National Strategy to Increase Foreign Direct Investment in Ukraine

Section 2.3: Digital Infrastructure

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Disclaimer

Key terms and abbreviations

Main definitions

AI	Artificial Intelligence
DTC	Digital Transport Corridor
EY, We	Ernst & Young LLC
ICT	Information and Communication Technology
IoT	Internet of Things
IXP	Internet Exchange Points
QES	Qualified Electronic Signature
RPA	Robotic Process Automation
VET	Vocational education and training

Names and Companies

EaP	EU Eastern Partnership, comprises of Armenia, Azerbaijan, Belarus, Georgia, the Republic of Moldova and Ukraine
EaPeReg	The EaPeReg Network – EU Eastern Partnership (EaP) Electronic Communications Regulators Network
EIDAS	electronic IDentification, Authentication and trust Services, an EU regulation on electronic identification and trust services for electronic transactions in the European Singe Market
EU	European Union
IFC	International Financial Corporation
IMF	International Monetary Fund
MDT	Ministry of Digital Transformation of Ukraine
NBU	National Bank of Ukraine
NCCIR	National Commission for the State Regulation of Communications and Informatization
OECD	Organization for Economic Co-operation and Development
USDR	Unified State Demographic Register
Parliament	Verkhovna Rada of Ukraine
World Bank, WB	The World Bank Group

Periods

1H20XX, 2H20XX	Periods from January 1, 20XX to June 30, 20XX and from July 1, 20XX to December 3, 20XX (unless stated otherwise)
1Q20XX, 3Q20XX	Periods from January 1, 20XX to April 31, 20XX or September 30, 20XX (unless stated otherwise)

Section 2.3

Digital Infrastructure

CONTENTS

Executive Summary

The proverbial **'digital age'** brought one profound key change to the global economy: **Digital Infrastructure became a core element of the Critical Infrastructure.** The growing dependency of nearly every sector of the economy on any given country's digital capabilities is having a dramatic impact on economic security, doing business environment, and ultimately, competition for investors.

Use cases for digital are everywhere around us – manufacturing, communication with consumers, public services, banking, smart cities, and countless other examples – are gradually becoming the **'new normal'** and **'minimum expected standard.'** Digital technologies are powering core business operations: this becomes a strategic imperative, not just an operational issue.

Those capabilities don't come for granted – the **throughput, quality and stability of the underlying infrastructure is of critical importance.** 2020 introduced the 'mother of stress tests' for that infrastructure – the COVID-induced planet-wide shift to remote work and life mode. Global experts note that the pandemic has accelerated global mass adoption of digitalization and improvement of underlying infrastructure by years, possibly a decade. Obviously, any FDI considerations by investors now factor in the destination countries' digital infrastructure capabilities – right at the top with other critical business environment considerations and enablers.

In fact, digital infrastructure and digital services are now playing a dual role – they're both a **potential target for local and cross-border investments and a key enabler** which creates a significant added potential for a number of traditional sectors by enhancing productivity, increasing efficiency, and enriching the labor and education markets with a new set of advanced skills.

Ukraine can definitely count on its current and planned digital infrastructure capabilities as an **advantage** compared to its immediate peers. Internet is cheap, broadband usage is widespread (at least across major cities) with a 2012-2019 CAGR of 8.1%, mobile communication services penetration is nominally over 120%, and the market is following the established global trends of data-driven services by electronic communications operators prevailing over voice services (with **mobile data traffic expected to grow 6-10 times within 5 years).**

To support the dynamics, data centers and cloud infrastructure facilities are being developed by international and local market players. Public e-services are growing in number, quality and customer-centricity, and, in many instances, **already exceed those provided by immediate peers.**

The potential of the sector is driven by several factors inherent to Ukraine – a generally **tech-focused population that serves both as a robust workforce pool and eager adopters of new services and solutions.** This is best represented by the incredibly fast penetration of the 'cashless economy' concept and high demand for peer-to-peer payment services and peer-to-peer e-commerce platforms.

The legal framework covering the sector and the government's strategic priorities for its development, however, has been largely lagging until recently. Hence, multiple gaps and barriers exist, which, if solved, would help to unlock the full investment and economy enabler potential of the sector – and drive investor interest into all sectors dependent on that element of the 'Critical Infrastructure Triad.' Let's have a closer look at what they are:

Executive Summary: Introduction

- The **infrastructure for fixed and mobile broadband connectivity,** with a feasible implementation plan based on a well-structured digital transformation strategy with clear actions aimed at investors, with established goals and means of achievement:
  - Coordination of inter-sectoral activities attracting long-term value investment,
  - Legal incentives securing investors' property on a long-term basis,
  - Capability enhancement and development of independence of national regulators in the digital domain,
  - Long-term planning of economic and investment activities and establishment of governance principles for all government authorities responsible for the digital sector visioning and development.

- The development of the **national digital services concept and strategy** emphasizing:
  - Citizen-centric approach to designing services and digitalizing the existing services (applying the 'digital by design' principle)
  - Unification of various government registries and conceptualizing of the digital national identification with embedded trust and security aspects
  - Identification and prioritization of digital investment programs mapping affected industries and applied technologies.

Technology-wise, the digital infrastructure and services will most effectively capitalize on the capabilities of **data analytics** – with the application of artificial intelligence, machine learning, software, and industrial robotics in all the sectors featured in this study.

The current state and outlook for the fixed and mobile broadband in Ukraine, growing capacities of data centers create the required conditions for more intensive development of the industrial and consumer solutions of the **Internet of Things**, which can result in the conceptualization and development of **Smart Cities.**

It is essential to develop digital services to ensure that digital infrastructure is used in the most efficient way. The government can enable that by requesting well-conceptualized and well-architected environments and platforms which are based on internationally accepted systems and regulations, ensuring **interoperability, trust and cybersecurity** in the initial design of information systems.

The impact of digital transformation on the labor market is crucial in the years to come, driving forward the need for government support in the **design of digital skills, education concepts, social and public services** driven by the market needs. This should be communicated on a regular basis with business associations, sectoral communities, and platforms, which would establish a productive and mutually beneficial **business-to-government dialogue nurturing investment growth** in key sectors of the Ukrainian economy.
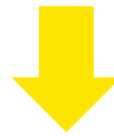
Executive Summary: Attractiveness Factors and Development Directions

Based on our analysis, **we identified the following**

KEY FACTORS

influencing the potential attractiveness of the digital sector for investors

⬇

The digital sector in Ukraine could be considered as an attractive one for potential FDI. **We see the following**
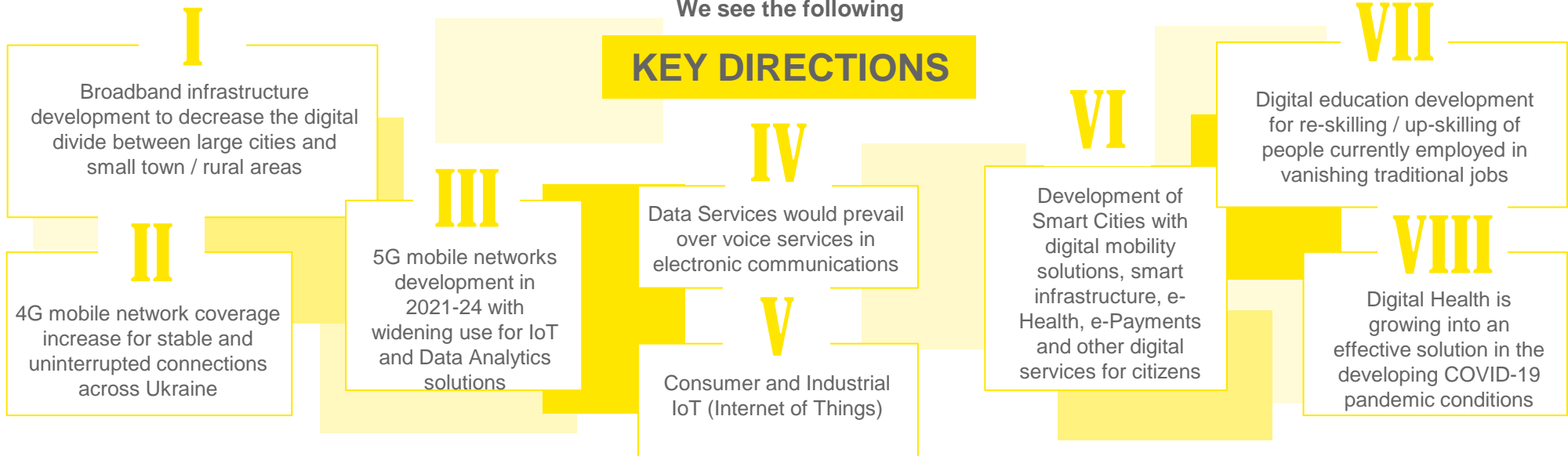
KEY DIRECTIONS

For digital infrastructure:

► Development and implementation of digital strategies in key sectors of economy to realize multiple digital initiatives of the Ukrainian Government;

► Implementation of the National Broadband Plan to increase the speed and coverage of broadband internet connections in 2021-24 and beyond;

► Upcoming signing of the EU Eastern Partnership Regional Roaming Agreement and development of 4G and 5G mobile networks across Ukraine;

► Increase of data centers capacity to support the growing demand for data storage and use.

For digital services:

► Interoperability of government registers and other datasets of general use while introducing multiple digital services;

► Harmonization of digital services based on leading international standards and approaches (e. g., the EU Digital Single Market);

► Evolving digital labor market with highly skilled and motivated IT specialists and growing markets for digitally advanced professionals in traditional sectors.

I
Broadband infrastructure development to decrease the digital divide between large cities and small town / rural areas

II
4G mobile network coverage increase for stable and uninterrupted connections across Ukraine

III
5G mobile networks development in 2021-24 with widening use for IoT and Data Analytics solutions

IV
Data Services would prevail over voice services in electronic communications

V
Consumer and Industrial IoT (Internet of Things)

VI
Development of Smart Cities with digital mobility solutions, smart infrastructure, e-Health, e-Payments and other digital services for citizens

VII
Digital education development for re-skilling / up-skilling of people currently employed in vanishing traditional jobs

VIII
Digital Health is growing into an effective solution in the developing COVID-19 pandemic conditions

Executive Summary: Gaps, barriers and enablers

Based on our analysis, **we identified the following**

KEY GAPS

limiting the potential attractiveness of the digital subsector for investors

For digital infrastructure:

► developing but patchy coverage by 4G mobile networks, especially in rural areas and across roads;

► high start-up cost of 5G rollout for network operators may hold off implementation without incentives from the state;

► fixed broadband operators are disappointed with levels of cable theft;

► loss of traditional jobs in key sectors of economy on the background of the ruined system of vocational education.

For digital services:

► inconsistency of court practice in IP protection holds investors from registering intellectual property in Ukraine;

► fragmented and chaotic approaches to formulation of sectoral and national digital transformation strategies holds business from planning long-term investment;

► ineffective communication between the Government and industry 4.0 associations and business representatives holds the technology sectors from efficient digital transformation and integration into regional and global value chains.
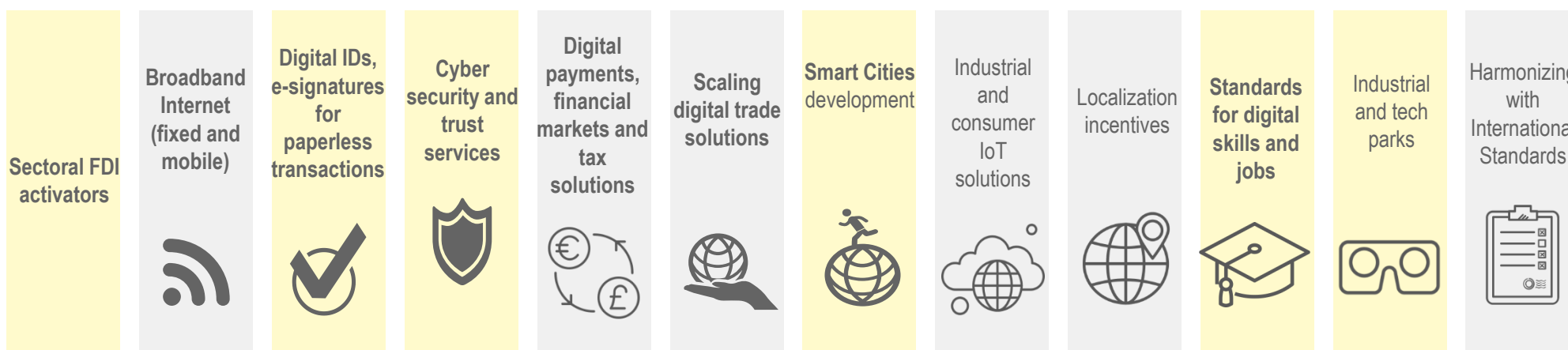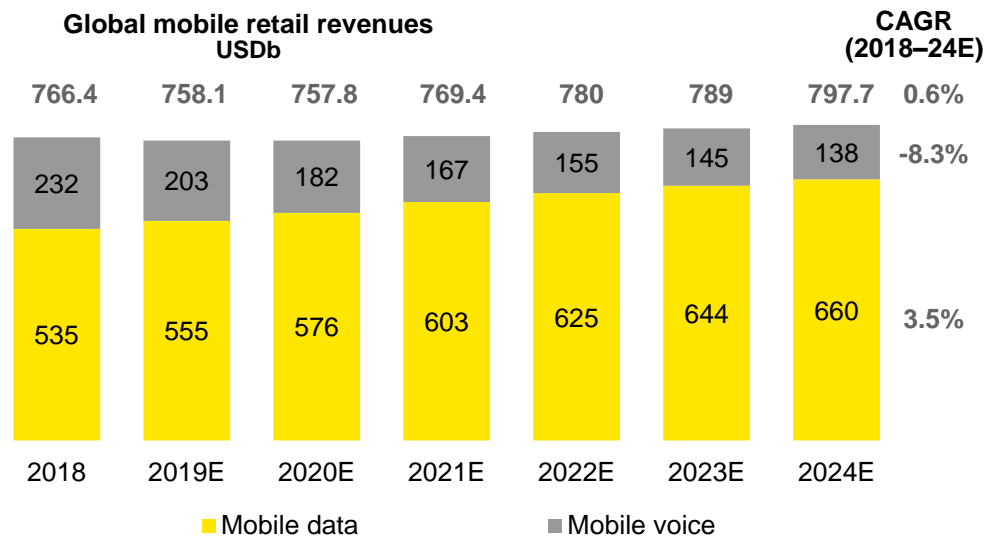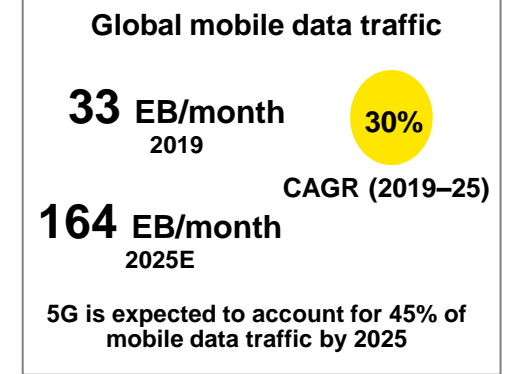
Nevertheless, gaps and barriers could be effectively mitigated, **underpinned by the following**

KEY ENABLERS

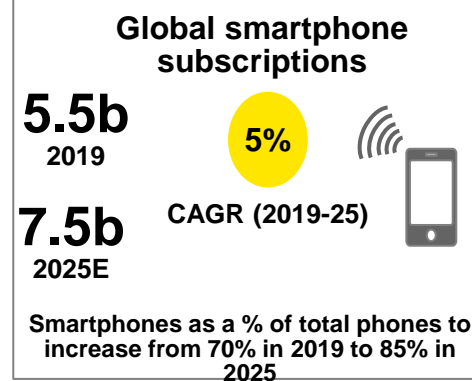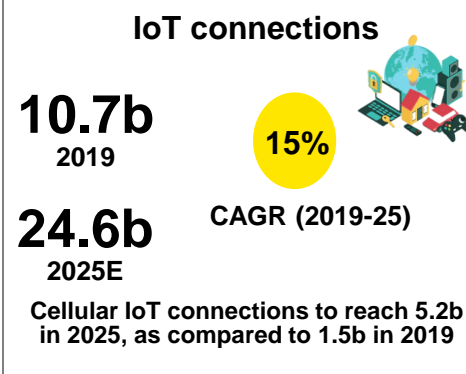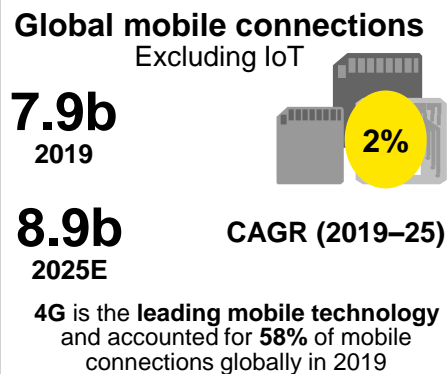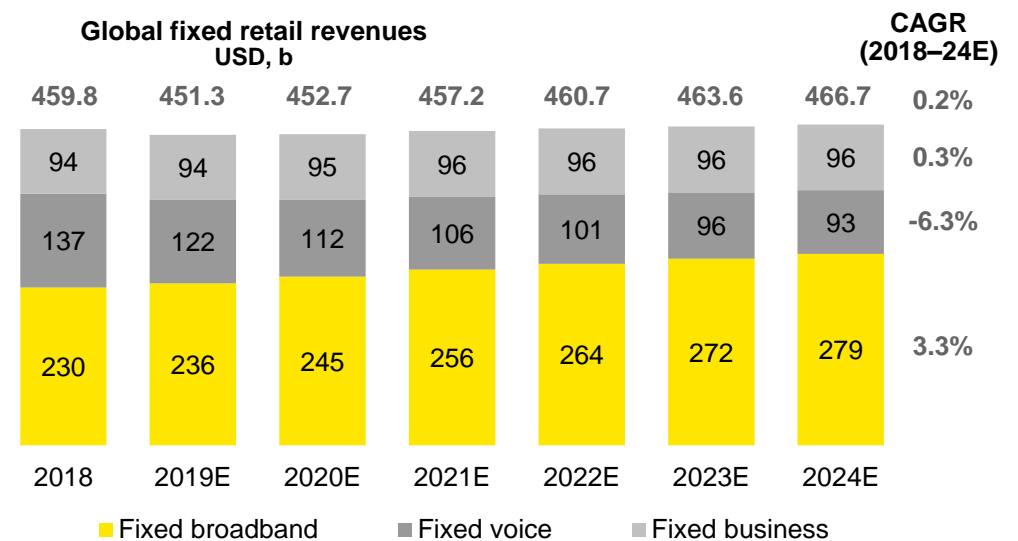| Sectoral FDI activators	Broadband Internet (fixed and mobile)	Digital IDs, e-signatures for paperless transactions	Cyber security and trust services	Digital payments, financial markets and tax solutions	Scaling digital trade solutions	Smart Cities development	Industrial and consumer IoT solutions	Localization incentives	Standards for digital skills and jobs	Industrial and tech parks	Harmonizing with International Standards

2.3.1. Global Trends

2.3.1. Global Trends

Global Revenue Growth Drivers – Data Services in Mobile, New Generation
Access Broadband – in Fixed

Data services to drive mobile revenue growth

**Global mobile retail revenues
USDb**

CAGR (2018–24E)

2018	2019E	2020E	2021E	2022E	2023E	2024E	
766.4	758.1	757.8	769.4	780	789	797.7	0.6%
232	203	182	167	155	145	138	-8.3%
535	555	576	603	625	644	660	3.5%

■ Mobile data ■ Mobile voice

Next-generation access broadband to drive fixed services

**Global fixed retail revenues
USD, b**

CAGR (2018–24E)

2018	2019E	2020E	2021E	2022E	2023E	2024E	
459.8	451.3	452.7	457.2	460.7	463.6	466.7	0.2%
94	94	95	96	96	96	96	0.3%
137	122	112	106	101	96	93	-6.3%
230	236	245	256	264	272	279	3.3%

■ Fixed broadband ■ Fixed voice ■ Fixed business

Global mobile connections
Excluding IoT

7.9b
2019

8.9b
2025E

2%
CAGR (2019–25)

4G is the **leading mobile technology** and accounted for **58%** of mobile connections globally in 2019

IoT connections

10.7b
2019

24.6b
2025E

15%
CAGR (2019-25)

Cellular IoT connections to reach 5.2b in 2025, as compared to 1.5b in 2019

Global smartphone subscriptions

5.5b
2019

7.5b
2025E

5%
CAGR (2019-25)

Smartphones as a % of total phones to increase from 70% in 2019 to 85% in 2025

Global mobile data traffic

33 EB/month
2019

164 EB/month
2025E

30%
CAGR (2019–25)

5G is expected to account for 45% of mobile data traffic by 2025

Source: Analysys Mason, GSMA - The Mobile Economy 2019, "Ericsson Mobility Report," Ericsson, June 2020

2.3.1. Global Trends
Growth Areas, Drivers and Inhibitors for Growth

Digital Transformation Potential

Traditional companies across industries are pursuing digital transformation to reimagine solutions to evolving business challenges and create exponential value for their customers and partners.
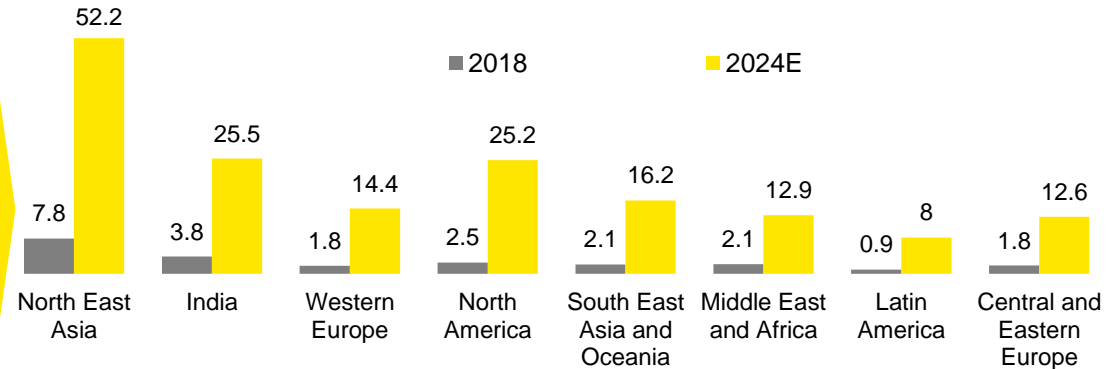
IDC estimates **the economic value of digital transformation to almost USD19 trillion, or more than 20% of global GDP**.

By 2022, more than 60% of global GDP will be digitized, with growth in every industry driven by digitally-enhanced offerings, operations, and relationships and **almost USD7 trillion in IT-related spending in 2019–22**.

6-10 times growth by 2024 in regional mobile data traffic (in Exabyte / month)

■ 2018   ■ 2024E

Region	2018	2024E
North East Asia	7.8	52.2
India	3.8	25.5
Western Europe	1.8	14.4
North America	2.5	25.2
South East Asia and Oceania	2.1	16.2
Middle East and Africa	2.1	12.9
Latin America	0.9	8
Central and Eastern Europe	1.8	12.6

Growth Areas

► Mobile traffic is expected to grow by 30% annually between 2018–24, with most of this coming from video traffic

► Video traffic is forecast to grow by around 34% annually up to 2024 and account for nearly 3/4 of mobile data traffic

► Traffic growth is driven by rising smartphone subscriptions and increasing average data volume per subscription, fueled by video

Drivers for growth

► Digital technologies are powering core business operations: this becomes a strategic imperative, not just an operational issue

► Rising customer expectations require more convenience, customization, and control

► External professional services firms are considered as preferred partners to implement digital transformation initiatives

► The success of digital strategy projects is led by the longer-established "pillars" of cloud, mobile, social, and big data/analytics

► 5G technology are driving the wider implementation of the Internet of Things

Inhibitors to growth

► Challenge of meeting rapidly evolving and increasing demands from customers, employers, and partners

► Lack of coordinated and holistic approach and long-term strategy paired with organizational resistance

► Low readiness for technological change of organizational leadership, talent and culture with insufficient technology expertise, skill gaps, and talent shortages

► Difficulties in meeting the requirements around data governance, privacy, and compliance

► Cybersecurity and data privacy risks

Sources: EY analysis of EMEIA – regional digital trends 2019, Analysys Mason, GSMA - The Mobile Economy 2019, "Ericsson Mobility Report," Ericsson, June 2019; North East Asia includes China

2.3.1. Global Trends
Digital Market Overview: Regional Trends in Europe

2020 – 2025: investors expect three megatrends to drive their European investment plans

1. Technology investment is set to accelerate post-COVID-19
  ► Businesses clearly recognize this: 82% expect technology adoption to accelerate in the next three years as a result of COVID-19.
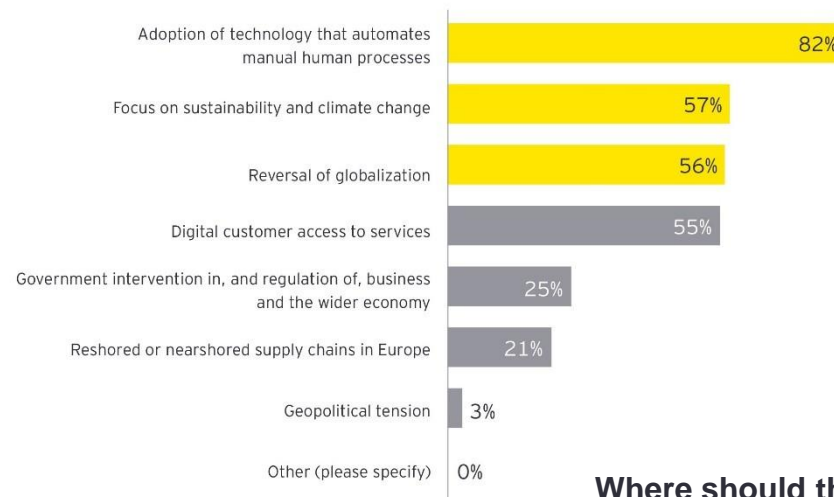
2. Renewed sustainability agenda will reshape the way investment decisions are made
  ► Most businesses recognize this: 57% anticipate a renewed focus on sustainability and climate change in the next three years due to COVID-19.

3. Reconfigure supply chains for resilience and agility
  ► Rather than a massive reshoring movement, 56% of the surveyed executives expect a reconfiguration of global supply chains, with a nearshoring of certain production sites.

