

Ukraine

Digital Development Country Profile



SUSTAINABLE DEVELOPMENT GOALS
17 GOALS TO TRANSFORM OUR WORLD



UNITED NATIONS
UKRAINE



With the contribution of:



UNHCR
The UN Refugee Agency

Acknowledgments

This Digital Development Country Profile was developed by the ITU Office for Europe within the framework of the ITU Regional Initiative for Europe on ICT Centric Innovation Ecosystems.

It was elaborated by Ms. Valentina Stadnic, Digital Ecosystem Expert, under the supervision and direction of Mr. Jaroslaw Ponder, Head of ITU Office for Europe. ITU would like to also acknowledge the contribution of Ms. Sarah Delporte, Project Officer, Mr. Julian McNeill, Consultant, Viktoriia Savitska, Consultant, and Ms. Jiae Yang, Junior Policy Analyst, from the ITU Office for Europe.

This Digital Development Country Profile was consulted with the United Nations Country Team and benefited from the contributions of UNDP and UNHCR. In this context, ITU would also like to express sincere gratitude to all the partners that engaged in promoting the "One United Nations" approach by supporting the development of this country profile.

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. Comments and additional inputs should be sent to the ITU Office for Europe (EURregion@itu.int).

All rights reserved. No part of this publication may be reproduced, by any means whatsoever, without the prior written permission of ITU.

Table of Contents

| | |
|--|-----------|
| 1. Introduction | 4 |
| 1.1 Background and context | 4 |
| 1.2 Objective of the Report | 4 |
| 1.3 Methodology | 5 |
| 2. Country Profile – Ukraine | 6 |
| 2.1 Building Block 1 – Meaningful connectivity as foundation for digital transformation | 6 |
| 2.1.1 General overview on connectivity indicators | 6 |
| 2.1.2 Market environment | 8 |
| 2.1.3 Meaningful connectivity in the regional context | 10 |
| 2.1.4 Connectivity policies and regulations | 12 |
| 2.1.5 Next generation infrastructure: 5G Development | 14 |
| 2.1.6 Increasing infrastructure reliability through cybersecurity | 16 |
| 2.2 Building Block 2 – People - centric digital transformation | 18 |
| 2.2.1 Digital skills development | 18 |
| 2.2.2 Bridging the gendered digital divide – Women and girls in the ICT and STEM sectors | 20 |
| 2.2.3 Digital inclusion and ICT accessibility for persons with disabilities | 23 |
| 2.2.4 Building trust and confidence in the use of ICTs for children and youth | 24 |
| 2.3 Building block 3 – Government - centric digital transformation | 26 |
| 2.3.1 E-government policy | 26 |
| 2.3.2 ICTs and the education system | 29 |
| 2.3.3 E-waste management | 31 |
| 2.4 Building block 4 – Sector - centric digital transformation | 33 |
| 2.4.1 Digital agriculture | 33 |
| 2.4.2 Digital health | 36 |
| 2.4.3 The role of SMEs | 38 |
| 2.5 Building block 5 – Digital - centric innovation ecosystem | 40 |
| 2.5.1 Digital innovation ecosystem | 40 |
| 3. Conclusions | 42 |

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 programmes fostering digital inclusion or the development of innovation communities.

Various independent research projects have been carried out by the ITU, UN agencies, and stakeholders in understanding these enablers, their impact on countries, the 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 country's 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 during times of lockdown has 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 comparative 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 specialised 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 country level in Ukraine. 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 country level. Below is a summary of each building block and an 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 catalyse 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 were 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 – Ukraine

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 Ukraine, 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, 70.1% of people in Ukraine used the Internet in 2019. Even though this result is far below the European region average of 83%¹ for the same year, the share of Internet users was steadily growing over the past decade. Over the last five years, the share of internet users has registered an increase of 21.2 percentage points.²

In 2020, Ukraine had 89.1% of the population covered with 3G and 87.2% with 4G/LTE. The number of fixed broadband subscriptions per 100 inhabitants was 18.6, and the number of active mobile-broadband subscriptions per 100 inhabitants was 85.3.

Since 2015, the number of fixed broadband subscriptions per 100 inhabitants experienced an annual growth with a Compound Annual Growth Rate (CAGR) of 9.9%. The greatest increase of this indicator was registered in 2019. It increased from 12.8 in 2018 to 16.2 in 2019. Meanwhile, the number of active mobile-broadband subscriptions per 100 inhabitants has registered during the same period of time an annual growth with a CAGR of 60.5%.³

¹ Measuring digital development, Facts and figures 2020, p.7, retrieved from <https://www.itu.int/en/ITU-D/Statistics/Documents/facts/FactsFigures2020.pdf>

² ITU, World Telecommunication/ICT Indicators Database, August 2021, retrieved from <https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspxhttps://www.itu.int/en/ITU-D/Statistics/Dashboards/Pages/Digital-Development.aspx>

³ ITU, World Telecommunication/ICT Indicators Database, August 2021, retrieved from <https://www.itu.int/en/ITU-D/Statistics/Dashboards/Pages/Digital-Development.aspx>

The pattern of moderate but stable increase observed in the case of the number of fixed broadband subscriptions is repeated by the share of individuals with Internet access at home. In 2019, this share reached 65.8%, experiencing an annual growth with a CAGR of 6.9% since 2015.

Table 1 below summarizes a set of ITU indicators that embed Ukraine in a European (encompassing 46 countries of Europe region⁴) and Global context with regard to telecommunications and Internet indicators. While on many fronts, Ukraine finds itself well above World averages, there remains a non-negligible gap on some key indicators between the country and Europe region averages.

Table 1. Key Telecommunications & Internet Indicators in Ukraine in comparison to the European and World average⁵⁶

| Key Indicator (2020) | Ukraine | Europe | World |
|---|---------|--------|-------|
| Fixed telephone subs per 100 inhabitants | 7.9 | 32.5 | 11.6 |
| Mobile cellular subs per 100 inhabitants | 129.3 | 118.3 | 107 |
| Active mobile broadband per 100 inhabitants | 85.3 | 101.5 | 77.3 |
| 3G coverage (% of population) | 89.1 | 98.4 | 93.6 |
| LTE/WiMAX coverage (% of population) | 87.2 | 98.5 | 85 |
| Individuals using Internet (%) | 70.1* | 84.9 | 59.1 |
| Households with Internet access (%) | 65.8* | 87.6 | 65.7 |
| Fixed broadband subs per 100 inhabitants | 18.6 | 33.8 | 15.8 |
| Fixed broadband subs by speed, % distribution: | | | |
| 256 kbit/s to 2 Mbit/s | 1 | 0.3 | 1.8 |
| 2 to 10 Mbit/s | 4.7 | 6.4 | 6.7 |
| 10 Mbit/s | 94.3 | 92.3 | 89.9 |

* Latest data available for 2019

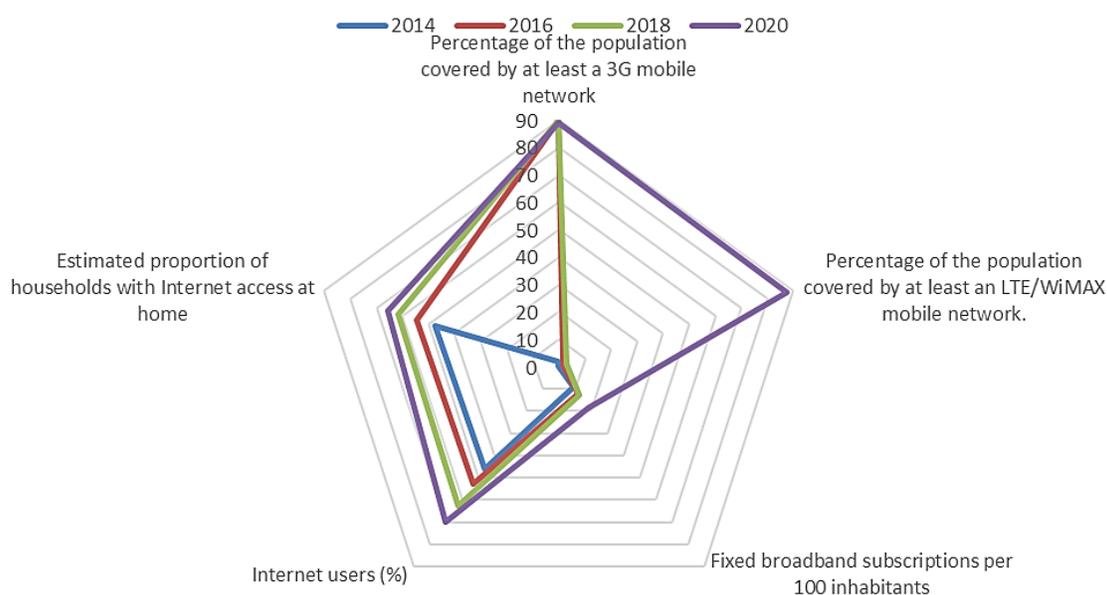
Figure 1 below shows a comparison of basic indicators of ICT-access in Ukraine, during the year 2014, 2016, 2018, and 2020.

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

⁵ ITU, World Telecommunication/ICT Indicators Database, August 2021, retrieved from <https://www.itu.int/en/ITU-D/Statistics/Dashboards/Pages/Digital-Development.aspx>

⁶ ITU global and regional ICT data, retrieved from https://www.itu.int/en/ITU-D/Statistics/Documents/facts/ITU_regional_global_Key_ICT_indicator_aggregates_Oct_2021.xlsx

Figure 1 - The basic indicators of ICT-access and usage in Ukraine⁷



2.1.2 Market environment

According to the ITU “Measuring Information Society Report 2018”, work is underway to develop new legislation in the sector of information and telecommunication technologies in Ukraine. New strategies for digital transformation, big data, blockchain and agile are discussed at state level. Meanwhile, mobile and fixed-broadband markets are developing and operators are eager to introduce new services and attract new subscribers. ⁸ In this context, capital investments of mobile operators in the telecommunication sector in 2020 amounted about UAH 12 billion (approx. EUR 375 million) out of the total amount of over UAH 15 billion (approx. EUR 468 million)⁹.

Despite the negative global economic trends caused by the COVID-19 pandemic, the telecommunications industry increased its revenues. In 2020, the revenues obtained from the service provision amounted to UAH 73,7 billion (approx. EUR 2.3 billion)¹⁰. It increased in 2020 by 10.9% compared to 2019. Five main market trends that characterized this development dynamics were:

- expansion of 4G coverage on the territory of Ukraine with the use of radio frequency bands of 1800 MHz and 2600 MHz;
- reforming and launching 4G networks in the 900 MHz radio frequency band by mobile operators to provide modern telecommunications services in rural areas and on Ukrainian highways;

⁷ ITU, World Telecommunication/ICT Indicators Database, August 2021, retrieved from <https://www.itu.int/en/ITU-D/Statistics/Dashboards/Pages/Digital-Development.aspx>

⁸ ITU, Measuring the Information Society Report 2018 – Volume 2, p. 188, retrieved from <https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2018/MISR-2018-Vol-2-E.pdf>

⁹ The National Bank of Ukraine, exchange rate on 17.01.2022 of EUR 31.989, retrieved from <https://bank.gov.ua/en/markets/exchangerates?date=2022-01-17&period=daily>

¹⁰ The National Bank of Ukraine, exchange rate on 17.01.2022 of EUR 31.989, retrieved from <https://bank.gov.ua/en/markets/exchangerates?date=2022-01-17&period=daily>

- increase in the volume of services and the number of users with Internet access;
- increase in the number of users of modern electronic services, primarily of the government services and in the fields of e-commerce, e-health, and education;
- growing demand for machine-to-machine and Internet of Things services among banks, security service providers, housing and communal service providers, as well as the transport and logistics companies.

In 2020, the largest shares of the revenue were registered by mobile communications - 63.7% and fixed access to the Internet - 18.8%. The revenue from the provision of mobile communication services increased by 12.1% and amounted to UAH 46.9 billion (approx. EUR 1.4 billion). The largest shares of it were from Internet access services - 59.9% and from voice telephony services - 18.1%. Their total share was of 78.0%. Moreover, due to the development of the 4G network, the revenue from provision of mobile Internet access services increased by 18.5% and amounted to UAH 28.1 billion (approx. EUR 0.8 billion).¹¹

Revenues from fixed Internet services increased by 10.9% and amounted to UAH 13.87 billion (approx. EUR 0.4 billion)¹², the share of which had the maximum increase in total telecommunications revenues. It is worth mentioning that the fixed Internet connections in rural areas increased by 36.5%. In such a way, the total number reached 7.8 million points of fixed access to the Internet.

