mapping Systems and Regional

[10] https://mioa.gov.mk/sites/default/files/pbl_files/documents/reports/north_macedonia_national_operational_broadband_plan_final_en.pdf

Harmonization Initiatives"[11]. Beyond recognizing the important actions taken by North Macedonia in this regard, the report illustrates how the National Regulatory Authority is making effective use of such systems to achieve defined objectives and goals in the country. The system may however be strengthened in the future and used to better target investments, not only to connect the public sector, but also to ensure all productive sectors of the economy are embracing the digital transformation.

The legal basis for broadband mapping is strong and aligned with the EU. The "Rulebook on the manner of construction of public electronic communications networks and accompanying assets" published in 2016 obliges operators to provide data on physical infrastructure and data on equipment, which ultimately allows an estimation of the type and characteristics of service which can be provided with that equipment. The "Guidelines for submitting data for newly built electronic communications network and accompanying assets." completes the regulation outlining operational measures for interaction of the private sector with regulatory authorities.

The responsible authority for these endeavors is the telecommunications regulator, the Agency for Electronic Communications (AEC). Since 2017, in fulfilment of the law, AEC has been implementing a project to build a Web GIS Collector that (i) provides full electronic data delivery for newly built electronic communications and associated facilities; (ii) automatically verifies the correctness and completeness of the submitted data; and (iii) provides three user roles, namely for geodetic companies, operators, and AEC employees.

Finally, from a wider regulatory standpoint, North Macedonia currently scores 88.0 in the ITU ICT Regulatory Tracker, the same score as in 2019, placing the country at the 50th place among the countries considered for the 2020 ranking.[12] The ITU Tracker pinpoints the changes taking place in the ICT regulatory environment. However, in case of North Macedonia, it highlighted the lack of any changes in the last year and minor changes in the previous ones.

At the same time, the ICT Regulatory Tracker facilitates benchmarking and the identification of trends and gaps in ICT legal and regulatory frameworks and allows decision makers to make the case for further regulatory reform towards achieving a vibrant and inclusive ICT sector. It is a composed metric based on a total of 50 indicators (11 composite, see full list below) grouped into four clusters:

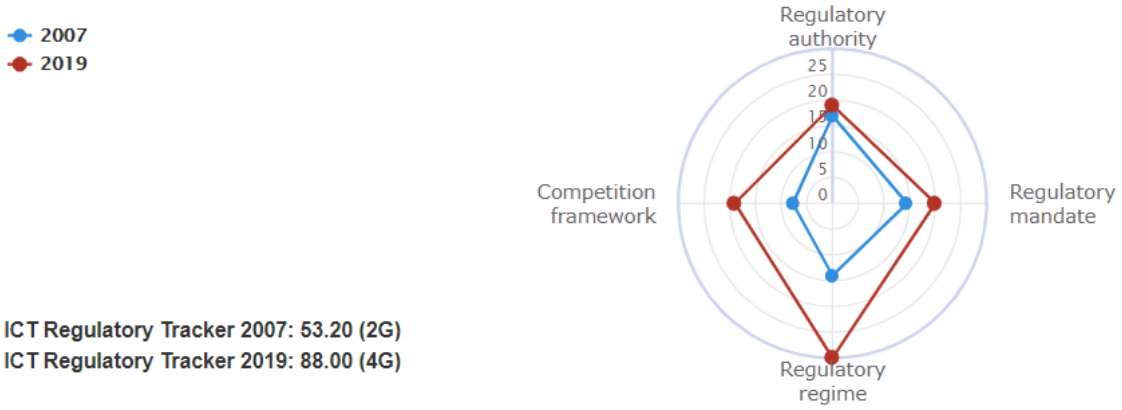
1. Regulatory authority (focusing on the functioning of the separate regulator): North Macedonia scores 19 out of 20;
2. Regulatory mandates (who regulates what): North Macedonia scores 20 out of 22;
3. Regulatory regime (what regulation exists in major areas): North Macedonia scores 30 out of 30;

[11] https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Events/2020/RRF/21-01-15%20Background%20Paper_Broadband%20Mapping%20Systems%20in%20Europe%20and%20Regional%20Harmonization%20Initiatives_final_clean.pdf

[12] https://tracker.gen5.digital/country-cards/North%20Macedonia#overall-score

4. Competition framework for the ICT sector (level of competition in the main market segments): North Macedonia scores 19 out of 28.

Figure 2 - ICT Regulatory Tracker - North Macedonia



This benchmark allows to position North Macedonia among the group of countries with a *Fourth-Generation regulatory regime (G4)*, that is integrated and led by economic and social policy goals. The country's overall result is slightly lower than Europe region average score of 94.1, but is well above the world one of 73.7.[13]

As the gold standard is currently Fifth Generation of regulation, focused on collaboration among different stakeholders in the ICT sector and with other sectors of the economy, there is still margin of improvement for the country.[14] According to the reviewed Fifth Generation of regulation benchmark recently launched by ITU, North Macedonia scores 55.77 in the G5 benchmark, compared to Europe region's average of 69.88. This suggests there is still margin of improvement for the country, particularly with regards to the pillars on Digital Development Toolbox and Digital Economy Policy Agenda.[15]

2.1.5 Next generation infrastructure: 5G Development

While there is still much potential to develop the fixed market in North Macedonia by means of the tools and policies described in the previous section, mobile services have always played a more significant role in the country relative to fixed services.

[13] Global ICT Regulatory Outlook 2020 Pointing the way forward to collaborative regulation, pp.29, 31, retrieved from: https://digitalregulation.org/wp-content/uploads/ebat-19-00942_Global-ICT-Regulatory-Outlook-2019-v11.pdf
[14] https://gen5.digital/
[15] https://digitalregulation.org/wp-content/uploads/G5Benchmark_ReviewBoardReport_21062021.pdf, p.41

With almost the entirety of the population already covered by 4G, the country is taking significant steps towards becoming a leader among peers in the region when it comes to 5G deployment. In particular, the NOBP sets out ambitious targets for North Macedonia:

- By the end of 2023, at least one larger city to be covered with 5G signal.
- By the end of 2025, the main corridors in accordance with the Treaty establishing the Transport Community on the basic and comprehensive road network in the country should be covered with an uninterrupted 5G signal.
- By the end of 2027, all towns in the country are covered with uninterrupted 5G signal.
- By the end of 2029, anyone can have the opportunity to access the internet through 5G with a minimum speed of internet access of at least 100 Mbps.

In this context, operators are expected to invest in two critical areas in the country to facilitate 5G development: (i) Infrastructure investments in fiber and base stations, and (ii) Investments in service innovation to stimulate the emergence of new 5G services.

Moreover, to ensure the achievement of targets set out by the NOBP, significant steps are being taken by the national regulator (AEK) and mobile network operators to ensure network readiness, safety and reliability. Contributing to this are ongoing efforts to free up the 700MHz, 3.6GHz and 26 GHz spectrum bands, to increase testing and conduct measurements of non-ionizing radiation and to create an environment for commercial trials and innovation.[16]

With regards to *spectrum*, the 2019 NOBP recognized the that one of the preconditions for the promotion of 5G networks is providing a sufficient and adequate radio frequency spectrum as early as possible to stimulate investments, innovation, and competition in the development of 5G services. For this reason, it was mandated that the Agency for Electronic Communications (AEK) would assign 5G spectrum in the second half of 2020, with plans to initially award 5G-suitable spectrum in the 700MHz and 3.6GHz bands. However, due to the pandemic, this process has faced substantial delays and will potentially have an impact on the overall rollout of 5G at the country level. It is of utmost importance that this process is resumed to ensure the investment cycle is not prolonged, thereby affecting the possibility to reach targets set by the NOBP.

To accelerate the investment cycle, *innovation* in the mobile market is also of fundamental importance and looking at the innovation efforts towards next generation technologies offers a good insight of future developments of the wider digital development ecosystem at the country level. Despite no commercial availability of 5G products as of 2021, the country has been active in conducting trials since 2018. In September 2018, Makedonski Telekom performed the first 5G demo in the country, claiming the tests results of the tests reached the highest Internet speed registered. On that occasion, the

[16] ITU Report on "5G Implementation in non-EU countries of the Europe Region", p.34 - 38

operator also claimed that the provider had planned investments in the next two years in order to meet all prerequisites for the commercial launch of 5G.