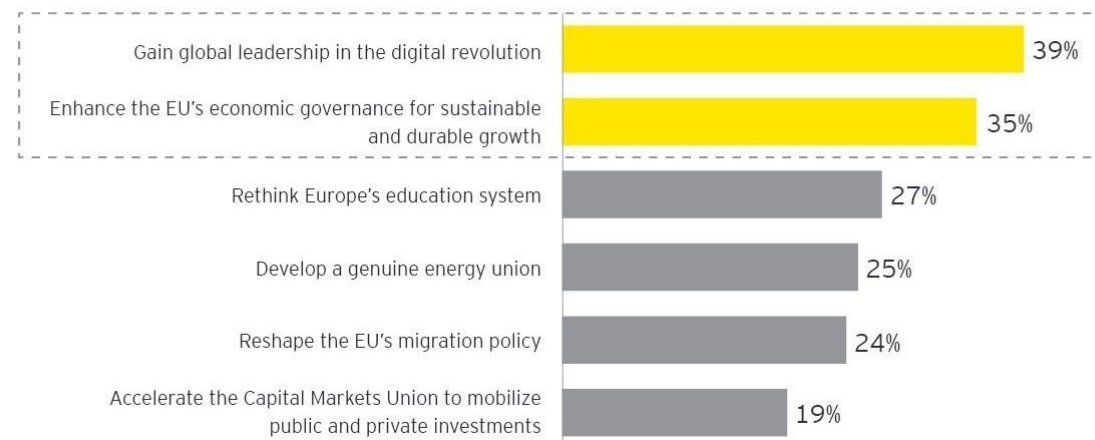|	
Adoption of technology that automates manual human processes	82%
Focus on sustainability and climate change	57%
Reversal of globalization	56%
Digital customer access to services	55%
Government intervention in, and regulation of, business and the wider economy	25%
Reshored or nearshored supply chains in Europe	21%
Geopolitical tension	3%
Other (please specify)	0%

Source: EY Flash Survey May 2020 (total respondents: 113)

Digital transformation is considered a key investment growth factor in Europe

To be competitive in the global market, the European leaders promote the advantages of the EU Digital Single Market, provide technical assistance to the nearby countries to implement interoperability standards, establish harmonization on the technical and organizational levels of collaboration.

Where should the EU concentrate its efforts in order to maintain its competitive position in the global economy?

Gain global leadership in the digital revolution	39%
Enhance the EU's economic governance for sustainable and durable growth	35%
Rethink Europe's education system	27%
Develop a genuine energy union	25%
Reshape the EU's migration policy	24%
Accelerate the Capital Markets Union to mobilize public and private investments	19%

Source: EY Attractiveness Survey Europe 2020

Source: EY Flash Survey May 2020 (total respondents: 504)

2.3.2. Ukraine: Digital Market Overview

Key indicators of the Ukrainian Telecommunications Industry

22.95m
Internet users

18.86 Mbps
mobile download speed

13.2m
active social media users

8.3m
Mobile gamers

184 b
min. of call traffic, 2019

54.9m
active number of mobile subscribers

USD 4-7
average monthly cost

USD 1.3 b
total industry revenues for 1H20

22
International interconnections
with 7 countries

x3 | 1 | x3 | x4 | x5 | 1 | x5

4.5%
Industry contribution to total GDP in 2019

USD 2,191.1m
Total Foreign Direct Investment in Telecoms in 2019

7.4%
Average annual industry growth rate (%)

139%
Mobile connections of the total population

63%
Internet penetration rate

8,1%
CAGR of fixed broadband subscriptions (2012-2019)

Devices used to connect to the Internet
(users often use several devices)

66%

40%

36%

14%

65%
of the population over 15 y.o.

2.3.2. Ukraine: Digital Market Overview
Digital Market Overview: Potential in the Ukrainian Market for Telecommunications Services

Sectoral contribution to GDP, 2016 – 2019, UAH b

■ 2016 ■ 2017 ■ 2018 ■ 2019

Average annual increase by 26% in current prices (by 7.4% in 2016 year prices)

Categories: Trade, Processing industry, Agriculture, Public administration and defense, Transport and warehousing, Education, Information and Communication
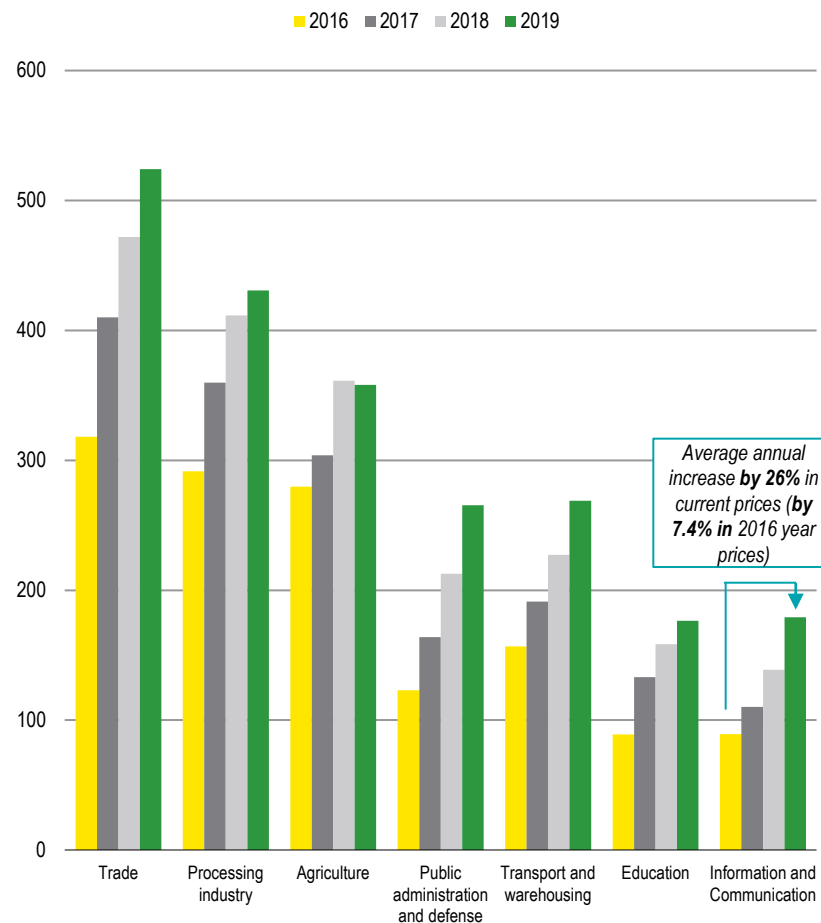
Source: Ukrstat

GDP Per Capita, 2019, USD

34,364

Countries: IE, PT, CY, DK, LU, BE, FI, NL, GR, MT, SE, ES, AT, GB, HR, IT, SI, EE, DE, FR, CZ, SK, HU, LV, BG, PL, LT, RO, UA
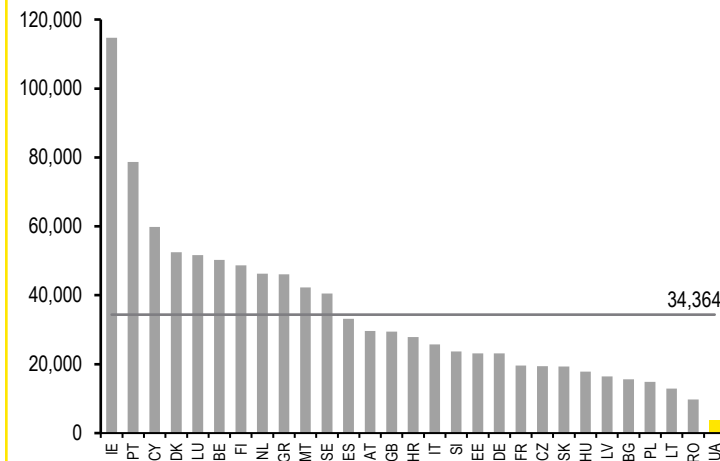
Source: WorldBank data

Age structure of the population, 2019

Years	M	F
85+ (16.8%)	2.965	2.792
55-64 (14.1%)	1.844	1.740
25-54 (44.1%)	8.112	8.346
15-24 (9.6%)	2.261	2.982
0-14 (15.4%)	2.099	4.149
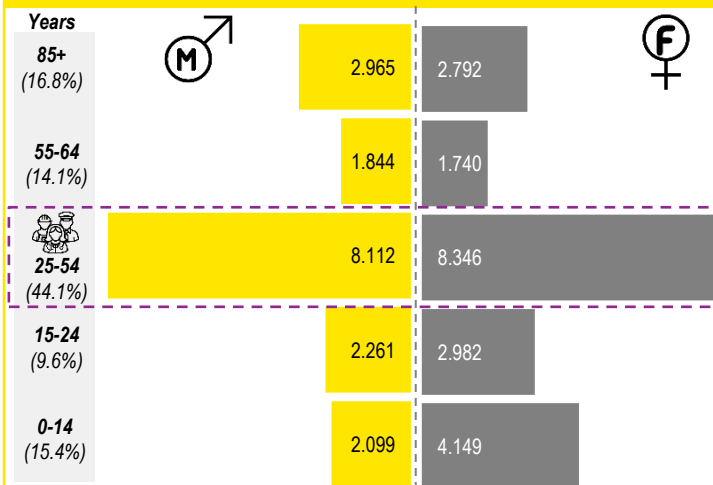
Source: Ukrstat

*Earning capacity for the average Ukrainian is low as GDP per capita was **USD 3,659** in 2019 that is **9.4 times lower** than the average GDP for the European Union.*

Even though the Ukrainian economy is developing and GDP continues to grow, this growth, however, is too slow compared to the relatively high population.

*This situation is mostly influenced by such **internal factors** as a high level of corruption (eats away up to 2% of GDP), escalation of the conflict on the East, rising inflation and NBU discount rates, growth of external debt, worn-out infrastructure, etc. However, the main reason for the slow growth is the lack of **economic development strategy**.*

*In spite of the economic headwinds, the Ukrainian population provides a **brimming market for the uptake of telecommunication services and products**.*

2.3.2. Ukraine: Digital Market Overview
Voice and Data Services by Telecom Operators

Global trend

Telecommunication industry, which previously used to be solely about voice traffic, evolved to data-type means of communication (videos, SMS, chats, web browsing, etc.) To reflect such a shift, the network is changing, as the trend of data telecom keeps gaining traction. As a consequence, the network must be optimized for data, that is becoming its primary function.

Trends in Voice vs Data services by telecom operators in Ukraine

Voice Services

Voice services, USD billion / Voice traffic by mobile broadband, b minutes
2017 2018 2019 2020*
- Income from Voice services**
- Voice traffic by mobile broadband
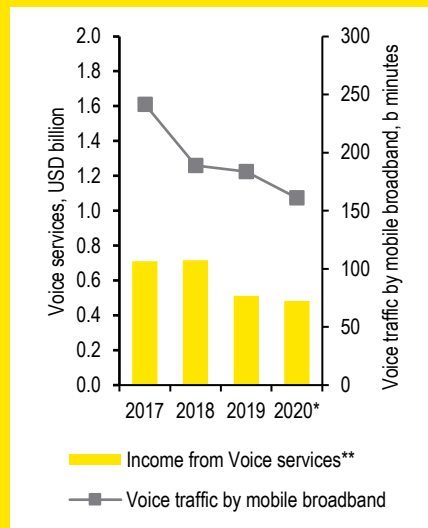
(i) The increasing use of mobile messengers for transmitting/ receiving voice calls and messages and (ii) the gradual expansion of 4G network geography is leading to the general replacement of voice services by data services.

According to the Draft agreement on International roaming services[4]:

► **the maximum retail price of outgoing roaming calls** shall not exceed EUR 0.24 per minute in 2022 EUR 0.15 – in 2023, EUR 0.09 – in 2024, and EUR 0.048 – in 2025;

► **the maximum retail price of incoming roaming calls** shall not exceed EUR 0.12 per minute in 2022 EUR 0.08 – in 2023, EUR 0.04 – in 2024, and EUR 0.015 – in 2025.

VS

Data Services

Data services, USD billion / Internet traffic by mobile broadband, PB
2017 2018 2019 2020*
- Income from Data services***
- Internet traffic by mobile broadband
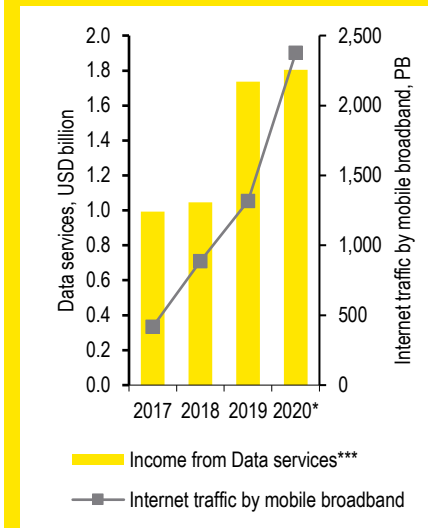
Provision of data services, including Internet access, is increasingly becoming a key revenue source for Telecom operators.

According to the Draft agreement on International roaming services[4]:

► **the maximum retail price of SMS message** shall not exceed EUR 0.076 per SMS in 2022 EUR 0.045 – in 2023, EUR 0.03 – in 2024, and EUR 0.015 – in 2025.

► **the maximum retail price of data transmitted** shall not exceed EUR 0.137 per megabyte in 2022 EUR 0.075 – in 2023, EUR 0.0375 – in 2024, and EUR 0.0116 – in 2025.

Source: EY analysis of NCCIR – the state of Ukrainian Telecom Market for 2017-1H20

1. Income figures are annualized 9multiplied by 2), traffic data is approximated by EY considering the trends of previous periods.
2. Includes income from fixed telephone connection and voice telecommunications by mobile broadband.
3. Includes income from fixed broadband and mobile broadband (less income from voice telecommunications).
4. Draft agreement on International roaming services in public mobile communications networks regulation in Eastern partnership countries of Armenia, Republic of Azerbaijan, Republic of Belarus, Georgia, Republic of Moldova, and Ukraine. The Signatories agreed to reduce the prices of roaming services of incoming and outgoing voice calls, SMS, and data transmission for the full coverage of all end-users in Signatory countries.

2.3.2. Ukraine: Digital Market Overview
Market Trends in Ukraine. Fixed Broadband

Coverage and affordability to Ukrainians

► Ukrainians have access to low-priced broadband access, especially in urban and semi-urban areas. However, there are some disparities in the distribution of the service as it remains uneven in rural and remote areas (mountain regions characterized by depopulation and high concentration of the poor).

► A study estimating the affordability of the households based on the consumption groups (urban, rural) shows that the target set by the NBDS is reachable. At the current prices of UAH 180 in the capital Kyiv and UAH 150 in other areas of Ukraine, at an affordable price, the broadband connection by households would represent around 2% of monthly total consumption.

► Due to the negative effects of COVID-19, the level of household income is expected to drop. Affordability studies should be conducted further by policymakers taking into account the new changing environment.

Affordability estimates of the targeted 100Mbps connection based on consumption groups

Consumption Group	Estimated household income in 2019 (monthly UAH)	Affordability in 2020 (100Mbps as % of monthly household income, UAH) Kyiv prices			Affordability in 2020 (100Mbps as % of monthly household income, UAH) Outside Kyiv prices		
		180	207	234	150	173	195
Average	11,930	2%	2%	2%	1%	1%	2%
Average (Urban)	12,368	1%	2%	2%	1%	1%	2%
Average (Rural)	11,024	2%	2%	2%	1%	2%	2%

Source: UkrStat survey of Ukraine's households - World Bank estimates 2019-2020

Jun19	Jun20	Δ, %
Number of fixed access points to the Internet, thousand		
7 060,7	7 101,3	0,6%
by area types:		
urban area		
6 004,0	5 844,8	-2,7%
countryside		
1 056,7	1 256	18,9%
by speed of connection:		
10+ Mbit / s		
5 096,8	5 521,0	8,3%
256 Kbps - 10 Mbit / s		
876,1	447,6	-48,9%
speed set up by the provider		
1 087,8	1 132,7	4,1%

Source: EY analysis of NCCIR – the sate of Ukrainian Telecom Market for 1H20

Planned investments

► According to the Ministry of Digital Transformation, the draft budget for 2021 provides UAH 850m to connect social facilities of rural areas to the high-speed optical Internet.

► Such decision was pushed by the results of a study that showed that about 40% of schools, 92% of libraries and 37% of hospitals throughout the country are not connected to the optical (fixed) Internet.

► In total, it is planned that the state program "Internet Subvention" will allow 2.5 million Ukrainians from 5 000 villages (among more than 28 thousand villages in Ukraine) to get the possibility of having fixed optical access to the Internet.

► Such connections are unprofitable yet because of the long-term return on investment and a small number of potential subscribers.

► Under the project, the Ministry of Digital Transformation announced the launch of a specialized portal, where it will be possible to track which providers connect a particular village and how much from the budget they spend on it.

► **Vodafone Ukraine.** According to its CEO, the company is considering several models for entering the fixed broadband market at once. One of the options under consideration is the purchase of existing market players – providers. Most likely, that the company will combine the purchase of assets put up for sale in Ukraine and the construction of its own network. In early November, it was announced that Vodafone Ukraine is going to invest up to one billion hryvnias in the development of the direction of the fixed Internet.

Market Trends in Ukraine. Mobile Broadband

Principles of Mobile Broadband
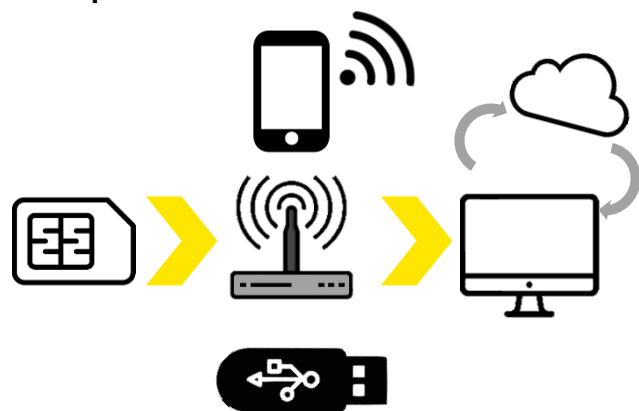
Key players of Ukrainian mobile market

Kyivstar
Member of the International Group VEON. Covers all Ukrainian cities and towns, including 28 000 rural settlements.4G network covers the territory with more than 70% of the population in Ukraine.

Vodafone
Was acquired by Azerbaijan's Bakcell in Q4 2019. LTE coverage reaches all 25 regions and 43% of the population (18m people).

Lifecell
Is owned by Turkcell. Started to test 5G technology in partnership with Ericsson.

Smaller national players, Intertelecom, Ukrtelecom (TriMob) and Telesystems (PEOPLEnet) cumulatively control less than 3% of the market.

Global trends

► The share of users of mobile broadband (3G+4G connections only) out of all users reached 77% in 2018. This means that the broadband market has potential for growth in the coming years, as close to a quarter of wireless users are not yet using 3G or 4G. As shown on the chart below, mobile broadband has saturated wireless markets of some EaP countries (Azerbaijan, Georgia), in WB-6, and Poland, but not yet in Ukraine, where 4G LTE networks went live only recently, in 2018.

Wireless vs. mobile broadband penetration per capita in %, 2018

■ Wireless penetration   ■ Mobile penetration
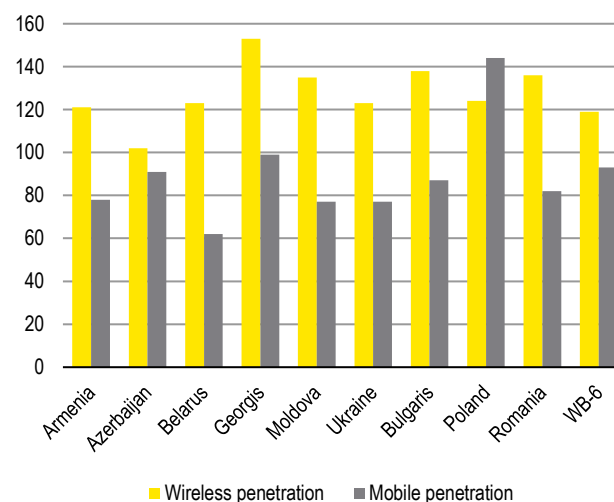
Source: TeleGeography GlobalComms, World Bank (2020)

Ukrainian trends

► The Herfindahl-Hirschman Index (HHI) calculations reveal that the mobile market in Ukraine is competitive (HHI index 0,38) and that market concentration is similar to the markets of other EaP countries, such as Moldova (0,39) or Azerbaijan (0,35). But less competitive than in Poland (0,2), Bulgaria (0,33) or Romania (0,28).

► The quality of mobile broadband remains insufficient for communication needs, especially in less populated oblasts and in rural and remote areas. As can be seen from the coverage map, only the largest cities have good coverage, whereas the rest of the country is severely underserved.

Mobile broadband coverage[1] as of 30 June 2020 (per 100 inhabitants)
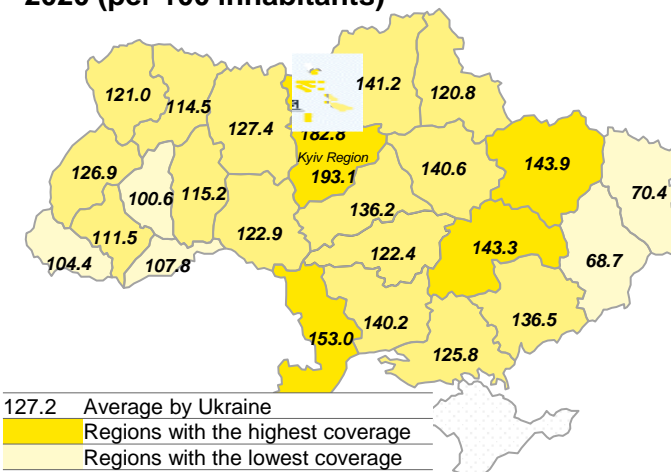
127.2	Average by Ukraine
▮	Regions with the highest coverage
▯	Regions with the lowest coverage

1. Provision by active mobile telecommunication cards.

2.3.2. Ukraine: Digital Market Overview

Market Trends in Ukraine. Mobile Broadband – 4G

Accelerating 4G mobile communications

▶ In 2019, the government signed a memorandum with four leading mobile network operators: Vodafone, Lifecell, Kyivstar, and Intertelecom, to reorganize radio-frequency resources in the 900 MHz band. It allows to ensure maximum coverage on the entire territory of Ukraine with 4G mobile communications and provide broadband Internet access.

▶ According to the analysis of Frequency Spectrum Management conducted by the Better Regulation Delivery Office (BRDO), the use of low-frequency ranges (800-900 MHz) would allow Ukraine to *increase the availability of 3G and 4G to 95% of the populatio*n within 1.5 years and would *facilitate the further introduction of 5G*.

LTE progression in Ukraine

Q4 2018   *Q3 2019*
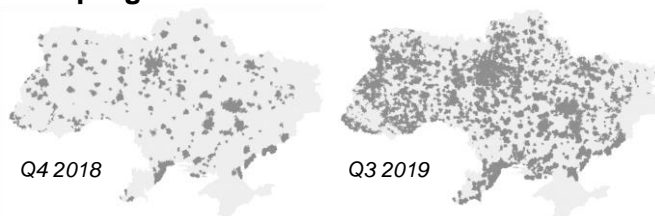
Since the start of deployment of 900 MHz 4G networks in July 2020:

2.7 k cities/towns are connected to 4G for the first time

2.6 k cities/towns with improved 4G

1.2 m citizens received 4G for the first time

2.6 m citizens received 4G improvements

Internet speeds and 4G availability in major cities in Ukraine

Q3 2019

	>70% of 4G availability
	>60% of 4G availability
	Not covered by analysis
	Above average (TOP-3)
	Below average (TOP-3)
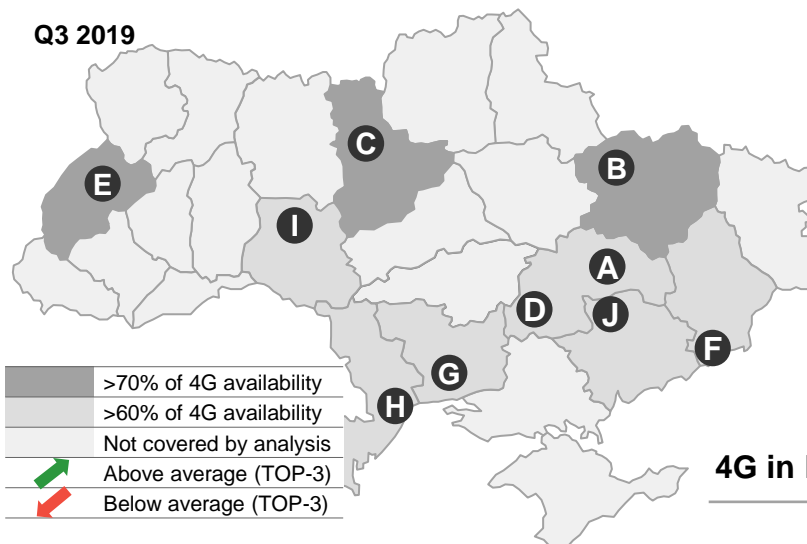
	City	Fixed (Mbps)	Mobile (Mbps)	4G availability
A	Dnipro	45.13	21.17	69.80%
B	Kharkiv	62.99 ↗	22.16 ↗	70.80% ↗
C	Kyiv	66.5 ↗	19.53	72.10% ↗
D	Kryvyi Rih	41.78 ↘	21.75	58.70%
E	Lviv	44.83	21.37	71.60% ↗
F	Marioupol	56 ↗	23.5 ↗	68.70%
G	Mykolaiv	37.64 ↘	25.38 ↗	65.60%
H	Odessa	47.75	21.42	65.50%
I	Vinnytsia	36.48 ↘	20.32	68.30%
J	Zaporijia	42.1	17.83 ↘	67.10%
	Average	**49.99**	**18.86**	**34.8%**

Source: SpeedTest Global Index, Data Q3 2019
Note: The sample is based on the available information

▶ 4G availability is significantly higher in larger cities than in towns or in rural areas because of the operators' commitment to bringing the LTE service to major population centers first.

4G in Kyiv Subway

23 stations and tunnels between them are connected to 4G by Kyivstar, Vodafone Ukraine and Lifecell, together with Huawei.

Dec 2020 Teremky station should be connected to 4G. The overall launch began in March 2020 from Akademmistechko station.

400 Tb have been used to date by subscribers of mobile operators.

1,800 Mhz two bands of frequencies are used
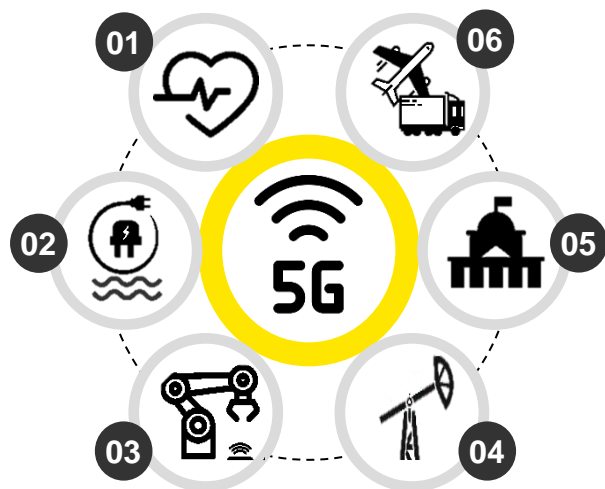**2,600 Mhz**

40 Mbps the average 4G speed in subway stations, according to mobile operators

2.3.2. Ukraine: Digital Market Overview

Market Trends in Ukraine. 5G – Global Development and Preparations in Ukraine

Possible Applications of the 5G Technology

01 Healthcare

02 Energy and Utilities

03 Industrial IoT

04 Oil and gas mining

05 Public Sector

06 Transportation and logistics

Global trends

► According to the recent research published at ResearchAndMarkets.com, the global 5G market is expected to reach **USD 277 billion by 2025** at a CAGR of 111% during 2019-2025. It is expected that the global 5G services market size will reach **USD 41.48 billion** by the end of 2020, recording y-o-y **growth of 89%**.