The fixed broadband services are provided using fibre-optic, copper communication lines, coaxial cable, satellite channels and wireless access. In terms of fixed Internet speed, the country ranks 58th in the Speed test Global Index, with 64.33 Mbps registered in December 2020.

At the same time, according to a study conducted by the Ministry of Digital Transformation, more than 57.2% of Ukrainian settlements do not have fibre-optic networks at all, and about 65% of rural settlements are not covered by high-quality broadband. Thus, in 2020, 5.75 million citizens of Ukraine were not connected to a high-quality fixed broadband system.¹³

Moreover, according to the UNHCR survey conducted among communities along the line of conflict, 74 settlements hosting 64300 residents reported having intermittent or no access at all to the mobile network. Internet connection was equally challenging for these communities. During the survey, people reported these limitations as the ones particularly affecting their ability to contact emergency, administrative and social services.¹⁴

¹¹ The National Bank of Ukraine, exchange rate on 17.01.2022 of EUR 31.989, retrieved from <https://bank.gov.ua/en/markets/exchangerates?date=2022-01-17&period=daily>

¹² The National Bank of Ukraine, exchange rate on 17.01.2022 of EUR 31.989, retrieved from <https://bank.gov.ua/en/markets/exchangerates?date=2022-01-17&period=daily>

¹³ https://nkrzi.gov.ua/images/upload/142/9626/Zvit_NKRZI_za_2020.pdf

¹⁴ UNHCR “PROTECTION MONITORING – UKRAINE”, p. 18, retrieved from https://www.unhcr.org/ua/wp-content/uploads/sites/38/2021/11/e-magazin_A4_UNHCR_PMT_Feb-May_2021_%D0%B1%D0%B5%D0%B7_%D0%BF%D0%B5%D1%80%D0%B5%D0%BD%D0%BE%D1%81%D0%B0.pdf

2.1.3 Meaningful connectivity in the regional context

Meaningful connectivity depends on a variety of factors. The most important are availability and affordability as these are also the strongest determinants of another factor of connectivity, uptake. Looking more in-depth at these three dimensions, the ITU report on “The status of connectivity in 9 non-EU countries of Europe region”¹⁵, prepared in the context of the ITU Regional Forum for Europe on Meaningful Connectivity held on 8 and 9 March 2021,¹⁶ gives a retrospective view at how these factors evolved and shows Ukraine’s positioning compared to regional peers.

In terms of *availability of connectivity*, Ukraine witnessed an extension of services, both demographically and geographically, and have scored significant improvements over the past years in two indicators considered for this domain:

- Percentage of the population covered by at least an LTE/WiMAX mobile network: the country is one of the two non – EU countries of the Europe region with less than a 95% coverage rate. Nevertheless, it exhibited extraordinary growth in coverage over the period from 2015 to 2019, departing from no 4G coverage in 2015 and bringing 4G to 78.1% of Ukrainians in 2019.
- The estimated proportion of households with Internet access at home: the availability of Internet at home continues to prove an area of challenge in Ukraine. About 34% of households remained without Internet as of 2019, placing the country among the least advanced regional peers in that year. However, there is a stable increase of the coverage since 2015 with an average yearly growth of 3.9 percentage points. As a result, Ukraine reached in 2019 the share of Internet availability in households of 65.8%, which surpassed the world average of 61.5%, but still has to streamline its efforts to get closer to the EU-27 average of 86.6%.
- Number of fibre connections per 100 inhabitants: Ukraine is the second after Georgia among 9 non-EU countries of the European region in terms of the fibre-to-the-home/building (FTTH/B) subscriptions per 100 inhabitants. Reporting almost 12 FTTH/B subscriptions per 100 inhabitants, it exceeds the EU-27 average of 8.7 for 2019. Besides, the fibre subscriptions as a share of total fixed broadband subscriptions remained higher in the 9 non-EU countries than in the EU-27 for the entire period of 2015-2019.

With regard to the *affordability* dimension, Ukraine provides relatively affordable Internet access. In 2020, the data only mobile broadband basket cost was 1.54% of Gross National Income (GNI) per capita for a monthly allowance of 1.5 Gb, which ranked the country 89th globally. Meanwhile, the country was ranked 56th globally based on the fixed-broadband basket cost of 1.60% of GNI per capita for a 5Gb Internet data cap.¹⁷

¹⁵ ITU, The Status of Connectivity in 9 non-EU countries of Europe region, retrieved from https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Events/2021/Meaningful%20Connectivity/Report%20-%20The%20Status%20of%20Connectivity%20in%209%20non-EU%20countries%20of%20Europe%20region_final_clean.pdf

¹⁶ <https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Pages/Events/2021/MC/Default.aspx>

¹⁷ ITU, Measuring digital development ICT price trends, pp. 68,73, retrieved from https://www.itu.int/en/ITU-D/Statistics/Documents/publications/prices2020/ITU_ICTPriceTrends_2020.pdf

Even though the country achieved the Broadband Commission target of 2% for fixed and mobile data baskets cost, Ukraine is still far from reaching the European countries average of 0.6% of GNI per capita on mobile broadband basket cost, and 1.2% of GNI per capita on fixed-broadband basket cost.¹⁸

Moreover, the in-depth analysis revealed that there is a significant part of the population that could not afford broadband in the Eastern part of Europe. In Ukraine, the share of population who cannot afford any of the baskets reached around 30%.¹⁹

Finally, when it comes to *connectivity uptake*, Ukraine has a weaker position in comparison to regional peers, even though it demonstrated good performance on the *affordability* and *availability* dimensions outlined above:

- Fixed broadband subscriptions per 100 inhabitants: all 9 non-EU countries of Europe region have seen an increase in fixed broadband subscriptions per 100 inhabitants over the period from 2015 to 2019. However, based on 2019 data, Ukraine is ranked on the 8th place among regional peers with 16.2 subscriptions per 100 inhabitants. This indicator is significantly lower than the EU-27 average of 34.3 subscriptions per 100 inhabitants over the same period, leaving room for further improvement.
- Active mobile-broadband subscriptions per 100 inhabitants: between 2015 and 2018, the country exhibited considerable growth in the mobile market, with a connectivity increase of 490.1%. However, it remained the Member State with the lowest number of active mobile-broadband subscriptions as of 2018. Even though, in 2020, the number of active mobile-broadband subscriptions per 100 inhabitants reached 85.3, which represent an increase of 80.7% compared to 2018, this result still falls beneath the European region average of 101.5 subscriptions per 100 inhabitants.
- Estimated proportion of households with a computer: between 2015 and 2018, the average CAGR for the nine countries in consideration was 0.6%. However, Ukraine was among the six of them which demonstrated limited, albeit positive, growth. This stable growth persisted over the following years, so that between 2018 and 2020 the proportion of households with a computer increased by 6.2%.
- Internet users (as % of the population): Europe is the global leader in the proportion of Internet users, and none of the 9 non-EU countries of the Europe region managed to reach, in 2019, the EU-27 average of 84.6%. Even though Ukraine has not reached the EU-27 average, registering in 2019 a share of 70.1% of population using Internet, the annual growth rates between 2015 and 2018 was of 9.4%.

¹⁸ ITU, Measuring digital development ICT price trends, pp. 14,24, retrieved from https://www.itu.int/en/ITU-D/Statistics/Documents/publications/prices2020/ITU_ICTPriceTrends_2020.pdf

¹⁹ ITU, Measuring digital development ICT price trends, pp. 51, retrieved from https://www.itu.int/en/ITU-D/Statistics/Documents/publications/prices2020/ITU_ICTPriceTrends_2020.pdf

2.1.4 Connectivity policies and regulations

The ICT sector development is currently among the top government priorities. The main progresses started in January 2018, when the government and the State Agency for E-Governance of Ukraine published the new “Digital Agenda for Ukraine 2020”. The main pillars of agenda are: i) Telecommunication and ICT infrastructure; ii) Digital skills; III) E-market; iv) Digital governance; v) Innovation and R&D; vi) Trust and cybersecurity; vii) Benefits from ICT for society and the economy.²⁰

To enact its implementation and accelerate the processes, the Cabinet of Ministers created a Coordination Council. It included government officials and an expert group comprised of more than 100 IT experts united under the Ukrainian non-governmental organization the “HiTech Office”. They joined forces to work on the Concept Paper on Digital Society and Digital Economy development and identified the first steps to be taken. As a result of these joint efforts, in January 2018, the Government approved the “Concept Paper of Digital Economy and Digital Society Development in Ukraine for 2018 – 2020”.²¹

This Concept aims to address Ukraine’s challenges, needs and opportunities by implementing the accelerated scenario of digital development which envisages:

- removing legislative, institutional, fiscal and other barriers to the development of the digital economy;
- incentivizing and encouraging business and industry in general to digitize;
- creating demand among citizens for digitalization;
- developing digital infrastructure as a basis for using the benefits of the digital world in everyday life and a platform for achieving economic efficiency;
- developing and deepening of digital competencies of citizens to ensure their readiness to use digital opportunities, as well as to overcome the associated risks;
- developing digital entrepreneurship, creating appropriate (including analogue) infrastructure to support innovation, implementing funding mechanisms, incentives and support.²²

The document also establishes the priority sectors and suggestions for digital development in Ukraine, with a particular focus on bridging the digital divide through the development of digital infrastructures; developing digital competencies; implementing the concept of digital workplaces; digitalizing the country’s economic systems; implementing digital transformation projects; supporting public security,

²⁰ ITU, 5G Implementation in non-EU countries of the Europe Region, p.80, retrieved from <https://www.itu.int/en/myitu/Publications/2021/10/12/12/56/5G-implementation-in-non-European-Union-countries-of-the-Europe-region>

²¹ ITU Report – DIGITAL SKILLS DEVELOPMENT UKRAINE GOOD PRACTICE CASE STUDY, p.9, retrieved from <https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/2021/Digital%20skills%20Development%20-%20Ukraine%20-%20Good%20practice%20case%20study.pdf>

²² <https://zakon.rada.gov.ua/laws/show/67-2018-p#Text>

education, healthcare, tourism, e-democracy, ecology and environmental protection and life of cities; e-payments; and harmonization with European and world initiatives as well as governance.²³

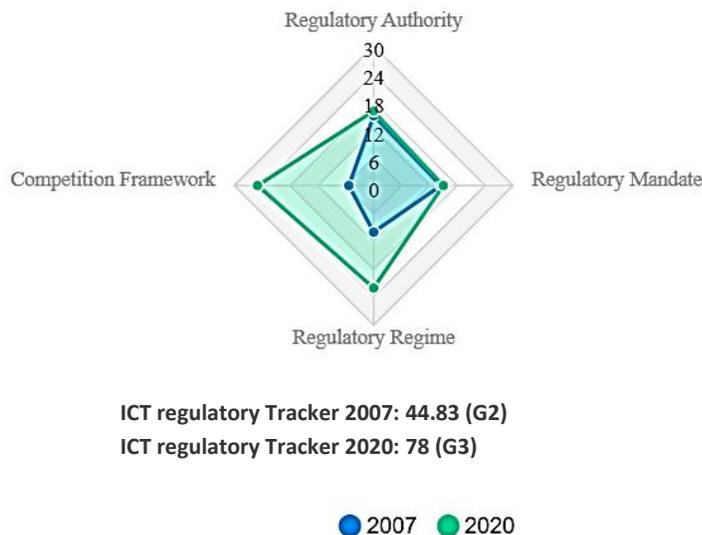
In 2021 Ministry of digital transformation launched the governmental program “Internet-subvention” for fibre networks roll-out in rural areas. The program aimed to encourage fixed broadband operators to connect sparsely populated areas. As a result, 3 thousand villages with 360k households were covered by fibre optic networks.

From a regulatory standpoint, Ukraine currently scores 78 in the ITU ICT Regulatory Tracker²⁴, placing the country at the 41st place among the European countries and at the 92nd place among 193 countries considered for the 2020 ranking. The ITU Tracker pinpoints the changes taking place in the ICT regulatory environment. It 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.