Over the course of 2019, several tests also took place:

- Makedonski Telekom, with the Faculty of Electrical Engineering and Information Technologies (FEEIT) of the "Ss. Cyril and Metodius" University, being also ITU Centre of Excellence, announced a partnership for testing 5G networks.
- The Agency for Electronic Communications issued two temporary frequency authorizations for testing 5G network. Frequency authorizations were issued to A1 Makedonija for frequency band 3.7-3.8 GHz (100 MHz) with validity date till 14.07.2020 and to Makedonski Telekom for frequency band 3.6-3.7 GHz (100 MHz) with validity date until 31.10.2020.
- Makedonski Telekom has set up a trial 5G network in the center of Skopje, with tests scheduled to be carried out during 2020 before a full commercial launch. These services included the following: super-fast fixed-wireless internet, virtual reality (VR) 3600 live video, VR gaming in real time and ultra-HD multi-video streaming.

A third important item relevant to 5G deployment and the overall mobile telecommunications market is that of *Electromagnetic Fields policy*. As stressed in the recent ITU report on "Implementing 5G for good: do EMFs matter?"[17], the discussion about EMF indeed matters, as it may pose obstacles to implementation at the country level. In the case of North Macedonia, AEK is taking a proactive approach to the matter, and in parallel to the commercial 5G trials undertaken by the operators, AEK conducted a series of measurements considering ICNIRP and CEPT recommendations, finding that 5G's contribution in the total-allowed density of electromagnetic energy is 38%, compared to 47% for LTE (4G) technology. Importantly, AEK notes that these measurements are to be considered as a worst-case scenario in which 5G sites were active 100% and the entirety of all beams were targeted directly towards the measurement equipment.

Finally, it is also important to notice that AEK has responded positively to the consultation on the Regional Assessment on Electromagnetic field (EMF) levels and risk communication challenges in the Europe Region[18], held in Q1 2021, noting the success of the transparent approach adopted by the organization which contributes to proactively addressing the matter at the country level. However, as in many other countries, AEK also noted that no risk communications strategy is in place, a matter that is currently under consideration in ITU for action to support countries.

[17] https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Events/2020/5GTech/%28final_clean%29%20Background%20Paper%20-%20Implementing%205G%20for%20Good_Does%20EMF%20Matter_Haim%20Mazar.pdf

[18] https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Pages/Projects/EMF/IndividualResponses.aspx

2.1.6 Increasing Infrastructure reliability through cybersecurity

According to the 2020 ITU Global Cybersecurity Index, North Macedonia ranks 24th in the Europe region and 38th globally, with a score of 89.92. This index is a trusted reference that measures the commitment of countries to cybersecurity at a global level to raise awareness of the importance and different dimensions of the issue and assess countries' ICT sector resilience and reliability. It highlighted the legal and cooperative measures as the country strength areas, and the technical measures as an area of potential growth. [19]

North Macedonia has taken important steps toward ensuring that its national infrastructure is reliable. The country is a member of the Budapest Convention on cybercrime, and it has a dedicated National Cyber Security Strategy for 2018-2022 complete with an implementation framework. This strategic document promotes development of a safe, secure, reliable and reliable digital environment, supported by high-quality capacities based on cooperation and trust in the field of cybersecurity.[20] In addition, North Macedonia has collaborated with the ITU to organize the ITU Regional Workshop for Europe on National Cybersecurity Strategies in 2019[21], hosted by the Ministry of Information Society and Administration, thus acting as a facilitator for regional and international cooperation in the field.[22] The Government of North Macedonia also made the strategic decision to establish the National ICT and Cybersecurity Council, as well as the National Center for Computer Incidents Response (MKD-CIRT).

Finally, the government of North Macedonia recognizes, through the open data strategy and action plan 2018-2020, that several measures were taken to ensure proper capacity building and raise awareness in the field of cybersecurity. These included incorporating content on safe internet in the primary education curriculum, and developing information security-focused programs for certain bachelor and master's degrees to meet the demand for cybersecurity professionals.[23] Despite these efforts, 2020 was marked by massive cyber-attacks on governmental networks and entities, demonstrating a need for additional improvements in national cyber defense capacity.

As stressed in this last paragraph, cybersecurity is a cross-cutting issue that is not only important for infrastructure but also encompasses all domains of digital transformation. This reinforces the claim of adopting different lenses to conceptualize digital development. Thus far, this report has looked at digital transformation from an infrastructural perspective, and the report will now turn to other perspectives of digital transformation in North Macedonia.

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[19] ITU Global Cybersecurity Index (GCI) 2020, pp.25, 30, 126

[20] https://mioa.gov.mk/?q=en/node/2379

[21] https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Pages/Events/2019/NCS/NationalCybersecurityStrategies.aspx

[22] https://news.itu.int/how-itu-and-the-republic-of-north-macedonia-collaborate-to-strengthen-cybersecurity/

[23] National Cyber Security Index (https://ncsi.ega.ee/country/mk/?fbclid=IwAR0-5wEWEZtNObAxvPsDiJ5lyt9gmoeQsIs1KuwNQ6JYNjRBNFaVdle3Gvk)

2.2 Building Block 2 - People-centric digital transformation

Addressing more in-depth the usage of ICTs by people and various groups of society allows a more comprehensive framing of the digital divide and identification of gaps that may require policy intervention to ensure that access to digital services is truly for all. This requires examining various dimensions of digital inclusion, including (i) digital skills development, (ii) gender issues, (iii) ICT accessibility for persons with disabilities, and (iv) child online protection.

2.2.1 Digital skills development

Among peers in the region, North Macedonia has one of the highest numbers of recommended hours for ICT as a compulsory, separate subject in primary education (around 150 hours), and digital competence is addressed as a compulsory separate subject. North Macedonia is also one of nine countries in which provision of continuing professional development in digital education is mandatory.

Substantive efforts have been undertaken by the government in order to strengthen the digital skills development of youth. The government of the Republic of North Macedonia adopted a strategy for innovation of North Macedonia 2012-2020, which creates a mechanism that encourages creativity among the young population and fosters skills development. For example, almost all higher education institutions and universities in the country offer an ICT curriculum. Also, the Council for implementation of ICT in primary and secondary schools in Macedonia has a mandate to oversee the integration of ICT and institutions in Macedonia. The government of North Macedonia also offered an online Digital Skills Training for teachers in primary and secondary schools for ICT in teaching process, a course which remains ongoing and offers the opportunity to develop skills for using different platforms like Plickers, Kahoot and Mentimeter as well as how to create video content. Moreover, MoES delivers video tutorials for educators to better equip them to use the Moodle and Teams platforms during teaching process. One of the measures for support due to the COVID crises was to give vouchers to young people (not older than 29 years of age) for digital skills training. During the summer of 2020, 2500 young persons received vouchers for trainings provided by digital education companies, and the project is ongoing.