► As of today, every government is enthusiastic about getting ahead of the curve in the 5G space. Especially, the governments of Japan, South Korea, the U.S., and China have been particularly active in pushing the rollout of 5G technology by the end of 2019.

► With 5G coming into the picture, providers will be able to increase both download speeds and monthly data capacity on unlimited plans.

► Service providers that recognize 5G's potential to revitalize their organization will be best placed to maximize their ROI over the next decade.

► **The potential for investment in 5G is analyzed in more detail in Section: Sector Potential**

Ukrainian trends

► In May 2019, the President of Ukraine signed a decree launching 5G technology in the country. Under this decree, the government and telecommunications regulator must develop and adopt a step-by-step plan for implementing 5G technology in Ukraine in 2020.

► As a part of regional initiatives, the EU, through the EaPeReg organization (the network of national regulators of telecom and electronic services), has worked on the draft Regional Spectrum Agreementю This document opens the opportunity to harmonize the approach of Eastern Partner countries, including Ukraine, to free the 700 MHz and 3400-3800 MHz spectrums of frequencies for 5G development.

► In early November 2020, epy Minister of Digital Transformation of Ukraine announced the 5G launch action plan. The working group was formed to prioritize and monitor activities connected with 5G launch in Ukraine.

► The announcement of the tender for frequencies will take place in October 2021, while the tender itself should take place in December 2021.

► The start of 5G development in Ukraine, according to the announced action plan, is expected in 2022.

2.3.2. Ukraine: Digital Market Overview
Market Trends in Ukraine. Network Infrastructure
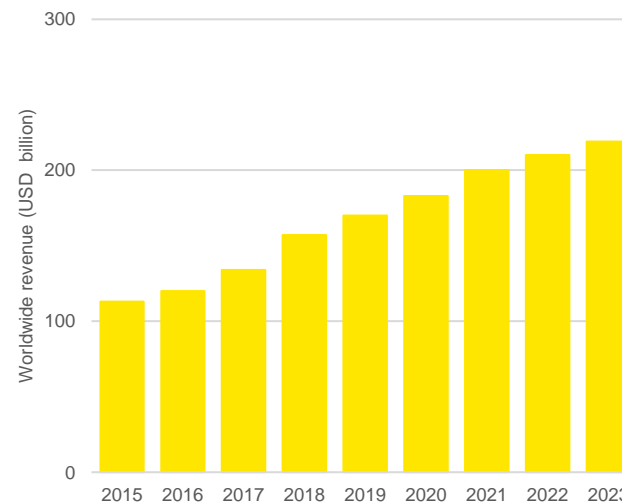
Principles of Network infrastructure
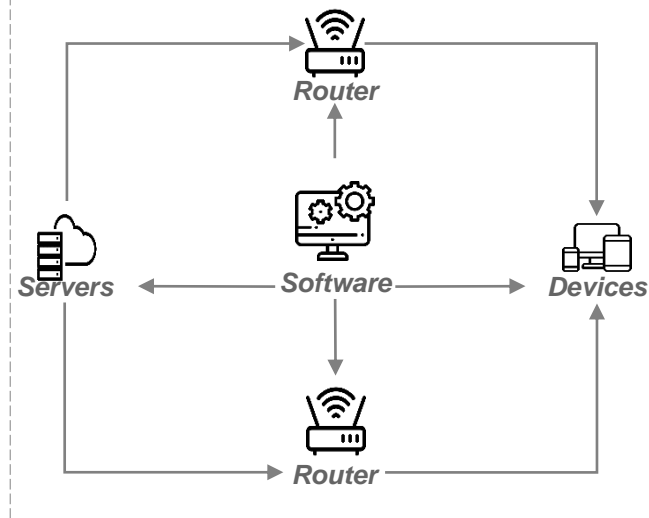
Principles of Network Infrastructure

► Network infrastructure is comprised of hardware and software.

► Hardware includes servers, routers, commutators, cables and, many more.

► Software is needed to coordinate and synchronize all the hardware within the network infrastructure.

► The primary goal of network infrastructure is to support day-to-day operations of the various entities as well as to maintain operations of the telecommunication networks.

Global trends

► The global market of the network infrastructure is expected to equal $183 billion in 2020 and is expected to grow at a rate of 4.5% until 2023.

► The key trends and growth drives are continuous advancements of telecommunication and enterprise networks. This includes the development of 5G networks, adoption of the SD-WAN standards, mass implementation of cloud solutions, IoT, and many more.

► The industry is very sensitive to developments in the telecommunication and IT industry as these industries are main consumers of the network infrastructure industry products.

Source: Statista

Ukrainian trends

► Ukrainian network infrastructure market size was estimated at $206 million, which is a two-time growth compared to 2015. It is expected that the industry will grow by 8% per year.

► The growth of the IT and telecommunication industries is a crucial driver behind the industry's strong growth as network infrastructure is essential for these industries.

► Governmental initiative of increasing 4G coverage also stimulates the industry. It is expected that the government will approve bill 4771, which will promote the development of the telecommunication market. This will trigger a demand surge in the industry's equipment.
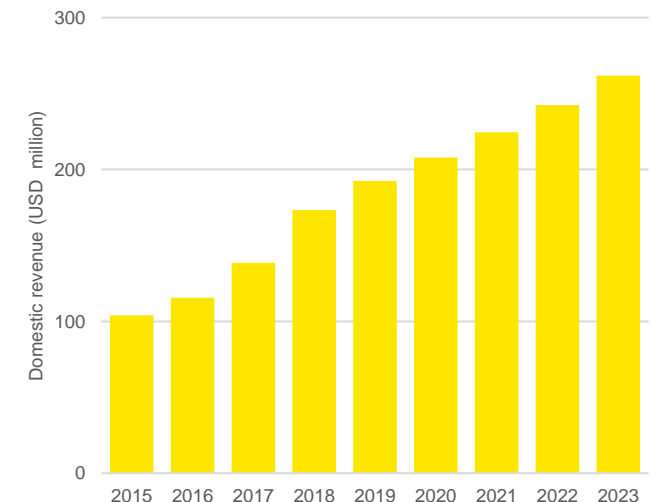

Source: EY analysis

Market Trends in Ukraine. Domestic Wholesale Market

Ukrainian market versus EU countries

► Domestic wholesale price in Ukraine is low compared to neighbors and EU countries (see the chart below). The total wholesale service segment is around USD 308 million in Ukraine, USD 315 million in Romania, while the average EU country is x4.8 times higher than in Ukraine.

Average cost of a fixed broadband package

(Sample data taken between November 2019 – January 2020)

32.08

4.8 times below the average
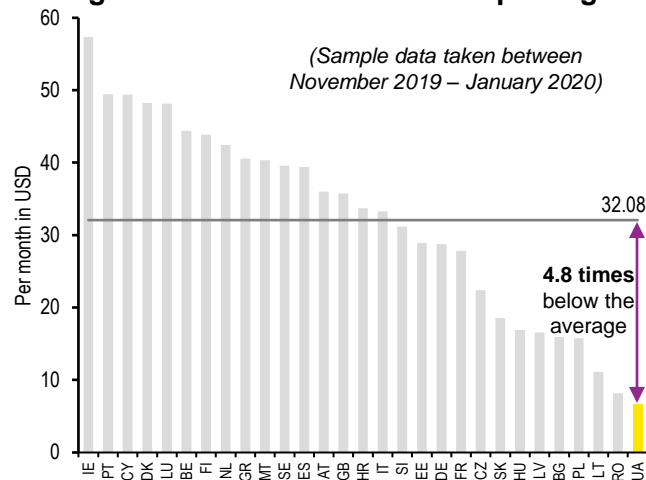
Source: cable.co.uk

► According to cable.co.uk research, the broadband in Ukraine is fast and cheap, though take-up is still relatively low – around half the population has internet access compared to 90% in the UK, for example.

Ukrainian largest market players

► According to NCCIR, in Ukraine, there are 12 active licensed wholesale telecom operators, the majority of which are presented in the table below.

► They provide dark fiber leasing and capacity leasing.

Dark fiber market shares of wholesale operators

Operator	Length of dark fiber, km	Market share, %
Ukrtelecom	42,764	32.5%
Omega Telekom	26,400	20.1%
Atrakom	24,000	18.3%
Datagroup	20,000	15.2%
VEGA	10,000	7.6%
ETT	6,000	4.6%
Gigatrans	1,000	0.8%
UARNet	1,000	0.8%
NetAssist	300	0.2%
Total	**131,464**	**100.0%**

Source: Operators' websites

► Ukraine's largest IXPs include UA-IX (cumulative traffic of around 800 Gbps), GigaNET (1.83 Tbps), and DTEL-IX (peak traffic of over 1.90 Tbps).

Domestic market in figures

► According to Ukrainian telecom operators, the volume of wholesale traffic in the country is growing rapidly. However, due to the low wholesale prices, the share of income from the service, compared to wireless communications or fixed internet provision, is not significant (**12.5%**).

► Growth in traffic, development of national backbones, and the increasing number of wholesale operators in the market led to an increased number of IXPs over the years. IXPs facilitate the local exchange of traffic among operators and free up the capacity of trunk communication lines for the transit of international traffic. IXPs contribute to the reduction of the domestic wholesale price.

14 IXPs in

7 cities (Kyiv, Odesa, Donetsk and Kharkiv being four major of them)

2 largest international traffic exchange points connected: DE-CIX (Germany) and AMS-IX (Netherlands).

>4.64 Tbps - the total capacity broadband traffic entering Ukraine.

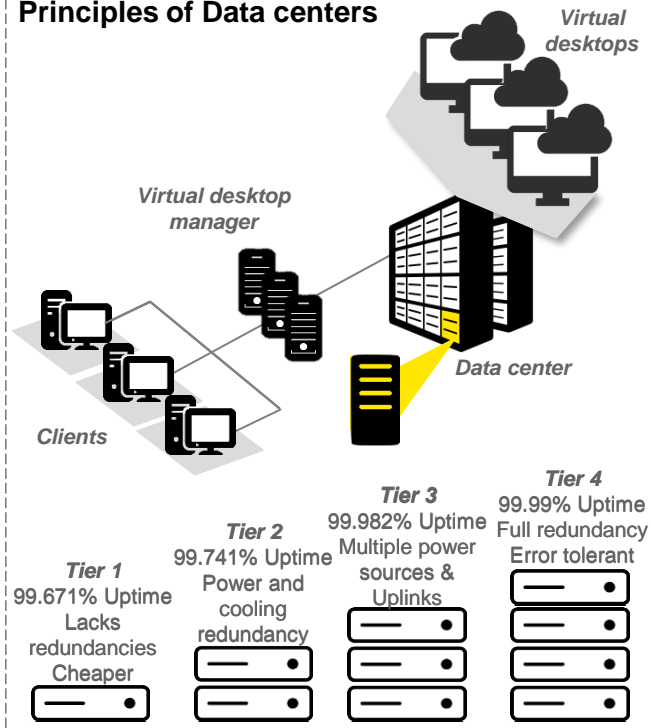**>4.5** Tbps – the total bandwidth for international connectivity.

► If Ukraine is to follow the EU Gigabit Society goals of providing each household with access to at least 100 Mbps, realistic assumptions suggest the required peak total capacity should be almost x2 times the current level, or **7.1 Tbps**.

2.3.2. Ukraine: Digital Market Overview
Market Trends in Ukraine. Data Centers

Principles of Data centers

Virtual desktops

Virtual desktop manager

Data center

Clients

Tier 1
99.671% Uptime
Lacks redundancies
Cheaper

Tier 2
99.741% Uptime
Power and cooling redundancy

Tier 3
99.982% Uptime
Multiple power sources & Uplinks

Tier 4
99.99% Uptime
Full redundancy
Error tolerant

USD 500m

The preliminary assessment of the value of rolling out in Ukraine the envisioned Azure Expansion Program into Ukraine is as above USD 0.5 bn USD.

TECHIIA # 500 MW

The projected capacity of Ecotechnopark data center in the Kherson region. To implement Phase 1 of the project, it is planned to attract at least USD 200 mln of investment.

Global trends

► Global revenues received by data centers market comprised USD 35 billion in 2019, compared to USD 32.5 billion in 2018, i.e., 7.7% of growth. It is poised to grow at 23.5% CAGR to 2026.

Ukrainian trends

Despite the rapid growth of the global data center market, there is a certain slack in the domestic one: revenue from services provided by data centers in 2019 did not exceed UAH 360 million (against UAH 351 million in 2018, i.e., 2.6% growth).

Largest Ukrainian Data Centers

16 DCs ① ⑤ ⑨ ⑬ ㉖ ② ⑥ ⑩ ⑮ ㉗ ③ ⑦ ⑪ ㉒ ④ ⑧ ⑫ ㉕ *Kyiv*

4 DCs ⑱ ㉑ ⑲ ㉓ *Kharkiv*

⑯ *Khmelnytskyi* ⑭ *Vinnytsia*

⑰ ㉔ *Odesa* ⑳ *Mykolaiv*
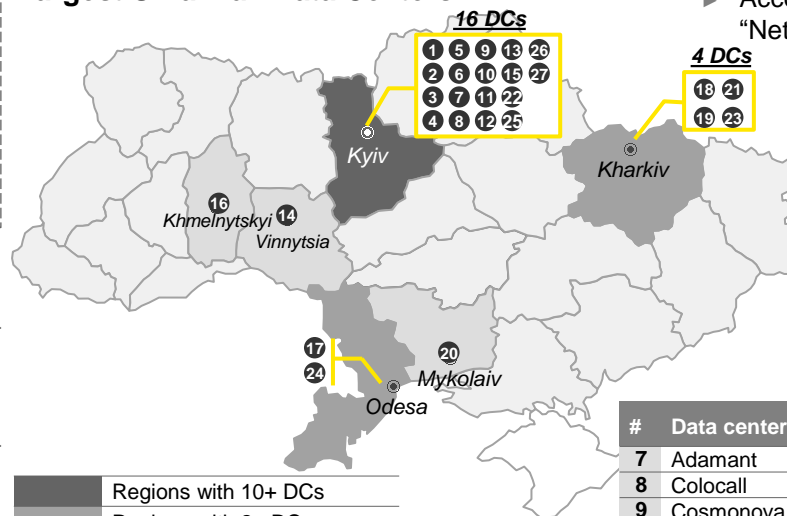
⬛	Regions with 10+ DCs
⬛	Regions with 2+ DCs
⬜	Regions with 1 DC
⬜	Regions with no DCs

Source: EY analysis of data published by Gigacenter.ua. Datacentercatalog, data centers web-sites

Top Ukrainian Data Centers

#	Data center	Key facts
1	De Novo	Commenced in 2010, built on a modular principle. Serves Ukrainian's largest banks and is the site for the largest IaaS cloud in Ukraine. Capacity of 360 racks.
2	Be Mobile I & II	Total area of 7,000 sq.m.
3	G 50	Commenced in 2013. Static public IP V4, V6.
4	GigaCenter	Capacity of 300 racks. Total area of 1,200 sq.m.
5	Volia I & II	Commenced in 2006. Hosts more than 3,000 servers.
6	Parkovyi	Total area of 2,715 sq.m. Capacity of 400 racks. Official partner of Microsoft Services Provider License Agreement

► According to the research conducted by "Networks and Business" magazine, in 2019 those six data centers occupied ***more than 75%*** of the total domestic market of commercial data centers. Moreover, the situation is unlikely to change much in the nearest future.

The state's transition to cloud services is increasingly being promoted as it is safer, more profitable, and necessary. Such a trend in turn partly affects the development of data centers.

#	Data center	#	Data center	#	Data center
7	Adamant	14	DC-16	21	Steep-Host
8	Colocall	15	Dreamline	22	Ukrainian Data Network
9	Cosmonova	16	GMhost	23	Ukrnames
10	Deac	17	Hosting.UA	24	Unit-is
11	Datagroup	18	Infium	25	United
12	Dataflex	19	Max Net	26	Wnet I & II
13	Newtelco	20	Omnilance	27	Xentime K

Market Trends in Ukraine. Cloud Infrastructure and Services

Principles of Cloud computing

SaaS
PaaS
IaaS
DaaS

Laptop

PC

Internet

Cloud provider

Tablets, phones
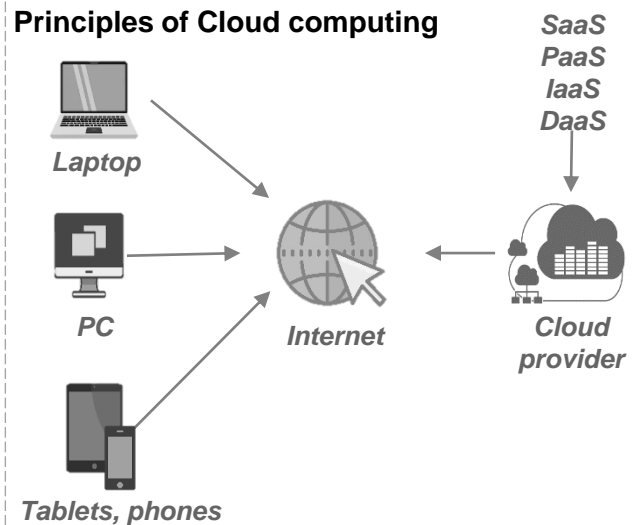
Technology Key Features:

► It allows performing resource-consuming tasks on almost any device like PC, laptop, or tablet
► Provides an opportunity to co-work and share results without being tied to the specific location
► Users are not tied to the specific workplace as cloud services are accessible virtually at any place with a network connection

High-Growth As-a-Service Segments

► **Teams SaaS:** +75% growth YoY. Leaders: Slack, Microsoft
► **Conferencing SaaS**: +64% growth YoY. Leaders: Zoom, Cisco
► **CPaaS (Communications Platforms)**: +33% growth YoY. Leaders: Twillo, Vonage

Global trends

► International experience shows that the use of cloud computing systems reduces the cost to build up and expand government capacities. According to The Economist, the introduction of cloud technology by the British government reduced the cost of digital transformation by 3.56 billion pounds from 2012 to 2015. Since 2011, cloud technologies have also been introduced in the United States, Germany, Singapore, India, the Republic of Korea, Australia, Canada, and Saudi Arabia.

► According to Synergy Research Group, the COVID-19 pandemic radically changed existing working practices, and the market had to reach on those changes suddenly. As a result, spending on UC collaboration tools grew by 7% in 2Q20 compared to 2Q19 and reached over USD 12 billion (see the chart below).

US collaboration market

Worldwide revenues (USD billion)

Hosted & Cloud solutions

On-premise products

2Q18   2Q19   2Q20
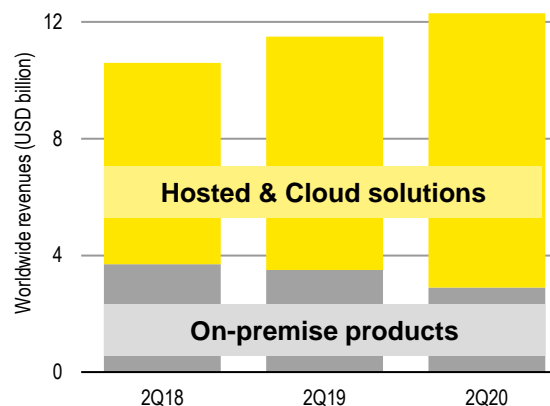
Source: Synergy Research Group

Ukrainian trends

► According to the CEO of GigaCloud, the Ukrainian market of cloud services has been continuously growing since 2012. In 2019, its volume increased almost 19 times - from USD 1.9 million to USD 36.2 million. The expected market growth in 2020 is 10%. The market is growing not only due to the emergence of new customers but also due to increasing the volume of consumed resources by existing customers.

► The key players of the Ukrainian market of public (IaaS / PaaS) cloud are Amazon Web Services, Microsoft Azure, De Novo, Tet, VoliaCLOUD, and Google Cloud Platform.

► One of the key initiatives is bill 2655 "About Cloud Services," which promotes usage of cloud services in the governmental entities instead of expanding existing capacities.

► In addition, the introduction of bill 2655 is aimed towards the elimination of corruption risks of purchasing expensive equipment and will significantly accelerate the introduction of innovations by the authorities and the digital transformation of the whole government.

► However, the bill did not get to the first reading for a long time. Thus, the benefits of cloud services will not help Ukraine become a modern state unless allowed on the governmental level.

2.3.2. Ukraine: Digital Market Overview
Market Trends in Ukraine. Local Equipment Producers and Solution Providers

LOCAL EQUIPMENT PROVIDERS:

Ukrainian industry of network hardware and software is very weak. Local Equipment producers are limited to the four cable factories that produce optic fibre and coaxial cables. These are OdesKabel, Utex, InterKabel Kyiv, and Twomen. Production of other hardware equipment like routers, commutators, servers is absent due to the inability to compete with international players, mainly from China. Similarly, the market of solutions is comprised of the companies that provide solutions from the key international players like HP Enterprise and Cisco. There are no wide-used solutions that were developed in Ukraine due to the inability to compete with international players. Thus, these sectors are unattractive for the investors unless the government will take structural measures to stimulate these industries. More detailed reasons are explained below.

Lack of R&D enablers	Negative economic conditions	Absence of governmental support
▶ Harsh competition again international players with vast resources available	▶ Current pandemic conditions limit the available resources of the companies that can be invested in the development;	▶ The low focus of the structural support of the local producers;
▶ Low market volume in Ukraine is too limited to absorb fixed costs and allow the development of cheap products	▶ General economic conditions are close to negative combined with weak internal demand levels;	▶ Government is not interested in supporting and incentivizing these industries;
▶ Extremely hard to achieve an adequate return on capital invested in R&D	▶ Structural problems of the economy with a high dependency on several sectors like Agriculture and IT	▶ Government has very limited resources;

LOCAL SOLUTIONS PROVIDERS:

The vast majority of domestic industry solution providers are aimed towards the foreign market. Only 2% of the companies are focused on the Ukrainian market. Industry participants do not develop their own solutions. Instead, they provide solutions based on the developments of giants like Cisco, HP enterprise, D-Link, and many more.
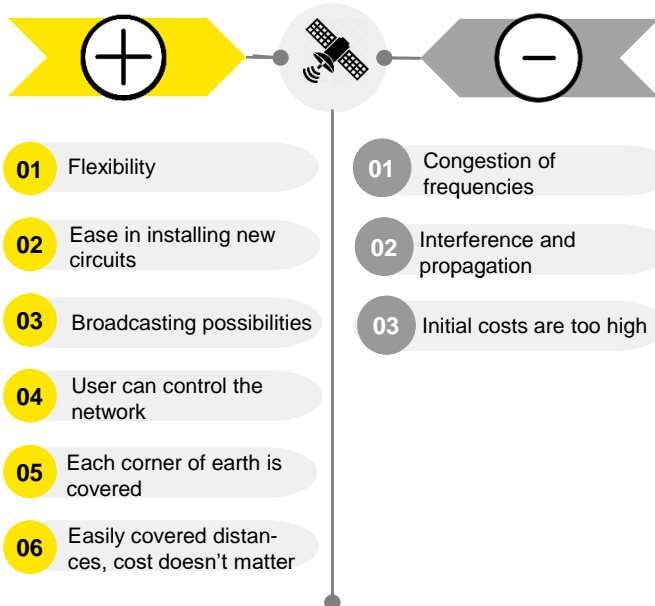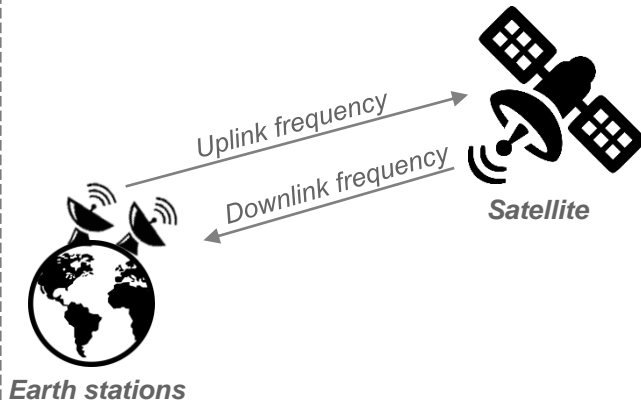
The Ukrainian local solutions market encompasses software solutions for the enterprise networks as well as services of installation and monitoring of the network infrastructure. It was estimated that the domestic solutions market constitutes from 0,5% to 1,5% of the total IT market of Ukraine and equals to the range of $25 million to $75 million. Historically, the market was growing continuously from 2015 at a rate of approximately 13% per year. It is forecasted that the domestic market will continue to expand at a rate between 8% to 10%.

The domestic market is highly concentrated, with hundreds of industry participants of different sizes. The majority of the players are small businesses that serve mainly small and medium enterprises. However, the majority of revenue is derived from the large industry participants that constitute less than 5% of the total number of industry participants. This is because large companies are able to serve global markets, additionally to the domestic ones.

2.3.2. Ukraine: Digital Market Overview
Market Trends in Ukraine. Satellite Communications

Principles of Satellite Communications

Uplink frequency

Downlink frequency

Satellite

Earth stations

01	Flexibility
02	Ease in installing new circuits
03	Broadcasting possibilities
04	User can control the network
05	Each corner of earth is covered
06	Easily covered distan-ces, cost doesn't matter

01	Congestion of frequencies
02	Interference and propagation
03	Initial costs are too high

Global trends

Satellite Internet Access

▶ Private US spaceflight company "Starlink" was primed to begin offering its own **satellite internet service** to the general population in 2020.

▶ According to Elon Musk, SpaceX will need at least **400 satellites** in orbit for **'minor'** broadband **coverage** and 800 satellites in our skies for 'moderate' coverage. As of October 2020, the company has launched **835 Starlink satellites**.

▶ These Low Earth Orbit (LEO) satellites are much smaller, and orbit is much closer to our planet than traditional geostationary satellites, which dramatically **reduces the lag** traditionally associated with satellite internet.

Mobile Satellite Communication

▶ Is seen as a key growth area for **5G, IoT, M2M,** and other technological advancements, with its use for data applications also expected to rise.

▶ MSC is positioning itself for traffic offloading, which can be achieved using **multi-casting technology** and edge servers.

▶ Driving growth in the MSC sector is its **use in remote areas** and by the mobile workforce, logistics companies, and **as a back-up in times of natural disasters**.

USD 271 billion

global revenue of the satellite industry in 2019, 7% of which is the space exploration economy.

Ukrainian trends

Telecom satellite "Lybid"

▶ According to the State Space Minister, Ukraine has spent 24 years and about USD 350 million to build the first Ukrainian telecom satellite, "Lybid." However, the work on it was suspended in 2014 due to political instability.