The ICT Regulatory Tracker is composed of 50 indicators grouped into four clusters:

1. Regulatory authority (focusing on the functioning of the separate regulator): Ukraine scores 16 out of 20;
2. Regulatory mandates (who regulates what): Ukraine scores 15 out of 22;
3. Regulatory regime (what regulation exists in major areas): Ukraine scores 22 out of 30;
4. Competition framework for the ICT sector (level of competition in the main market segments): Ukraine scores 25 out of 28.

Figure 2 - ICT Regulatory Tracker - Ukraine



Ukraine is positioned among the group of countries with a *Third-Generation regulatory regime (G3)*. The country reached it only in 2018 and is among the 8.9% of European region countries with the G3 regime. The country’s overall result is significantly lower than the Europe region average score of 86.9, but is slightly above the world one of 71,9.

Recently, ITU launched a reviewed Fifth Generation of regulation benchmark, focused on collaboration among different

²³ ITU, 5G Implementation in non-EU countries of the Europe Region, p.80, retrieved from <https://www.itu.int/en/myitu/Publications/2021/10/12/12/56/5G-implementation-in-non-European-Union-countries-of-the-Europe-region>

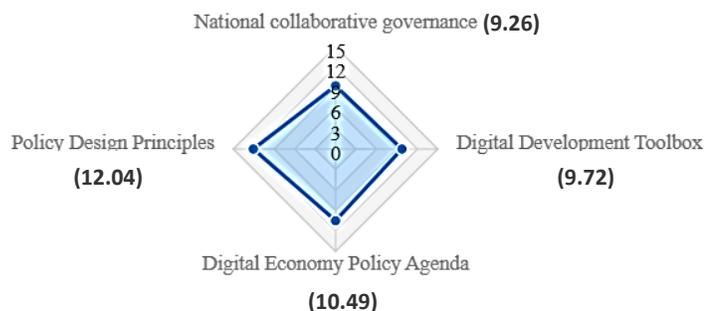
²⁴ ITU ICT Regulatory Tracker, accessed on 21.12.21, retrieved from <https://app.gen5.digital/tracker/metrics>

stakeholders in the ICT sector and with other sectors of the economy.

The G5 Benchmark covers four pillars, with 66 indicators taken into account: National Collaborative Governance, Policy Design Principles, Digital Development Toolbox, and Digital Economic Policy Agenda.

According to the latest data, Ukraine scores 44.83 in the G5 benchmark, which leaves a lot of space for improvement if compared to Europe region average of 73.9. This positions the country on the 119th place among 193 countries and suggests that there is still margin of improvement.²⁵

Figure 3 - G5 Benchmark 2021 - Ukraine



2.1.5 Next generation infrastructure: 5G Development

Ukraine journey towards 5G network rollout started in May 2019 on World Radio Day when the President signed a decree in this regard. The decree stated that the 5G network will be launched in 2020 but provides no additional details. Based on this decree the Government together with the National Commission for the State Regulation of Communications and Informatization (NCCIR) should articulate and adopt a step-by-step plan for 5G implementation. Consequently, in November 2019 NCCIR issued a Decision No. 529 confirming that it will allocate countrywide 5G-suitable wireless spectrum in the 3 400 MHz-3 600 MHz range on a competitive or tender basis.

In May 2019, Vodafone Ukraine announced its readiness to launch 5G tests, and the Lifecell in partnership with Ericsson tested 5G mobile technology in Kyiv in the 28 GHz frequency range. Through Ma-MIMO, a peak download speed of 25.6 Gbit/s was reached in the ultra-high frequency range of 28 GHz. Between December 2019 and May 2020, Ericsson and the operator Lifecell conducted 5G tests using the 3.5 GHz band in seven of the operator's points of sale in six Ukrainian cities: Kyiv, Dnipro, Kharkiv, Lviv, Odessa and Cherkasy.

Moreover, in February 2020, the Ministry of Digital Transformation of Ukraine and Ericsson signed a memorandum of cooperation in the development of fixed and mobile 4G LTE-A and 5G networks. A joint working group is being organized to work on technical expertise in mobile and fixed internet development, as well as provide advisory and information support to the ministry on the evolution of mobile communications, frequency strategy and licensing policies.

²⁵ ITU G5 Accelerator, accessed on 21.12.21, retrieved from <https://gen5.digital>

In April 2020, Vodafone Ukraine completed testing of AirScale equipment from Nokia on its LTE network in Kyiv. The 5G-ready equipment was tested in the 1 800 MHz and 2 600 MHz bands, achieving connectivity speeds as fast as 525 Mbit/s. In July 2020, Vodafone Ukraine and Kyivstar signed a memorandum of intent on network sharing for exchange of the 900 MHz spectrum in eight Ukrainian regions. The agreement covers both passive and active infrastructure on operators' mobile networks and should result in an acceleration of LTE technology coverage of Ukraine, reaching the country's rural areas and highways.

Since authorities conducted the 4G frequencies auction in 2018, telecommunication sector actors are currently focused on 4G network expansion and covering the rural areas with broadband Internet. In January 2020, Kyivstar, Lifecell and Vodafone Ukraine submitted a joint statement on redistribution of the 900 MHz band and separate applications for licence renewal to NCCIR. As a result, in March 2020 NCCIR allowed these operators to begin offering 4G LTE-900 services starting on 1 July 2020 with an obligation to offer services to all areas of the country with a population of over 2 000 people over the next two years.

To foster the development of current 4G networks and advance the potential of 5G-enabled services and applications, the Cabinet of Ministers of Ukraine instructed the Ministry of Health to raise the maximum permissible level of electromagnetic radiation by a factor of 10 – from 10 $\mu\text{W}/\text{cm}^2$ to 100 $\mu\text{W}/\text{cm}^2$. In such a way, the high level of electromagnetic radiation is 30–300 MHz, ultra-high is 300-3000 MHz, and very high is 30–300 GHz. Similar adjustment of the EMF legislation was previously done in 2017, when the permissible level was increased from 2.5 to 10 $\mu\text{W}/\text{cm}^2$.

In response to public pressure concerning alleged health hazards from the introduction of 5G in Ukraine, an order issued by the President of Ukraine in July 2020 requested NCCIR to propose a number of measures to resolve the issue and provide the public with the appropriate information on the impact of mobile technologies and networks. In August 2020, NCCIR announced its action plan to fulfil the President's request aiming to involve the Ministry of Digital Transformation, the Ministry of Health, the Administration of the State Service for Special Communications and Information Protection of Ukraine and other bodies in taking action on a number of EMF-related challenges. Some of the actions included:

- providing protocols for the measurement of EMFs by operators;
- public consultations with suppliers of radio equipment;
- developing and approving the procedure for the relevant bodies in the Ukrainian Ministry of Health's system to measure compliance with EMF levels at the request of citizens.
- adopting national standards that are necessary to assess the impact of EMF from cellular base stations on humans;
- carrying out regular measurements within the Ministry of Health's system to monitor EMF levels during the deployment of 5G networks;
- introducing a warning sign to signal the presence of a source of non-ionizing radiation and the relevant danger level for humans;
- additional medical research on the effects on humans of non-ionizing radiation from 5G stations;
- rising awareness on the impact of mobile radio technologies on human health.

Private stakeholders in Ukraine are also engaging with questions pertaining to EMF. In August 2020, representatives from Huawei Ukraine and ZTE presented solutions on EMFs from 5G base stations and on 5G Ma-MIMO EMF to NCCIR.²⁶

2.1.6 Increasing infrastructure reliability through cybersecurity

According to the 2020 ITU Global Cybersecurity Index, Ukraine ranks 39th in the Europe region and 78th globally. 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.

The country’s overall score is 65.93, which is quite far from the European region average of 80.7. Yet, the overall score is based on five main pillars which shape the inherent building blocks of a national cybersecurity culture. As a result, the index highlighted the cooperative measures as the country strength area and the legal measures as an area of potential growth.²⁷

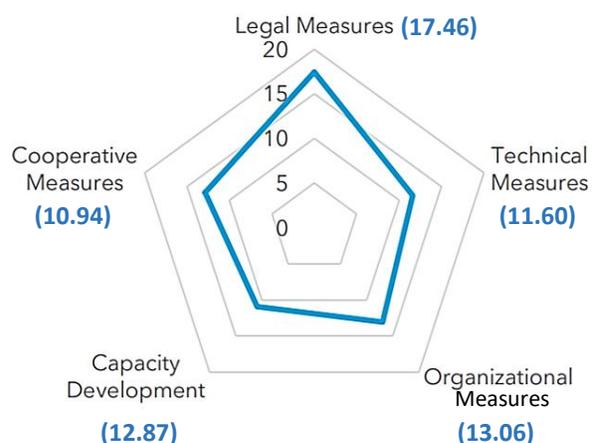
However, in 2018, the country ranked 32nd in the Europe region in this same index, and 54th globally, which emphasized a clear need for greater efforts and commitment to strengthening the country’s cybersecurity.²⁸

The country has ratified the Budapest Convention on cybercrime by the Law No. 2824-IV of 7 September 2005, but its cybersecurity landscape was shaped by multiple elements, including the institutional and legislative frameworks.

The Ukraine first Cyber Security Strategy was approved by the President in March 2016. It aimed to create conditions that ensure a safe cyberspace and its use in the interests of individuals, the society and the government. The strategy defined the national cybersecurity system, the main actors in cybersecurity, principles and main threats, as well as the main directions of countering them. Areas identified as key ones for ensuring cybersecurity in Ukraine are:

- development of safe, sustainable and reliable cyberspace;
- cybersecurity of the government electronic information resources;

Figure 4 – GCI 2020 Country profile



²⁶ ITU, 5G Implementation in non-EU countries of the Europe Region, pp.82-85, retrieved from <https://www.itu.int/en/myitu/Publications/2021/10/12/12/56/5G-implementation-in-non-European-Union-countries-of-the-Europe-region>

²⁷ ITU Global Cybersecurity Index (GCI) 2020, pp. 26, 31, 127, retrieved from https://www.itu.int/dms_pub/itu-d/opb/str/D-STR-GCI.01-2021-PDF-E.pdf

²⁸ ITU Global Cybersecurity Index (GCI) 2018, p.61, retrieved from https://www.itu.int/dms_pub/itu-d/opb/str/D-STR-GCI.01-2018-PDF-E.pdf

- critical infrastructure cybersecurity;
- development of cybersecurity capacity in defence sector;
- fighting cybercrimes.²⁹

The strategy implementation resulted in the adoption of the Law "On Basic Principles of Cybersecurity of Ukraine", improvement of the regulatory support for cybersecurity of critical information infrastructure facilities, and approval of the procedures for its definition and general requirements for its cybersecurity. Entities for cybersecurity or cyber defence have been established in the State Service for Special Communications and Information Protection of Ukraine, the Security Service of Ukraine, the National Bank of Ukraine, the Ministry of Infrastructure of Ukraine, and the Armed Forces of Ukraine. Moreover, the National Coordination Centre for Cyber Security as a working body of the National Security and Defence Council of Ukraine was established and Cyber Security Month has been launched.

At the same time, the national cybersecurity system activities remain insufficiently coordinated and aimed at fulfilling only current tasks. The issues of operational exchange of information on cyber threats, an effective training system and an effective model of public-private partnership remain unresolved. Besides the organization and conduct of research in the field of cybersecurity is insufficient.

To address these and other issues, the new Cyber Security Strategy of Ukraine was approved in August 2021. The strategy outlines challenges and cyber threats, strategic goals and necessary steps to achieve cyber resilience. The highlighted national cybersecurity priorities are:

- securing cyberspace to protect the sovereignty of the state and the development of society;
- protection of the rights, freedoms and legitimate interests of the citizens of Ukraine in cyberspace;
- European and Euro-Atlantic integration in the field of cybersecurity.

Furthermore, it details the strategic goals to be achieved during the period of implementation of this Strategy which covers building the capacity of deterrence, gaining cyber resilience, and improving interactions among the national and international stakeholders.³⁰

This strategic framework is completed by the legal one which includes:

- The Law of Ukraine No 2163-VIII of 5 October 2017 "On the Basic Principles of Cybersecurity of Ukraine";³¹
- Law of Ukraine "On protection of information in information and telecommunication systems";³²
- Law of Ukraine on Personal Data Protection No 2297-VI dated 1 June 2010;
- The Resolution of the Cabinet of Ministers of Ukraine No 518 of 19 June 2019 "On the Adoption of the General Requirements to the Cybersecurity of the Critical Infrastructure Objects";

²⁹ <https://zakon.rada.gov.ua/laws/show/96/2016/ed20160315#Text>

³⁰ <https://zakon.rada.gov.ua/laws/show/447/2021#n7>

³¹ <https://zakon.rada.gov.ua/laws/show/2163-19#Text>

³² <https://zakon.rada.gov.ua/laws/show/80/94-bp#Text>

- The Resolution of the Cabinet of Ministers of Ukraine No 943 of 9 October 2020 “On Certain Questions of the Critical Infrastructure Objects”.