Outside of the context of COVID-19, North Macedonia provides training for primary and secondary school teachers focused on basic ICT skills, as well as on the integration of software solutions in interactive teaching. According to one survey, however, around half of Macedonian teachers reported that they needed additional training to enable them to adequately integrate ICT in their classrooms.[24]

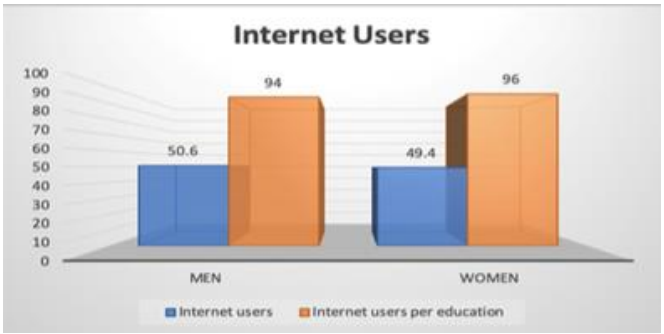
Moreover, according to a forthcoming report by ITU and UNICEF, it is estimated that 123,000 PCs would be needed in the country to align with OECD standards of 0.83 PCs per student, as the figure for North Macedonia stands at 0.43 according to the latest data. Provision and renovation of ICT infrastructure in

[24] https://www.itu.int/en/myitu/Publications/2021/05/31/10/16/Digitally-empowered-Generation-Equality

the classroom is therefore also a fundamental enabler for digital skills development, particularly as children return to schools for in-person learning.[25]

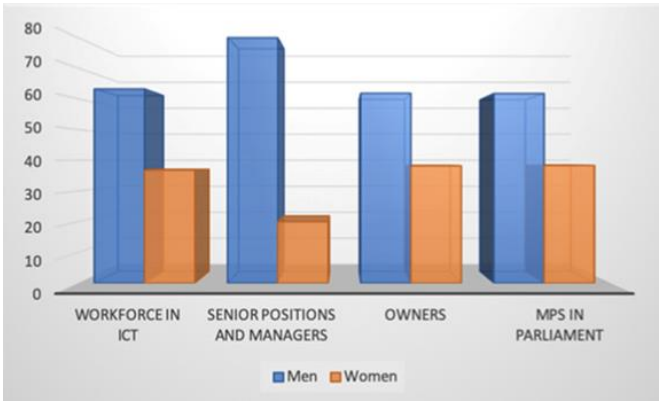
2.2.2 Bridging the gendered digital divide – Women and girls in the ICT and STEAM sectors [26]

Women's access to ICT



Of the total number of Internet users in 2017, 49.4 per cent were women and 50.6 per cent were men. Data by age group show that the percentage of regular users is highest among individuals aged 15-24 years; 95 per cent of women and 100 per cent of men in this age group are regular users. The smallest percentage of regular users is registered in the 55-74 age group. Data also show that the percentage of regular users is highest among populations with tertiary education, in which 96 per cent of women and 94 per cent of men are regular users. The percentage of regular users is smallest in populations with only primary education, where only 51 per cent of women and 57 per cent of men regularly use the Internet. [27]

Women's participation and leadership in ICT



Employment in North Macedonia is characterized by an unfavorable gender structure. The Government adopted a national action plan to implement the Istanbul Convention and a national action plan for gender equality for 2018-2020, which proposed introducing a 50 per cent quota by 2020 to ensure female participation in electoral processes and decision-making. There is a 27 per cent gap between women and men in participation in the labor market.

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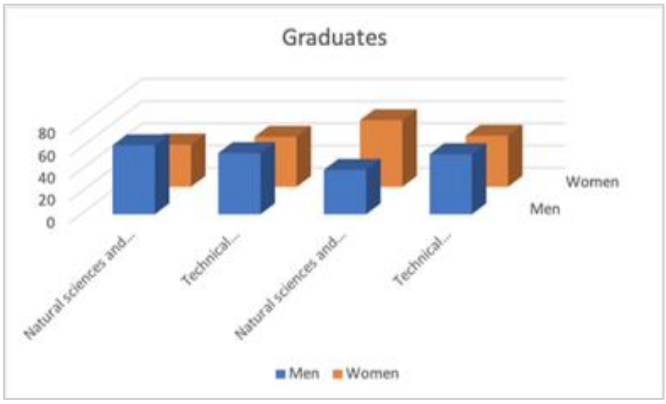
[25] Forthcoming – ITU-UNICEF Report "Connectivity in Education: Status and recent developments from 9 non-EU countries of Europe"

[26] https://www.itu.int/en/myitu/Publications/2021/05/31/10/16/Digitally-empowered-Generation-Equality

[27] ITU-UN Women "Digitally Empowered Generation Equality : Women, Girls and ICT in the context of COVID 19 in selected Western Balkan and Eastern Europe Partnership countries" (2021) : https://www.itu.int/en/myitu/Publications/2021/05/31/10/16/Digitally-empowered-Generation-Equality

This gap is reinforced in the ICT sector, in particular in senior and management positions, which sees a gender ratio of 80 per cent men to 20 per cent women. Women are also severely underrepresented among company owners and in public sector jobs. [28] The recently launched ITU Network of Women seeks to address this gap and empower women to take on leadership roles in their respective organizations.[29]

Women in ICT education



Over the years, there has been an increase in the number of women enrolling in higher education, most notably in the second and third cycles, and in the number of graduates from the first, second and third cycles. The number of women enrolled in and graduating from the first, second and third cycles is generally higher in social sciences, humanities and medical sciences, while for technical and technological sciences, the number of women is lower in comparison with male students. In the country, women are more likely than men to choose general programs or social sciences as their primary field of education. [30]

Looking more closely at numbers in STEM, there is a significant difference in the number of women and men pursuing degrees in STEM as well as a significant gender disparity in those employed in the ICT sector. Women comprise only 27% of the IT workforce, hold only 12% of management level positions and are underrepresented as owners of companies and in public sector jobs. In order to tackle this issue, the government adopted a Convention and a national action plan for gender equality (2018-2020) and established a venture fund of EUR 10 million that includes gender equality as part of its corporate priorities and is mandated to invest in early-stage start-ups, accelerators and other innovative programs. Additionally, support is offered by organizations like the Women in Tech Macedonia Chapter, through programs that seek to educate, equip and empower women and girls with the necessary skills to succeed in STEM careers.[31]

Given the persistence of stereotypes that girls and women encounter, it is no surprise that their self-confidence is affected. According to cross-country surveys, girls may already have lower confidence in

[28] ITU-UN Women "Digitally Empowered Generation Equality: Women, Girls and ICT in the context of COVID 19 in selected Western Balkan and Eastern Europe Partnership countries": https://www.itu.int/en/myitu/Publications/2021/05/31/10/16/Digitally-empowered-Generation-Equality

[29] https://www.itu.int/en/ITU-D/Conferences/WTDC/WTDC21/NoW/Pages/Events/Regional/Europe/2021_01.aspx

[30] ITU-UN Women "Digitally Empowered Generation Equality: Women, Girls and ICT in the context of COVID 19 in selected Western Balkan and Eastern Europe Partnership countries": https://www.itu.int/en/myitu/Publications/2021/05/31/10/16/Digitally-empowered-Generation-Equality

[31] Digitally empowered Generation Equality: Women, girls and ICT in the context of COVID-19 in selected Western Balkan and Eastern Partnership countries, p.32, 46, 75-78

their digital skills than boys by age 15; In fact, where girls are good at both STEM and humanities (i.e. non-STEM subjects), they may choose humanities because they believe it will be easier for them to achieve higher grades. A self-evaluation conducted among secondary school students in North Macedonia showed that, while girls and boys believed that they were equally competent in mathematics and science, boys evaluated themselves much higher than girls in information technology (IT).[32]

The way in which STEM subjects are taught also influences girls' motivations to pursue technology careers later in life and further enriches stereotypes around girls and women in ICT. In North Macedonia, girls tend to see technology as less relevant to their everyday lives and less linked to their interests. For example, whereas video games may be based on competition and destruction; instead, girls appear to be motivated by different types of games based on completion and fantasy. Textbooks and learning materials themselves can also perpetuate or dispel stereotypes. Efforts are being undertaken in the country on this aspect, as textbooks are being updated to include "respect for diversity" (in terms of gender, ethnicity, religion, language, social status, intellectual and physical abilities) within the curricula[33]

ITU's Girls in ICT initiative has been tackling these issues for 10 years. In conjunction with the European Celebration of the 10th Anniversary of Girls in ICTs[34], this year's Girls in ICT Day was also celebrated in North Macedonia.[35]

Good practices in informal ICT education

The Macedonia Chapter of Women in Tech was launched on 25 September 2019. Women in Tech is an international non-profit organization with a double mission: to close the gender gap and to help women embrace technology. The organization focuses on four primary areas that represent a call for action: education, entrepreneurship, events and research. The aim is to educate, equip and empower women and girls with the necessary skills to succeed in STEM career fields in the ICT sector, such as programming, digital marketing and social media. This project provides free programming workshops, mentoring sessions and other educational content. [36]

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[32] ITU-UN Women "Digitally Empowered Generation Equality: Women, Girls and ICT in the context of COVID 19 in selected Western Balkan and Eastern Europe Partnership countries": https://www.itu.int/en/myitu/Publications/2021/05/31/10/16/Digitally-empowered-Generation-Equality