Vega light class launch vehicle

▶ The launch vehicle was manufactured jointly by the European Space Agency and the Italian Space Agency with the participation of Ukraine. In November 2020, the second vehicle was launched, which was unsuccessful.

EOS Data Analytics

▶ The company is headquartered in the US. However, its development centers are located in Ukraine. It is planned that in 2022, it will launch a satellite with two multispectral cameras into the LEO in partnership with the South African company Dragonfly Aerospace.

Ukraine: 17 legal entities, 8 of which are lossmaking

• and 2 – are in the process of liquidation, under the Ukrainian State Space Agency

• The Agency does not carry commercial activities for over 10 years

• Ukraine uses satellites from other countries through international operators.

2.3.3. Ukraine: Digital Services Overview

Citizen-Centric Digital Services

General approach

► Traditionally, digital services organizations tended to adopt "one-stop-shop" models as a single platform for citizens to access information without the need to fill out redundant paperwork. Services Australia, for example, provides specific online services tailored to vulnerable groups, such as people with disabilities, careers, Indigenous Australians, migrants, and refugees.

► Individuals can then request specific services available to them based on their circumstances. This is complemented by a digital assistant to direct users to the services they need the most.

► Thus, it is necessary to move from the usual approach to the services to their designing from the end-users' point of view.

One-stop shop

▸ Single access point for citizens to request services across multiple departments
▸ Integrated citizen-centric services across entities using a shared database
▸ Omnichannel communications
▸ Services grouped by target group, life event, or function

No-stop shop

▸ Citizen-centric zero-form service delivery
▸ Organizations anticipate services needed to be based on individual life events
▸ Information from multiple sources is collected and collated
▸ Government-wide integration leads to predictive and anticipatory service delivery

International benchmarks

► However, the next stage of citizen-centric digital services will entirely eliminate forms and website visits. "No-stop shops" will be able to anticipate services based on new events in a person's life. For example, disability parking permits can be automatically sent to eligible citizens after a doctor's visit rather than requiring the person to apply online.

► Austria's provision of new family allowances exemplifies the "no-stop-shop" approach by having the hospital inform the civil registry electronically when a new child is born. The Austrian Government then consolidates data across departments and automatically sends benefit payments to the new family.

E-Baby Key Figures in 2020

33k   families used E-Baby services in Ukraine since launch

130+   locations across Ukraine where the service is accessible online and in 380+ locations accessible offline

9-in-1   services are provided

Source: Ministry of Digital Transformation (DIIA services site)

Ukrainian experience: e-Health system enabling other services for Ukrainians

► Since 2018, e-Health in Ukraine was launched as a patient-centric solution allowing to register a general practitioner declaration. The Service has been successful, with 27.7 mln Ukrainians registered in the e-Health central database (as of H2 2020).

► The e-Health in Ukraine opens a number of solutions and services in healthcare and beyond:
  ► Patient resume
  ► E-Prescription with connection to a country-wide network of pharmacies where patients can receive medications prescribed by a GP
  ► E-Referrals
  ► E-Illness Certificates
  ► E-Medical Records
  ► E-Baby

► The solution around E-Baby is based on the E-Medical Records but goes beyond healthcare, as it is aimed to provide to parents a list of free-of-charge or at-cost public services for their children, still being at the maternity hospital, by submitting ан electronic application, such as:
  ► registration of the child's birth certificate, child's residence, Ukrainian citizenship, etc.
  ► preparation of documents to sign a declaration with pediatrician and be linked to the whole list of e-Health services in Ukraine.

Trust and Security: Electronic Identification in Ukraine

e-ID, ID cards with a Qualified Electronic Signature (QES) for Ukrainian citizens

► Since February 5, 2020, the Ministry of Interior and the State Migration Service presented the Ukrainian citizens' ID cards with a Qualified Electronic Signature (QES).

► The new service is free of charge, offering a few advantages for both government and businesses.

► As of today, the service counts 4.4 million owners of modern ID cards. Any owner of an ID card may get a QES. The validity period of the QES key certificates will be 24 months.

► The Ministry notes the QES registration and introduction in the ID card chip is not mandatory and is carried out at citizen's request. Using an electronic signature, citizens can get access to government information systems and use electronic services. The president of Ukraine became the first citizen of Ukraine who used the free service.

► **The e-Signature** pilot project was launched in 2020 by EU4Digital and is aimed at interoperability and harmonization with EIDAS regulations.

► However, to implement globally accepted Ukrainian e-Signatures in investment-related business processes and transactions, it is needed to conclude international agreements on mutual recognition of electronic signatures between Ukraine and partner countries and/or to implement internationally accepted standards on electronic signatures. In addition, the cost of e-Signatures or e-Seals offered in the market is relatively high and limits the availability of electronic services that can be obtained using electronic trust services.

The BankID project

► The BankID project was launched in November 2016 by the National Bank of Ukraine, which allowed the commercial banks of Ukraine to join the program that aims to facilitate the provision of administrative services online verifying the identity of their clients to governmental institutions and other third parties.

► The main purpose of BankID is to ensure access to a variety of online services through safe remote identification.

Subscribers
As of Nov20

22 banks

► Oschadbank	► FUIB	► OTP Bank
► JSB Radabank	► Pivdennyi Bank	► Asvio Bank
► Kredobank	► Bank Forward JSC	► Accordbank
► Motor Bank		► Concord
► Vostok Bank	► Bank Alliance	► Bank Grant
► Idea Bank	► A-Bank	► MTB Bank
► Universal Bank (monobank)	► Alfa Bank	► CB Globus
	► CB Privatbank	► Pravexbank

16 commercial service providers

► Univer capital	► Aventus Ukraine
► Global credit	► Freedom Finance Ukraine
► Kiyv trade investment company	► Miloan
► PF "liga pensiia"	► Zaporizviazokservis
► FC Herts	► Safety Agency Should Credits
► Investment Capital Ukraine	► Bank Familny
► CC Loan	► Spozhyvchyy Tsentr
► FC SFS	► Ukr Credit Finance

11 non-Commercial service providers

► Ministry Of Economic Development, Trade And Agriculture Of Ukraine	► State Service Of Ukraine for Geodesy Cartography and Cadastre
► NGO "Social Boost"	► Public Association "Narodna Vlada Ukrainy"
► East Europe Foundation International Charitable Organization	► NGO "Elektronna Demokratia"
► Chief Information and Estimation Center Utility Company	► Ministry of Digital Transformation of Ukraine
	► Poltava region Council
► Registration Department Of Kharkiv City Council	► Kharkiv Data Center UE

Cybersecurity and Data Privacy. Benchmarking for Ukraine in EU4Digital Regional Assessment and in the National Cyber Power Index

Trends in Cybersecurity and Data Privacy

► Increased scrutiny of data protection regulations and privacy standards are observed in the post-pandemic world. This heightened awareness will drive "privacy-by-design" features to be embedded in the design of future digital applications and platforms.

► The pandemic has also raised awareness of cybersecurity risks, including email phishing attempts impersonating governmental public health authorities and malware websites mimicking official COVID-19-related government and institutional websites. All of this will increase greater scrutiny of cybersecurity.

► Moreover, the ethical implications of AI-enabled tools leveraged by governments during the pandemic will gain prominence. As the world recovers, we expect more countries to design and implement frameworks for countering algorithmic bias and regulating AI.

Benchmarking: Ukraine in the EU4Digital Cybersecurity Assessment

► EU4Digital Facility held in 2019 maturity assessment of cybersecurity development in EU Eastern Partner countries, including Ukraine. The analysis showed that Ukraine is better than peers in both technical and legal aspects of trust services maturity.

► This allowed Ukraine to be selected for the EU4Digital eSignature piloting projects with Moldova and Estonia.

► Following the maturity assessment, the following action points are identified to strengthen Ukraine's cybersecurity.

Obstacles / Challenges	Next steps
• Insufficient funds and low interest of authorities in cybersecurity aspects • Lack of qualified personnel and resources • Large volumes of legacy hardware and software presenting high cyber risks	• Enhancement of cross-border cooperation • Implementation of the NIS Directive • Updating cybersecurity strategy • Development of partnership with technological and industrial partners

Source: EU4Digital Facility

Benchmarking: Ukraine in the National Cyber Power Index

► The Belfer National Cyber Power Index (NCPI) measures 30 countries' cyber capabilities in the context of seven national objectives, using 32 intent indicators and 27 capability indicators with evidence collected from publicly available data.

► The overall NCPI assessment measures the "comprehensiveness" of a country as a cyber actor. Comprehensiveness, in the context of NCPI, refers to a country's use of cyber to achieve multiple objectives as opposed to a few. The most comprehensive cyber power is the country that has (1) the intent to pursue multiple national objectives using cyber means and (2) the capabilities to achieves those objective(s).

$$National\ Cyber\ Power\ Index\ (NCPI) = \frac{1}{7}\sum_{x=1}^{7} Capability_x * Intent_x$$

Ukraine is ranked 26th on overall ratings, among the 30 analyzed countries, with the highest marks on defense, offense and surveillance capabilities, and lower ones on norms, intelligence, information control, and commerce.
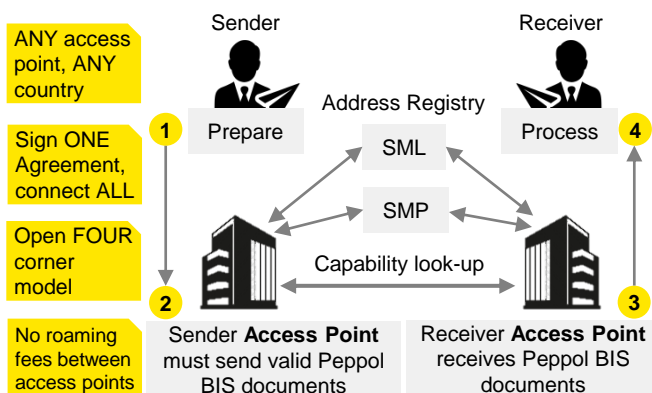
Source: National Cyber Power Index 2020
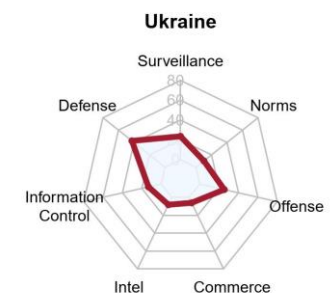
2.3.3. Ukraine: Digital Services Overview
E-Trade Aspects: E-Delivery and E-Signature

E-delivery is the delivery of a document by electronic means to the electronic address at, or through which, an owner of a separate interest has authorized electronic delivery.

E-delivery pilot components concept

- ANY access point, ANY country
- Sign ONE Agreement, connect ALL
- Open FOUR corner model
- No roaming fees between access points

Source: https://peppol.eu

Abbreviations used in the chart above:
- PEPPOL – Pan-European Public Procurement On-Line, is an EDI (electronic data interchange) protocol, designed to simplify the purchase-to-pay process between government bodies and suppliers. It is a set of artifacts and specifications enabling cross-border eProcurement.
- BIS – Business Interoperability Specifications
- SMP – Service Metadata Publisher, the purpose of which is similar to an address book or business registry containing details of participants within a specific eProcurement community
- SML – Service Metadata Locator, the central registration system defining which SMP (Service Metadata Publisher) should be used for finding out the delivery details of any PEPPOL participant

E-Delivery and EU4Digital

- ► In Ukraine, the first Peppol e-Delivery access point was created, serviced, and managed by the State Enterprise "Diia" - a subordinate agency of the Ministry of Digital Transformation of Ukraine.

- ► According to EU4Digital Initiative, in October 2020 it was launched a pilot exchange of data through the E-Delivery channel. The largest companies from Ukraine (Kernel and Premier Food) and Poland (Agerona and Aryzta) were selected for participation.

Exports and sends e-Invoice via E-Delivery *UA/ PL*	→	Imports and receives e-Invoice *PL/ UA*

- ► EDO EDIN provider, a partner of Premier Food, supported the Project and took part in the preparatory activities. From the Polish side, Edison S.A. provides electronic data exchange.
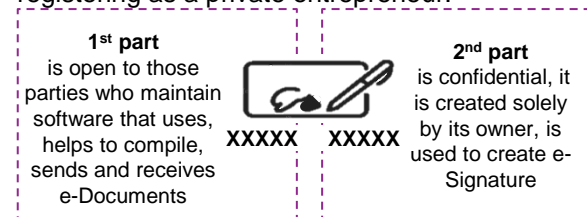
1 Companies-participants will exchange trade data on the Peppol e-Delivery Network

2 Success will be achieved if participants will be able to exchange standardized invoice data at the time of invoicing using e-Delivery

3 Following the pilot project, EU4Digital will prepare recommendations for required adjustments to scale the service
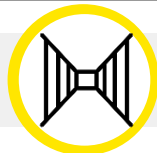
E-Signature capabilities

- ► The revenue of the e-Signature global market comprised USD 951.3 million in 2019. According to the e-Signature Market Research Report, it is predicted to observe a CAGR of 24.6% during the forecast period (2020–2030).

- ► Main factors driving the market include rising demand of the corporate sector for workflow efficiency, security, and supply chain management, increase in online documentation activities, and strong governmental support of this technology.

- ► In Ukraine, the transition to the new e-Signatures took place within two years (2018-2020). As a result, advanced e-Signatures were introduced for mass use in 2020. They are more affordable and replaced the outdated digital e-Signatures. 92% of citizens use just such a signature. Its main feature is the ability to be stored on file media (i. e., on a regular flash drive, token, or in a cloud environment). It can be used for receiving e-services on the "Diia" portal, for example, when registering as a private entrepreneur.

1st part is open to those parties who maintain software that uses, helps to compile, sends and receives e-Documents

XXXXX XXXXX

2nd part is confidential, it is created solely by its owner, is used to create e-Signature

E-Trade Aspects: Digital Transport Corridors

Digital Transport Corridor (DTC) is a set of data-related services across physical cross-country transport corridors for end-to-end information exchange at all stages of transportation – air, road, rail, and sea.

Advantages of DTC

01 Real-time data on cargo movement status

02 No territorial, technical or legal limits

03 Better mutual transport cooperation

04 Faster cargo movement

05 Easier document processing

06 Cutting costs through reducing delays

Source: https://eufordigital.eu/

Baltic and the Black Sea DTC

► EU4Digital is working under the development of preparatory actions to test the technological approach for information exchange, regulatory environment, and organizational arrangements within and between Eastern partner countries. In this context, experts are defining preparatory actions to pilot a Digital Transport Corridor between the Baltic Sea and the Black Sea.

► The DTC between the Baltic and the Black Sea is expected to help in organizing logistics processes and electronic transport data flow so that information is exchanged instantly between logistics chain participants, optimizing the flow of goods and services and saving time and money.

► Below are summarized the actions that should be taken by Ukraine to implement a pilot project:

#	Action
1	Assess perspective of DTC pilots: - between Baltic and the Black Sea; - based on extension of TEN-T corridors to EaP Countries
2	Develop the core digital platform for national e-Logistics systems providing services for multimodal cargo shipments
3	Develop DTC supply chain visibility sub-system for cargo tracking
4	Harmonize e-Documents standards related to multimodal transport, based on the concept of a unified system of documentary support for the carriage of goods

Source: https://eufordigital.eu/

Transport portal of electronic services

► In December 2019, the Internet portal e-transport.gov.ua was launched in Ukraine, uniting electronic services in all spheres of the transport industry.

► Currently, the e-transport.gov.ua web-site provides six services:

► (1) booking permits for international transportation, (2) tracking violators of the use of these permits, (3) issuing permits for oversized transportation, (4) tracking protocols of the State Service for Transport Safety, (5) online broadcasting from places of issuing permits and (6) registration of the electronic consignment note.

► According to the Minister of Infrastructure of Ukraine, the Ministry plans to expand the list of services to be provided by the portal in the nearest future. In particular, it is planned to introduce additional services for road carriers, services for seafarers, and the possibility of aircraft registration.

E-Customs is a form of business transactions with which the Customs Administration ensures a paperless environment for business to its users via an electronic service.

USD 115 per container

can be saved, according to the World Bank, while digitally transforming the customs process

European E-Customs overview

► Following the EU E-Customs Decision in 2008, the implementation of initiatives started in the EU countries like the single window services for data flows, inter-operational import, export and transit systems, etc.

► The key E-customs benefits in the European Union have reduced trading costs, diminished incentive for 'customs shopping,' improved control of fraudulent / counterfeit / dangerous goods, efficient collection of customs duties.

Source: European Commission: Taxation and Customs Union

E-Customs concept

► When logistics businesses move goods across borders and interact with customs offices of various countries, they experience delays caused by the lack of automation and the absence of timely communication between customs offices. This happens because:

   ► Customs information is not received on time, creating ineffective safety and security risk management for customs and businesses;

   ► Automatic data matching is not set (e.g., to match if declaration info in the departing country is the same as in the arrival country);

   ► Pre-arrival information is not exchanged (e.g., when cargo comes to the border crossing point, the carrier must wait until the risk assessment is completed before crossing the border).

► E-Customs activity aims to solve these problems by providing businesses and governments with necessary cooperation models, allowing efficient information sharing and exchange.

► It is expected that while launching e-Customs, it will be possible to optimize interaction with customs offices, decrease trade costs for businesses and deliver goods and services faster.

Source: https://eufordigital.eu/

European E-Customs success stories

► SEED (Systematic Exchange of Electronic Data) solution for the e-Customs pilot has been implemented by Customs Administrations of the Western Balkan countries. It is financed by EU4Digital Facility and offers:

   ✓ Proven security

   ✓ Data standards

   ✓ Easy adaptation to national systems

   ✓ Flexibility in terms of functionalities and data sets exchange requirements

► In the Western Balkans, e-Customs have successfully tackled the following problems:

   01 Undervaluation through swapping of invoices and decrease of the customs value;

   02 Fake confirmation of exits of loaded trucks (violations related to VAT refunds)

   03 Irregularities related to the (mis)use of transport documents (e.g., ATA carnets)

   04 Detection of serious customs offenses like smuggling of tobacco and drugs

► Two other e-Customs pilots will take place, one between Belarus and Lithuania – and the other between two Eastern partner countries, yet to be confirmed.
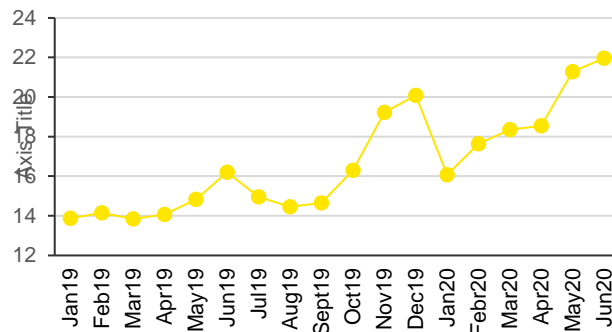
E-Trade Aspects: E-Commerce

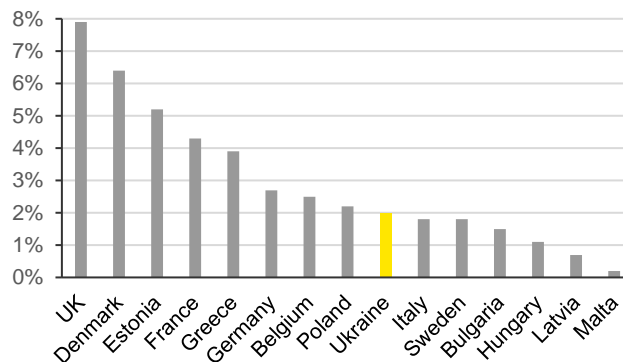**E-commerce** is a business model that lets firms and individuals buy and sell things over the Internet.

B2B   B2C   C2B   C2C

Monthly average retail e-Commerce website traffic worldwide, billion visits

Source: statista.com

E-GDP by country, 2019

Source: European Ecommerce Report 2020

E-Commerce Developments in Ukraine

► The e-Commerce growth in Ukraine in recent years has shown that customers praise the speed, accessibility, transparency, and personalization provided by key Ukrainian market players in their service offerings.

► According to the e-Commerce European B2C Country report, e-commerce sales in Ukraine constituted USD 3.4 billion in 2019 with a forecast value of USD 4.0 billion in 2020. CAGR of e-commerce amounts to 30% for 2016-2020 and outperforms worldwide e-Commerce CAGR, amounting to 20% for the same period.

► Ukraine's e-GDP shows substantial growth potential. As presented on the graph to the left below, the e-GDP of most advanced European countries constituted a higher e-GDP percentage in 2019 compared to Ukraine.

► Ukrainian B2C e-Commerce turnover growth rate in 2019 constituted 24%, which is higher than an average growth rate for European countries. Only Romania, Bulgaria, Spain, Latvia, Estonia, and Greece showed a higher e-Commerce growth rate (from 30% to 25% in 2019).

► In 2019, the size of an average check of one online purchase decreased by 7-10%, and the cost of delivery increased to 5-15% of the value of delivered goods, resulted from average price decline as well.

COVID-19 Impact on e-Commerce

► Retail platforms have undergone an unprecedented global traffic increase in the 1st half of 2020, caused by the COVID-19 pandemic situation. Overall, retail websites generated almost 22 billion global visits in June 2020, up from 16.1 billion visits in January 2020.

► COVID-19 conditions drastically impacted consumers' behaviors, shopping habits, and priorities. Early in the pandemic, shoppers were focused on buying masks, toys to keep children entertained at home and stocking up on groceries. As of June 2020, the customers were more focused on home and garden improvements.

► The coronavirus outbreak is not only transforming the way consumers shop but also how they pay for their purchases. Contactless payments received an unprecedented boost during the pandemic, seen by consumers as a cleaner way to pay in-store. Consumers are also trying out new payment methods while purchasing from e-Commerce websites and favor those methods that have the strongest protection against fraud losses. Total payment volumes are expected to decrease in 2020 due to losses in travel and in-store segments but resume growth in 2021 and benefit from the shift to cashless payments and online shopping.
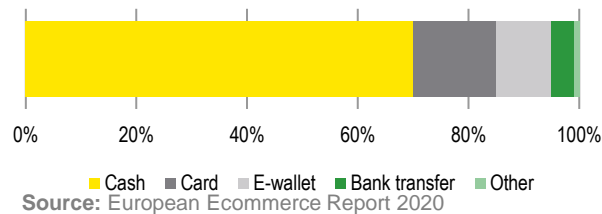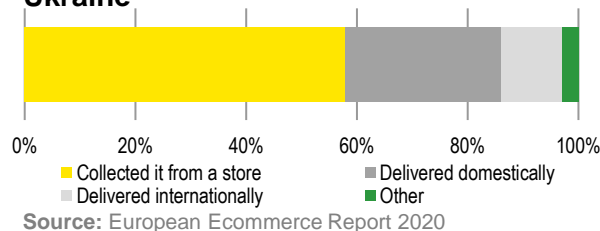
E-Trade Aspects: Cashless Economy

Cashless economy (e-Payments) is a system where any type of money transactions are done through digital means like debit cards, electronic fund transfer, mobile payments, internet banking, mobile wallets.

Payment methods used for online transactions in Ukraine

■ Cash ■ Card ■ E-wallet ■ Bank transfer ■ Other

Source: European Ecommerce Report 2020

Delivery methods preferred by consumers in Ukraine

■ Collected it from a store ■ Delivered domestically
■ Delivered internationally ■ Other

Source: European Ecommerce Report 2020

New payment use cases

01 Open Banking in-store payments

02 In-store payments with mobile devices

03 Conversational Commerce, in-car payments

04 Online payments on cards, wallets bank accounts

05 Contactless card payments, Wearables and IoT devices

Advantages and Threats

► The introduction of the cashless economy requires purposeful state influence on the growth of cashless payments in the area of personal payments, real estate, payment for goods and services, e-Commerce, transport, rent, tourism, wage payments, purchasing consumer goods, consumer crediting, rural economy crediting, government payments, social benefits, pensions, and subsidies.

► *Advantages* of the cashless economy are the following: cost reduction, increased protection against robbery and money counterfeiting, shadow economic sector reduction, increase of the transparency of the formation of income and expenses of any entity, access to additional opportunities and services, time of the transaction, ability to pay in any currency and country and ease of use.

► The *treats* of the total transition to cashless payments are the fear of absolute control by the global financial institution and the tendency of cyber risks in digital technology.

Development trends in Ukraine

► The goal of the "Cashless Economy" project in Ukraine is "to shrink the shadow economy through electronic payments." As of today, more than half (55%) of cashless transactions are conducted on the Internet, while in the developed countries of the EU, this figure reaches 90%.

► The POS network is unevenly distributed across Ukraine. Payment cards and payment devices are mostly concentrated in Kyiv city and oblast, and in Dnipropetrovsk and Kharkiv oblasts, while Luhansk and Donetsk regions have the smallest number of payment devices per capita.

► *90%* of Internet users have shopped online at least once. *70%* of consumers prefer cash payments, while only *15%* pay with bank cards. Other consumers use e-wallets or bank transfers.

68.6m	issued payment cards in Q1 2020 (1.63 times above the population)
by 14.4%	has expanded the network of POS terminals in 2020 (331.4k units)
UAH 920.5b	the total amount of cashless payments made by cards, payments increased in number by 24.5% (Q1 2019)
UAH 503b	the total value of cashless transactions, out of which 54.6% relate to card transactions
8.9m	contactless payment cards issued (16% increase), 1/3 of active cards are contactless

Market Trends in Ukraine. Data Analytics Will Increase the Capabilities of Telecom Operators

Key data analytics services

Telecom data types

- ▶ Mobile app usage
- ▶ Network data consumption
- ▶ Location and movement data
- ▶ Network performance data
- ▶ IoT applications data
- ▶ IoT connections data
- ▶ User demographics
- ▶ Payment and contract info

Basic analytics
- ▶ Combination of location and movement data with customer background data
- ▶ Sold to retailers, cities, transport authorities

IoT analytics
- ▶ Offered through data-as-a-service model
- ▶ Typically on top of IoT platforms
- ▶ Data management and analytics deployments across verticals

Business analytics
- ▶ Data analytics as a service or managed services to enterprises
- ▶ Operators already active in the cloud space

Key telecom big data global trends

1 Only one of the analysed telecoms reports big data as a standalone revenue metric (China Unicom with nearly USD 100m in revenue from big data in 2018). Still, a relatively small business compared to IoT and cloud. Other operators typically include big data revenue within the broader category of ICT services or within industry solution categories.

2 Telecoms started their data analytics and AI journeys by leveraging anonymised data generated by their networks and customer devices. A second wave involves IoT data analytics offered through a data analytics-as-a-service model. Looking ahead, data analytics and big data will become integral to telecoms' IoT, cloud, security, and 5G B2B offerings and will serve as stepping stones for operators targeting the digital transformation of industries.

3 Telecoms are building their data analytics capabilities in various ways: acquiring specialised data analytics companies (e.g., Telefónica acquiring Synergic Partners), organic expansion (Orange), and joint ventures (KDDI-Accenture).

Big data services of Ukrainian telecom operators

Big data analytics is a modern tool that opens up new opportunities for each business. It is widely used in telecom as well.