The cybersecurity incident response in Ukraine is being handled by the CERT-UA, a special subdivision of the State Service of Special Communications and Information Protection of Ukraine. Its tasks are defined at the legislative level by the Law of Ukraine "On the Basic Principles of Cybersecurity of Ukraine".³³

Meanwhile, the Cyberpolice Department of the National Police of Ukraine is in charge of prevention, detection and countering cybercrime. The Security Service of Ukraine is fighting cyberterrorism, cyber espionage and is countering cybercrimes which pose direct threat to vital interests of Ukraine. The Ministry of Defence of Ukraine prepares the state to respond to military aggression in cyberspace.

All the aforementioned intuitions', among other relevant actors from public and private sectors, are part of the National Cybersecurity Coordination Centre. This Centre is the working body of the National Security and Defence Council of Ukraine which coordinates and controls the actors responsible for cybersecurity.

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

As stated in the ITU Report – Digital Skills Development Ukraine Good Practice Case Study³⁴, the lack of conceptual foundation for the formation of state policy in the field of digital skills hindered digitization processes in all spheres of public life and the economy, as well as reduced the efficiency of public e-services.

The process of digital skills development at the national level accelerated with adapting the European DigComp Frameworks³⁵. The basis for further multistakeholder effort of its transformation into a practical tool was put by the Erasmus+ project which worked on adapting the European DigComp 2.0 to the Ukrainian needs. It demonstrated a holistic approach, a so-called benchmark conceptual model that could be adapted to many areas of life: education, employment, active citizenship, and social inclusion. In its turn, the DigComp Framework 2.1 showcases the spheres, descriptors, and levels of digital skills. It serves

³³ ITU Global Cybersecurity Index (GCI) 2018, p.40, retrieved from https://www.itu.int/dms_pub/itu-d/opb/str/D-STR-GCI.01-2018-PDF-E.pdf

³⁴ <https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/2021/Digital%20Skills%20Development%20-%20Ukraine%20-%20Good%20practice%20case%20study.pdf>

³⁵ <https://ec.europa.eu/jrc/en/digcomp>

as a reference for policymakers, professional standard developers, educators, HRs, etc. and citizens on what to teach and how to assess digital skills.

Based on the DigComp framework for citizens, a number of context specific digital competency frameworks were developed in Ukraine. Several derivative frameworks have recently been developed for educators, public officers, and entrepreneurs. DigComp framework for doctors is expected to be published in 2022.

These professional DigComp frameworks aim to provide the instruments which could help various target audiences. For instance, professionals can benefit from self-evaluation, setting learning goals, identifying gaps and training opportunities, as well as facilitating job search. Policy makers can get support in monitoring professional digital skills, curricula development, and measuring human capital which is needed to take advantage of the possibilities offered by a digital society. Human resource specialists can use them for setting qualifications needed in terms of digital skills while educators for planning and designing education and training offers.

In 2019, the Ministry of Digital Transformation conducted a survey conceptually based on DigComp 2.1. It showed that 37.9% of the Ukrainians aged between 18 and 70 have low basic e-skills, and 15.1% do not have them at all. In such a way, 53% of the population needs to develop digital skills. The majority of 61.6% of people with digital skills at the level above average are young people between 10 and 17.³⁶

The second survey conducted in 2021 showed a gradual increase in the level of digital skills in comparison to 2019. The number of Ukrainians with digital skills below the basic level decreased by 5.2% or 1.42 million people reaching 47.8% of the population. The share of those with no skills decreased by 4% or 1.09 million people.

Nevertheless, the approval of the “Concept Paper on Digital Skills for Ukrainian Citizens” in March 2021 served as a starting point for upskilling and reskilling the workforce’s digital competences. It aims to raise public awareness on the issue of the low level of digital skills, showcase key principles, approaches, objectives, as well as the actions to increase the level of digital literacy of the population. The Concept Action Plan aims to launch legislative, informational, scientific, methodological, and organizational processes for the further development of digital competencies across the country. All actions should comply with the SMART-goal approach and be completed by 2025.

The expected outcomes are meanwhile complemented by results generated from a number of recently launched initiatives. One of them is the Online Platform Diia.Digital Education launched in January 2020 with an aim to reach the goal of educating at least 6 million Ukrainians in digital skills by the end of 2023. Its two components include an online platform with different categories of digital skills training courses and self-assessment tests for different target groups, as well as an offline network of Digital Skills Centres with a programme to bridge the digital divide.

³⁶ https://osvita.diia.gov.ua/uploads/0/588-the_first_in_the_history_of_ukraine_research_compressed.pdf

Another part of Diia.Digital Education Project is offline part, that include more than 6000 Digital Hubs – physical places, mostly based on a local libraries, where are: computer or some kind of equipment with access to the Internet and a person who can help with simple request. The impact generated by the platform is increasing exponentially. As of 1 January 2021, the platform had 400,000 users taking eSkills courses. Ten months later, the platform had more than 1 million active participants and 833 000 of which in Digital Education.

Digital literacy tests are also available on the platform. “Digigram” offers an opportunity for any citizen to check their digital literacy. This platform provides two versions of the test for citizens and separate tests for teachers, doctors, and civil servants. After completing the test, citizens receive a certificate and access to educational materials meant to further improve their skills. Among the educational materials in the edutainment format are over 70 educational movies.

Another one is the “Train the Trainer” Program provided through the Diia.Digital Education Platform. The eSkills trainers of the offline Hub can take an interactive course with practical assignments for free and receive a certificate after successful completion. The course covers such topics as creating the training plan and guiding users through Diia.Digital Education series, the concept of blended learning, and how to adapt courses to individual learning paths and needs. It also includes good practices and recommendations on the efficient use of digital technologies for teaching and learning, etc.

As of November 2021, more than 2209 trainers completed the course and were certified. Yet, the dropout rate is still high, at nearly 43.6% of participants. It means that the reasons need to be analysed and the curriculum improved in the coming years. Nevertheless, the number of DigComp trainers is steadily increasing to ensure that DigComp training is supported in the regions and local communities.

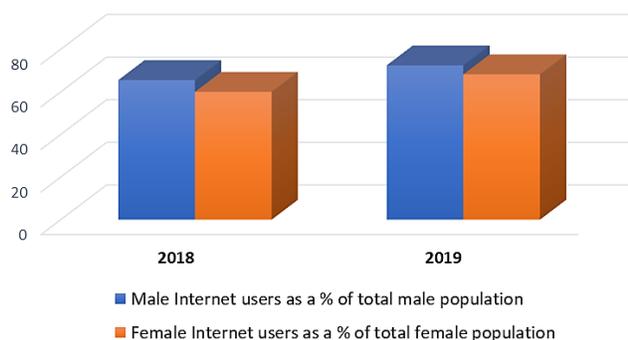
Besides, to increase the awareness about opportunities digital literacy offers, in March 2020, the Ministry of Digital Transformation of Ukraine launched a Chapter for digital ambassadors on the national platform Diia.Digital Education. This project engages active and innovative Ukrainians of all ages to participate in achieving the ambitious goal of educating 6 million Ukrainians in digital literacy over 3 years.

2.2.2 Bridging the gendered digital divide – Women and girls in the ICT and STEM sectors

Women’s access to ICT

In terms of Internet use in the general population, the gender gap in Ukraine is relatively small. According to the latest data available, 68.2% of the female population is using the Internet, which is 4.2 percentage points lower than the share of men using the Internet. Even though the share of women using Internet increased in 2019 with 8.2 percentage points compared to 2018, the gender gap did not diminish dramatically. Compared to 2018

Figure 5 – Share of female and male Internet users in 2018 vs 2019



when the data showed a difference of 5.6 percentage points between the shares of male and female Internet users.³⁷

Women's participation and leadership in ICT

Women account for 46% of individual entrepreneurs, but they lead only 30% of enterprises and organizations. Education is the only sector where most managers are women. Sectors with a high share of female managers also include public administration and defence, social security and the hotel and restaurant business. Sectors where a majority of managers are men include transport, construction, agriculture, the extractive industry and power engineering. The percentage of female managers is greater in smaller cities and villages, including in the ICT sector. In the ICT sector, 74.8% of management positions are held by men, and 25.2% held by women.³⁸

According to Ukrainian online service YouControl, from 2017 to 2019, the number of individual female entrepreneurs in IT grew by 62%. In comparison to 2018, in 2019 the number of female individual entrepreneurs in IT grew by 24% which is faster than the overall entrepreneurs number growth of 19%. Besides, the overall number of women employed in the IT industry is steadily growing, but hardly reached a quarter of the total number of IT specialists.³⁹

Women in ICT education

Technical education is the foundation of Ukraine's IT ecosystem. Every year, over 150 000 students graduate, of whom around 40 000 obtain degrees in technological studies, including some 15 000 IT specialists. Additionally, around 40 000 IT specialists graduate annually from IT schools.⁴⁰ Yet young people report a gap between the "old fashioned" and "highly theoretical" curriculum that they are being taught and the world of innovation that characterizes the forward-looking technology ecosystem. Thus, the "New School" reform implemented in the country includes the creation of the first generation of gender-sensitive textbooks and the development of e-learning tools based on gender equality. According to the strategy, all documents produced as part of the reform will be subject to antidiscrimination expertise and adjusted on the basis of gender equality.⁴¹

This is particularly important because even parents who encourage girls to obtain good grades in all subjects – including STEM – may not be supportive when it comes to girls choosing a science or technology career. Similarly, teachers may not take girls' ambitions seriously or even display offensive attitudes. This includes cases like questioning whether women had enrolled in a technology-related faculty simply to

³⁷ ITU, World Telecommunication/ICT Indicators Database, August 2021, retrieved from <https://www.itu.int/en/ITU-D/Statistics/Dashboards/Pages/Digital-Development.aspx>

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, p.85, retrieved from <http://handle.itu.int/11.1002/pub/818d024e-en>

³⁹ <https://eufordigital.eu/ukrainian-it-industry-looking-for-further-growth-and-opening-opportunities-for-women/>

⁴⁰ 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, p.86, retrieved from <http://handle.itu.int/11.1002/pub/818d024e-en>

⁴¹ 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, p.17, retrieved from <http://handle.itu.int/11.1002/pub/818d024e-en>

“find a husband”. This kind of attitudes and beliefs affect students’ confidence in and perception of their own skills.⁴²

With the transition to online learning, girls reported feeling more pressure over online learning because they “study more and take school more seriously.” Besides, Roma women reported difficulties supporting online learning for their children owing to a lack of both technical capacity and access to connected digital devices. To partially overcome this issue, a group running STEM workshops for girls held their programming on weekends, when parents were not working, so that girls could use their parents’ laptops.⁴³

Dark side of ICT and cyberviolence

Ukraine faces unprecedented challenges affecting gender equality and the enjoyment of equal rights and opportunities by women, particularly those facing multiple forms of discrimination. The structural discrimination of women persists in both the public and private spheres to varying extents. Even though Ukraine adopted a law on preventing and counteracting domestic violence in 2017 and criminalized domestic violence in 2019, it hasn’t yet ratified the Istanbul Convention.

Cyberspace in Ukraine is rife with abusive and harmful expressions of violence. Spikes in online violence against women often coincide with four major events: scheduled releases of annual government data; electoral cycles; salient political events; and highly visible or controversial actions by women in the public eye. In many cases, perpetrators who attacked politicians endeavoured to degrade victims by questioning their abilities as civil servants.

An analysis of data from 2014-2018 showed that women were more likely to face socio-psychological harassment and they primarily face attacks against their physical appearance, intelligence and professional competence.⁴⁴

Good practices to increase women participation in STEM careers

Among the Ukraine’s best practices is the STEM IS FEM initiative which offers wide exposure to the STEM field to schoolgirls aged 12-17 years throughout the country. Through a series of two-day workshops, girls participate in “dive-in educational modules”, lectures from role models and inspirational speakers, hands-on problem-solving challenges and visits to high-tech companies, among other activities. The aim is to offer career perspectives to enable girls to picture themselves working in a STEM-related field. Modules include bioengineering, energetics and ecology, engineering and robotics, 3D modelling and printing, mechanical engineering, construction and architecture, and computer science and artificial

⁴² 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, p.12, retrieved from <http://handle.itu.int/11.1002/pub/818d024e-en>

⁴³ 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, pp.7,9, retrieved from <http://handle.itu.int/11.1002/pub/818d024e-en>

⁴⁴ 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, p.86, retrieved from <http://handle.itu.int/11.1002/pub/818d024e-en>

intelligence. The goal of the modules is to foster a community of girls. Monthly online activities are also available after the workshops.