[33] ITU-UN Women 'Digitally Empowered Generation Equality: Women, Girls and ICT in the context of COVID 19 in selected Western Balkan and Eastern Europe Partnership countries": https://www.itu.int/en/myitu/Publications/2021/05/31/10/16/Digitally-empowered-Generation-Equality

[34] https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Pages/Events/2021/GInICT/Default.aspx

[35] https://www.itu.int/net4/ITU-D/CDS/gq/GICT2021/display.asp?ProjectID=1374&Quest=58112

[36] ITU-UN Women "Digitally Empowered Generation Equality: Women, Girls and ICT in the context of COVID 19 in selected Western Balkan and Eastern Europe Partnership countries": https://www.itu.int/en/myitu/Publications/2021/05/31/10/16/Digitally-empowered-Generation-Equality

A bootcamp for first-time women entrepreneurs was also launched as an outgrowth of the Womenpreneur Stories initiative to celebrate successful businesswomen. While it is too early to determine their impact, the increase in programs for women founders is a testament to their growing numbers, as well as an acknowledgement of the challenges that they face within male-dominated founder and investor communities.[37]

Another notable good practice is the launch of a national gender equality index, which allows a comparison of the country's performance with other European countries. Future indices should include meaningful digital access indicators to measure the true state of women's and girls' access to technology.[38]

2.2.3 Digital inclusion and ICT accessibility for persons with disabilities

North Macedonia ratified the Convention on the Rights of Persons with Disabilities (UN CRPD) and its Optional Protocol in 2011.[39] The UNCRPD stipulates (Article 9 - Accessibility) that countries should ensure equal access of persons with disabilities to the physical environment, transportation, information and communications (ICTs), including information and communications technologies and systems. In September 2018, the Committee on the Rights of Persons with Disabilities provided its concluding observations of the situation in North Macedonia, based on the State party report submitted by the Government of North Macedonia. While the Committee noted the country's comprehensive approach to the right to physical access, it is also underlined a lacking legislative framework undergirding accessibility of ICTs and ICTs systems. Hence, the Committee included the following recommendations:

- Review its legislation to provide for the mandatory application of accessibility standards in all areas, including information and communications technologies and systems;
- Ensure that access to buildings, transport, information and communications technologies and systems, other facilities and services open to the public and public institutions and services are available;
- Speed up the adoption of the comprehensive national action plan on implementing accessibility standards, in close consultation with organizations of persons with disabilities, with clearly defined time frames, monitoring and evaluation benchmarks.

North Macedonia has achieved several key milestones in building a legislative framework for digital inclusion and ICT accessibility. The country has adopted the National Strategy on Achieving Equal Rights for the Persons with Disabilities, which among others, emphasizes the need to provide accessible

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[37] ITU-UN Women "Digitally Empowered Generation Equality: Women, Girls and ICT in the context of COVID 19 in selected Western Balkan and Eastern Europe Partnership countries": https://www.itu.int/en/myitu/Publications/2021/05/31/10/16/Digitally-empowered-Generation-Equality

[38] ITU-UN Women "Digitally Empowered Generation Equality: Women, Girls and ICT in the context of COVID 19 in selected Western Balkan and Eastern Europe Partnership countries": https://www.itu.int/en/myitu/Publications/2021/05/31/10/16/Digitally-empowered-Generation-Equality

[39] ITU report on "ICT accessibility assessment for the Europe region", p.70,72

information and enabling communication for persons with disabilities,[40] and the provision of appropriate materials in the educational process depending on the type of disability.[41] In 2018, the country adopted the Public Administration Reform (PAR) Strategy and Action Plan 2018–2022, in which one of its key objectives is to provide public services in a fast, simple and easily accessible way (Specific Objective Number 4).[42] Yet, substantive efforts are required at the country level to meet the requirements of the European Union on the European Accessibility Act.

While the government plays a major role, non-government organizations and development partners are the primary catalysts for the improvement of ICT accessibility. Among successful initiatives implemented with their support are: e-accessible education[43], active inclusion in mainstream schools[44], and collaboration among museums in the Balkans to develop accessibility[45].

Text to Speech Synthesis software for the Macedonian and Albanian languages has been developed by UNDP and Ministry of Labor in partnership with the National Association of Blind, to help blind people, people with visual impairments, persons with dyslexia and learning difficulties supporting their independent functioning in the society. First ever developed TSS software for the Macedonian language with the symbolic name of Kiko (Jul '21), is available for android and in desktop version. The app is free and accessible in Macedonian, while its Albanian version is under development and will be available in September 2021.

Another initiative to be implemented by the end of 2021, aims to offer reliable information and tools for sexuality education that meet the needs of children and youth with autism spectrum disorder. Following the motto of "leaving no one behind," UNFPA North Macedonia is developing a "Digital toolkit"[46] with customized and highly visual stories for Comprehensive Sexuality Education for children and youth with autism spectrum disorder. The core elements of the toolkit, including the content, text and illustration and core features and functionalities of the platform, were codesigned with parents, caregivers and professionals.[47]

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[40] The UNCRPD stipulates (Art. 21, para 1 (e)) that countries should recognize (and promote the use of) sign languages. Only a few European countries have recognized sign languages in their constitutions as mother-tongue languages of deaf citizens. While this is yet to be done in North Macedonia, the government have passed laws referring directly or indirectly to sign languages of deaf citizens and continued to adopt laws and strategies aiming to ensure access to ICTs for all persons with disabilities.

[41] Despite the strategy acknowledging the need to provide accessible educational materials, the country has yet signed/ratified the Marrakesh Treaty to Facilitate Access to Published Works for Persons Who Are Blind, Visually Impaired, or Otherwise Print Disabled.

[42] https://joinup.ec.europa.eu/sites/default/files/inline-files/Digital_Public_Administration_Factsheets_North_Macedonia_vFINAL.pdf

[43] https://zeroproject.org/practice/e-accessible-education-in-macedonia-and-serbia/

[44] https://zeroproject.org/practice/macedonia-open-the-windows-2/

[45] https://zeroproject.org/practice/pra181439bih-factsheet/

[46] https://www.youtube.com/watch?v=R5ELFUyXr20

[47] https://www.youtube.com/watch?v=dxnIa8xqBqE

ITU is committed to advancing digital accessibility. Accessibility is not only embedded in the Union's strategic goals and targets, but, in 2018, ITU Member States affirmed that enabling environments ensuring accessible ICTs for persons with disabilities should be established in all countries by 2023.[48] The ITU Office for Europe actively collaborates with partner organizations to foster enabling environments, ensuring accessible ICTs for persons with disabilities and inclusive digital society in the region. The efforts to promote ICTs accessibility consist of the following tracks:

- Annual ITU-EC Forum on Accessible Europe: ICT for All;
- Regional Competition: Innovative Digital Solutions for Accessible Europe;
- ICT Accessibility Assessment for Europe Region;
- Technical Assessment in Enhancing ICTs Accessibility at a country level;
- Capacity building in ICT Accessibility.

2.2.4 Digital access and inclusion of refugees, asylum seekers and stateless persons

Refugees, asylum seekers and stateless persons are among the groups with the greatest risk of being left behind in North Macedonia, as outlined by the UNSDCF.[49] They often have multiple vulnerabilities, many lacking accesses to basic rights, including, inter alia, due to lack of documentation or documentation not compatible to the requirements in the country (e.g., a personal identification number is not issued for asylum-seekers). Displaced populations have the right, and the choice, to be part of a connected society, and to have access to technology that enables them to build better futures for themselves. Connectivity and digital inclusion are essential for self-reliance and positive change for these groups.