In Ukraine, the leading mobile operators are developing products and services based on Big Data. Below are described some of such services:

- ▶ create a client profile
- ▶ find out the look-like audience
- ▶ build up a targeted communication campaign
- ▶ create a heatmap using geospatial analytics to discovering better locations for branches, outlets, terminals, or ATMs
- ▶ make credit scoring cards of potential clients, provide identification of potential fraudsters, and propose anti-fraud measures
- ▶ develop business data solutions for finding customers and analyzing their needs

2.3.3. Ukraine: Digital Services Overview
Case for Change. Up-skilling in Traditional Jobs and Re-Skilling for New Job Roles

Digital technologies are rapidly changing the demands placed on services by both businesses and business users. Leading education, content-driven, and customer-centric organizations are already adept at leveraging digital capabilities. To remain competitive, ICT needs to be able to support continued membership growth and end-user demand for a seamless and engaging digital experience

Cases for change in digital skills

Users expect seamless and up to date digital experiences

▶ Business users now expect the same agility and speed of feature uplift from their company's technology services that they do from their personal smartphone applications.

Businesses are reliant on digital as a key enabler of value

▶ Market growth predicts demand for ICT services will double within 3-5 years to service business-led demand for digital and emerging technologies.

Just-in-time and virtual learning

▶ On demand learning that can be completed anytime, from anywhere in the world with the same quality of learning, interactivity, and collaboration as face to face classes.

Non-traditional learning

▶ Virtual and augmented reality environments are becoming increasingly popular and available to enhance the learning experience.

Exceptional user experience

▶ Bring best of breed learning and collaborations tools together to improve how we engage with and deliver services to our members and customers.

Continuous learning and micro-credentialing

▶ As the workforce rapidly changes, customers are seeking out short courses and 'Nanodegrees' that enable micro-credentialing for ongoing learning and upskilling.

Analytics and actionable insights

▶ Customer lifecycle
▶ Business performance

Business efficiency, agility and scalability

▶ Remaining responsive to flex, grow, or even contract.

Up-skilling in Traditional Jobs and Re-Skilling for New Job Roles

Disruption in the labor market, created by current technological trends:

▶ Traditional jobs and skills become obsolete in the industries with faster technology adoption rates

▶ Traditional jobs are re-shaped with new digital skills requiring more intensive use of modern technologies applied along with the implementation of digital solutions

▶ Low-skilled workers may have fewer opportunities and capabilities to learn digital skills

▶ The current vocational education system is virtually non-existent in Ukraine, destroyed after the collapse of the Soviet system

▶ Corporates and SMEs have developed a strong demand for blue-collar workers' services, while the current labor composition is under-supplied and under-skilled.

New job roles are evolving under the influence of current technological trends, especially:

▶ Agriculture Technologists
▶ 3-D Printer and Network Engineers
▶ Grid Modernization Engineers
▶ Wearable Tech Designers
▶ Data Security and Cloud Computing Experts
▶ Industrial Programmers
▶ E-Discovery Investigators
▶ Intermodal Transport Designers
▶ Data Scientists and Solution Architects
▶ Robot Coordinators and Counter Hackers

2.3.3. Ukraine: Digital Services Overview
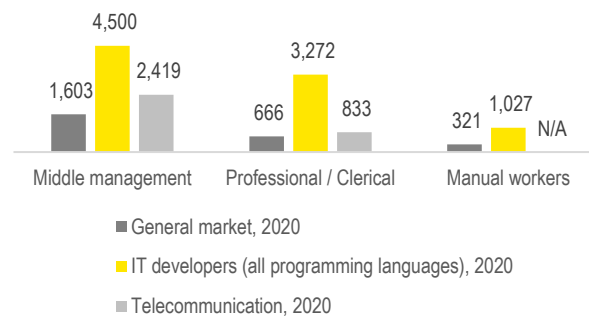# Digital Labor Market in Ukraine

Labor supply and demand in Ukraine

► Number of people employed in IT and telecommunications have increased during the last 5 years and constituted 1.7% out of all employed people in 2019[1]. Their actual number is significantly higher, as IT specialists usually work as private entrepreneurs (183 thousand in 2020[2]). IT sector has been the most attractive in terms of employment for the last 5 years among both students and professional candidates[3].

► The demand for these specialists is also growing, as IT companies continue increasing the headcount (in particular, 56% of IT companies planned to increase headcount by 11% on median[4]). Moreover, 38% of IT companies mentioned that they engage foreign personnel to work in Ukraine (mainly on managerial and professional positions)[4].

► In 2020 73% of IT companies mentioned that they have difficulties in recruiting4 mainly with senior candidates (in particular with Data Scientists, Software developers (C++, JavaScript, etc.), Architects and QAs). At the same time, employers mention that there is a sufficient number of junior specialists (both young specialist without working experience and those specialists, who came from other sectors), while more senior and well-skilled professionals are in a great shortage.

Number of people employed in IT and telecommunications in Ukraine, thousands

Year	Value
2015	273
2016	275
2017	274
2018	280
2019	289
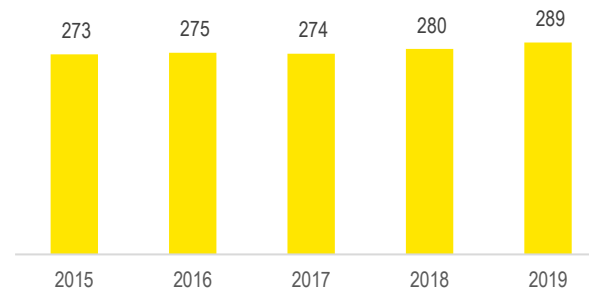
Source: The State Statistics Service of Ukraine

Monthly remuneration level by category of employee in Ukraine, USD net

Category	General market, 2020	IT developers (all programming languages), 2020	Telecommunication, 2020
Middle management	1,603	4,500	2,419
Professional / Clerical	666	3,272	833
Manual workers	321	1,027	N/A

- General market, 2020
- IT developers (all programming languages), 2020
- Telecommunication, 2020

Remuneration in Ukraine for jobs in the digital sphere

► Remuneration is the main factor of attractiveness for this sector. Levels of remuneration for IT developers is significantly higher than for the general market as most of the IT companies offer salaries denominated in hard currency (100% of IT employers mentioned it[1]). Telecommunication specialists also have higher remuneration compared with the general market, although it is lower than in IT sector.

► Such a situation causes difficulties for non-IT companies to attract and retain IT specialists, as they are not able to offer comparable levels of compensation and benefits. As a result, the non-IT companies struggle to drive digital transformation relying on their own internal resources.

2.3.3. Ukraine: Digital Services Overview
Digital Education and Training

STEM education and trainings

► The supply of digital ready specialists is expected to grow. In 2020 the share of students enrolled in IT and telecommunication fields of study is significantly higher, than the share of graduates (8.5% vs 6.0%), which means that this sector becomes more attractive. Moreover, students of other STEM specialties (18% out of total) also usually seek employment within this sector.
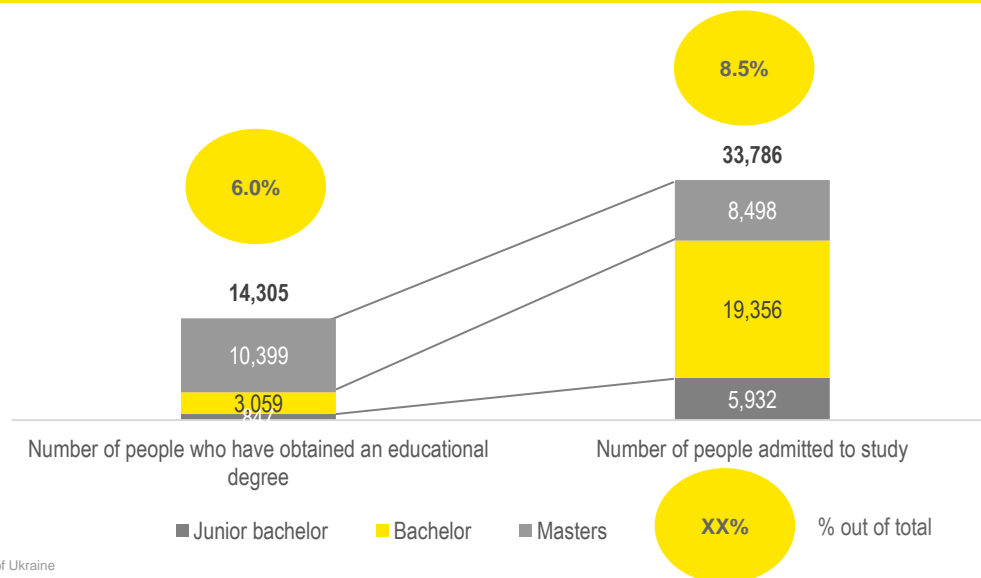
Digital skills: employers' viewpoint (1)

► The majority of employers often mention the high quality of higher education in these fields of study in terms of theoretical knowledge base. However, there is a significant gap between education programs and business needs – in particular, in terms of practical skill set, understanding of the industry, competencies (communication, business acumen, entrepreneurship, critical thinking, product management, design thinking, innovations, data analysis).

Digital skills: employers' viewpoint (2)

► To improve the quality of sector-specific education, the companies are actively engaging in cooperation with the target universities, helping to shape the curricula and investing in the university infrastructure. However, a lot of efforts is still on the employers' side only (such as paid internships for students, investment in upskilling etc.).

► In addition, there is a number of training centers run by the companies independently, that provide learning opportunities for wider audiences (e.g. *EPAM University Programs, GlobalLogicEducation, SoftServe IT Academy* etc.). Usually the cost of these programs are affordable or they are even free of charge. Also, there is a great number of stand-alone IT-schools.

► At the same time, the majority of companies have in-house learning and development centers, which provide trainings for employees and ensure adoption of new technologies that may be required on the market.

► At the same time, employers mention the lack of digital skills among employees and moreover, among managers (digital skills in Ukraine are measured at 57.53 points out of 100), which may prevent innovation and transformation of business in Ukraine.

Number of persons, who obtained an educational degree and admitted to study in IT and telecommunication fields of study, 2020

8.5%

6.0%

33,786
8,498
19,356
5,932

14,305
10,399
3,059

Number of people who have obtained an educational degree

Number of people admitted to study

■ Junior bachelor ■ Bachelor ■ Masters

XX% % out of total

Digital Skills and Vocational Education in Ukraine

Shortage of skilled workers

► Ukrainian government notes the shortage of skilled workers: in 2016 the Cabinet of Ministers approved a list of professions of national importance, consisting of 25 positions. And one year ago, it was complemented by six more.

► More than 90% of this list are professions taught in vocational education and training system (VET). However, as of today, about 40% of VET institutions have only up to 300 students.

► According to the study of the state of Ukrainian education, conducted in 2019 by the World Bank, the trends of the last ten years show a steady trend of reduction of VETs. Firstly, this is due to the constant reduction of general secondary schools graduates that affects the number of those wishing to obtain a professional (vocational and technical) education. Secondly, the reduction of VETs was also affected by the disruption of direct links between production and education institutions: where businesses closed, the need for VETs disappeared.

VET program and reforms

► Modernization of the education system has been a key national priority in Ukraine since 2016 when the Ministry of Education and Science began the reform of general education with the New Ukrainian School concept.

► It introduced the development of a competency-based approach and the EU key competences, including digital competence, as an obligation of the state in formal primary and secondary education.

► The adoption of the Law on Education in 2017 legally endorsed the concept of the New Ukrainian School and provided the basis for the reform of vocational education and training (VET).

► All VET learners currently acquire basic digital skills through compulsory ICT lessons (144 hours in total – 72 hours per year for two years) and compulsory and elective vocational subjects.

Online platforms for VET

► As of today, there is a lack of vocational school system that leads to the lack of most all working specialties, categorized as those of national importance.

► To deal with it, it is important to create a unique training system that will combine the studying of both digital and basic technical skills.

► The general growth of the audience at online platforms in Ukraine and transfer to online education due to COVID-19 pandemic indicates that adults are eager to develop and learn. It suggests that online education will become increasingly popular.

Dynamics of VET Institutions in Ukraine, units

Emerging jobs examples (1)

► Automation experts
► Digital grid operators
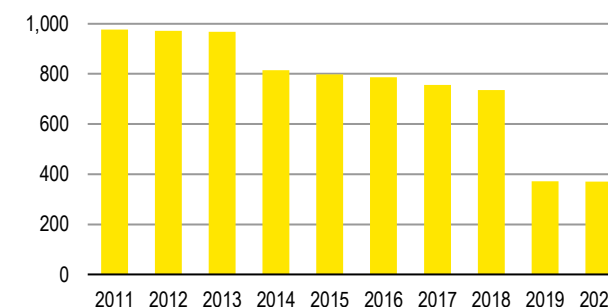► System operators
► IoT specialists
► IoT equipment installers

Emerging jobs examples (2)

► Big Data Experts
► Data analysts
► Cloud experts
► Online market operators
► Cybersecurity specialists

Source: European Training Foundation, 2020; World Bank study of the state of Ukrainian education, 2019

Digital Health: Centralized Solution in Ukraine. COVID-Related Applications

#ezdorovya

the e-Health Central Database

1,939
Medical institutions

24,607
PMD doctors

27,732,174
Patients

1,122
Pharmacies

9,395
Pharmacists

eZdorovya is the main developer of the e-Health technical core in Ukraine. eHealth is an electronic health care system. The Ministry of Health regulates the implementation of eHealth at the regulatory level. The National Health Service of Ukraine enters into agreements with health care providers; analyzes and uses data to forecast the needs of the population in medical services, development of a program of medical guarantees, setting tariffs, monitoring contracts; makes payments for medical services under the terms of the contract.

✓ To ensure the transparency of funding of the health care systems

✓ To provide the ability to work without paper to pass into an electronic accounting system (e-prescription, e-card, e-referral)

✓ To create a business environment by creating new electronic services

✓ To produce a space for innovation in medicine using machine learning, big data, blockchain, etc.

✓ To promote development of the medical IT market

COVID-related applications

Дій вдома
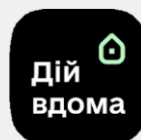
In April 2020, the Ministry of Digital Transformation launched the **"Diy Vdoma"** ("Act at Home") application to counteract the spread of COVID-19 in Ukraine.

The initiative is designed to maintain contact with the person and control its observance of obligatory self-isolation during the quarantine. To protect and ensure the safety of the citizens during the pandemic, individuals will be offered the choice to either go to the hospitals for isolation or enter a 14-day self-isolation at the place of residence for persons who have agreed to undergo it using the app (voluntary).

Population targeted:
▶ People who have returned from abroad and need to be on a 14-day observation
▶ COVID-19 patients being treated at home
▶ People with suspected coronavirus infection

Functions of the mobile application:
▶ Confirmation of the location of self-isolation with location determination
▶ Photo confirmation of stay at the place of self-isolation
▶ Emergency call to the Ministry of Health hotline
▶ Planned function for monitoring symptom development

#HackCorona:

United Nations Development Program (UNDP) partners with the Ministry of Digital Transformation (MDT) to fight COVID-19

The MDT, in partnership with UNDP, is launching a national competition for IT projects and ideas to make life easier for citizens and businesses during the coronavirus pandemic.

The competition aims to boost innovated solutions to tackle the outbreak of COVID-19 in Ukraine. Projects are selected in such areas: COVID counteraction, e-services for citizens, social entrepreneurship, mutual assistance.

The total prize fund for the winners is UAH 4m (USD 142,000). Winners will also receive mentoring support during implementation.

Source: eZdorovya (e-Health System), Ministry of Digital Transformation

National Strategy to Increase Foreign Direct Investment in Ukraine | Section 2.3: Digital Infrastructure | **Page 43 of 96**

COVID-19 Concerns in Digital: COVID-19 Has Altered Attitudes to Digital Transformation – It Is Now a "Must-Have" Solution

‣ The pandemic has dramatically accelerated many long-term digital trends, such as the shift to e-commerce, disintermediation, and remote working

‣ It has spurred faster adoption of digital government — including online delivery of public services, telehealth, and virtual learning

‣ Technology is playing a crucial role in managing the health crisis, including contact tracing apps, robotic process automation (RPA) to deliver test results faster, and digital tools to understand the needs of citizens in real time

‣ The use of big data and AI has become central to evidence-based policymaking

‣ But there is also greater vulnerability to disinformation campaigns and cyberattacks, particularly where immature technologies have been rushed into service
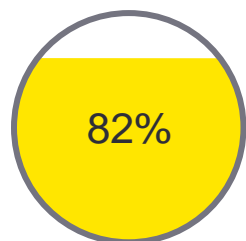
82% of respondents to EY's European Attractiveness Survey expect technology adoption to accelerate in the next three years as a result of COVID-19

COVID-19 has forced many public agencies to have their team members work from home. Governments have rapidly shifted to virtual working to maintain continuity of vital services, like healthcare

Governments have stood up new services such as virtual call centers, process automation using RPA, and payment systems to provide emergency employment insurance and income support funds

Governments' have demonstrated a capability to innovate and deliver digital solutions at speed

Governments have created solutions to reduce pressure on the system for e.g., platforms to stratify COVID-19 information to reduce hospital admission by providing the right information to citizens
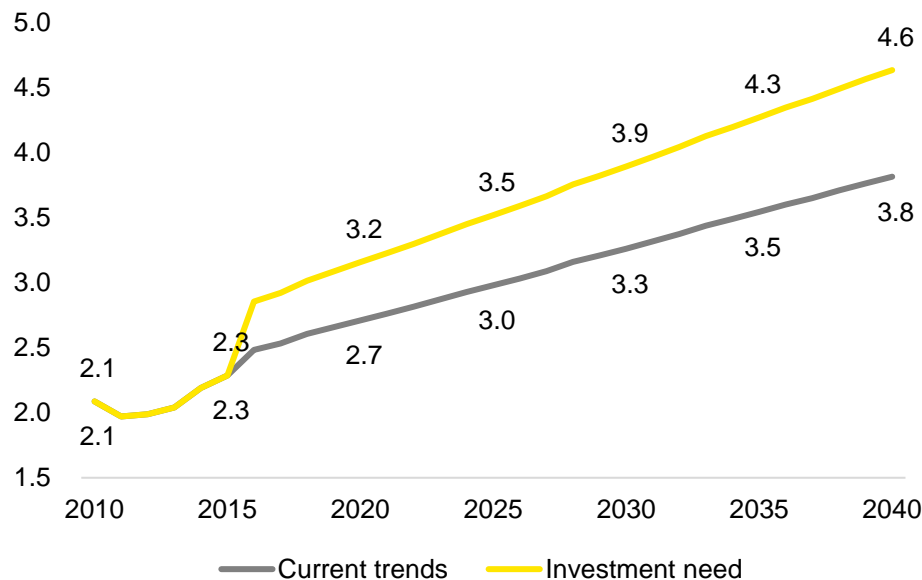
Contact tracing applications have allowed governments to understand citizen experiences, monitor physical and mental wellbeing, counter misinformation, and aid in crisis management responses.

2.3.3. Ukraine: Digital Services Overview
COVID-19 Concerns in Digital: Can Infrastructure Investments Help to Improve Our Quality of Life?

Infrastructure spending is a key lever that government can pull to stimulate the economy, but it needs to focus on the right kind of infrastructure

Global infrastructure investment gap (USD trillion)

Current trends: 2.1, 2.1, 2.3, 2.3, 2.7, 3.0, 3.3, 3.5, 3.8
Investment need: 2.3, 3.2, 3.5, 3.9, 4.3, 4.6

Legend: Current trends — Investment need

Source: Global infrastructure outlook

The world is on track to face a USD 15 trillion gap between the infrastructure investment needed and the amount provided by 2040

The issue

Physical and digital infrastructure is vital for a community's social and economic well-being and, as such, must be planned, funded, and managed by the government. For example, 5G will provide the connectivity that will transform the lives of billions by improving mobility, healthcare, home working, and distance learning citizens

The impact

The infrastructure investment gap was already significant – estimated by WEF to reach $15 trillion by 2040. But in the wake of COVID-19, there are concerns that lack of investments will lead to lagging future growth, threaten resilience to climate change, and eventually undermine our quality of life

The response

Governments should prioritize new value adding and strategically important projects, e.g., digital infrastructure (broadband, data centres, cloud, and 5G), vertical farming, social housing, and hospitals, to build greater capacity and resilience. Governments will look at ways of cutting through political and regulatory barriers and speeding up procurement processes and delivery of projects to support their stimulus packages.

COVID-19 Concerns in Digital: Is Technology Making Us Less Human?

COVID-19 has increased our reliance on technology to live, learn, and stay connected, but has blurred the boundaries between work and leisure and reduced opportunities for human contact

Growth of video conference apps in different countries during COVID-19 pandemic

During Weeks of March 15-21, 2020 vs. Weekly Average for Q4 2019 During COVID-19 Pandemic
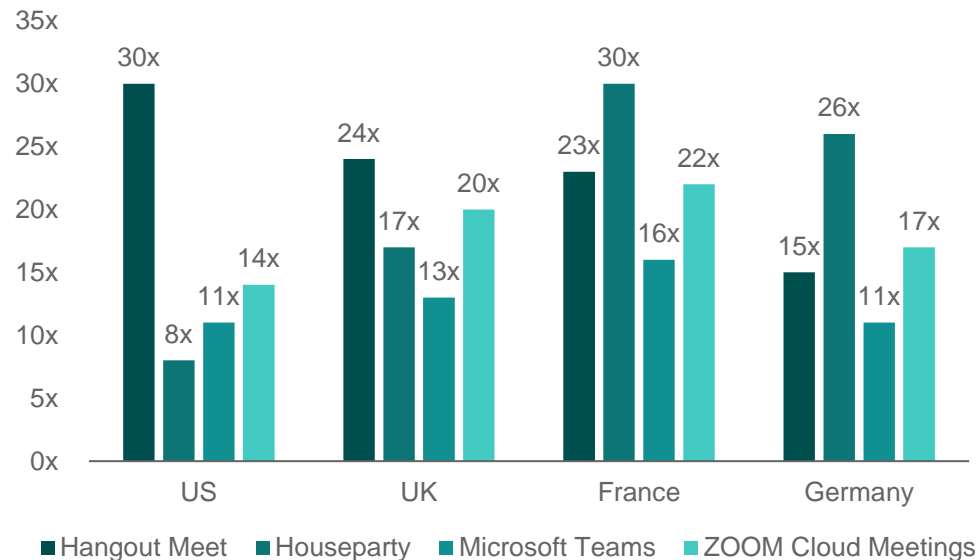
Source: App Annie

The issue

More people are working from home and communicating only at a distance using networking apps. The coming wave of "human augmentation" technologies, such as AR and VR, will further reduce the need for human contact by providing immersive experiences without leaving the home

The impact

This will have profound implications for our social fabric, the future of work (including productivity, team building, on-the-job learning), and institutional intelligence. And it brings other complications — the challenge of demarcating personal and work domains, technology addiction, declining motivation, and feelings of isolation — highlighting issues that will need to be addressed in a more virtual future of work and life

The response

Researchers and policymakers must consider the effects the next generation of technology might have on our behaviour and cognitive abilities. New cultural norms and solutions will be needed to build resilient workforces, e.g., pulse checks to assess employees' biopsychosocial risks, assess the health of team connectivity and morale while working remotely, and enable more effective virtual teaming

COVID-19 Concerns in Digital: Can We Ever Return to Full Employment?

With automation gathering pace and activity in many economic sectors curtailed by COVID, labour markets may be depressed for the foreseeable future

Estimated percentage working hours lost due to COVID-19 (%)
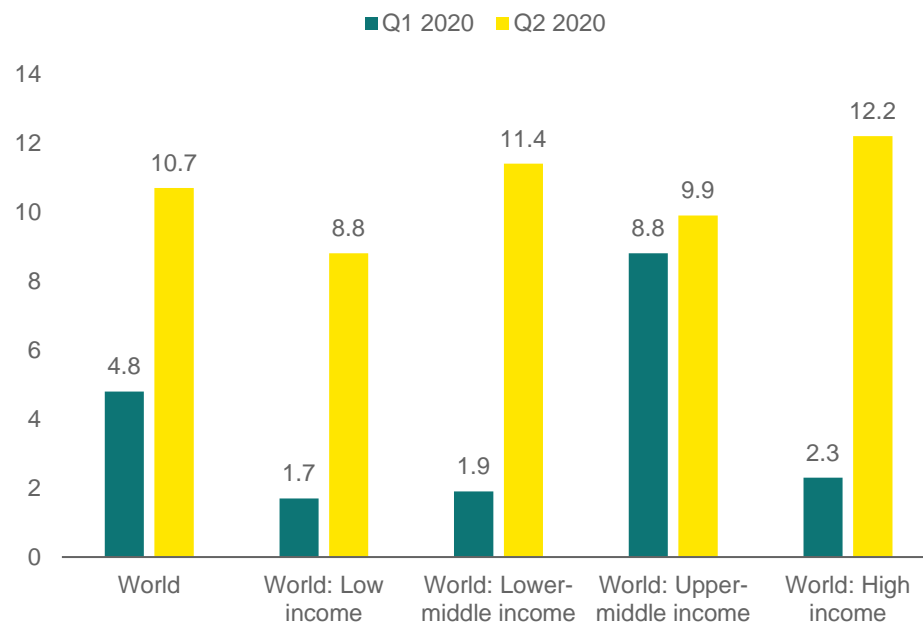
Source: International Labour Organisation

The issue

COVID-related workplace closures have led to massive losses in working hours, equivalent to 305 million full-time jobs, in Q2 2020. Some 1.25 billion workers — 38% of the workforce — are employed in sectors at high risk of workforce displacement. The effect of the crisis on micro, small and medium enterprises is also severe as they have lower resilience to shocks

The impact

Young people, women, the unskilled and low-paid are disproportionately affected due to their concentration in informal employment and those sectors most affected by the lockdown, and the amplification of existing trends, such as increasing automation, that were already eroding jobs

The response

Governments must create more agile and lifelong education and re-training programs that adapt quickly to changing needs and help workers remain relevant and competitive; they will need to build bridges for employees transitioning from the old to the new. Targeted tax incentives can encourage job creation and skills development in hardest-hit and future-oriented sectors; while stimulus relief can be linked to guarantees of job security and training

COVID-19 Concerns in Digital: Will Personal Privacy Be One of the Victims of COVID-19?