Another example of successful initiatives is a contest entitled “Best gender-sensitive STEM lessons: How to teach”. It was held two years in the row to encourage teachers to design new, immersive approaches to ensure girls’ engagement. Teachers in the fields of mathematics, physics, chemistry, computer science, technology, astronomy and geography, among others, submitted lessons plans that were judged on their creativity, innovativeness, use of equipment and gender sensitivity.

Private sector also tries to support women working in IT field. One of them is Ukraine’s largest IT companies “Intelius” which provides comprehensive benefits for families. These include baby essentials for employees with new-borns and classes and educational tours to teach older children about technology. Children are welcome in the office, where on-site daycare facilities are equipped with toys, books and games, and a childcare worker supervises small children. The company also made efforts to ensure that the office space was child-friendly, such as by refitting windows for safety. Lastly, study spaces are available for older children to do their homework on site.⁴⁵

2.2.3 Digital inclusion and ICT accessibility for persons with disabilities

Ukraine ratified the Convention on the Rights of Persons with Disabilities (UN CRPD)⁴⁶ and the Optional Protocol to the UNCRPD in February 2010. The UNCRPD stipulates (Article 9 - Accessibility) that countries should ensure equal access of persons with disabilities to the physical environment, transportation, information and communications, including information and communications technologies and systems. Yet, Ukraine has not signed the World Intellectual Property Organization Marrakesh Treaty to Facilitate Access to Published Works for Persons Who Are Blind, Visually Impaired, or Otherwise Print Disabled.⁴⁷

Besides, according to the Art. 21, para 1 (e) of UNCRPD, 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. However, Ukraine is one of the countries that passed laws or regulations to facilitate the use of sign languages.⁴⁸

In such a way, in April 2019, the Ukrainian parliament voted a new law, "On provision of the functioning of the Ukrainian language as the State language" which entered into force in June 2019. The Article 3 of the law is dedicated to support Ukrainian language. It is envisioned, inter alia, through development of Ukrainian sign language as the main or one of the main means of communication of sign language speakers. The status, principles and rights of sign language speakers are determined by the Article 4 of the same law.⁴⁹

⁴⁵ 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, pp. 22,26,43, retrieved from <http://handle.itu.int/11.1002/pub/818d024e-en>

⁴⁶ <https://www.un.org/development/desa/disabilities/convention-on-the-rights-of-persons-with-disabilities.html>

⁴⁷ https://wipolex.wipo.int/en/treaties/ShowResults?start_year=ANY&end_year=ANY&search_what=C&code=ALL&treaty_id=843

⁴⁸ ITU, ICT accessibility assessment for the Europe region, p.52, retrieved from <http://handle.itu.int/11.1002/pub/8182b00a-en>

⁴⁹ <https://zakon.rada.gov.ua/laws/show/2704-19#Text>

Access to emergency services for persons with disabilities is critical particularly during the COVID-19 pandemic. However, together with the challenges it brought, it also became a catalyst in enhancing their rights. In response to the pandemic, the Ukrainian Government put in place a 24/7 remote-interpreting service, affirming its leadership in providing accessible emergency communications to the deaf or hard of hearing persons. The government has also launched the mobile application '101', which complements traditional services and enables communication between the State Emergency Service of Ukraine and the community, providing citizens, including persons with disabilities, with the necessary information and assistance.⁵⁰

ITU continuously supports the country to advance on digital accessibility. Accessibility is not only embedded in the Union's strategic goals and targets but also, in 2018, ITU Member States affirmed that enabling environments ensuring accessible ICTs for persons with disabilities should be established in all countries by 2023.⁵¹ In this sense, 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 - Example of Serbia](#);
- [Capacity building in ICT Accessibility](#).

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

Ukraine ratified the Council of Europe Convention on Protection of Children against Sexual Exploitation and Sexual Abuse (“the Lanzarote Convention”) in December 2012 and is a member of the WePROTECT Global Alliance.

Yet, Ukraine is among the top 3 suppliers of child pornography in the world. According to the Prosecutor General Irina Venediktova, every week, 5,000 devices upload this kind of porn. In most of the cases, sexual violence is carried out by people from children’s inner circle, and by relatives in 30% of all cases.⁵²

The current state of online safety in Ukraine is changing but there seems to be room for further improvement. The progress and work already carried out at national level include the following legal acts:

- [Law “On Amendments to Certain Legislative Acts of Ukraine Concerning the Implementation of the Council of Europe Convention for the Protection of Children against Sexual Exploitation and Sexual Abuse”](#) of February 18, 2021;
- [National Strategy for Reforming the System of Justice for Children](#) for the period up to 2023, approved in December 2018;

⁵⁰ ITU, ICT accessibility assessment for the Europe region, p.42, retrieved from <http://handle.itu.int/11.1002/pub/8182b00a-en>

⁵¹ [ITU Strategic Goal 2 – Inclusiveness, Target 2.9.](#)

⁵² <https://tass.com/society/1296935>

- [State Social Program "National Action Plan for the Implementation of the UN Convention on the Rights of the Child"](#) for the period up to 2021, approved in May 2018;
- [Law of Ukraine "On Childhood Protection"](#) of April 26, 2001.

The legal framework ensured that there are existing measures in place to prevent offenders convicted of child abuse crimes from taking a position as a social worker, adopted parents, police officers, or a role in public office.⁵³ Besides, the punishment for production, dissemination and sale of child porn was tightened and carry between 8 and 12 years in prison.

Despite considerable progress, there seems to be no coordinated body or organization to guide and direct activities on online child protection in Ukraine. There is a diverse group of organizations, NGOs, as well as industry and ministries involved in child online protection in Ukraine, but there appears to be little collaboration amongst the stakeholders. Moreover, the general level of awareness of online risks and threats is low, particularly amongst parents.⁵⁴

To raise the awareness, a Safer Internet Day is organized in the country on the yearly basis with the support of the Institute of Modernisation of Educational Content of the Ministry of Education and Science of Ukraine. It informs children, young people, teachers, youth workers, parents and caregivers about online safety.⁵⁵

Moreover, in September 2020, the Child Online Safety Consultation Line 1545 was launched in Ukraine. The line offers 24/7 support to children and parents who have encountered problems an opportunity to consult with experts and get the information on safe behaviour in the digital environment.⁵⁶

International cooperation supports country's efforts in ensuring effective online protection. In this sense, the Council of Europe implemented the Project Combating violence against children in Ukraine lasting until 31 December 2021. This project is a direct follow-up to the to the previous Council of Europe project on Combating violence against women and children implemented in 2017-2018.⁵⁷

Meanwhile, through its COP Guidelines, ITU is supporting Ukraine among other 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

⁵³ ITU Status of national child online protection ecosystems in South Eastern Europe, p. 26, retrieved from <http://handle.itu.int/11.1002/pub/815a8b6c-en>

⁵⁴ ITU Status of national child online protection ecosystems in South Eastern Europe, p. 28, retrieved from <http://handle.itu.int/11.1002/pub/815a8b6c-en>

⁵⁵ <https://www.saferinternetday.org/en-GB/in-your-country/ukraine>

⁵⁶ https://www.datagroup.ua/en/novyny/datagrup-pidtrimala-vprovadzhennya-uryadovoyi-konsultacijnoy-281?fbclid=IwAR3mnhblGpuDvpV5ytr7T_EMU2AFleDnOqwFaUaXpiZgw_L1rQuZkmfZg7A

⁵⁷ <https://www.coe.int/en/web/kyiv/combating-violence-against-children-in-ukraine>

⁵⁸ ITU COP Guidelines, retrieved from <https://www.itu-cop-guidelines.com/>

The ITU National child online safety assessment for Ukraine, conducted in line with the COP Guidelines, provided the following recommendations:

- to implement the recommendations made by the Council of Europe project (End Online Child Sexual Exploitation and Abuse@Europe – EndOCSEA@Europe) in accordance with the Lanzarote and Budapest Convention, especially the recommendations to review International Instruments and Criminalisation of OCSEA;
- to review and update the Law of Ukraine on Education to include cyberbullying to recognize that bullying can occur online as well as physically;
- to establish a national stakeholder council;
- to provide parents with simple parental control tools;
- to manage the access to Internet in schools and the public open Wi-Fi;
- to implement a reporting mechanism for child sexual abuse material;
- to establish a Ukraine safer Internet centre modelled on the European Network of Safer Internet Centres;
- to raise awareness and reach a greater understanding across the population of the laws related to child online protection;
- to increase the number of international partners;
- to ensure educators’ professional development to enable them to spot child online protection issues through the signs of abuse as well as provide children with the defined digital competencies;
- to undertake comprehensive academic research on child online protection in Ukraine;
- to review Article 156 of the Criminal Code to include the offence of grooming.

2.3 Building block 3 – Government - centric digital transformation

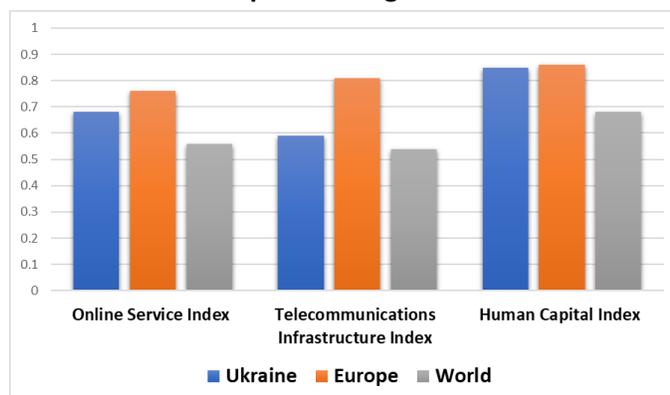
One of the most important triggers of the digital transformation at the national level is the government’s approach to ICTs for governance, administrative purposes and the delivery of public services online. This section will look at (i) the general approach to e-government in Ukraine, (ii) an example of the specific approach used with regards to the use of ICTs in the education system from an administrative and service delivery perspective, as well as (iii) e-waste management.

2.3.1 E-government policy

According to the 2020 UN E-Government Survey results, Ukraine is among the 13 countries (Armenia, Azerbaijan, Bahamas, Costa Rica, Georgia, Hungary, Islamic Republic of Iran, Kyrgyzstan, Mauritius, Philippines, Seychelles, Sri Lanka and Ukraine) with very highly developed human capital, but the state of their infrastructure may be impeding further progress.

Even though the Telecommunications Infrastructure Index is diminishing the overall country score, e-Government Development Index (EGDI) ranked Ukraine 69th out of 193 countries with a score of 0.7. This result is far above the world average score of 0.6, but still needs improvement to reach the European average of 0.8. The comparative assessment of Ukraine scores with the European and world averages on online service component, telecommunication infrastructure component and human capital component is reflected in the Figure 6.

Figure 6 – Comparative assessment of Ukraine scores on EGDI components, with the world and European average scores



Compared to 2018 results, the country has improved its positioning in the ranking by 13 positions, increasing its score by 0.09 points by 2020. In 2018 the country already scored highly on Human Capital Index. Thus, the increase of this indicator was less significant than the growth registered on the other two components.

Similar dynamics is registered with regard to 2020 E-Participation Index which ranks the country 46th out of 193 countries with a score of 0.8. The country improved its performance by 0.1 points and its position in the ranking by 29 places compared to 2018.^{59 60}

The increase of Ukraine public sector efficiency is due to substantial work of implementing since 2018 of a broad range of reforms. In this sense, the Digital Agenda for Ukraine adopted in January 2018 was the main strategic document providing direction for Ukraine’s digital transformation. Its Digital Governance pillar addressed the ways to modernise Ukraine’s public administration including through development of public sector architecture, data collection, application, technology, information security architectures, common business processes, introducing unified document templates and standard solutions.

For successful implementation of the Digital Agenda of Ukraine, the Concept of digital economy and society development and action plan for its implementation for 2018 – 2020 was adopted in January 2018. In 2019, the Action Plan for the implementation of eServices development concept for 2019 – 2020 was adopted. It aimed to improve the quality of administrative services delivery for citizens and businesses.