Refugees, asylum seekers and stateless persons have not been included in the various national assessment on digital inclusion. UNHCR and its partners in the field have observed the following:

1) Arriving asylum seekers and refugees in the country rely almost exclusively on smartphones to maintain **essential communication and orientation.**
2) **Transit and reception centers** hosting asylum seekers provide free Wi-Fi connectivity. However, the transit centers (Tabanovce and Vinojug) still rely on donors for the provision of this service.
3) **Regulatory barriers and restrictions:** mobile and fixed Internet connectivity are conditioned by proof of identity through an ID number. Asylum seekers and stateless persons do not have an ID number, or an ID, which results in limited access to SIM cards and mobile financial services.
4) **Digitalization of asylum proceedings.** During the Covid-19 emergency, asylum authorities were among the first in the region to start with online registration of asylum applications and conducting asylum interviews. There is ongoing interest in the digitalization of the asylum proceedings, in particular for the use of online interpretation in rare foreign languages for which interpreters are not available in the country.

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[48] ITU Strategic Goal 2 – Inclusiveness, Target 2.9.

[49] Republic of North Macedonia and United Nations Sustainable Development Cooperation Framework (UNSDCF) 20 October 2020.

5) All persons under subsidiary protection and more than one third of asylum seekers in North Macedonia are women and children, including unaccompanied and separate minors. Therefore, it is crucial to **sensitize digital services** to the needs of these groups.
6) While refugee and asylum seekers have the right to access services according to the national legislation, **intersecting barriers related to language** (online services are available in Macedonian and occasionally in English) mean that they are deprived of effective access to rights and services (access to information, online applications for rights and documents, digital education and others).
7) Stateless populations are at risk of poverty, have no legal income and have low digital literacy making them among the **most vulnerable populations in this context.** Digital exclusion further deepens the vulnerability as they are effectively cut off from public calls for ad-hoc registration of stateless persons, or forms of public assistance and subsidies which are increasingly published exclusively online.

2.2.5 Building trust and confidence in the use of ICTs for children and youth

Recently, the Government has adopted a strategy to prevent violence against children and protect children from all forms of violence for 2020-2025 with an accompanying action plan for 2020-2022. With respect to Child Online Protection, North Macedonia is a member of Lanzarote Convention's "We protect" model, and it has a National Strategy on prevention and protection of children against violence. In order to raise awareness and equip citizens with the right knowledge, the Faculty of Computer Science and Engineering annually organizes the Safer Internet Day. Yet, no data is available on a national Safer Internet Centre in the Republic of North Macedonia.

In parallel to these annual events, a series of notable initiatives have been undertaken by several national stakeholders. The "Privacy Lessons" project for example seeks to bring the problems of data protection closer to high school students by providing guidelines on the secure use of social networks, preventing hate speech etc. The project has been delivered in 21 schools and was coordinated[50]

The Metamorphosis Foundation is another important stakeholder active in the field of child online protection, including its guide for parents[51] published in 2015. There has also been research and analysis[52] through a questionnaire for high school children in the city of Skopje. In 2019, in cooperation with the Ministry of Information Society and Administration (MISA) and the Ministry of Education, the Metamorphosis Foundation developed educational content for children, parents and teachers and organized one-day educational events of parallel workshops with all three target groups.[53] This event helped to implement the important youth component of the National Strategy for Cyber Security 2018-2022.

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[50] https://dzlp.mk/en/node/3060

[51] https://dzlp.mk/sites/default/files/u1002/Vodic%20za%20roditeli.pdf

[52] metamorphosis.org

[53] https://metamorphosis.org.mk/aktivnosti_arhiva/metamorfozis-del-od-obukata-za-sajber-bezbednost-za-uchenici-nastaven-kadar-i-roditeli/

In its strategy for 2019-2023, the Metamorphosis Foundation gives particular emphasis to cybersecurity as part of its Human Rights Online Program, aiming to help communities, including young people and children. Such channels for reporting computer-related or online incidents and crimes include: (1) every police station in person or via phone, (2) to the Department of Cybercrime and Digital Forensics Unit at the Ministry of Interior, and (3) to the Directorate of Personal Data Protection in the case of data abuse. The Directorate website informs citizens of their rights, such as making a "request for confirming violation of the right for personal data protection".[54] The Ministry of Interior also offers direct phone numbers for citizens to report any computer crime directly to the Department of Cybercrime and Digital Forensics Unit and also to any police station. The ministry has established the Red Button[55] service, whereby citizens can report online content related to child sexual abuse, hate speech online, and also report calls for violence. Also, there is the possibility of reporting online child abuse to the ministry via email. The Government of North Macedonia is supporting a website[56] aimed at educating and promoting protection software for safe and responsible use of the Internet.[57]

These efforts can benefit from better coordination to ensure wider impact. While there are some activities on the protection of children online, there needs to be a significant shift in the size and organizational capacity of activities aimed at raising awareness and education amongst children, parents and teachers. While some of the activities are aimed at raising awareness and enhancing the level of knowledge, this could be improved by adding more topics and increasing the number of such activities. Internet stakeholders should take a more active part in promoting the tools and promotional activities already being carried out. Governmental support and further involvement would help, especially for the creation of a national Safer Internet Centre. A multi-stakeholder approach stands up best to the challenges of child online protection in the digital world, with stakeholders actively contributing and engaging with each other to create a more coordinated approach to the challenges of child online protection. There are examples of single activities and projects, such as raising awareness about hate speech online or producing printed educational material. All such activities should be commended, but there remains a need for a much more robust, organized and guided approach to issues and concerns of online safety in North Macedonia.

Through its COP Guidelines, ITU is supporting countries in Europe and beyond to adopt a strategic and holistic approach to child online protection that brings all components together at the country level, as well as to provide expert guidance on the various dimensions of COP, including for children, parents and educators, industry and policymakers.[58]

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[54] https://dzlp.mk/en/node/2191

[55] http://redbutton.mvr.gov.mk/prijavi.aspx

[56] https://surfajbezbedno.mk/

[57] ITU Report on "Status of national child online protection ecosystems in South Eastern Europe", p.15-17

[58] https://www.itu-cop-guidelines.com/

2.3 Building block 3 - Government centric digital transformation

One of the most important triggers of the digital transformation at the national level is the government's approach to ICTs for governance, administrative purposes and the delivery of public services online.

This section will look at (i) the general approach to e-government in North Macedonia and (ii) an example of the specific approach used with regards to the use of ICTs in the education system from an administrative and service delivery perspective.

2.3.1 E-government policy

The Government Work Program 2017–2020 set the strategic target of creating an efficient, accountable and transparent administration that would provide quality services for the citizens and the business sector and will protect their rights.

To advance on this strategic target, the Ministry of Information Society and Administration (MISA), together with the relevant stakeholders, prepared the Public Administration Reform (PAR) Strategy and Action Plan 2018–2022. One of the four PAR priority areas is "service delivery and ICT support to the administration". To achieve this goal, measures and activities are undertaken to access resources for increasing the quality and availability of public services and provide greater access to eServices as a result.

In light of the above, the Ministry of Information Society and Administration launched its Strategic Plan for 2019– 2021 covering two program areas. The first program area is public administration reform, covering: capacity building and introduction of a modern system for human resource management; professional development of the administration; and regulatory reform. The second area is Information society, covering: infrastructure and support; eServices, eCitizens, and single-point-of-services; and open data.

In 2019, the country enhanced its legal framework by adopting three laws that set the bases for implementation and promotion of digital services for citizens, businesses and government that include:

- The Law on Central Population Register, which regulates the structure, content and exchange of information between of the Central Population Register and the competent bodies and entities.
- The Law on Electronic Management and Electronic Services, which regulates the operation of electronic exchange of data and documents, as well as the functioning of the National eServices Portal, the Service Catalogue, the Single Point of Service and Interoperability.
- The Law on Electronic Documents, Electronic Identification and Trust Services, which complements the above with regulation on the creation, preservation and processing of electronic documents, electronic identification and trust services.[59]

[59] European Commission Digital Public Administration Factsheet 2020 on Republic of North Macedonia, p.9

Additional enablers of the digital transformation of the government are the Law on Personal Data Protection, Law on Public Sector Data Use, Law on Free Access to Public Information and the Law on the Security of Network and Information Systems.