Governments are seeking to use data to improve public health and generate better societal outcomes. The challenge will be to do so in ways that do not erode personal freedoms

COVID-19 tracing by number of countries

Comprehensive tracing	110
Limited tracing	55
No tracing	12
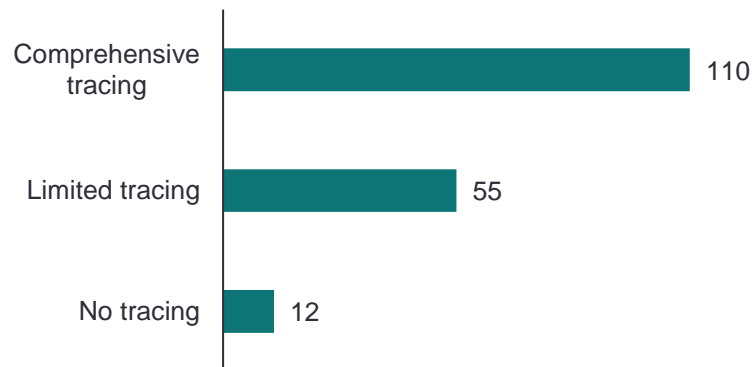
71%

of Americans are hesitant to download COVID-19 contact tracing apps due to digital privacy concerns

86%

of UK respondents have data privacy concerns in downloading COVID-19 contact tracing app

Source: The Oxford COVID-19 Government Response Tracker (OxCGRT)

The issue

The need for greater testing and monitoring of the population for signs of spreading COVID-19 has been used to justify greater surveillance powers as societies make trade-offs between liberties and security. But there is potential for misuse if this becomes normalised (e.g., if data is hoarded and used to manipulate behaviour)

The impact

Efforts to promote health security - and use data to personalise other public services - will have to be balanced with privacy, ethics, and trust concerns. This will create new regulatory and data management challenges for governments, as well as a need to investigate enhanced security and privacy-preserving measures

The response

Governments should look at strengthening regulations around people's personal data, giving citizens more control over how their data is used, and develop rules to manage ethical concerns over the use of new tools, such as AI. Greater transparency and the willing co-operation of a well-informed public will be vital to build trust and help people make more informed personal choices. Encryption and other cybersecurity best practices for data security and privacy will be crucial

COVID-19 Concerns in Digital: Will Our Children Be Taught by Teachers or AI Tutors?

COVID-19 has accelerated the shift to online learning platforms as providers move rapidly from experimentation and pilots to implementation in order to maintain continuity of learning during disruption

Numbers of learners impacted by school closures worldwide (million)

Date	Value
25-02-2020	279
10-03-2020	367
25-03-2020	1,534
10-04-2020	1,578
25-04-2020	1,568
10-05-2020	1,252
25-05-2020	1,186
10-06-2020	1,101
20-06-2020	1,091
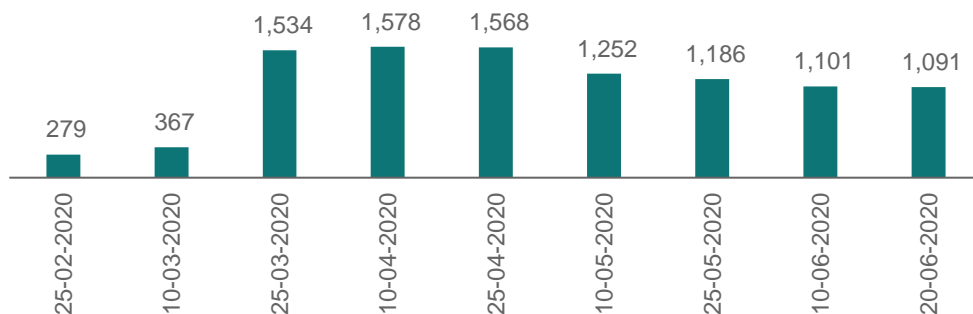
Global online education market (USD billion)

Year	Value
2020	205.1
2021	224.1
2022	244.7
2023	267.3
2024	292.0
2025	319.0
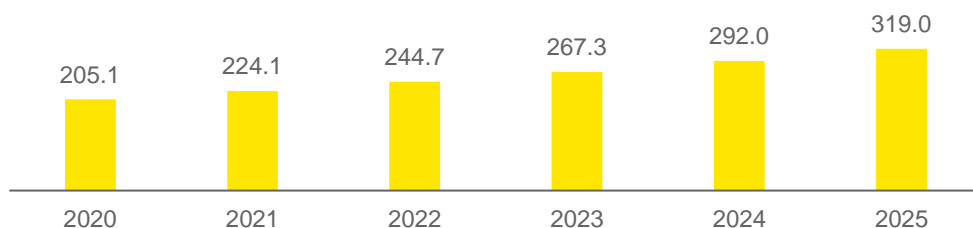
Source: UNESCO, Research And Markets

The issue

COVID-19 led to the near-total closures of schools, universities, and colleges in 195 countries worldwide, impacting almost 1.6 billion learners, or 98.5 percent of the world's student population. There are fears of children falling behind in their learning and widening of inequalities in some areas

The impact

Education providers have had to rethink their traditional teaching methods, with students shifting from classroom to remote learning within days and staff rapidly increasing their digital competency. These measures have helped maintain some continuity of learning during disruption, but have also accentuated inequities and critical skills gaps

The response

Students can benefit from differentiated, personalized educational opportunities in a blended learning environment. Bespoke learner analytics technologies allow educators to tailor content and teaching methods, monitor student performance in real-time, and personalise interventions to improve the outcomes for that student. But governments must improve the accessibility of virtual learning for disadvantaged communities by bridging the digital divide

2.3.4. Sector Development Strategy and Existing Barriers

2.3.4. Sector Development Strategy and Existing Barriers

FDI Attraction Factors: National Economic Agenda Consistently Aimed at Satisfaction and Serving the Needs of Investors

To build an economy attractive for investment, Ukraine should develop a hierarchy of sectoral and cross-sector strategies that consistently indicate the targets, principles, and approaches well-understood and acceptable by the international investors. The key attributes of a viable national economic agenda for the digital sector are outlined below.

Key Elements of the National Digital Agenda

Policy Foundation

- **Building on economic competitive advantages**
  - ‣ Digital development strategies must focus on the **evidence-based selection of economic sectors or sub-sectors** which are enabled by the digital innovations (including digital readiness assessment, mapping of key investment opportunities based on adopted principles, priorities, financial and social effect estimation)
  - ‣ **Coordination** and integration **of state and regional strategies** with national innovation, competitiveness, and development plans

- **Attracting long term Investments**
  - ‣ Incentives to **promote clusters or value chain linkages** in the local economy
  - ‣ Accurate and comprehensive **information services to support private sector investors**
  - ‣ **Efficient onboarding** for inbound investments
  - ‣ **Scaling up investment promotion** efforts
  - ‣ **Relationship management** of key investors

- **Reducing investment bottlenecks**
  - ‣ **Streamlined, non-biased regulatory framework**
  - ‣ **Consistent**, efficient, and secured **implementation** of adopted regulation

- **Addressing market failures and promoting inclusion**
  - ‣ **Open and trustworthy communication** with investors
  - ‣ **Small and medium business promotion**
  - ‣ **Inclusion** of women and disadvantaged demographics

2.3.4. Sector Development Strategy and Existing Barriers
Digital Infrastructure and Digital Services: Key Enabling Factors and Concerns for FDI Growth in Ukraine

Digital Infrastructure is seen as an enabler to attract private investment in the Ukrainian industry by ensuring connectivity with high-speed broadband internet, especially for social infrastructure, wider mobile coverage, and uninterrupted connections via 4G and 5G networks.

Key Contributing Factors

► Implementation of fixed and mobile broadband infrastructures increases **mobility and connectivity** of businesses and consumers, which allows:

  ► To **grow the market and long-term value** by personalizing customer experience and creating new services

  ► To **create the ecosystem mindset** aiming to integrate suppliers, competitors, customers, regulators – in order to widen the opportunities for interaction and overall market growth

  ► To **improve quality of life** by widening access to mobile health, education, work, entertainment

► Digital transformation enables **promotion of entrepreneurship, SME development** with direct access to global consumers and suppliers, financing, talent pools, knowledge bases

► Digital transformation of businesses delivers the following advantages to attract foreign direct investment into Ukraine:

  ► Improves **service levels** and **capital allocation**

  ► Increases **utilization of** existing **assets** and **labor productivity**

  ► Allows to realize **cost savings due to efficiencies** in energy, maintenance, re-work, overheads

► The **COVID-19 pandemic situation** caused an **acceleration of long-term trends like e-commerce, disintermediation, remote working, and wider adoption of digital government** like public e-services, telehealth, virtual education. It also exposed a general **vulnerability to disinformation campaigns and cyberattacks**, where immature technological solutions were implemented based on weak digital architectures. The industry sectors gaining from the COVID-19 pandemic show high levels of deployment of digital tools, resilient supply chains and smart manufacturing capabilities, implemented workforce digital skills programs

Digital Transformation Concerns

Digital infrastructure and e-services development brings up certain aspects that need attention while analyzing the digital influence on industry sectors:

► **Digital divide**: significant differentiation between connectivity levels and coverage in cities and rural areas. This opens a material gap in access to digital, and creates inequality between Ukrainian citizens based on location

► **Cybersecurity**: the pace of change and complexity of transformation are exposing all stakeholders to cyber threats and attacks, ranging from breaches of data and payment systems to cryptocurrency hijacking, as well as phishing and social engineering risks, all of which require additional investment

Technical

► **Interoperability**: digital transformation requires harmonization with global and regional best practices and industry standards, caused by the lack of clearly stated country-level and sectoral digital strategies. For example, the incentive of harmonizing with the EU Digital Single Market opens huge growth opportunities in a variety of sectors of the economy and society

► **Intellectual property rights protection**: the knowledge economy increasingly relies upon intellectual property. While it remains among the key unresolved issues for the Ukrainian legislative framework, it significantly lowers the FDI inflow into Ukraine

► **Data protection**: the EU GDPR regulation requires stricter compliance for businesses with EU-based customer, which implies additional investment – which may become a significant burden for SMEs

Legal

► **Digital skills**: the gaps and misfits are significant in most geographies, sectors, and professional domains - with increasing commercial demand and low preparedness of higher education institutions

► **Loss of traditional jobs**: as digital transformation brings multiple efficiency and productivity gains, many digitally unskilled workers are at risk. The government faces social, educational, political challenges to be addressed within 3-5 years and looks for best practices from digitally advanced countries

Social

2.3.4. Sector Development Strategy and Existing Barriers
Mapping Digital Transformation Concerns to FDI Growth Opportunities

The systematic approach allows to map identified types of digital transformation concerns and formulate hypotheses where to look for investment growth opportunities, considering Ukraine's conditions. In addition to digital transformation concerns in the previous slide, there is an organizational one linked with capacity enablement.
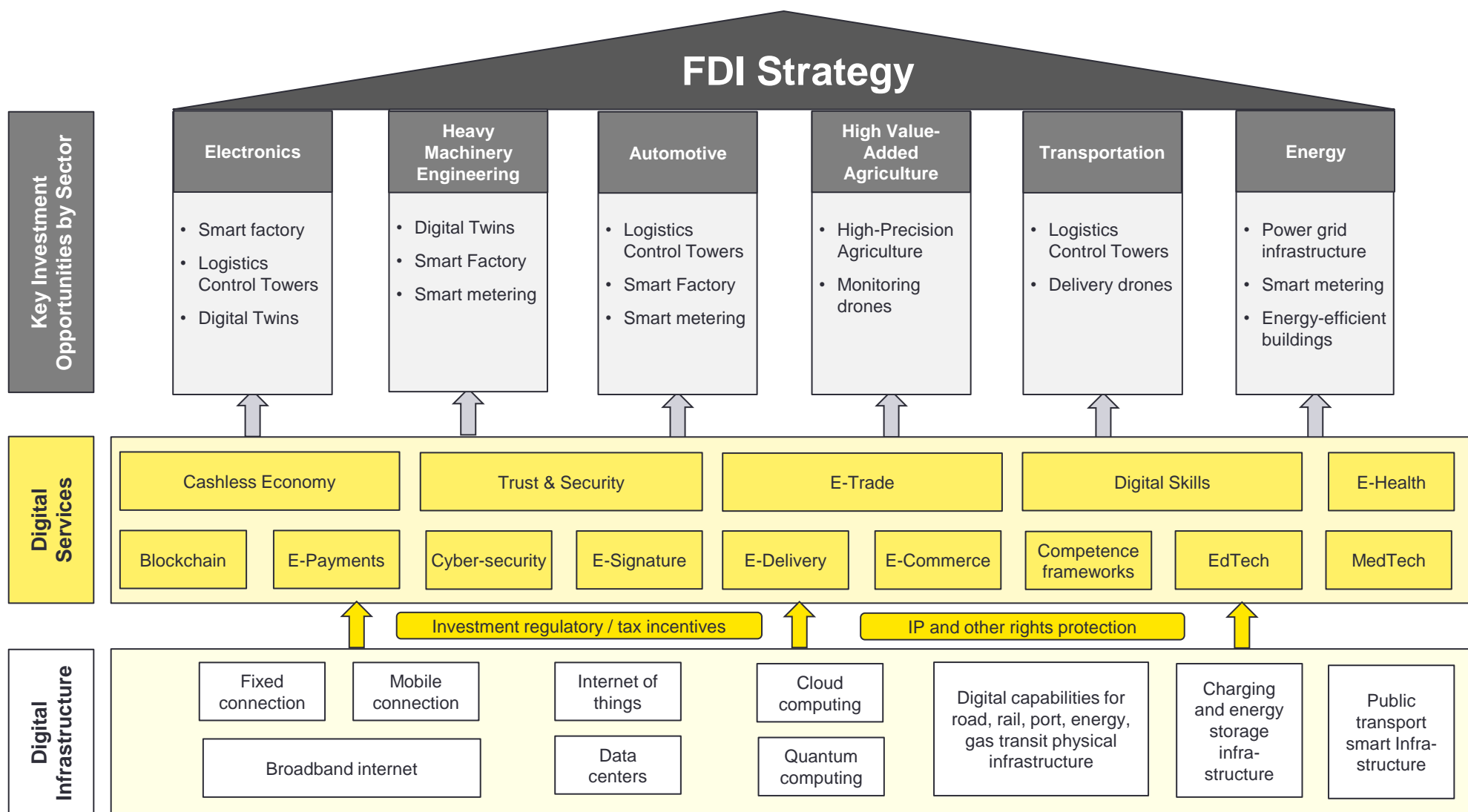
Type	Subtype	Areas of Concern for Digital Transformation	Prerequisites for FDI Growth	
Capacity-building	'Hard': applicable to physical or digital infrastructure	• Physical Protection for Critical Infrastructure (damage, war, cyber attacks)	• Defense strategies (cybersecurity etc.) • Defense infrastructure modernization	Technical
		• Digital Divide	• Broadband national strategy implementation to improve digital connectivity, coverage for rural areas, and to equalize Internet access for rural dwellers	
		• Standards	• Interoperability with best international standards for the easy, quick, inexpensive exchange of resources, data • Security for international and local investors • Protection of national interest	
	'Soft': applicable to rights, skills, services, social aspects	• Legal protection	• Investors' and creditors' rights protection • IP rights protection • Consumer rights protection • Human rights protection (e. g., adoption of Internet access among basic rights) • Investment incentives	Legal
		• Jobs	• Social security for 'digitally unemployed' (universal allowance?) • Connection to digital up-skilling/re-skilling programs	Social
		• Skills	• Formulation of digital competencies and standards • Introduction of digital training programs • Digital up-skilling/re-skilling	
		• Healthcare	• Universal access to healthcare on a guaranteed minimum internationally accepted level of healthcare for investors, employees, and citizens	
Capacity-enabling	Organizational	• Strong and independent institutions	• Courts • Ministries and state agencies – regulating sectors • State agencies – promoting investment	Organizational

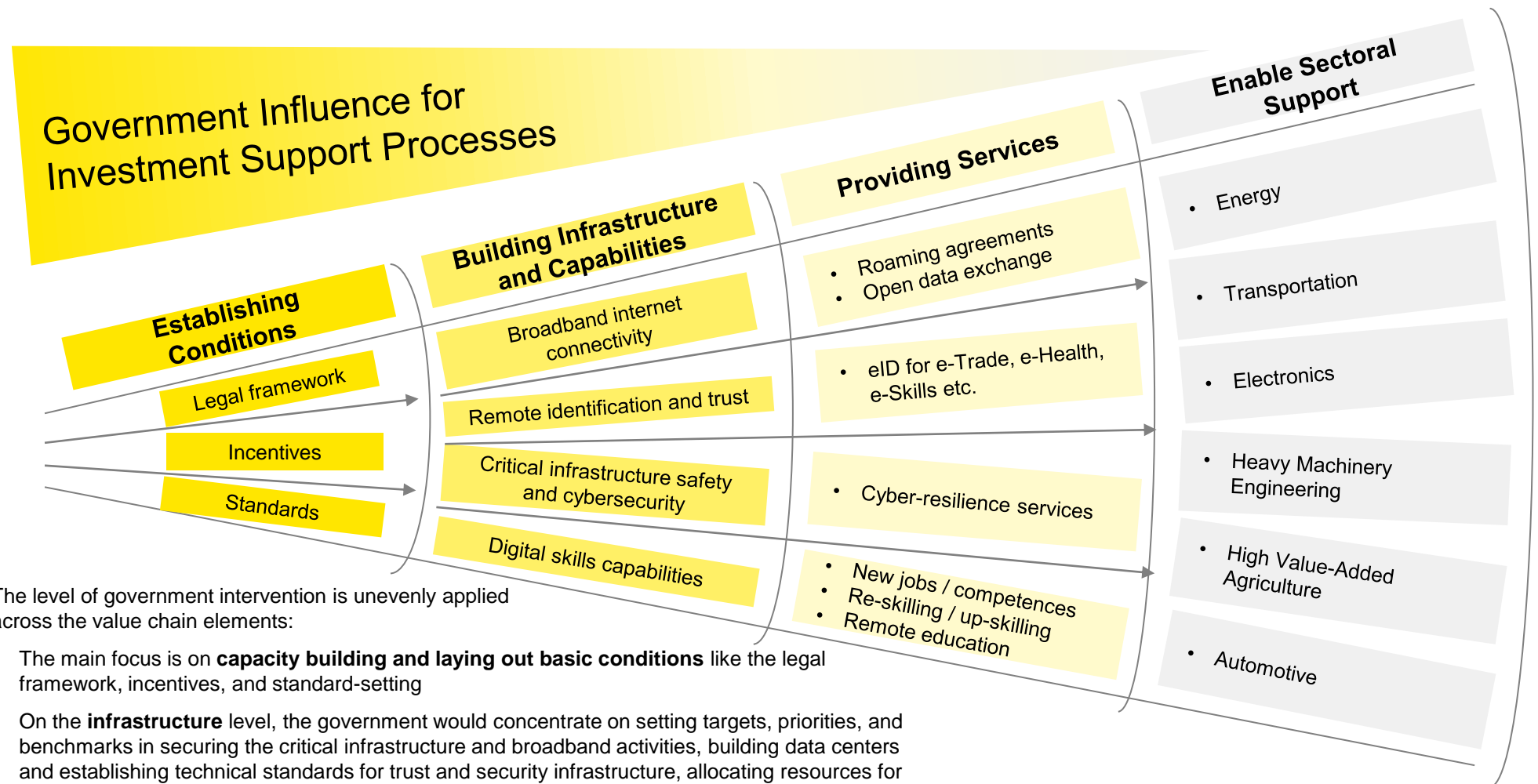## 2.3.4. Sector Development Strategy and Existing Barriers
Digital Infrastructure and Digital Services as Fundamental Enablers for
Economic Growth and FDI Attraction

The countries which are better prepared with the digital infrastructure and digital services receive a clear advantage in the quantity and quality of investment.

FDI Strategy

Key Investment Opportunities by Sector

Electronics	Heavy Machinery Engineering	Automotive	High Value-Added Agriculture	Transportation	Energy
• Smart factory • Logistics Control Towers • Digital Twins	• Digital Twins • Smart Factory • Smart metering	• Logistics Control Towers • Smart Factory • Smart metering	• High-Precision Agriculture • Monitoring drones	• Logistics Control Towers • Delivery drones	• Power grid infrastructure • Smart metering • Energy-efficient buildings

Digital Services

Cashless Economy · Trust & Security · E-Trade · Digital Skills · E-Health

Blockchain · E-Payments · Cyber-security · E-Signature · E-Delivery · E-Commerce · Competence frameworks · EdTech · MedTech

Investment regulatory / tax incentives — IP and other rights protection

Digital Infrastructure

Fixed connection · Mobile connection · Internet of things · Cloud computing · Digital capabilities for road, rail, port, energy, gas transit physical infrastructure · Charging and energy storage infrastructure · Public transport smart Infrastructure

Broadband internet · Data centers · Quantum computing

Government Influence for Investment Support Processes

Establishing Conditions
- Legal framework
- Incentives
- Standards

Building Infrastructure and Capabilities
- Broadband internet connectivity
- Remote identification and trust
- Critical infrastructure safety and cybersecurity
- Digital skills capabilities

Providing Services
- Roaming agreements
- Open data exchange
- eID for e-Trade, e-Health, e-Skills etc.
- Cyber-resilience services
- New jobs / competences
- Re-skilling / up-skilling
- Remote education

Enable Sectoral Support
- Energy
- Transportation
- Electronics
- Heavy Machinery Engineering
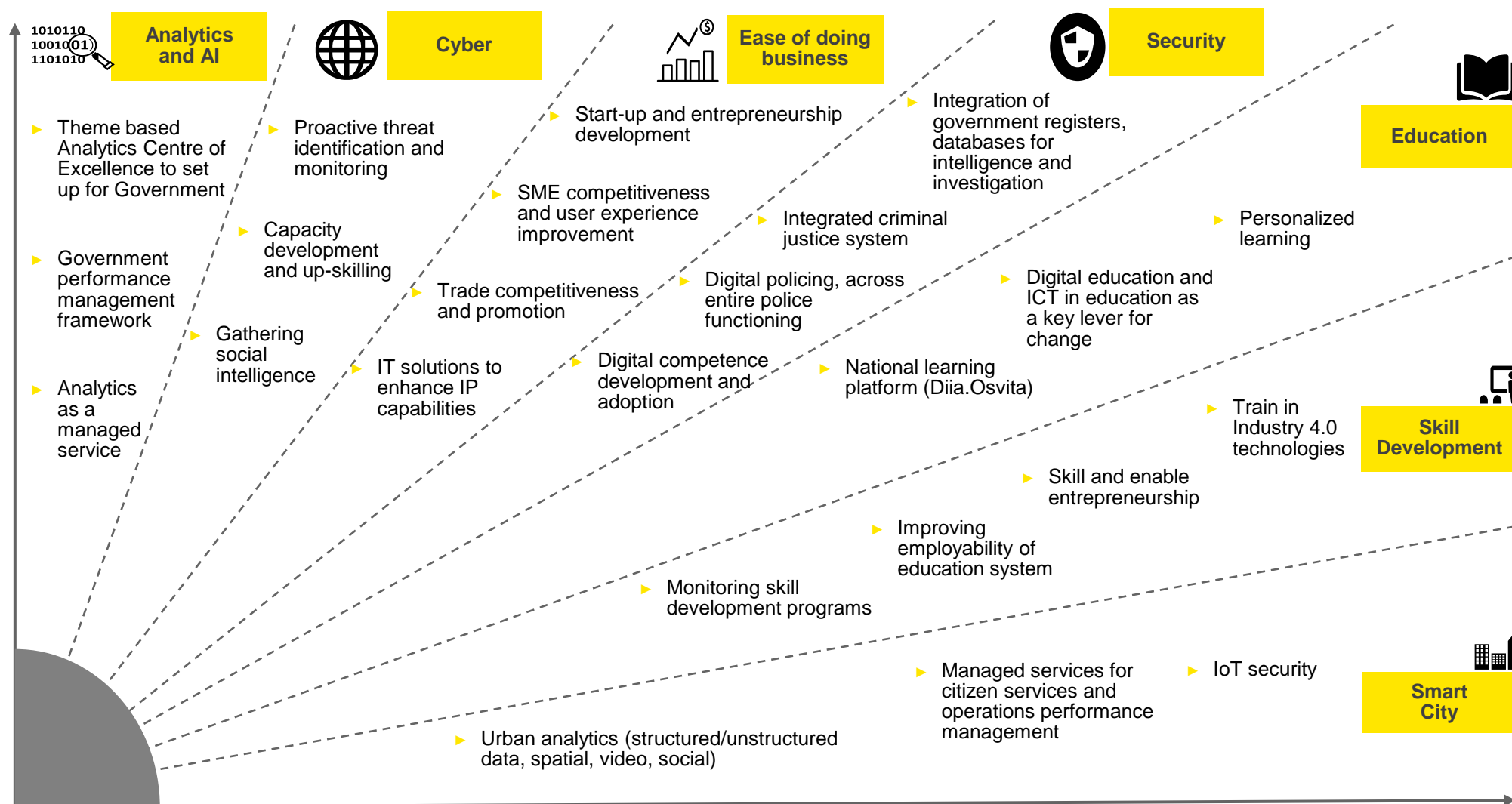- High Value-Added Agriculture
- Automotive

The level of government intervention is unevenly applied across the value chain elements:

- The main focus is on **capacity building and laying out basic conditions** like the legal framework, incentives, and standard-setting

- On the **infrastructure** level, the government would concentrate on setting targets, priorities, and benchmarks in securing the critical infrastructure and broadband activities, building data centers and establishing technical standards for trust and security infrastructure, allocating resources for digital skills development

- The **digital services** and **sectoral support**, based on the relevant conditions and infrastructures, would rather be developed by the incentivized investors. The role of government shifts here from implementation to supervision, regulation, and guidance – based on national interests and sectoral preferences formulated in relevant strategies.