Additionally, the Government adopted the Action Plan for the Implementation of the eGovernment Development Concept for 2018-2020. The Action Plan is focused on modernisation of eServices and of the public administration, as well as on management of the eGovernment development process.

⁵⁹ UN E-GOVERNMENT SURVEY 2020, retrieved from <https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2020>

⁶⁰ UN E-GOVERNMENT SURVEY 2018, retrieved from <https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2018>

In line with the country's strategic vision, a comprehensive legal framework enabling e-government transformation was completed by several more strategic and normative acts as follows:

- Action Plan on Open Government Partnership Initiative Implementation for Years 2018-2020;
- Action Plan on the Implementation of the International Open Data Charter Principles;
- Decree no. 56 Some Questions of Digital Development, which defined the digital by default principle;
- Law of Ukraine on Access to Public Information;
- Law on Electronic Trust Services;
- Procedure of Compliance Assessment in the Sphere of Trust Electronic Services;
- Procedure of Use of Trust Electronic Services by State and Local Authorities, and by State-Owned Enterprises;
- Order on Requirements to the Electronic Identification Tools and their Use in eGovernance;
- Law on Public Electronic Registries;
- Decree no. 357 Some Questions on Interoperability of State Information Resources;
- Decree no. 55 Some Questions of Administrative Activity Recording;
- Decree no. 60 On Requirements to Data Formats of Electronic Documents Flow in State Entities.

Historically, the Ukrainian State Agency for eGovernance which was established in 2014 was responsible for the digital government policy formulation and implementation, ensuring the interoperability of state registries, as well as monitoring and evaluation of IT systems in state authorities. In 2019, this mandate, together with the role of the key driver of digital transformation in Ukraine has been undertaken by the Ministry of Digital Transformation. Its activity targets a large number of areas including: digital economy, innovation and technology, e-government and e-democracy, information society development, open data, telecom infrastructure, electronic trust services and electronic identification, IT industry development, etc.

The Ministry of Digital Transformation was also the one leading the “State in a Smartphone” nationwide initiative launched in 2019 which is supposed to digitize all state services until 2024. The goals to be achieved are:

- 100% of public services available to citizens and businesses online;
- 95% of transport infrastructure, settlements and their social facilities with access to highspeed Internet;
- 6 million Ukrainians involved in the digital skills development programme;
- at least 10% of country's GDP generated by IT-industry.⁶¹

Reaching these goals implies the implementation of appropriate legal framework and of the 94 digital transformation projects in various fields. Yet, the country's digital backbone for e-governance and e-

⁶¹ <https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/2021/Digital%20Skills%20Development%20-%20Ukraine%20-%20Good%20practice%20case%20study.pdf>, p.10

services which currently connects more than 80 authorities was rolled out in 2018 with first data exchanges occurring in 2019. Called “Trembita”, the platform ensured since then 180 different electronic interactions and services with more than a million data exchanges monthly.⁶²

The simple, clear and fast interaction between individuals and government is ensured through “Diia” online platform. It is a web portal, a mobile application, and the brand of e-governance in Ukraine. The Ministry initially launched the Diia Portal on February 6, 2020, and introduced version 2.0 on October 5, 2020, during the Diia Summit, where the government presented the first major update to the application and web portal under “Diia 2.0” brand. Since its launch, the number of active users grows exponentially, reaching in February 2022 14 million active users.⁶³

Yet, a number of services and documents should still be considered for digitalisation, with an expected impact on processing and provision. This is the case of the digitalisation of key documents to refugees and asylum seekers.

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 new ITU-UNICEF report on “Connectivity in Education: Status and recent developments in 9 non-EU countries of Europe region” published in October 2021⁶⁴ looks at the two dimensions of ICTs for e-government of education and ICTs as a medium for delivering remote education.

In Ukraine, the Ministry of Education and Science manages a centralized education system. In 2020, more than 5 million students are enrolled in pre-primary to upper-secondary education in Ukraine. Out of this number, 1.7 million pupils were enrolled in primary school and 2.5 million students in secondary schools. Between 2015 and 2020, the number of students was constantly growing with a CAGR of 2.3% in primary and 1.3% in secondary education.

Figure 7 – Enrolment in Ukraine



In total, primary and secondary education institutions employ 423 947 teachers. Even though the number of students were slowly but steadily increasing, the number of teachers decreased during the same period of time. In such a way, the number of teachers employed in primary education increased with a CAGR of

⁶² https://e-estonia.com/deployment-of-trembita-system-in-ukraine-a-milestone-for-estonian-digitisation-efforts/?fbclid=IwAR2gWueu0zxaLDGnAe_nWBb_slwJgKAYVK2CXtRDu2mwyllMEw7ctf8pcTgl

⁶³ <https://www.facebook.com/diia.gov.ua/posts/737876980949988>

⁶⁴ ITU, Connectivity in education: Status and recent developments in nine non-European Union countries, retrieved from <http://handle.itu.int/11.1002/pub/81a5eef1-en>

1.3% between 2015 and 2018, but it dropped by 16% in 2019. The number of teachers employed in the secondary education was in a constant decrease from 2015 to 2019 with a CAGR of -2.1%. Yet, the number of teachers employed in both primary and secondary education institutions started to slowly recover/increase in 2020.⁶⁵

Significant reforms towards the school digitization, introduction of competency-based curriculum, and significant changes in key education indicators, together with other reforms, triggered improvements in education infrastructure and quality throughout the country.

In 2013, the National Strategy for the Development of Education in Ukraine for the period up to 2021 was launched. Its two overarching goals were (i) increasing the availability of high-quality and competitive education to every citizen, as well as (ii) ensuring citizens development in accordance with their individual abilities, needs and aspirations.

According to this strategy, the strategic directions of state policy in the field of education are:

- Reforming the education system;
- Updating the regulatory framework of the education system;
- Implementing a competency-based approach in education;
- Creating and providing opportunities for the implementation of various educational models, and establishing educational institutions of various types and forms of ownership;
- Ensuring the availability and continuity of lifelong learning;
- Cultivating a safe educational environment;
- Accelerating the development of scientific and innovative activities in education and improving the quality of education on an innovative basis;
- Modernizing the informatization of education, with a focus on improving the provision of library and information resources in education and science;
- Ensuring national monitoring of the education system;
- Raising the social status of scientific and teaching staff; and
- Creating a modern material and technical basis for the education system.

The 2017 Education Act and a concept paper entitled “The New Ukrainian School” acknowledged the importance of ICTs both in the education process and in the management of educational institutions. The plan also lists ICTs and digital skills as one of the 10 key competencies for the education system. The overarching goal points to the need to harmonize all levels of education both in the liberal arts and humanities and in science and technology, maintaining good traditions and securing a high level of education in science and ICT in every school. The actions aimed to reach this goal are broken down into three implementation phases: phase I (2016-2018), phase II (2019-2022), and phase III (2023-2029).

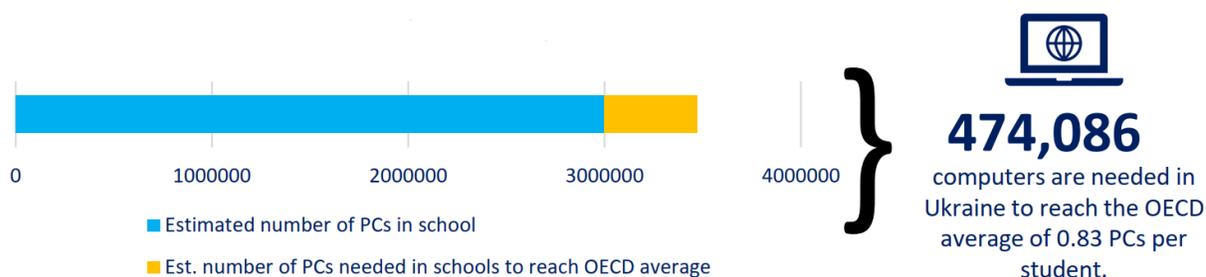
Additionally, in January 2018, the Government and State Agency for e-Governance of Ukraine published a new Digital Agenda for Ukraine 2020, which aimed to guide the country’s digital development. The

⁶⁵ <http://data.uis.unesco.org/#>

digitalization of education is listed as one of the priority sectors alongside other initiatives aiming to bridge the digital divide through the development of digital infrastructure.

Despite all the government measures, according to the research conducted by the Ministry of Digital Transformation, there are 16 317 schools in Ukraine, about 60 per cent of which have an Internet connection using fibre-optic technologies, while 40 per cent lack Internet infrastructure. Most of these institutions are located in villages and small towns. However, the challenges that emerged during the COVID-19 pandemic, changed the way authorities approached the education process.

Figure 8 – Computers per Student in School⁶⁶



The online platform "All-Ukrainian School Online " was launched in December 2020 by the Ministry of Education and Science of Ukraine in close collaboration with the Ministry of Digital Transformation and public association "Osvitoria". The platform helps manage high-quality distance learning and guarantees equal access to educational materials for students across the country and abroad.

This online resource for students in grade 5-11 contains teaching and learning materials on 18 basic subjects, which are structured according to the principle of microlearning and are aligned to the state curriculum. Registration on the platform is free and allows users to subscribe to courses, review materials and track their progress.

In 2021, there were over 640 000 platform users, 216 079 of them registered ones. Among them 73% were schoolchildren, 22% teachers, and 5% other participants. In addition, almost 2 million users have visited the platform and conducted almost 11 million interactions.⁶⁷

2.3.3 E-waste management

According to the Regional E-waste Monitor CIS + Georgia⁶⁸, in Ukraine, E-waste is regulated within the framework of the general waste management regulations which is the Law no.187/98-BP of 1998 "On Waste". This Law defines the basic principles of state policy on waste, namely: ensuring the collection and disposal of waste; minimizing waste generation; organisation of control over the placement of waste; etc

⁶⁶ ITU – UNICEF Ukraine Country Brief "Connectivity in Education", retrieved from

⁶⁷ <https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/2021/Digital%20Skills%20Development%20-%20Ukraine%20-%20Good%20practice%20case%20study.pdf>, pp.17-18

⁶⁸ Regional E-waste Monitor CIS + Georgia, 2021, retrieved from: https://ewastemonitor.info/wp-content/uploads/2021/11/REM_2021_CISGEORGIA_WEB_final_nov_11_spreads.pdf

However, a number of technical regulations and orders specifically dedicated to e-waste management are in place including:

- Resolution of the Ministers Cabinet of Ukraine of September 22, 2017 “On approval of the Technical regulation on use restriction for some hazardous substances in EEE”;
- Resolution of the Ministers Cabinet of Ukraine “On the procedure of functioning and maintenance of roster and information system, registration, reporting in information system for placement in the management market of EEE and e-waste”;
- Order of the Ministry on the issues of the housing and communal services (HCS) of Ukraine “On approval of the methodological recommendations for collection of WEEE in the composition of domestic waste”;
- Order of the Ministry on the HCS issues of Ukraine “On approval of the methodological recommendations on detection of morphological content of solid domestic waste”;
- Order of the Ministry of the regional development, construction, and HCS of Ukraine No. 423 dated August 30, 2013 “On approval of the Methodological recommendations on safe handling of hazardous waste components in the composition of domestic waste”;
- Order of the Cabinet of Ministers of Ukraine dated July 13, 2020 No. 1120 “On approving the provision on control over cross-border transportation of hazardous wastes and their utilisation/removal and yellow and green list of wastes”.

Within the EU-funded Twinning project, the Ministry of Regional Development of Ukraine received support for improving the legal framework on disposal of e-waste and batteries. In this framework, the draft law “On batteries and accumulators” and the draft law “On e-waste” have been developed. Both draft laws are currently undergoing approval procedures.

The existing legislative framework does not allow for effective accounting and reporting or for monitoring systems in the field of e-waste management. Even though the regular reporting on waste management is in the mandate of the State Statistic Service of Ukraine, information on e-waste is not specifically available or required. Besides, there is currently no definition of the list of goods and products related to e-waste, no statistical record of the volume of their production and treatment/recycling, as well as no legal basis for regulating the process of handling them.

Moreover, no administrative liability exists for failure to separate waste collection.