With these efforts, North Macedonia ranked 72 globally on the 2020 e-Government Development Index. Despite a significant improvement of 7 ranking positions compared to 2018, this is still low.[60]

As evidence of the public administration modernization, the national eServices portal was launched in 2019. It currently offers Single-Sign-On access to 151 e-services, information on 789 administrative services and offer data from 1288 public institutions.[61] In order to bridge the gap between public authorities and citizens, several initiatives were launched such as the Open Data Portal, the ePersonal Income Tax Portal, the Open Finance Portal, and the ePension Portal, among others.[62]

Transformation of the way the Employment Service Agency (ESA) operates can serve as another example of modernization of services and the way they are delivered. Development and implementation of an IT system for establishing alternative, web-based access to employment measures and services of the ESA made possible the online provision of all services for the unemployed and the employers, according to the Operational Employment Plan for 2021. Besides, the Document Management System enables the transformation of the archive system of the ESA into a fully digital format.

Besides, digital tools are widely used to support the transformation of services toward a self-government system that includes people in policymaking, offers the possibility to track public revenue and expenditures, and enables citizen participation in developing and monitoring local budgets.[63]

As the PAR is one of the key priorities of the Ministry of Information Society and Administration, other state authorities at the national and local level are supporting the transformation through the implementation of sectorial ICT and eGovernment projects.

Among them is the “Occupational Outlook”, the web platform launched by the Macedonian Ministry of Labor and Social Policy together with the ILO, which is designed to inform young people about the occupations and sectors that offer sound career prospects in the medium term. “Occupational Outlook”[64] currently offers insight into 60 occupations and by the end of 2021 it is planned to reach a number of 72 occupations covered in the platform. For each profession, the Outlook provides a job

[60] https://publicadministration.un.org/egovkb/Portals/egovkb/Documents/un/2020-Survey/2020%20UN%20E-Government%20Survey%20(Full%20Report).pdf

[61] https://uslugi.gov.mk

[62] European Commission Digital Public Administration Factsheet 2020 on Republic of North Macedonia, p.29-33

[63] https://www.mk.undp.org/content/north-macedonia/en/home/blog/digitalization-and-corruption-prevention.html

[64] https://zanimanja.mk/

description, conditions of work (pay, work schedule, work environment, work hazards); education, training and work experience requirements, and job prospects.[65]

This sectorial ICT and eGovernment projects implementation process is monitored by the National ICT council that consists of the relevant ministers, thereby ensuring the coherence of strategic-level decisions across state institutions. In this process, various tools and solutions were implemented to equip authorities with instruments to access structured data, ensure the data exchange, facilitate knowledge management and even empower cross-border cooperation.[66]

2.3.2 ICTs and the education system

In the context of e-government, e-administration and e-delivery of government services are fundamental enablers of digital transformation. Looking at the education sector from a perspective of the governance of the education system and the delivery of education, and beyond the actual content delivered (i.e. curricula including digital skills), proves that ICTs are playing an even more essential role.

The newly ITU-UNICEF report on "Connectivity in Education: Status and recent developments in 9 non-EU countries of Europe region" published in October 2021[67] looks at the two dimensions of ICTs for e-government of education and ICTs as a medium for delivering remote education. With regards to North Macedonia, collection, the Ministry of Education and Science has developed and implemented an Education Management Information System (EMIS) in 2010. However, an OECD-led study argues that the major factor impeding evidence-based policymaking in North Macedonia is underdeveloped and under-utilized data systems. Central databases for school inspection and student examination results, for example, are not integrated with EMIS and data are collected multiple times from schools by different parts of the ministry. Data are also not comparable across the sector, for example, as the State Statistical Office and EMIS use different definitions for key indicators like school drop-out.

When it comes to the impact of the pandemic in the delivery of education, North Macedonia was hit hard compared to the countries in the region. During lockdown in the spring of 2020, COVID-19 related school closures affected approximately 360,000 students in North Macedonia.[68] According to the ITU-UNICEF report, the Republic of North Macedonia managed to implement a quick response and started to offer many options of live broadcast and online lessons tailored to primary and secondary institutions across the country in a variety of topics and subjects. As part of UNICEF's support under the #Inno4Edu initiative, which aims at "setting up an environment for quality teaching and learning through co-creation and innovation," two projects stood out from the early phases of the COVID-response collaboration in North Macedonia: TV-Classroom and E-classroom. The E-classroom platform can be accessed by up to 100,000 users at the same time and is being improved continuously in response to feedback from students, parents and educators. By the end of 2020, the platform hosted a professional

[65] https://www.ilo.org/budapest/whats-new/WCMS_625307/lang--en/index.htm
[66] European Commission Digital Public Administration Factsheet 2020 on Republic of North Macedonia, p.24-37
[67] https://www.itu.int/pub/D-PHCB-CONN_EDUC-2021
[68] https://www.itu.int/en/myitu/Publications/2021/05/31/10/16/Digitally-empowered-Generation-Equality

development community of 22,700 educators who both benefit from and participate in the creation of resources, webinars and trainings.

The Ministry of Education and Science has established a daily monitoring system to track teaching modalities, challenges in access to and quality of distance learning, and infections among children and staff. This has supported advocacy to keep schools open by demonstrating a low rate of COVID-19 transmission in schools in 2020.

Response to the COVID-19 pandemic prompted many countries to implement emergency remote education measures. The Inclusive Education, Learning & Distance Learning in North Macedonia publication, commissioned by UNDP, tackles the digital divide and provides arguments that there is a significant correlation between the difficulties in accessing the internet and social inequities.

To address some of these inequalities, UNDP initiated the #Edu4All crowdfunding campaign to give a chance to at-risk children to learn and gain new skills while staying off the streets. With the funds mobilized from this crowdfunding campaign, the Shuto Orizari Center for daily support for at-risk children will be equipped with computers and other IT equipment that will help at-risk children to stay on track with their educational needs and learn new skills. It's open till the end of the summer of '21.[69]

2.4 Building block 4 - Sector-centric digital transformation

Having addressed the digital transformation dimensions of infrastructure, people-centric and government-centric approaches, this section will utilize the critical lens of sector-centric digital transformation, analyzing the specific sectors which are affected by, and which dually enable, increasing levels of digital transformation in the Republic of North Macedonia.

This section will address (i) digital agriculture as a key productive sector in North Macedonia, (ii) Digital health and e-health services and (iii) the role of SMEs in fostering digital transformation.

2.4.1 Digital agriculture

Agriculture and food production play a vital role in the North Macedonian economy, accounting for around 7-8 per cent of GDP and employing more than one-sixth of the national workforce. Because of the highly fragmented farm structure – each farm is smaller than two hectares, on average – farms are less productive and competitive than those in other countries in Europe. Small-scale farmers are responsible for about 87 per cent of the country's total agricultural production value. Arable agricultural land totals 1,261,000 hectares, or 50.1 per cent of the total territory.

From a regulatory standpoint, since receiving the status of European Union candidate country in 2005, North Macedonia has been working to bring its national agricultural policy in line with the EU Common Agricultural Policy (CAP). Thus, the Law on Agriculture and Rural Development (effective from 2008 and serving as the current legal framework for the country's agricultural policy) represents a gradual

[69] https://give.undp.org/campaign/lets-create-a-better-future-for-the-education-of-at-risk-children-in-north-macedonia/c342505

transition to the CAP and includes two parts – one regulating agricultural markets and the other for rural development. In June 2018, the European Commission published its new legislative proposals on the future of CAP. The three proposals are: the CAP Strategic Plan Regulation on support for CAP strategic plans; the CAP Horizontal Regulation on financing, managing, and monitoring the CAP; and the Amending Regulation on the single common market organization (CMO). North Macedonia is expected to integrate these proposals into the national legislative framework to further align with CAP regulation.

As of April 2021, North Macedonia remains moderately prepared in agriculture and rural development. Good progress has been made in implementing the Instrument for Pre-Accession Assistance for Rural Development (IPARD) II, constituting the second legal stage of activation of the EU instrument for pre-accession assistance. The same can be stated for the Farm Accountancy Data Network (FADN), an important EU informative source for understanding the impact of measures taken under the Common Agricultural Policy, as well as for monitoring farms' income and business activities. The country should strengthen the capacity of the national paying agency, particularly with respect to IPARD. North Macedonia also needs to work on the alignment with the EU acquis concerning common market organization.