Analytics and AI

Cyber

Ease of doing business

Security

Education

Skill Development

Smart City

► Theme based Analytics Centre of Excellence to set up for Government

► Government performance management framework

► Analytics as a managed service

► Proactive threat identification and monitoring

► Capacity development and up-skilling

► Gathering social intelligence

► IT solutions to enhance IP capabilities

► Start-up and entrepreneurship development

► SME competitiveness and user experience improvement

► Trade competitiveness and promotion

► Digital competence development and adoption

► Integration of government registers, databases for intelligence and investigation

► Integrated criminal justice system

► Digital policing, across entire police functioning

► National learning platform (Diia.Osvita)

► Personalized learning

► Digital education and ICT in education as a key lever for change

► Train in Industry 4.0 technologies

► Skill and enable entrepreneurship

► Improving employability of education system

► Monitoring skill development programs

► Managed services for citizen services and operations performance management

► IoT security

► Urban analytics (structured/unstructured data, spatial, video, social)

2.3.4. Sector Development Strategy and Existing Barriers
Key Barriers and Limitations to Digital Transformation in Ukraine

There are a few obstacles slowing down foreign direct investment in the Ukrainian digital infrastructure, digital services, and other sectors. The supply and demand side have to be stimulated to provide progress, and there is a need to sustain an efficient competition in all the segments of the value chain, to attract more investments and be able to expand the network coverage to all the population and introduce new technologies which will impact the economic growth of the country, but also decrease the gap of digital knowledge between urban and rural areas to improve the business case for investors and increase productive uses of broadband internet connectivity.

| Demand-side factors	Supply-side factors	Regulatory environment factors
► Limited connectivity of socio-economic objects, especially outside urban areas (schools and health institutions	► Limited network expansion and lack of last mile connectivity in rural and remote areas, some key objects of social infrastructure are unconnected or under-served	► Lack of mutual recognition of electronic signatures
► Lower demand for individuals and households in rural areas for broadband internet, owing to lower economic viability	► Fragmentation of the fixed broadband electronic communications market, which leads to regionality and inadequate financing for investment in larger infrastructure projects	► Absence of integration of Ukraine to EU Digital Single Market (harmonization with global best practices and standards)
► Lack of use and integration of the digital services by objects of social infrastructure	► Vandalism and physical security challenges on the cable facilities of fixed broadband operators	► Absence of interoperability between Ukrainian public registers
► Lack of customer-oriented integration / bundling of infrastructure and services from the market players	► Unleveraged opportunities to improve broadband infrastructure rollout through infrastructure sharing	► Lack of legal framework on cybersecurity
► Limited direct monetization of investment intensive digital technologies like 5G, IoT	► Unexplored opportunities to increase international interconnectivity through utility networks and submarine network development	► Lack of legal framework on broadband access to the Internet
► High cost of smartphones and personal computers due to the national low purchasing power	► Unavailability of spectrum resources to support further expansion of 4G coverage and deployment of 5G	► Complicated access to network facilities for telecommunication operators
► Relatively low levels of digital literacy and demand for digital skills	► Unreliable and incomplete statistical information distorts the information about the current market situation	► The High Court of Intellectual Property has not begun its activities yet

Source: Ministry of Digital Transformation

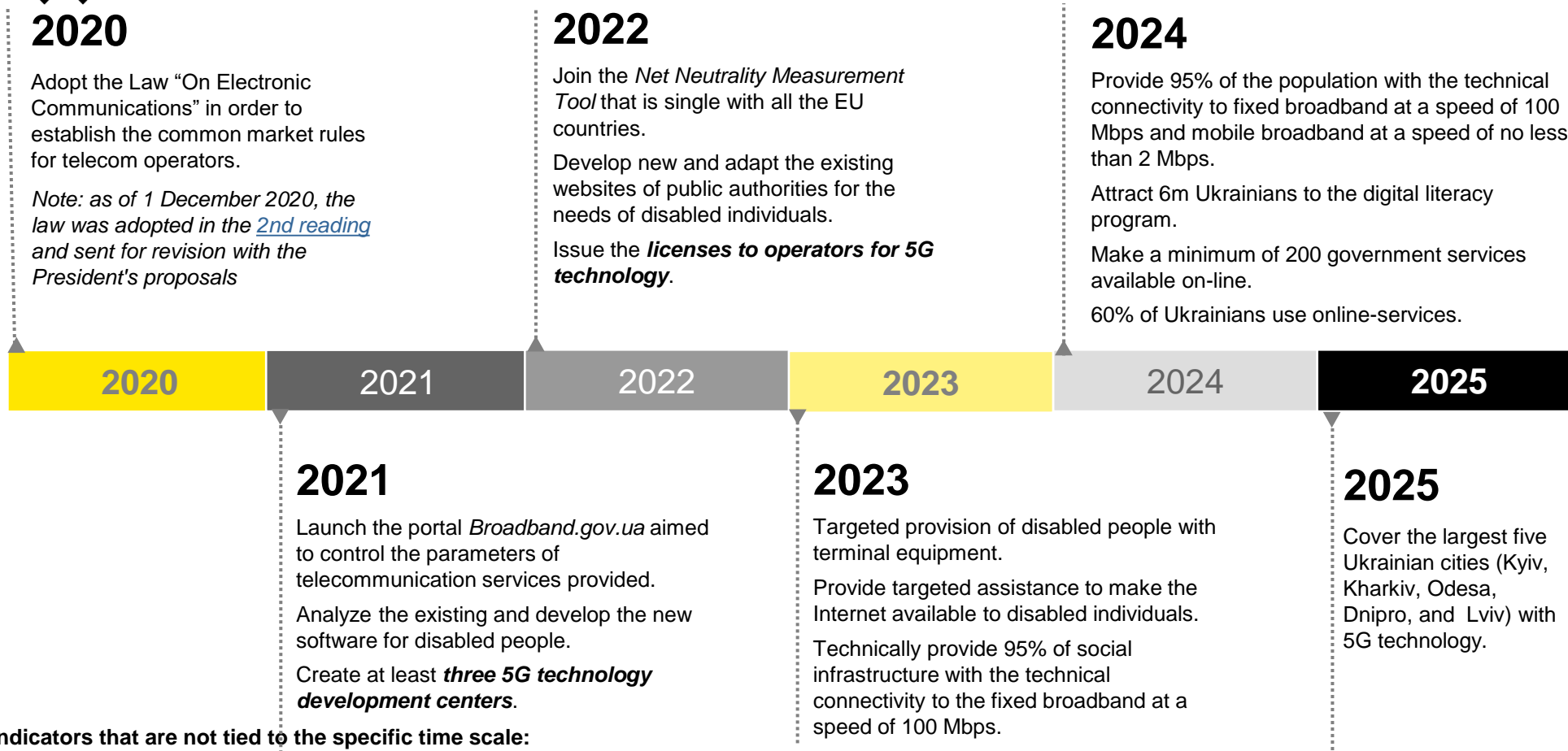## 2.3.4. Sector Development Strategy and Existing Barriers
Ukraine's National Broadband Strategy
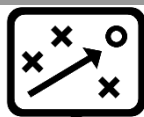
The National Broadband strategy is aimed at:
► provide the maximum number of people, public authorities, enterprises and organizations with the Internet access availability and
► make them comprehensively use all the opportunities such access provides.

Steps that should be taken by the Government to achieve such a strategy are summarized below.

2020
Adopt the Law "On Electronic Communications" in order to establish the common market rules for telecom operators.

Note: as of 1 December 2020, the law was adopted in the 2nd reading and sent for revision with the President's proposals

2022
Join the *Net Neutrality Measurement Tool* that is single with all the EU countries.

Develop new and adapt the existing websites of public authorities for the needs of disabled individuals.

Issue the **licenses to operators for 5G technology**.

2024
Provide 95% of the population with the technical connectivity to fixed broadband at a speed of 100 Mbps and mobile broadband at a speed of no less than 2 Mbps.

Attract 6m Ukrainians to the digital literacy program.

Make a minimum of 200 government services available on-line.

60% of Ukrainians use online-services.

2020	2021	2022	2023	2024	2025

2021
Launch the portal *Broadband.gov.ua* aimed to control the parameters of telecommunication services provided.

Analyze the existing and develop the new software for disabled people.

Create at least **three 5G technology development centers**.

2023
Targeted provision of disabled people with terminal equipment.

Provide targeted assistance to make the Internet available to disabled individuals.

Technically provide 95% of social infrastructure with the technical connectivity to the fixed broadband at a speed of 100 Mbps.

2025
Cover the largest five Ukrainian cities (Kyiv, Kharkiv, Odesa, Dnipro, and Lviv) with 5G technology.

Indicators that are not tied to the specific time scale:
1. 75% of households use fixed broadband at a speed of no less than 30 Mbps.
2. 95% of social infrastructure institutions and local governments are connected to the fixed broadband with a speed of no less than 100 Mbps.

Source: EY analysis of Ukraine's National Broadband Strategy
Note: years refer to the maximum time frames up to which the targets should be reached

2.3.4. Sector Development Strategy and Existing Barriers

International Cooperation in the Digital Sphere: Highlighted Memorandums
of Cooperation of the Ministry of Digital Transformation of Ukraine

Ukraine's current digital priority is its integration into the EU Digital Single Market. According to the Prime Minister, Ukraine agreed in 2020 on a new Program worth EUR 25 million for supporting e-governance and the digital economy. The goal is to ensure 100% digitizing public services by 2024.

In addition, the Ministry of Digital Transformation actively seeks support in the digital sphere from global corporate giants. The ministry has signed Memorandums of understanding with Microsoft, Google, Huawei, Rakuten, Samsung.

Microsoft	Google	Huawei	Rakuten	Samsung
The Ministry of Digital Transformation has signed a Memorandum with Microsoft on the implementation of the Azure Expansion Program, which provides for the creation and localization of Microsoft cloud services in Ukraine. The Memorandum is signed within the framework of the presidential project "The state in a smartphone."	In November 2020, the State Agency for Tourism Development and Google had signed a Memorandum of Cooperation in the development of the tourism industry and the digital transformation of Ukraine. Among other cooperation areas, the Memorandum is to provide an exchange of experience in the field of innovative information technologies implementation.	In 2019, the Ministry of Digital Transformation signed the Memorandum on mutual understanding and cooperation. Its purpose is to overcome the digital divide, develop broadband communication networks and ensure access to the Internet throughout Ukraine. In addition, since 2016, Huawei provides the global educational project "Seeds for the Future" for IT and STEM students.	Rakuten Viber continues to grow in the financial market: in 2019, Rakuten Viber and Mastercard together with NeoPay and Edenlab launched the Moneytou money transfer service in Ukraine. Early in 2020, the Ministry of Health together with Viber launched a service to inform about the COVID-19 situation. Rakuten also announced establishing an R&D center in Kyiv.	In October 2020, The Ministry of Digital Transformation had signed a memorandum with Samsung Electronics Ukraine. The Memorandum stipulates cooperation in the field of digital transformation, development of digital technologies, economy, innovations, and digital skills.

2.3.4. Sector Development Strategy and Existing Barriers
Key Sources of Investment in the Digital Sphere in Ukraine

Microsoft cooperation investment

USD 500m

Will be invested in the development of cloud services in the Ukrainian market

► Memorandum was signed in October 2020 as part of the presidential project **"A State in a Smartphone"**. It envisages the creation of the **cloud infrastructure Microsoft Azure**, Office 365, etc. on the territory of Ukraine. The goal is to create a data center to store national confidential data and ensure the availability of the latest technologies to the government, businesses and citizens.

► Additionally, considering Ukraine's plans regarding digital upskilling, Microsoft offered a collaboration that would allow people and businesses to access free digital learning. Microsoft demonstrated the intention to work with people and institutions across Ukraine to address the transition to the digital era. Three months since the launch of the global skilling initiative, Microsoft, LinkedIn, and GitHub reached more than 15 thousand Ukrainian learners.

VISA

► Memorandum was signed in November 2019 aimed at establishing consulting areas for small and medium-sized businesses and the development of on-line public services. VISA will support the implementation of this project and will direct its efforts to the development of information and educational materials for small and medium-sized businesses in digital literacy, use of modern technologies (Tap to Phone technology, which turns a smartphone into a mobile POS terminal, and QR codes). It is planned to introduce technological solutions through the mobile application and online public services system, Diia.

Currency.com

► Memorandum was signed with Belarusian company **Currency.com** on developing Ukrainian legislation in the field of IT and crypto regulation. The parties will work on drafting legislative proposals using the Belarusian experience of successful creation of IT regulating legislation.

TECHIIA cooperation investment

T USD 200m

Data center will maintain the equipment of ≈ USD 1bln. 200+ jobs will be needed.

► The Ministry of Digital Transformation of Ukraine and **TECHIIA** signed a Memorandum of Cooperation on the development of the Information Technology industry, construction of data centers, development of esports, and STEM education.

► This cooperation implies the implementation of the Ecotechnopark project in the Kherson region. In its core is the data center with a capacity of up to 500 MW, which will perform the functions of storage, data processing and 3D-rendering. The data center is planned to be built using the latest technologies taking into account the care of the environment. The heat generated by the data center is planned to be utilized by the agricultural farm, which will also be a part of the Ecotechnopark.

Samsung Electronics Ukraine

► In October 2020, Memorandum with **Samsung Electronics Ukraine** was signed to make electronic services on the Diia portal and mobile application more accessible and convenient. The objective is to popularize Diia mobile application by working jointly on the digitalization, development of digital technologies, economy, innovation and digital skills of the population.

Facebook

► The Ministry for Digital Transformation of Ukraine in cooperation with **Facebook** has launched an online training center for small and medium-sized businesses. Trainings have been developed by Facebook experts. The topics of trainings include effective online presentation of the company, building a brand in social networks, building relationships with customers, creating interesting and attractive content with the help of free mobile applications.

2.3.5. Sector Potential

2.3.5. Sector Potential
Summary of Digital Market Trends and Investment Opportunities

What's happening in the Digital Infrastructure market?

Growth from 'traditional electronic communications services' is slowing due to regulated price reductions, a controlled competitive environment (3 – 4 providers per country), and competition from OTT players in both the consumer and enterprise market. Expansion into content, gaming for Consumer and (Industrial) IoT, Cloud & Security for Enterprise is happening

Paradigm shift to Digital is essential and happening at scale, as digital technologies (AI, Intelligent Automation/Robotics, Analytics, Cloud, Blockchain) have the power to "supercharge" traditional telecom providers: The most relevant are customized offerings, highly automated and personalized customer interactions, effective and low cost operations, IT & network management, quality financial and operational decision making

RoIC in Digital infrastructure is the top priority. Rising capex burdens due to network upgrades add to concerns. 5G (and supporting backhaul) investments require advanced network planning and smart make-buy-share decisions; in parallel operational excellence is sought to increase cash returns

5G provides a great opportunity to grow, especially in the Enterprise/IoT space where there is an expectation of 25B devices connected in 2025 and a total of $3B in IoT business,\ when Industry 4.0 comes into existence. Roll out of 5G networks and use case trials are happening everywhere

Source: EY analysis

Global Megatrends	Top priorities for market players
1. Need to **Expand Role in the Value Chain for Growth**, as legacy services and connectivity continue to face challenges due to regulated price reductions (e.g., roaming) and competition	**Active growth agenda beyond connectivity:** ► Extension of the core in Consumer and/or Enterprise, moving beyond connectivity to monetize data, is essential for growth ► Partnerships should be actively pursued for both horizontal and vertical collaboration, including public-private partnerships for larger infrastructure investments ► Corporate Venturing should be seriously considered for growth
2. Acceleration of the **introduction of Digital** solutions (AI, IA/RPA, Analytics, Cloud, Blockchain, SDN/NFV) with an increased focus on short and long term returns	**Generation of best short and long term returns on Digital investment:** ► Re-thinking how to run and operate the company (business model, operating model, where to compete) vs. optimizing the current situation ► Investigating and defining key areas for the best return on Digital investments ► Designing (and delivering) comprehensive programs (vs. siloed initiatives) **Creation of a highly adaptive environment:** ► Moving IT to cloud-based applications to create better time-to-market, increased agility, and lower Opex
3. Urgent need to improve RoI, leading to a strong focus on **Funding, Capital Allocation, Asset Management and Operational Excellence**	**"Venture Capital quality" funding, asset management, and capital allocation capability:** ► Advanced funding capability, connection with sources of funding ► State of the art capital allocation mechanisms, and decision making ► Sophisticated make/buy/sell assets decision-making **Maximizing returns from operational activities**: ► Advanced enterprise/Network asset management ► Lean (re-)modelling of business processes ► Advanced use of outsourcing and resource-sharing models ► Zero-based budgeting
4. Introduction of 5G, focused on (massive) business growth in Enterprise/IoT area	**Running Technology (Network and IT) with the lowest cash out:** ► Best-in-class spectrum decisions and buying/auctions ► Sophisticated network planning, make/buy/share decisions for infrastructure, financing, and consequent (legal, organisational, operational) set up **'Re-fitting' commercial, organisation, and skills sets:** ► Rethinking of business and operating models ► New value propositions for enterprises across all industries ► Re-skilling of workforce, upgrading M&A, venturing and partnering capabilities **Have the ability to provide "Trust":** ► Compliance to the regulatory agenda, building on the right regulatory expertise ► Advanced (IoT) data management, ensuring compliance, realizing security

2.3.5. Sector Potential
Potential and Incentives for Investment Growth with Effect on the Selected Industry Sectors

The digital infrastructure development has sector-specific applications in relation to the key selected industries for the purpose of this study.

Electronics
- Integration to global supply chains via advanced digital tools (e-Delivery, e-Signature, digital transport corridors etc.)
- Use of additive manufacturing for design and testing of new products and services
- Smart manufacturing technologies for data collection, monitoring, analysis and predictive techniques

Engineering and Heavy Machinery
- Real-time equipment monitoring via smart sensors for predictive maintenance and productivity gains
- Use of virtual and augmented reality for workers on-site training, maintenance and repairs
- Artificial intelligence for scheduling manufacturing optimization, maintenance planning

Automotive (incl. components)
- Artificial intelligence for optimization of resources based on the sales/supply/production data analysis
- Intelligent automation in manufacturing, warehousing, back-office systems for improved productivity and efficiency
- Access and activity tracking systems for safe production environment

Energy
- Digital grids with integration of renewable generation and distributed generation capabilities
- Asset optimization through Industry 4.0 technologies (e. g. smart sensors), predictive maintenance functionality and network stability improvements
- Implementation of digital monitoring and alerts systems for increased safety requirements

Transportation
- Cross-border digital transport corridors
- Driving of Smart City developments
- Digital last-mile solutions (drones, automated vehicles)
- Data analytics based on real-time monitoring and data collection multiple market operators and government agencies
- Artificial intelligence for route and load optimization, predictive maintenance

High Value-Added Agriculture
- Driving field productivity through Smart Farming solutions
- Data analytics regarding localized weather forecasts, real-time pricing, irrigation and soil fertility dynamics for precision agriculture decision-making
- Increased asset security through the use of drones and autonomy vehicles for real-time monitoring and crop protection
- Efficiency gains via robotic milking, weeding, harvesting and fresh fruit picking
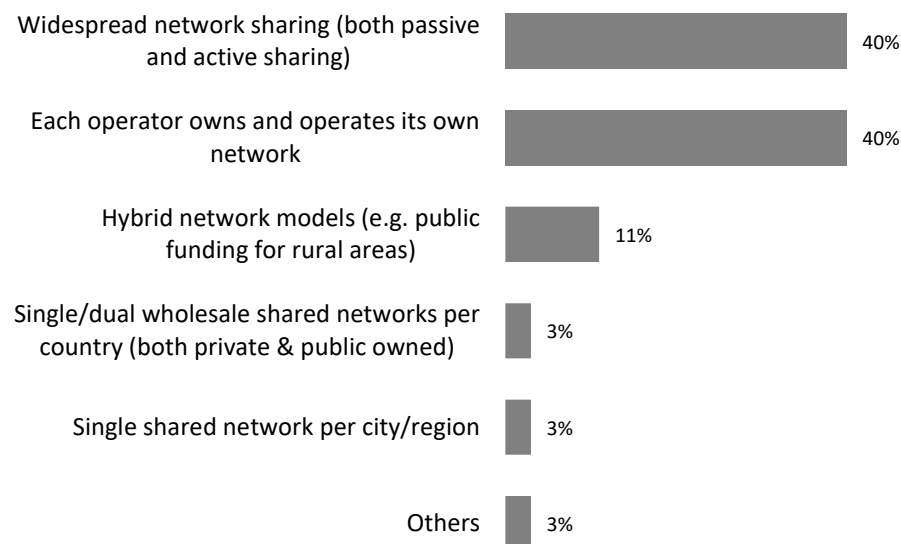
5G Key Characteristics and Use Cases

5G roadmap

2022	Optimized standard Full 5G vision
2021	3GPP 5G Rel. 17 > 40 GHz (mm wave)
2020	**Standards-based mass rollout**
2019	3GPP 5G Phase 2 Critical IoT Massive IoT
2018	**First deployments**
	3GPP 5G Phase 1 Mobile broadband
2017	**Pre-standards 5G start**
2016	3GPP 5G Rel. 14 Industry specs

Enhanced mobile broadband

5G

Massive IoT   **Critical communication**

- Human
- Homes
- Offices & Work
- Urban Environments
- Education
- Warehouses & Retail Sites
- Health Care
- Agriculture
- Factories & industries
- Transportation & logistics
- Utilities
- Vehicles

5G unlocks new use cases

🚀	Speed	**10 Gbps** 100 times faster than 4G
⏱	Latency	**10%** of 4G latency
📢	Mobile data volume per area	**1000x** greater than today
📱	Connected devices per area	**1000x** greater than today
⚡	Energy consumption	**1/10th** compared to 2010

5G Investment: the Savings Potential of Network Sharing

Advent of 5G will necessitate infrastructure sharing in a much bigger way

Q. What will be the most common industry structure for infrastructure ownership in the 5G era? N = 750 operator CEOs

Widespread network sharing (both passive and active sharing)	40%
Each operator owns and operates its own network	40%
Hybrid network models (e.g. public funding for rural areas)	11%
Single/dual wholesale shared networks per country (both private & public owned)	3%
Single shared network per city/region	3%
Others	3%

40% Potential cost savings in 5G rollout through network sharing – small cells, 5G macro network, core upgrades, and spectrum

Breakdown of targeted 5G opex savings: network sharing constitutes one third of all savings

33% reduction in opex targeted over 5 years

- Full network sharing — 33%
- Physical automation — 19%
- Neutral host — 14%
- SDN* orchestration — 14%
- Virtualization — 11%
- Spectrum sharing — 9%
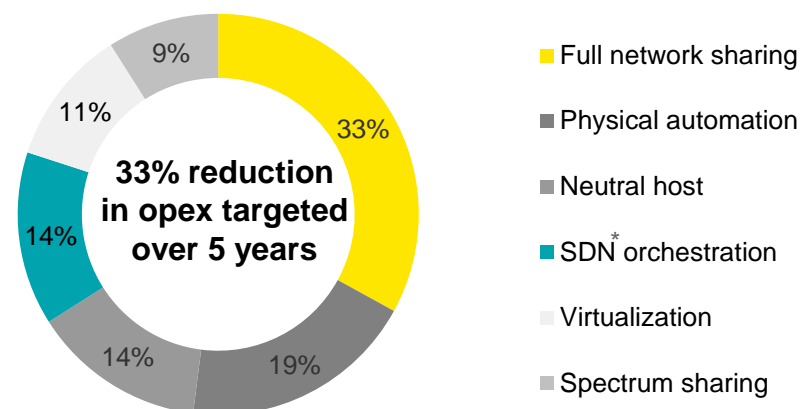
Substantial capex and opex savings owing to network sharing, particularly RAN**

Type of network sharing	Capex savings	Opex savings
Passive sharing cost savings	16%-35%	16%-35%
Active sharing (excluding spectrum) cost savings	33%-35%	25%-33%
Active sharing (including spectrum) cost savings	33%-45%	30%-33%

Sources: GSMA, Delta Partners, Analysys Mason, BEREC

* SDN -Software-defined networking   ** RAN – Radio access network

2.3.5. Sector Potential
5G Is the Catalyst for Smart Cities, Which Creates Opportunities for Data-Driven Business Models

It is hard to separate the legitimate buzz from the hyperbole surrounding 5G, yet fifth generation networks are here (almost). And they are key for connected cities.

From Lyft to Airbnb, 4G mobile networks sparked an explosion of mobile apps that have transformed the way we live. And in doing so, they ushered in the sharing and gig economies. But if 4G marked a big step forward in communications technology, 5G will be a quantum shift. And this will be taking place on an increasingly urban planet.

5G will provide the connectivity that will transform the lives of millions and millions of new city-dwellers. Realizing this exciting future will bring challenges. 5G technology relies upon dense, fiber-optic networks, which are very expensive to build. And investing budget in networks is a big ask for city leaders who also have pressing social issues to solve.

5G Use Cases for Smart Cities

- Connected city operations
- Connected health
- Connected home
- Digital divide and inclusivity
- Intelligent traffic systems
- Mobility-as-a-service
- Smart buildings
- Smart construction
- Smart public safety

it is clear that most advanced companies are now tech companies. And data is the currency for success.

Network Carriers

Mobile carriers are using their wealth of data to offer cities new solutions and services on top of their existing business of network connectivity. The first 5G networks and their complementary solutions will carry public safety broadband networks and applications, IoT networks, and dashboards of real-time city operations via IoT networks and cybersecurity threat detection.

Mobility

Businesses that once operated in the automotive sector building cars are moving into mobility-as-a-service, where data and apps are as important as autonomous technology. And cities are their most important market.

125 billion

Number of connected devices globally, producing massive amounts of data by 2030, according to IHS Global Insights
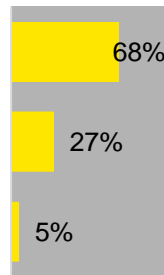
2.3.5. Sector Potential
Internet of Things: Expanding the Opportunities for Industry Integration

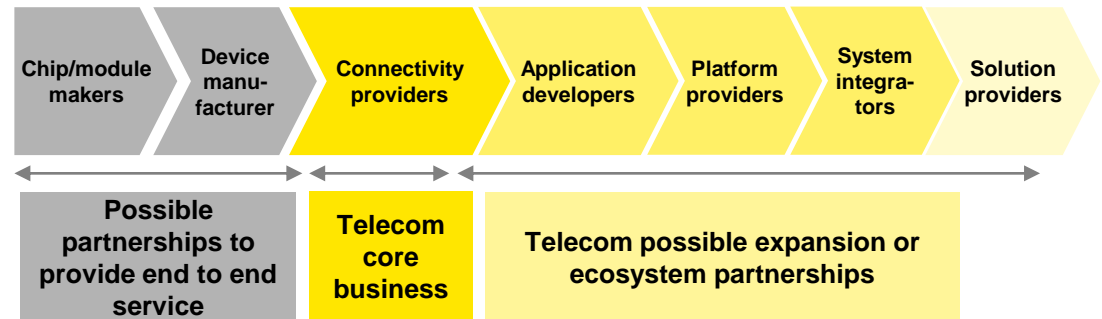### Global IoT market size 2025, with shares of global IoT revenues in 2025 (%)

USD1.1t

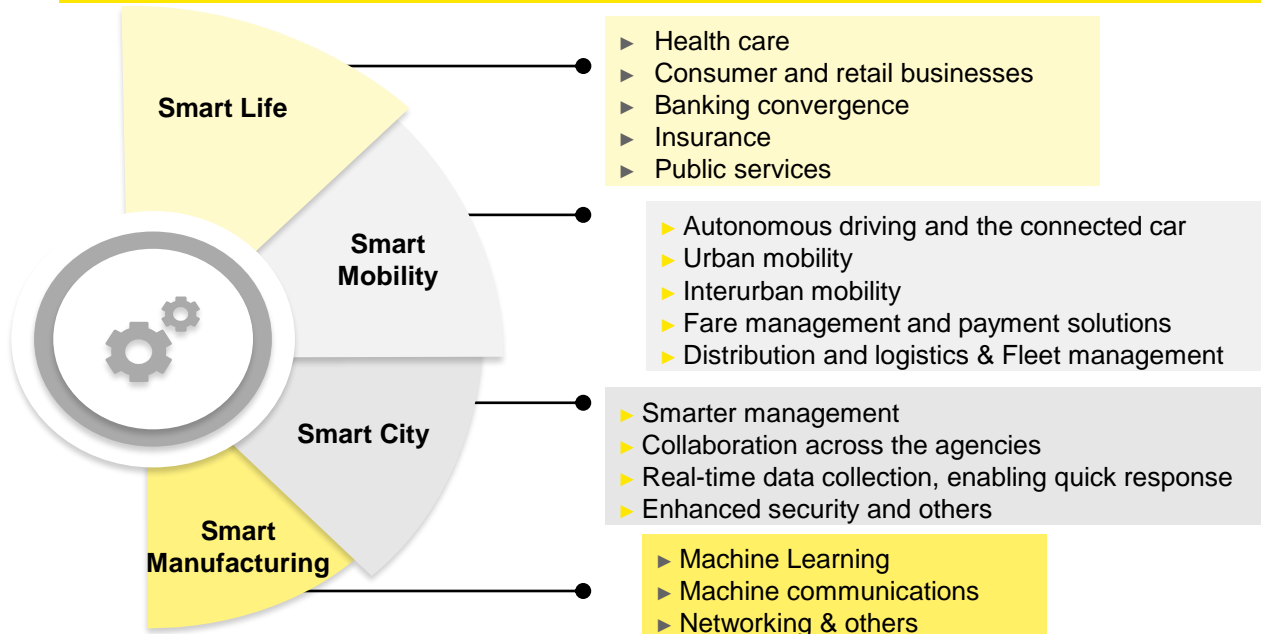|	
Platforms, applications and services IoT professional services	68%
	27%
Connectivity	5%

As IoT is one of the fastest growing revenue streams, telecommunications companies with their core service of connectivity are well placed to leverage their capabilities and move up the value chain

Value Chain and Potential Growth Areas for Market Players

Chip/module makers → Device manu-facturer → Connectivity providers → Application developers → Platform providers → System integra-tors → Solution providers

Possible partnerships to provide end to end service

Telecom core business

Telecom possible expansion or ecosystem partnerships

Key areas of IoT integration

Smart Life
► Health care
► Consumer and retail businesses
► Banking convergence
► Insurance
► Public services

Smart Mobility
► Autonomous driving and the connected car
► Urban mobility
► Interurban mobility
► Fare management and payment solutions
► Distribution and logistics & Fleet management

Smart City
► Smarter management
► Collaboration across the agencies
► Real-time data collection, enabling quick response
► Enhanced security and others

Smart Manufacturing
► Machine Learning
► Machine communications
► Networking & others

Impact on various industry sectors

Key sectors such as health care, education, financial, retail, communications, hospitality, industry, transportation, and agriculture are already enriched by internet-based technology, and further advancements will make other key economic sectors part of the digital connectivity landscape.