Due to the lack of official data availability, UNU/UNITAR internal data has been used to quantify the main statistics indicators for e-waste in Ukraine. The amount of electrical and electronic equipment (EEE) placed on the market (POM) in Ukraine has increased over the past five years. Still, there was a relevant drop from 9.1 kg/inh (414.8 kt) in 2010 to 5.8

Figure 9 – EEE POM and e-waste generated in Ukraine



kg/inh (248.2 kt) in 2015 before the increase to 8.7 kg/inh (365.7 kt) in 2019. Still, the value hasn't reached the level of 2009.

The e-waste generated in Ukraine consistently rose from 4.6 kg/inh (211.1 kt) in 2010 to 7.7 kg/inh (324.1 kt) in 2019. In 2019, the highest share of 31% of e-waste was small equipment, followed by 24% of temperature exchange equipment.

Consumers can hand e-waste over at municipal or private collection points and at retail shops that have take-back obligations. More than one hundred companies are licenced for e-waste management in Ukraine, and 80% of them are also licenced for waste recycling. So, the infrastructure of the country is developed enough to implement an effective e-waste management system.

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, analysing the specific sectors which are affected by, and which dually enable, increasing levels of digital transformation in Ukraine.

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

2.4.1 Digital agriculture

According to 2018 data, 71.3% of the country territory represent agricultural land, but the share of arable land is about 56.8% of the country territory. However, the latest available data show that the employment in agriculture reached its lowest indicator since the country gained independence. In 2019, only 14 % of total employment was in the agriculture sector. It is dominated by men, as the percentage of male employment is 16% while female employment is only 11%. It is worth mentioning that the biggest decrease in employment of both men and women in this sector happened in 2014.⁶⁹

Still, this sector remains one of the main sectors of the Ukrainian economy, contributing in 2020 to 9.3% of GDP.⁷⁰ According to ITU-FAO "Status of Digital Agriculture in 18 Countries of Europe and Central Asia" the Ukrainian agricultural sector is dominated by large farms and agroholdings, with about 70 agricultural companies engaged in relative monoculture on 25% of the arable land. Besides the large and medium entities, an estimated 900 000 or so unregistered smaller or family farms produce crops with higher added-value for local markets and generate most job opportunities in rural areas. Because of the very favourable climate conditions and rich soils, Ukraine's agricultural sector has great potential for improvement and further development.

According to a study from 2015, the country has failed for years to design and support the establishment of sustainable agricultural extension schemes and there were almost no active extension services in Ukrainian rural areas. This further worsened the plight of small farms, which have not been provided with

⁶⁹ World Bank Open Data, retrieved from <https://data.worldbank.org/topic/agriculture-and-rural-development?locations=UA>

⁷⁰ World Bank Open Data, retrieved from <https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS?locations=UA>

effective advice on how to develop and integrate with value chains, and lack the funds and knowledge needed to take advantage of such services.

In the same year, the Agricultural and Rural Development Strategy 2020 was approved as the guiding document for agricultural and rural policy in Ukraine. It focused on land reform, food security, agri-food value chain development, rural development and the revival of the Ukrainian village.

Moreover, in the digital economy section of the Digital Agenda for Ukraine, there is a digital agriculture subsection that stresses the fundamental role of digital technologies in the agricultural sector's development in the next 50 years. The agenda refers essentially to precision agriculture, citing the economic, environmental, health-related and social benefits thereof. The agenda calls for support for the production, technical, educational and scientific aspects of precision agriculture, the training of qualified specialists and the creation of a milieu that can facilitate the "digitalization" of the agricultural sector. It also considers that the "digitization" of agriculture should be viewed as part of a broader programme of "digitization" of the countryside, bridging the digital divide and promoting the socio-economic revival of rural areas.⁷¹

Among the latest legal framework developments is the State Strategy for Regional Development for 2021-2027, which particularly focuses on agricultural co-operation, small and medium-sized agricultural producers, storage infrastructure, and the introduction of new technologies and equipment for the processing of agricultural raw materials.

The development of State Land Cadastre is crucial to the functioning of the agricultural land market. In this sense, the cabinet of Minister's Resolution of March 2020, requires that the approval of all types of land management documentation be transmitted and approved in electronic form through a personal account at StateGeoCadastre. The Law on the National Infrastructure of Geospatial Data, which entered into force in June 2020, aims to enhance access to geospatial data, the development of markets for modern geo-information products and services. Moreover, the law adopted in November 2020 created a single state information system, the State Agrarian Register. It aims to integrate information on agricultural producers and their property as well as on related land, the environment, labour, finances and credits, among others. The law also expands to the range of potential recipients of state support to include enterprises engaged in aquaculture, organic production, irrigation, vegetables, fruits and berries.⁷²

Taking into account that two fastest-growing industries in Ukraine are IT and agriculture, the quickly growing startup industry launched multiple projects combining these two industries. The domestic start-up ecosystem, including business accelerators and venture capital companies, is growing around the

⁷¹ ITU and FAO. 2020. Status of Digital Agriculture in 18 countries of Europe and Central Asia, retrieved from [https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/Status of Agriculture in Europe and Central Asia %287%29.pdf](https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/Status%20of%20Agriculture%20in%20Europe%20and%20Central%20Asia%202020.pdf)

⁷² https://www.oecd-ilibrary.org/sites/9972bb3a-en/index.html?itemId=%2Fcontent%2Fcomponent%2F9972bb3a-en&fbclid=IwAR3xdZ07fRIDLCsdXW-zgweHVE8V0TZQ5MdK_ObVBbRDuvCLBiJVazr1Tb8

Ukrainian agritech industry. One of the most notable examples is AgroHub, a collective impact organization that brings together players from across the sector to realize multiple collective benefits.

These range from digital platforms to smart farming solutions. Companies supported by CRDF Global's Science and Technology Entrepreneurship Program (STEP) in Ukraine and awarded in various competitions can serve as an example:

- **Tradomatic: The Digital Matchmaker for Farmers and Buyers in Ukraine** - is a mobile platform that is digitizing agricultural trade in Ukraine. Through a mobile chat bot, agricultural traders can identify best prices, observe market trends, and search for potential buyers in a single one-stop shop.
- **AGRIEYE: Empowering Farmers to Farm Sustainably.** With the help of autonomous drones and multispectral cameras, this company helps farmers predict and maximize crop yield and cut costs.
- **AGRO.BI** is a business intelligence platform that uses high-precision drone imagery and original machine learning technologies to help farmers mitigate threats to crop yield and maximize profitability.⁷³

Besides, UNDP Supporting Green Recovery in Ukraine Project implements a pilot to develop digital Environment, Social and Governance (ESG) risk assessment tool to be placed in public DIA.BUSINESS platform for the use by agricultural producers to familiarize them with non-financial risks of their business activities. The farmers will be able to familiarize with ESG approach, assess their non-financial risks, develop their businesses with sustainable development goals and hence improve their access to finance.

Meanwhile, multinational suppliers of agricultural inputs, machinery and equipment introduce their own digital solutions in Ukrainian agricultural sector, including those to improve application of fertilizers, crop protection use, irrigation systems, carbon emission calculation.

Satellite monitoring of fields, precision farming tools, navigation systems, and digital sensor technologies are as well being increasingly used by large Ukrainian agroholdings. In addition, agroholdings deploy various IT solutions to integrate the obtained data into enterprise management systems and enable data analysis with modern analytical tools. A substantial portion of these modern tools has been developed by local technology providers or in-house IT specialists.⁷⁴

Also, large Ukrainian agricultural holdings are becoming increasingly involved in proprietary and joint agritech projects, working with e-agriculture companies such as Bitrek (telemetry equipment producer) and Craftscanner (automating adjustments of soil cultivation depth). There is also an association, AgTech Ukraine, to promote the role of IT in agriculture.

⁷³ <https://www.crdfglobal.org/news/digitizing-agribusiness-ukraine>

⁷⁴ <https://www.largescaleagriculture.com/home/news-details/what-drives-digital-transformation-of-agriculture-the-case-of-ukraine/>

2.4.2 Digital health

The government of Ukraine undertook major steps to modernize the ICT infrastructure aiming to improve the healthcare service response, as well as to increase the efficiency of core services which results among in patient satisfaction.

In 2016 the Cabinet of Ministers of Ukraine approved the Concept of health care financing reform, which helped increase the efficiency of the system and improve approaches to its financing model. The systemic changes held during 2017-2020 care sector included The Law of Ukraine “On State Financial Guarantees of Public Health Care”, Resolution of the Cabinet of Ministers of Ukraine of April 25, 2018 no 411 “Some Issues of the Electronic Health Care System” (Official Gazette of Ukraine, 2018, 46, p. 1604), as well as a number of bylaws in which the electronic health care system and digital tools are defined as fundamental to the development of the field.

An important step towards an e-Health system accessible by patients, providers and administrators was the launch in 2018 of “eZdorovya”. This system was initially developed and tested by Transparency International Ukraine in 2017 to support the restructuring of health financing and allow for better management of public spending. With its transformation into a state-owned enterprise, it aimed to digitize all appointments and medical records, thereby making paper-based record-keeping obsolete. The next steps for eZdorovya are the roll-out of digital patient health records and the integration of the secondary and tertiary care levels into the system.⁷⁵ Attention will be needed not to create situations of exclusions from these systems, in particular for people lacking adequate personal documentation.

In October 2019, Deputy Prime Minister, Minister of Digital Transformation Mykhailo Fedorov together with Health Minister Zoriana Skaletska have agreed on a joint plan of priorities and actions for the development of eHealth. The Action Plan (2019-2020) was developed with an active engagement of the representatives of the National Health Service of Ukraine, eHealth Association, interested NGOs, information systems developers and international technical assistance projects. It envisaged 14 steps which included the approval of the concept of an electronic healthcare system, conducting an audit of existing information systems and registers in the sector, and the development of a plan for the introduction of standards for the storage and transfer of medical information.⁷⁶

In December 2020, the Cabinet of Ministers of Ukraine approved the order no.1671-r on the approval of the Concept of development of electronic health care. This Concept defines the main directions of e-health development, the existing problems and ways to solve them, as well as the expected results and issues of resource provision. Its implementation is envisaged until 2025 in two stages.

The purpose of this Concept is to form political, legal, organizational, technological and ideological conditions and principles of e-health development in Ukraine, which will improve the quality and accessibility of medical services, empower patients, ensure their continuing health care and safety,

⁷⁵ <https://thedocs.worldbank.org/en/doc/796791611679539176-0090022021/original/ReformsintheHealthSectorinUkraine.pdf>

⁷⁶ <https://www.kmu.gov.ua/en/news/zatverdzheno-plan-rozvitku-sistemi-ehealth>

increase effective management and use of resources, a high level of public awareness on healthy lifestyles, disease prevention and health care.

The concept implementation is expected to be achieved through:

- regulatory and legal support for the development of e-health;
- organizational, managerial and technical support of e-health development;
- resource provision of e-health development;
- ensuring the quality, safety and accessibility of e-health.⁷⁷

Besides, in September 2021, the Ukrainian government adopted an Action Plan aimed to ensure the effective coordination and control over the Concept implementation.⁷⁸

Moreover, from September 2021, an international COVID vaccination certificate was made available in the Diia application. The development and technical implementation of COVID-certificates were jointly carried out by the Ministry of Digital Transformation, the Ministry of Health, the National Health Service of Ukraine, the Ministry of Foreign Affairs, and the State Tax Service.

In Ukraine all relevant patient data is included into the electronic healthcare system. The document can be generated in the Diia application or on the Diia Portal with the use of electronic signature. In case a paper certificate is needed, the Diia app sends a request to the electronic healthcare system then the E-health system transfers medical data for the COVID-certificate to the Diia app. and a certificate is generated in PDF format.

It can be printed out or be saved to the file on the mobile phone or other device and can be seen through the QR code on the screen. COVID certificates can be used like other official documents in the Diia. One can check if the certificate is valid by QR-code, which is convenient, because there's no need to introduce additional special equipment for checking.⁷⁹

UNDP supports the Ministry of Health and the SoE eHealth to provide quality assurance services for the National Information System of Newborn Screening. In particular, to ensure the smooth functioning of the system, to extend the monitoring, and to provide reliable access to services. Furthermore, UNDP provides for the eSickLeave implementation. The organisation also works on the basic functionality of the State Register of Medical Devices, which includes the registers with basic CRUD operations, API for interaction with the register, the basic functionality of its administration. UNDP is developing the technical requirements for the National Blood System IT system. Lastly, UNDP is upgrading the Electronic Integrated Disease Surveillance System (EIDSS), specifically its Human cases and Outbreak modules capabilities to record and contact trace COVID-19 cases and the consequent decision-making for actions against the COVID-19 spread.