To better implement policy, the government provided support to industry by introducing the Integrated Administration and Control System in 2007, including the Single Registry of Agricultural Holdings, and the Land Parcel Identification System (LPIS) to improve farming. This and several other issues related to e-agriculture are covered in the General Agricultural Strategy developed by the Ministry of Agriculture, Forestry and Water Economy. As a result, some financial support has been provided to farmers who have invested in ICT-related technologies.

Besides conventional and broadly accepted digital tools such as radio and television (98 per cent), farmers have significant know-how when it comes to using ICT devices such as smartphones (55 per cent), computers (70 per cent) and the Internet (60 per cent) – a good indication that there is a sound basis for the introduction of digital technologies in agriculture. On the other hand, farmers have little awareness or knowledge about more advanced technologies based on ICTs, such as automated systems, GPS or GIS systems, and other tools for precision agriculture. In addition, while farmers are moderately aware of the significance of conventional ICTs (television, radio, mobile phones) for business results, they have little or moderate awareness of the impact of smartphones on agribusiness, even though the devices are widely used in rural areas. More capacity building support may be needed to ensure a digital ecosystem supporting this sector.

The European Commission expects North Macedonia to finalize the national Farm Accountancy Data Network legal and procedural alignment with the acquis, and to have improved data quality and widened data use for policy and research purposes. In this context, concerning the LPIS, new orthophoto maps have been produced and agricultural land is being digitized. However, the cadastral data records are still used as references for area-based payments, as the LPIS and claim systems are not yet fully connected. On a similar front, designing a state-of-the-art forest monitoring system tailored to the country’s needs and conditions has been the focus of a two-year project run by FAO and the North

Macedonian Ministry of Agriculture, Forestry and Water Economy. A remote sensing survey has been carried out using high-resolution satellite imagery, to generate information on land use and changes.

Another project led by FAO, "Land Resources Information Management Systems (LRIMS)," is a data management and analysis system that integrates various functionalities and methodologies into one processing environment. LRIMS offers a suite of information management and analysis tools organized into a toolbox; provides access to organizational data and metadata; contains query, analysis and map-building functions that allow standardized analysis, monitoring and forecasting; and enables assessments of the physical/socio-economic conditions of the land together with evaluations of the benefits and constraints of different options by simulating various scenarios. The project has also led to the development of a web platform[70] hosting a wealth of content on agri-environmental indicators in digital spatial format, including training materials. The platform provides open access to digital maps on evapotranspiration, climate, yield suitability projections and more; all can be viewed on the website and downloaded for further processing and analysis. The country's Soil Information System (MASIS) was launched in 2015. It was developed with support from FAO and its Global Soil Partnership. Such FAO projects contribute to fostering value chain digitalization and growth.[71]

In continuation of this work, as part of FAO's global multi trust fund project "Sustainable productivity growth in agriculture" the organization is currently supporting the Ministry of Agriculture, Forestry and Water Economy (MAFWE) to integrate the LRIMS system into the global EarthMap tool (www.earthmap.org). This tool serves for quick historical environmental and climate analysis, which is based on Google Earth Engine and developed within FAO's Open Foris Initiative with the support of the Government of Germany through The International Climate Initiative (IKI) from the Federal Ministry of the Environment, Nature Conservation and Nuclear Safety. As part of this tool, North Macedonia will be one of the first countries to fully integrate the majority of its national agro-ecological spatial information under a dedicate sub-domain in the tool. Furthermore, as part of the work under this project, the organization is working on developing a web/mobile data platform or tool that will integrate data collection and environmental spatial information for broad access by national stakeholders and in particular farmers. This work is ongoing and it encompasses the potential introduction of Agriculture Knowledge Information systems as part of the newly developed app/tool and the possibility of integrating market information data as well. The initial results and products of this project are expected to be developed by the end of 2021 when more information will be available.

In parallel FAO has been providing continued support to the national Hydro Meteorology Service (HMS) to improve its services in Agrometeorology as a key element of building climate-resilient agriculture. As part of the "Reducing Vulnerability of Agriculture to Climate Change" three states of the art automated

[70] www.agroekologija.mk

[71] ITU and FAO report on Status of Digital Agriculture in 18 countries of Europe and Central Asia, p.36-39 http://www.fao.org/publications/card/en/c/CA9578EN/

weather stations were installed in the country and a new platform "Agrometeo[72]" was introduced, that provides agrometeorological information, frost and pest information and warning. In continued cooperation with FAO, the HMS is now expanding and improving the 'agrometeo' platform under the "Increased resilience of agriculture sector through the promotion of climate-smart agriculture practices". While under the aforementioned global project in continued cooperation with the HMS, phenological data of the HMS are being digitized and geospatial models on phenology for grape are also being developed in cooperation with the Council for Agricultural Research and Economics of Italy (CREA).

Furthermore, as part of FAO's regional technical cooperation, the ongoing project "Strengthening Capacity in Price and Market Information Systems and Policy Monitoring in Response to COVID-19 and Other Shocks" is working closely with MAFWE to modernize the national agriculture market price information system. Pending on the technical capacity, and limitations of the existing MAFWE IT infrastructure and policy system, FAO is supporting the ministry to integrate the national data into a cloud-based solution as part of the FAO Global Information and Early Warning System[73] (GIEWS). Specifically, ongoing work is taking place to provide the country with a dedicated cloud-based national version of FAO's Global Food Price Monitoring and Analysis – FPMA, which will advance the existing agriculture price market information service in the country.

2.4.2 Digital health

With the recognition of health as a fundamental human right, North Macedonia set out to develop a strategy that allows affordable and quality healthcare for all citizens. Health Strategy 2020 sought the development of several enablers guided by a strategic vision to improve the treatment of both non-communicable and communicable diseases. North Macedonia developed an enabling health information system to support this vision. The MojTermin (My Time) system improved patient management for healthcare with novel health dashboards, enhanced patient experience and follow up with a booking system, as well as valued e-services. This strategy has come to term, but efforts are now underway to prepare the new National Health Strategy 2030. The new strategy aims to modernize the Health Care System, and this presents an opportunity for the country to adopt best practices in e-health.[74]

In 2014, North Macedonia was ranked 16th in the Euro Health Consumer Index because it was an early leader with electronic booking technology for the sector with its MojTermin system. Citizen access to health services improved with the deployment of electronic booking of appointments, electronic health card system, e-services platform for insured citizens, e-receipt service, video-communication stations for the deaf and hearing-impaired, and the use of telemedicine in areas like mental health.[75] Despite the many efforts to embrace digital technology in healthcare, the country had lost competitiveness in the

[72] http://agrometeo.mk/
[73] http://www.fao.org/giews/en/
[74] https://sustainabledevelopment.un.org/content/documents/26388VNR_2020_Macedonia_Report.pdf
[75] http://fzo.org.mk

sector by 2018 as it ranked 25th in the same index.[76] Therefore, more actions that engage the ICT innovation ecosystem will be needed in order to regain competitiveness.

2.4.3 The role of SMEs

SMEs are recognized as drivers of the country's transformation. They account for 99.8% of all businesses, employ 76.6% of the workforce and add an estimated two-thirds of the country's total annual value-added, a proportion similar to the EU average. The economy continues to offer a business environment receptive to SME needs but competition from SMEs in the informal economy and access to finance are seen as a major obstacle to doing business for regular companies in the formal economy.[77]

Even though the ICT is one of the fastest growing SME sectors, the absorption of technology by SMEs from other sectors remains low. For example, North Macedonia has one of the lowest shares in the region of SMEs selling and purchasing online. Only 3% of SMEs sell online, the lowest percentage in the region and well below the EU average of 18%.[78]

To help improve SMEs competitiveness, the government enacted the Strategy on Competitive SME's driving inclusive economic growth 2018-2023, which establishes a framework for public, private and civil society actors to collaborate in the support of SME development and innovation. One of the three strategic pillars of the strategy is dedicated to dynamic entrepreneurship and innovation ecosystem.

A particular focus will be on the groups it seeks to support like: high-growth-oriented SMEs, SMEs in high-growth sectors and value chains, highly innovative SMEs, and women-owned and youth-owned SMEs.[79]

Given its ambitious objectives and broad action areas, the effective implementation of the SME strategy relies on a strong coordination mechanism with a leading role offered to the Agency for Promotion of Entrepreneurship. The Agency serves as an intermediary between policy creators and SMEs, but due to the crosscutting nature of innovation, the responsibilities are also split with several institutions including the Ministry of Education and Science and the Ministry of Economy.