⁷⁷ <https://zakon.rada.gov.ua/laws/show/1671-2020-p#n8>

⁷⁸ <https://zakon.rada.gov.ua/laws/show/1175-2021-p?fbclid=IwAR3oGITTQYjQuJ3iNHZlVw2tbYBp6OgH5m0luERPg8m4hA7D5LqEynbhZg#Text>

⁷⁹ ITU Report – DIGITAL SKILLS DEVELOPMENT UKRAINE GOOD PRACTICE CASE STUDY, p.17

Nevertheless, attention is still needed to ensure that people without the documentation required to be properly registered into the new digital solutions are not excluded from vaccination, and that inclusion into digital systems remains possible for people lacking documents, for instance by accepting non-ID documents for essential services.

2.4.3 The role of SMEs

In 2018, SMEs made up 99.8% of all enterprises in the business sector, 96% of them being microenterprises. SMEs accounted for 63% of the total business employment in Ukraine and generated 49% of value added in the business sector. The majority of SMEs in Ukraine still remain concentrated in low-value-added sectors. However, recent years have seen a growing number of SMEs in the IT sector (9% in 2018 versus 5% in 2015).⁸⁰

In 2019, the share has registered an insignificant increase of 0.1%, the share of person employed reached 63.8% and their value added in the business sector increased to 52.9%. Besides, the share of SMEs exporting goods in 2019 was slightly higher than the EU average. Yet, the level of private equity investments in SMEs in Ukraine is low, amounting to 0.025% of GDP.

Later on, due to the COVID-19 pandemic 84% of SMEs experienced a decline in turnover and 25% have had to reduce their staff numbers. According to the Ukrainian Chamber of Commerce and Industry, approximately 700 000 small businesses in the service sector closed and between 3.5-4 million jobs were lost.

To support SMEs and entrepreneurs during this difficult time, several financial support programmes and other measures were launched, such as social security exemptions or a tax reduction. There are equity funds as well as several incubators offering scale-up programmes.⁸¹

The SME Development Office under the Ministry of Economy is in charge of entrepreneurship promotion, acting as key engine for development of SME competitiveness in the country. It develops targeted SME support programmes and works to enhance entrepreneurial capacities and skills, facilitate access to finance and support development of the SME institutional infrastructure network.⁸²

To simplify enterprises interaction with the public authorities, the State Employment Service has moved most of its services to online platforms and simplified administrative procedures by introducing deferred formal registration and online registration in unemployment and part-time programs.

⁸⁰ SME POLICY INDEX: EASTERN PARTNER COUNTRIES 2020 © EBRD, ETF, EU, OECD 2020, pp.483-484, retrieved from <https://www.oecd-ilibrary.org/docserver/8b45614b-en.pdf?expires=1642372066&id=id&accname=guest&checksum=B74427C0267096F275911167C511306A>

⁸¹ 2021 SME COUNTRY FACT SHEET Ukraine, retrieved from https://ec.europa.eu/neighbourhood-enlargement/system/files/2021-09/ukraine_-_sme_fact_sheet_2021.pdf

⁸² <https://eu4business.org.ua/en/news/ukraine-sets-up-sme-development-office-with-eu-support/>

Additionally, in December 2019, the Ministry of Digital Transformation launched a hotline for entrepreneurs <https://thedigital.gov.ua/hotline>. Information for businesses regarding restrictions, government support and other emergency measures is posted on the website www.sme.gov.ua.

Ukraine is considering the establishment of a wide national network of 24 Certified Business Innovation Centres and included this programme in the Government Priority Action Plan of Economic Recovery 2020 -2022. The initiative will allow to form a system of comprehensive support for ICT innovation and digitalisation of SMEs, providing access to knowledge, markets, infrastructure and sources of funding.⁸³

In Ukraine, ICT sector is one of the key sectors of the economy attracting investments and generating innovation. Yet, despite a relatively high share of businesses employing ICT specialists in Ukraine, there has only been moderate adoption of digital technologies and business models by SMEs. In this sense, creation of the Ministry of Digital Transformation in 2019 and the online public services platform 'Diia' in 2020 has accelerated SME digitalisation.⁸⁴

New business environment pushed SMEs into applying new digital tools and strategies to stay agile and resilient in the new business environment. This ranges from remote teamwork and virtual events to e-commerce.

As organisations had to quickly adapt to new realities, the demand for online training also increased dramatically. One of the organizations supporting SMEs in their endeavour is the Enterprise Europe Network (EEN) Ukraine Consortium. They developed a series of online training programmes, focused on topics such as how to find international business partners and investors, promote new products on the global market, prepare international projects, and more. The Consortium also launched an online EEN School for SMEs.⁸⁵

The EBRD has created an online training and information hub on crisis management issues - Academy of Know-how: Free business advice, business tools, including digital, training. In addition, since March 2020, entrepreneurs had the opportunity to receive training as part of the online series of events put in place by the Entrepreneurship Information Support Centres and the Merezha online platform.⁸⁶

The UNDP has created an educational online platform "[Start a business](#)" featuring video courses dedicated to the most promising business areas such as the creative industry, hotel management, fabric or ceramics production and other. Here, active and would-be entrepreneurs can find information on how to start a business, where to look for funding, how to attract investment, how a creative approach can multiply earnings, and how to safeguard a business against crises.

⁸³ <https://eap-csf.eu/wp-content/uploads/SMEs-digital-transformation-in-the-EaP-countries-during-COVID-19.pdf>

⁸⁴ 2021 SME COUNTRY FACT SHEET Ukraine, retrieved from https://ec.europa.eu/neighbourhood-enlargement/system/files/2021-09/ukraine_-_sme_fact_sheet_2021.pdf

⁸⁵ <https://een.ec.europa.eu/blog/leading-change-through-digitalisation-example-ukrainian-network-partners>

⁸⁶ <https://eap-csf.eu/wp-content/uploads/SMEs-digital-transformation-in-the-EaP-countries-during-COVID-19.pdf>, p.20

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.

The innovation divide stems in part from inefficiencies in the use or allocation of resources in the innovation ecosystem, from inefficiency or lack of key supports, policies, and other elements of a nurturing environment, as well as a need for stronger collaboration between stakeholders to develop a complete ecosystem through coordinated support activities.

This section addresses the importance of innovation ecosystems as local catalysers of creativity in the use of digital technologies for business. It also covers aspects related to the major challenges countries and key ecosystem stakeholders face in developing an enabling environment conducive to digital innovation and entrepreneurship across sectors.

2.5.1 Digital innovation ecosystem

Ukraine performs above expectations on key international rankings. Even though the Global Innovation Index (2020) ranks the country 45th out of 131 countries, the Global Entrepreneurship Index (2018) ranks it 73rd out of 137 countries and the Global Competitiveness Index (2019) only 85th out of 141 countries.⁸⁷

According to ITU Report “Regional Good Practices Accelerating innovation, entrepreneurship and digital transformation —Europe”, Ukraine is among the European countries that have successfully launched strategic policies and initiatives to drive digital transformation and develop ICT-centric innovation ecosystems. Yet, the country’s ICT infrastructure is insufficiently developed and thus requires significant public and private sector investments for balanced and equitable ICT access and usage.

Besides, the country is among 21 European countries which do not have a sufficient number of people with the skills to allow countries to compete effectively on a global level, as a result of either a mismatch between academic institutions’ curricula and the needs of the markets, or the exodus of skilled people from the country.

Ukraine leaves space for improvement in terms of existence and performance of the soft infrastructure and is underperforming vis-à-vis the provision of sufficient financing to enable start-ups to grow and scale up.

However, the country has some good practices. Among them is the Unit City, the capital’s largest innovation hub. At Unit City, open innovation activity is developing fast, involving both international

⁸⁷ ITU, 2021 Regional Good Practices Accelerating innovation, entrepreneurship and digital transformation —Europe, pp.6, 11, retrieved from https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/GOOD_PRACT.03-2021-PDF-E.pdf

corporations and domestic corporations as DTech and Kyiv Star. More than one third of the Unit City's residents are corporate innovation teams.⁸⁸

Ukrainian Startup Fund is another example that aims to promote the creation and development of technology startups in the early stages, in order to increase their global competitiveness. At the outset, there were only two support tools for startups: \$25,000 for pre-seed grants and \$50,000 for seed grants. To date, the range has expanded significantly and now includes: grants of up to 10 thousand dollars for acceleration in Ukrainian and international accelerators, innovation vouchers of up to 10 thousand dollars for participation in powerful international events, the program "Corporate Innovation" with the European Business Association; which helps to mark startups and corporations. The non-financial opportunities offered by the fund include educational programs, bootcamps, hackathons, demos and more. In total, the startup can receive from the Fund up to 95 thousand US dollars.

In two years of existence, the Fund received more than 4,000 applications from startups, of which more than 200 received funding totalling UAH 166.9 million (approx. EUR 5.2 million)⁸⁹. According to statistics, every second-winning startup has already attracted additional investment, totalling about \$ 30 million. Besides, the book "20 Ukrainian startups: success stories" was developed.⁹⁰

According to the Global Startup Ecosystem Index 2021, Ukraine has fallen 5 positions since 2020 and now ranks 34th globally. The country has 6 cities in the global top 1000. Kyiv is the highest-ranking city in Ukraine, and after falling 16 positions now ranks 48th, maintaining its position in the global top 50. Lviv is ranked 2nd in Ukraine and it jumped 99 positions to 255th globally. Meanwhile, other Ukrainian cities contributing to the decrease of the country's overall ranking.⁹¹

To advance on digital innovation ecosystem development and challenge the existing constraints, a large number of initiatives were launched in 2021.

In July 2021, the Ministry of Digital Transformation of Ukraine signed a Memorandum with the Amazon Web Services to accelerate digital transformation and innovation in Ukraine. This document will allow educational institutions to join the AWS Academy and teach Ukrainian students cloud technologies based on the Amazon experience. These services will be free and available to an unlimited number of students and professors.⁹²

In the same month, Kyiv Academic University and twelve institutes of the National Academy of Sciences signed the Memorandum to establish the Association of Academic Cooperation "Academ.City" in Kyiv. This represented a step towards establishing a high technology science park which aims to bring together leading actors of the innovation ecosystem of Ukraine from both basic research and business and foster

⁸⁸ <https://eap-csf.eu/wp-content/uploads/SMEs-digital-transformation-in-the-EaP-countries-during-COVID-19.pdf>, p.17

⁸⁹ The National Bank of Ukraine, exchange rate on 17.01.2022 of EUR 31.989, retrieved from <https://bank.gov.ua/en/markets/exchangerates?date=2022-01-17&period=daily>

⁹⁰ <https://usf.com.ua/en/pidsumki-drugoi-richnici-ukrainskogo-fondu-startapiv/>

⁹¹ <https://www.startupblink.com/startupecosystemreport.pdf> p.131

⁹² <https://www.ukrinform.net/rubric-society/3282051-it-startups-cloud-technologies-ukraine-signs-document-with-amazon.html>

their mutually beneficial collaboration. The main goal of the future “Academ.City” is to advance scientific and technological developments to higher levels of readiness and stimulate their further commercialization.⁹³

Besides, the Law on Stimulating the Development of the Digital Economy in Ukraine (the “Diia.City Law”) was adopted by the Ukrainian parliament in July 2021. The tax incentives, part of the Diia.City regime was adopted through a separate law in December 2021. As a result, the Diia.City Law establishes a special preferential regime for IT companies that are residents of the Diia.City technology park and guarantees their protection. The Diia.City regime is expected to function for at least 25 years from the date of registration of the first resident.⁹⁴

Even though the country has been going through economic difficulties for several years but still manages to create technology that is both scalable and global. Among the ecosystem champions from Kyiv are:

- Preply online educational platform that pairs students with private tutors remotely via online chat;
- Grammarly - a unicorn which is a cross-platform writing assistant that reviews spelling, grammar, punctuation using AI.
- Reface which is a face-swapping app that can swap faces in videos, GIFs and memes using AI/ML technology.⁹⁵

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 Ukraine 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 involved in digital transformation work in Ukraine. 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.

⁹³ <https://ukrainet.eu/2021/07/27/academ-city/>

⁹⁴ <https://chamber.ua/news/key-healthcare-and-life-sciences-developments-ukraine/>

⁹⁵ <https://www.startupblink.com/startupecosystemreport.pdf> p.132