SMEs platform bizz4all has been developed during the Covid-19 crisis. It combines interventions offered by the Government and other financial instruments open to the private sector, to ensure access to services as well as help companies sustain their workplaces. Features of the platform allow users to find a series of simple and useful basic business tips & tricks, up-to-date information on available financial mechanisms, as well as free coaching and mentoring services. It also allows them to download short brochures prepared for most influenced sectors, with some concrete steps for working online, retaining customers and remaining relevant.

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[76] https://healthpowerhouse.com/media/EHCI-2018/EHCI-2018-report.pdf

[77] EBRD – North Macedonia Diagnostics 2019 – Assessing Progress and Challenges in Developing a Sustainable Market Economy;

[78] https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/sba-fs-2019_north-macedonia.pdf

[79] National Small and Medium Enterprise Strategy (2018-2023)

Currently, a range of initiatives is available to upgrade the skills of aspiring entrepreneurs, support the transformation of business ideas into start-ups, and promote the growth of Startups into SMEs. These include innovation fund, technological development support, and a range of incubators and accelerators such as YES Foundation's business incubator, South East European University TechPark Incubator, CEED Hub and the Centre for Technology Transfer and Innovations, etc.

For example, the Future Skills Training Centre[80] established by UNDP together with the South East European University (SEEU) seeks to operationalize models for the provision of non-formal business-tailored training for future skills, primarily in the construction sector, in renewable energy and textile sectors. The proposed model will constitute an 'entrepreneurial/ technology transfer center'. Selected training in future skills is the result of the assessments done within industries as well as proposed new technologies - based on their potential for transformation and implementation of new approaches to improve sector productivity and green transition. Training will be offered to different audiences i.e. already employed workers as well as the future workforce, i.e. unemployed youth and students. The model Centre will also provide training in "soft" skills alongside most demanded and future-oriented skills to increase the overall employability. The Center is also expected to catalyze dialogue with the Employment Service Agency, companies, and the education sector and develop synergies with the partners. Also, from the regional perspective, the Youth Resource Center[81] (YRC) in the Polog region was established by UNDP in partnership with South East European University and the Municipality of Gostivar. The YRC functions as an innovation hub and resource center for employment and self-employment of young people with focus on future jobs and to offer a missing link to get to needed skills and competences in a labor market. It works on development of entrepreneurial services at an earlier age and builds capacities for business management, development of start-up businesses and support for local businesses growth and development. Bringing together key stakeholders in the community, YRC makes available a broad range of services like career counselling and talent management, as well as services for the private sector. In 2020/2021, over 50 promotional and informational events and trainings were organized, and more than 2000 students were directly contacted and introduced to the job opportunities and trained for different skills.

2.5 Building block 5 - Digital centric innovation ecosystem

Digital innovation is both an enabler of digital transformation in all dimensions addressed above and also a measure of the robustness of digital development at the country level. A good level of digital innovation in a given country also underpins endogenous digital development, rather than development that depends on foreign markets.

[80] Skills4future.mk
[81] https://ican.mk

This section addresses the importance of innovation ecosystems as local catalyzers of creativity in the use of digital technologies for business.

2.5.1 Digital innovation ecosystem

North Macedonia ranks above average on key international rankings on entrepreneurship, innovation and technology. The Global Innovation Index (2020) ranks the country 57th out of 131 countries, and the Global Entrepreneurship Index (2018) 66th out of 137 countries. However, these performances are not translated into similar competitiveness for the country as North Macedonia only ranks 82nd out of 141 countries in the Global Competitiveness Index (2019).[82]

The National Innovation Strategy (2012-2020) sought to build an effective national innovation system. This strategy was complemented by existing strategies, policies and programs such as: 1) Strategy for Industrial Policy 2009-2020; 2) Competitiveness Strategy and Action Plan 2016-2020; 3) Master Plan on Competitiveness ; 4) National Economic Reform Program 2015-2017; 5) Entrepreneurial Learning Strategy 2014-2020; 6) Program for Promotion and Support of Techno- logical Development 2012-2015; 7) National Strategy for Entrepreneurial Learning 2014-2020; and 8) other current government programs and related initiatives. Although the Nationwide Innovation Strategy was adopted, its implementation lagged. Both the Strategy itself and the complementing documents/programs need revision in terms of timeline, as well as precise action plans and metrics, in order to ensure more effective implementation going into the new decade.

Across the innovation ecosystem, the National Committee for Innovation and Entrepreneurship (NCIE), established in 2011 by the Prime Minister, is a relevant institution that plays a significant role in the financing and commercializing of innovation. The Committee includes key ministers as well as representatives from academia and the business sector. One output from the Committee was the Law on Innovation Activity, adopted in 2014. It aims to regulate innovation activity by outlining principles and goals, as well as how innovation outcomes are captured, with a scope that includes scientific and research activity, technical and technological knowledge, inventions and innovations, and the establishment, status, competencies, management, governance, funding, supervision of operations, and other issues related to the Fund for Innovation and Technological Development.

The Agency for Promotion of Entrepreneurship, a body of the Ministry of Economy, serves as an intermediary between policy creators and SMEs and is responsible for the implementation of government programs for SMEs. Because policies supporting innovation touch upon several policy areas, including research, education and SME support, the responsibility for innovation policy is split between several institutions, including the Ministry of Education and Science and the Ministry of Economy. On the other hand, the Ministry for Information Society and Public Administration is responsible for overall ICT development, and the Innovation Fund is gradually evolving from a financial facility into an innovation agency. Therefore, a continuous inter-institutional dialogue needs to be established.

[82] Regional Good Practices Accelerating innovation, entrepreneurship and digital transformation —Europe

Furthermore, as policies in these areas ultimately aim to develop a competitive private sector, public-private consultation needs to be developed or strengthened.

Entrepreneurial motivation in North Macedonia is still driven by the need to create new businesses and jobs for young people. However, as a result of early entrepreneurial education and exposure to international success stories, significant numbers of young entrepreneurs are becoming increasingly motivated by opportunity, rather than necessity – a development that creates great potential for innovation. Commercial finance available at lower interest rates, venture capital, equity and mezzanine, business angels, micro-finance and Innovation Fund instruments – should all be made more accessible and more visible in order to catalyze this trend. Innovative SMEs can benefit from the EU funded Horizon 2020 SME instrument, as well as from the COSME program. Growing numbers of networks provide support in terms of soft infrastructure, training, mentoring, coaching and accessing finance. Dozens of entrepreneurial/ innovation/ tech events gather young entrepreneurs together on a regular basis. The country's pool of talent should be better prepared and deployed in the development of original products and solutions. Besides, boosting entrepreneurial spirit among students and professors, as well as incentivizing commercialization of technologies/innovations developed at the universities, has the potential to lead to the establishment of university spin-offs.

Legal and institutional frameworks that foster innovation are in place, but improved inter-governmental coordination and sustainable funding for programs are needed. The survival rate of start-ups in the country is relatively high but scaling up is challenging. The main impediments to innovation include its high cost, limited market size, a low market demand for innovative goods, low levels of cooperation with academia, limited access to funding and low visibility of what funding is available. Sustainable financial support will improve the situation significantly.

North Macedonia has positioned itself well on the ICT outsourcing map. However, current outsourcing capabilities are not necessarily producing much-needed innovation. Public procurement that targets innovative solutions can create a huge B2B market for innovative products and services.[83]

3. Conclusions

This document has provided a framework to unravel digital development that includes five identified dimensions of digital transformation. It has provided information about North Macedonia for each domain, based on the experiences and activities of the ITU and other stakeholders operating in the country and wider region.

This report will serve as a reference for discussions on digital development at the country level as well as stocktaking of relevant activities, initiatives and projects and experiences developed by UN agencies

[83] ITU research for Digital Innovation Profile North Macedonia

involved in digital transformation work in North Macedonia. It will serve as a guide for future dialogue with country stakeholders and pave the way for increasingly fit-for-purpose engagements of the UN system in the country.