Key Advantages for Affected Industry Sectors

• New business development

• Potential for business revenue growth

• Improved decision-making

• Cost reductions

• Safety and security

• Improved citizen experience

• Improved infrastructure

Source: GSMA, Press articles, EY analysis

Internet of Things: Potential Use Cases for Smart Cities

Public transport & smart mobility

- Smart ticketing
- Real-time vehicle monitoring
- Smart toll collection
- Real-time passenger information
- Smart parking

Energy and environment

- Electricity management
- Waste management
- Water management
- Smart buildings
- Environment sensing

Revenue (tax) administration

- Real time information on tax receipts
- Optimized route of field collectors
- Location tracking of companies liable to pay taxes

Public Safety and Management

- Emergency response
- Disaster management
- Crime monitoring

Education

- Connected learning
- Smart exams
- Automated attendance logging

Internet of Things For Smart Cities

Infrastructure Management

- Bridge maintenance
- Road/railway/water line maintenance

Defence

- Connected militarized defence
- Connected assets
- Connected technologies to train soldiers and care for injured troops

Integration Services Potential with Smart Cities

Smart cities are trending

▶ Smart cities are large infrastructure projects that aimed towards creating an ecosystem for the comfortable and efficient operations of the companies mainly related to the IT industries;

▶ Smart cities are highly attractive targets for investments as they offer a wide variety of investment types;

▶ Investment types are funds, accelerators and R&D laboratories, and general IT companies. Moreover, cities can be seen as attractive targets for real estate investments;

A unique characteristic of integration

▶ Smart cities offer an ability to establish a business in an environment where information-sharing is one of the key features;

▶ The concept of smart cities implies that all companies interact with each other as they are using the same facilities and coworking spaces. This enables efficient information and knowledge sharing that positively affects the performance of the companies;

▶ Efficient knowledge sharing also makes operations of R&D labs, investment funds, and accelerators more efficient as information is flowing freely within the smart cities;

Key market drivers

Number of IT specialists (thousands)
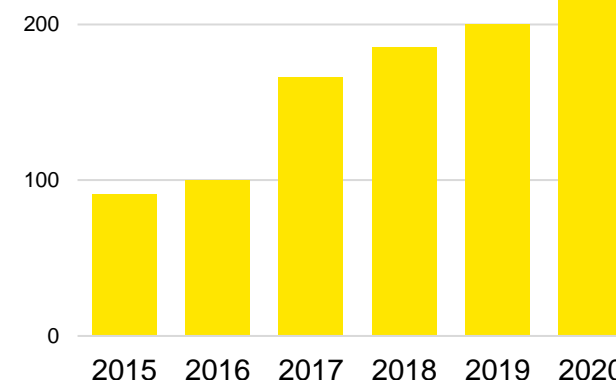
Revenue of IT industry (USD billions)

Regions with smart cities
Regions with potential for smart cities
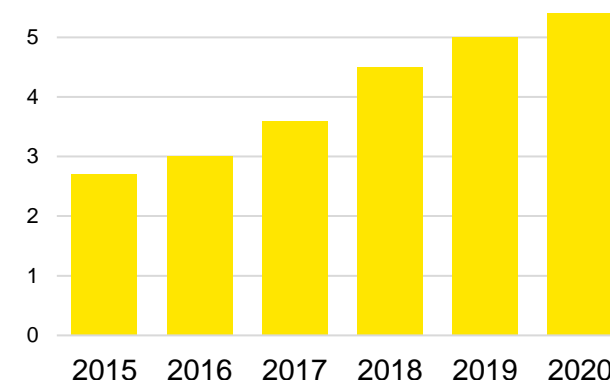
2.3.5. Sector Potential
Internet of Things (IoT) Investment in Ukraine

Investment in the IoT sphere in Ukraine

► In 2015, **Microsoft** opened an IoT Lab in Kyiv to support startups and SMEs looking to harness the power of IoT. The selected Ukrainian software development teams can learn IoT basics and building blocks for free in the Microsoft-hosted laboratory and get access to tools, platforms, and equipment required to practice and master their IoT skills.

► The mobile operator **Lifecell** and IoT Ukraine have created the first in Ukraine Internet of Things laboratory in June 2017 based on the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute."

► **SoftServe**, a leading digital authority and consulting company, through its partnership with Ivano-Frankivsk IT cluster members, opened an Internet of Things Laboratory at King Danylo University in Ivano-Frankivsk in April 2019. The company opened a new laboratory in July 2019 at the Lviv Polytechnic National University in Lviv.

► These are initiatives to boost a wave of local IT development in Ukraine and foster hands-on experience for students studying this technology.

► Startups such as **DeviceVoice** and **eNaturr** (*see columns to the right for more details*) rooted from IoT Lab's support programs have already implemented their IoT solutions successfully.
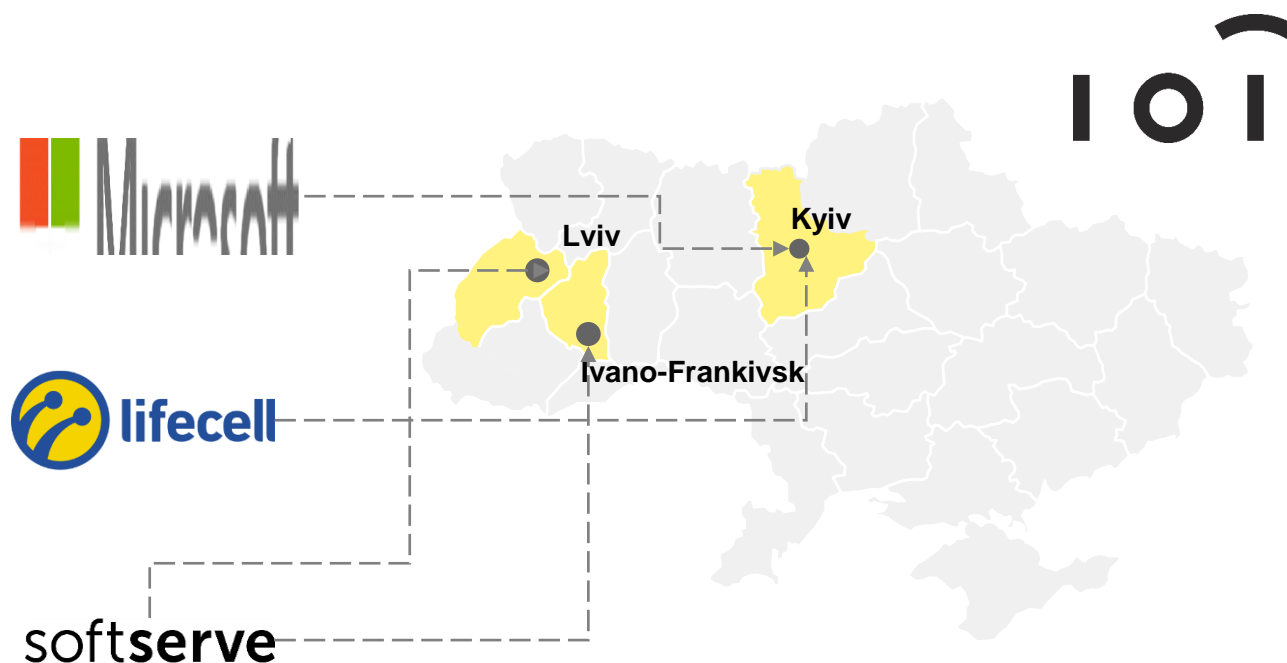
DeviceVoice	eNaturr
► **DeviceVoice** is a technological startup developing telemetry and cashless payment IoT solution for the vending industry. It consists of hardware and software parts (Web-portal, clients, and mobile service applications). The project started in 2015 and now provides a unique product that is useful for vending operators and their customers.	► **eNaturr** develops an IoT device and application which allows to collect and analyze environmental information from anywhere in the world and present it in an understandable form right to your smartphone.

2.3.5. Sector Potential
Smart Cities: Concept of the City-As-a-Platform

Cities are using PPPs to validate technologies, gather environmental data, provide services and guarantee new revenue streams

1 Application and services

| Mobility | Education | Tourism | Government | Healthcare |

2 Service delivery platform

Interoperable, multichannel, API enabled

| Digital identity | Payments | Urban control centers | Open/Big Data | Geographic Information |

3 Sensors

4 Infrastructure

Broadband
WI-FI   FIBER

Transport
PARKING   TRAFFIC LIGHTS
ROADS   TRANSPORT

Energy
RENEWABLES   STREET LIGHTING
ELECTRIC ENERGY   SMART GRID   GAS NETWORK

Environment
WASTE
WATER   SEWERAGE

2.3.5. Sector Potential

Smart Cities: COVID-19 Impact – Acceleration of the Urgency to Build
Resilient, Connected, Green, Inclusive, Sustainable Cities

Financing	**Digital transformation**	**Sustainability**	**Mobility**
Impact:	*Impact*:	*Impact*:	*Impact*:
► Economic recovery programs have opened up **new channels for smart city investment** and greater opportunities for **public-private partnerships**	► Sudden progression of digital public services have made **data a vehicle for improving well-being**	► The fragility of existing infrastructure has prompted calls to **"build back better" during the recovery**	► Cities have discouraged the use of public transportation and **prioritized safety and hygiene standards**
► However, challenging public finances will place greater emphasis on finding **innovative financing solutions**	► Unequal access to telework and e-learning opportunities have accentuated the **digital divide**	► Reduced transport and industrial production have led to **public awareness of the temporary drop in emissions and a cleaner environment**	► The temporary drop in transport usage has elevated the need to consider **road space priorities and smart demand measures**
► Shifting **government procurement strategies** will continue to seek out supply chain resiliency	► Heightened vulnerability of citizens have made **mobile apps** and **predictive analytics** a priority for cities	► Cities have rolled out **low-carbon, environmental sustainable recovery plans** in an effort to create new green jobs	► An uptick in bicycle and moped usage renews the need for **accessibility standards for disadvantaged communities** in new mobility solutions
City innovations:	*City innovations*:	*City innovations*:	*City innovations*:
► **Toronto** launched a partnership with leading tech companies to help provide SMEs with loans and digital services	► **Tel Aviv** has rolled out incentives for strengthening the IT infrastructure of SMEs and digital transformation of public services	► **Amsterdam** has adopted a new sustainable development model, "Doughnut Model," where policies will be designed around the city's overall well-being	► **Major cities such as Bogota, Milan, San Francisco, Melbourne, Paris, and Berlin** have repurposed roadways for bike and foot traffic
► **Bilbao** has leveraged a PPP to invest in a digital mapping solution to boost demand in shops as lockdowns ease	► **Toronto** has partnered with tech companies to provide free temporary internet access to disadvantaged communities	► **Burlington, Vermont,** has put toward a green stimulus package that provides investment for energy efficiency projects	► **New York** has accelerated the use of **digital payments** for transit fares
► **Milan** established a "mutual aid fund" by encouraging financial contributions by individuals and the private sector	► **Major cities** have deployed contact tracing apps, digital dashboards, and predictive analytics at the speed		► **Luxembourg** increased rebates for bicycles, mopeds, and motorcycles by 100% and electric vehicles by 60%

2.3.5. Sector Potential
Smart Cities: Benchmark – Edinburgh, Scotland

·ЄDINBVRGH·
THE CITY OF EDINBURGH COUNCIL

Edinburgh has laid out ambitious plans for transport and other urban development programs and is supporting this vision with a range of pilots

Edinburgh has laid down several plans and initiatives for the targeted achievement of its future vision for the development of the city. The city has secured £1.3 billion of funding and a potential £3.2 billion private investment to invest in the city region over the next 15 years.

Edinburgh's key areas for implementation

1	**City Vision**	Edinburgh Vision 2050 focused on four themes: Inspired; Thriving; Connected & Fair City.
2	**Transportation and mobility**	Focus on sustainability, MaaS, smart parking, intelligent transport, and pedestrian viability.
3	**Collaboration government & private sector**	Smart Cities Scotland and Scottish Cities Alliance help drive the programs in partnership with the city
4	**Sustainability and livability**	Becoming a low carbon, resource efficient city, delivering a resilient economy.

Strategy

Edinburgh 2050 Vision	Circular Edinburgh	Sustainable Edinburgh 2020

Key Points

► Edinburgh is carrying a consultation campaign to develop and adopt a 2050 vision for the city. ► The program is focused on developing a city with a focus on creativity, innovation, shared spaces, good quality of life, entrepreneurial spirit, culture, and education	► Aimed at investigating the opportunities around the circular economy and the support for business. ► Key identified opportunities across the sectors include: Knowledge hub, ICT refurbishment, Alcohol by-product, hospitality, and facilities management	► Strategic framework aimed at making Edinburgh a low carbon, resource efficient city, and vibrant economy. ► The framework focuses on good governance, management, environment conservation, responsible consumption, inclusive communities, etc.

Key Challenges

Growing and ageing population	Rise in housing costs
Poverty and community inclusion	Changing climate
Inadequate social care	Poor air quality

Major Smart city activities
Some of the smart city initiatives include:
► Edinburgh Apps Civic Challenge Programme
► Edinburgh Living Lab
► Smart building energy management
► City Operations: Intelligent lighting, Smart Bins, and CCTV
► City APIs: BusTracker and Festival Edinburgh

Key investment areas identified for the city are data, infrastructure, innovation hubs, housing, culture, tourism, and cross-cutting tourism such as inclusive growth and skills; digital; and low carbon

Digital Infrastructure: Effect on Industrial Manufacturing – Advantages of Implementation of Smart Factory Solutions
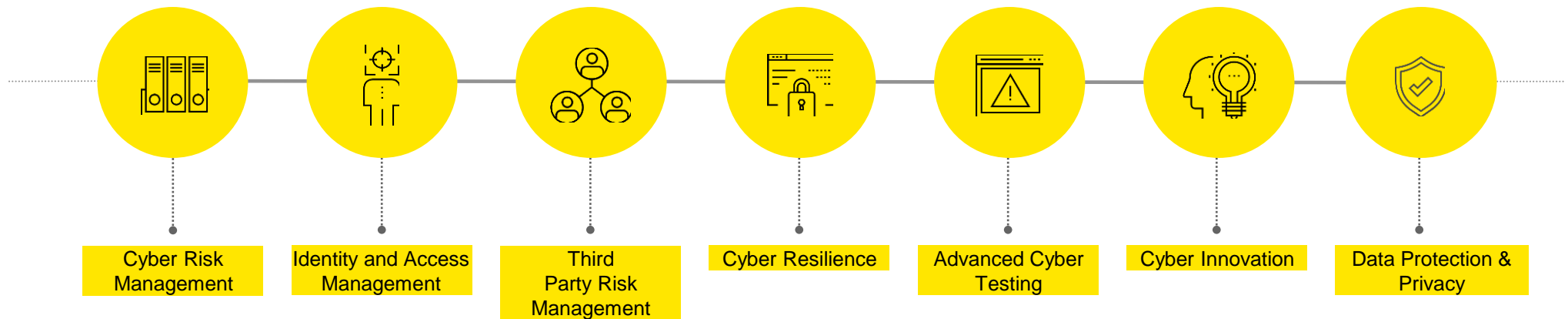
Smart Factory solutions built on emerging digital technologies drive toward zero-touch operations, provide significant operational improvements, and drive towards attractive returns on invested capital.

Smart Maintenance Management

▸ Defect Logging
▸ Maintenance Planning
▸ Condition-based Predictive Maintenance
▸ Intelligent Maintenance (AR)

Smart Quality Management

▸ Intelligent Process Optimization
▸ Zero Loss Yield

Smart Energy Management

▸ Energy management analytics

Smart Planning and Material Management

▸ Supply Chain Synchronization
▸ Supply Chain Integrity
▸ Autonomous Stock Control

Smart Tasks Management (My Tasks)

Digital enablers

- Advanced Analytics, Machine Learning, Artificial Intelligence
- Automation, Robotics
- Digital Twins
- Augmented Reality, Virtual Reality
- Blockchain

Operational advantages from implementation of Smart Factory solutions

Benchmark

Productivity increase 0% – 30%

Waste reduction 0% – 70%

Labor cost reduction 0% – 20%

Energy and water cost reduction 0% – 30%

Maintenance cost reduction 0% – 20%

Product recall reduction 0% – 40%

SOURCE: EY analysis

| Cyber Risk Management | Identity and Access Management | Third Party Risk Management | Cyber Resilience | Advanced Cyber Testing | Cyber Innovation | Data Protection & Privacy |

Cyber Risk Management

It is critical to articulate the impact of cyber risk from the top level down. This can be achieved by defining cyber risk appetite and metrics and by producing accurate and up-to-date reports that enhance decision making.

Identity and access management

Robust management of digital identities ensures that the right people have the right access to the right resource at the right time.

Third party risk management

Third party risk management is the oversight of key service providers who contribute to operations. The expectations from customers and regulators are that organizations are responsible for their third parties and cannot transfer the risk or, following an incident, culpability. Organizations must be conscious that the performance of their third parties will directly reflect upon them; a service can be outsourced, a risk cannot.

Cyber Resilience

Cyber Resilience is the ability of organizations to anticipate, prepare for, respond and adapt to change and sudden disruptions in order to survive and prosper.

Advanced Cyber Testing

The traditional approach to attack and penetration testing has, in the past, been effective at helping organizations identify common vulnerabilities. However, regulators are now demanding a more holistic and rigorous approach to testing the ability to anticipate, prevent, detect and respond to sophisticated attacks by advanced threat actors on people, processes, and technology.

Cyber Innovation

Urgent action to address the challenges of today and the future - robotics and intelligent automation have a role to play in better security.

Data Protection & Privacy

GDPR remains an area of focus as organizations look to ensure ongoing compliance. Data breaches are resulting in regulators issuing substantial fines and penalties incurred across jurisdictions.…

2.3.5. Sector Potential
Digital Skills: Current Trends Force Existing Educational Institutions to Expand Their Digital Offerings

As the education sector changes and lifelong learning becomes the norm, competition is emerging from unexpected places, requiring traditional teaching and learning providers to be agile and adaptable in order to respond to rapidly changing consumer demands.

Continuous learning

The need for workforce agility in the gig economy is increasing the demand for continuous development, requiring learning that is self-directed, affordable, accessible, and time critical. 87% of past students believe people must continuously upskill to remain competitive in the workforce, with education providers increasingly promoting lifelong learning beyond course completion

International competition

Global rankings, international mobility, and global knowledge hubs will change the competitive landscape and open up new opportunities for learning. Student mobility is increasing as technological, political, and demographic changes make internationalization the new norm for educational institutions

Evolving digital behavior

Digital transformation is empowering learners by converting them into consumers of educational services. As nearly every consumer activity shifts to the digital realms of the web, mobile, social, mixed reality, and virtual reality, digital natives are developing new, radically different learning behaviours and expectations
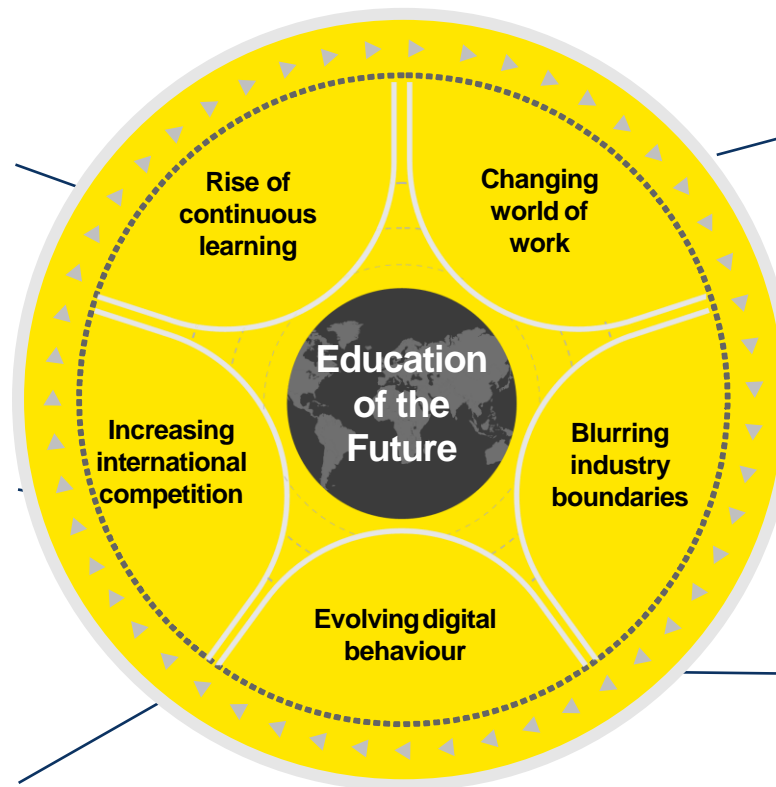
Changing workforce

Technology disruption is affecting the nature of employment and employability. As workplaces change, so does the education that aims to equip students for the modern workplace

Non-traditional market entrants blurring industry boundaries

New rivals offering unique educational services are increasingly challenging the dominance of traditional education providers. Technology is driving convergence in almost every industry, as disruption reconfigures value chains and democratises information. Learners want just-in-time learning and micro-certifications that provide immediate employment payoffs

Rise of continuous learning

Changing world of work

Increasing international competition

Education of the Future

Blurring industry boundaries

Evolving digital behaviour

Source: EY, Can the Universities of Today Lead Learning for Tomorrow?, 2018

2.3.6. Legislative Framework and Key Action Steps for Improvement

2.3.6. Legislative Framework and Key Action Steps for Improvement
Current legislative framework and legislative initiatives in digital infrastructure

Association Agreement between the European Union and Ukraine and Plan of Measures for Implementation of the Association Agreement approved by Resolution of the CMU No. 1106 dated 25 October 2017

► Provides for cooperation on protection of personal data under best European and international standards, maintaining a dialog on regulatory issues raised by electronic commerce, and exchange of information on the relevant legislation and its implementation

► Prohibits any restrictions on the provision of the cross-border electronic communication services

► Provides for the obligation to ensure confidentiality of electronic communication and related traffic data in public electronic communication networks and public electronic communication services without restricting trade in services. Ukraine should ensure that the provision of electronic communication services is authorized, as much as possible, following mere notification and/or registration, as well as ensure licensing on the attribution of numbers and frequencies

► Determines types of intermediary service providers and their obligation to ensure the free movement of information services and enforce intellectual property rights in the digital environment

► Provides for the approximation of the national regulations with the *EU acquis*, including the Directive 2002/21/EC on a common regulatory framework for electronic communications networks and services (Framework Directive), Directive 2002/20/EC on the authorization of electronic communications networks and services (Authorization Directive), Directive 2002/19/EC on access to, and interconnection of, electronic communications networks and associated facilities (Access Directive), Directive 2002/22/EC on universal service and users' rights relating to electronic communications networks and services (Universal Service Directive), Decision No. 676/2002/EC on a regulatory framework for radio spectrum policy in the European Community (Radio Spectrum Decision), Commission Directive 2002/77/EC on competition in the markets for electronic communications networks and services, Directive (EU) 2016/1148 on measures for a high common level of security of network and information systems across the EU

► Ensures the technological compatibility (interoperability) of electronic signatures, including:
  ► Development of the procedure for the use of information and telecommunication system for electronic trust services between subjects of different states (implemented by the Resolution of the CMU No. 60 dated 23 January 2019)
  ► Development of requirements for electronic trust services and the procedure for verifying compliance with the requirements of the law on electronic trust services (Resolution of the CMU No. 992 dated 7 November 2018)
  ► Mutual recognition of public key certificates, in particular by the execution of international agreements until 2023 (**not implemented yet**)

Directive 2000/31/EC on certain legal aspects of information society services, in particular electronic commerce, in the Internal Market (e-Commerce Directive)

► Establishes rules on transparency and information requirements for online service providers, commercial communications, electronic contracts, and limitations of liability of intermediary service providers

► Sets out basic requirements for mandatory consumer information, steps to follow in online contracting, and rules on commercial communications (e.g., online advertisement and unsolicited commercial communications)

► Most provisions were implemented by the Law of Ukraine "On Electronic Commerce" No. 675-VIII dated 3 September 2015 (Law on e-Commerce)

Convention for the Protection of Individuals with regard to Automatic Processing of Personal Data dated 28 January 1981 (ratified on 6 June 2010)

► This Convention is applicable to automated personal data files and automatic processing of personal data in the public and private sectors and defines basic principles for data protection

► Prohibits automatic processing of "sensitive" data revealing racial origin, political opinions or religious or other beliefs, as well as personal data concerning health or sexual life, without appropriate guarantees in domestic law

► Defines the rights regarding the automatic processing of personal information, including its correction or erasure

► Allows derogation from the Convention's provisions in certain cases provided by domestic law (state security, public safety, etc.)

► Parties should not prohibit or set up special authorization transborder flows of personal data going to the territory of another Party, except in cases where their legislation includes specific regulations for certain categories of personal data and the other Party does not provide an equivalent protection

► These principles were incorporated into the Law of Ukraine "On Personal Data Protection" No. 2297-VI dated 1 June 2010 (Law on Personal Data Protection)

Additional Protocol to the Convention for the Protection of Individuals with Regard to Automatic Processing of Personal Data, Regarding Supervisory Authorities and Transborder Data Flows dated 8 November 2001 (ratified on 6 July 2010)

► Increases the protection of personal data and privacy by setting up national supervisory authorities on personal data protection and transborder data flows. The Department on the personal data protection was established in the Ombudsman's Office (Article 23 of the Law on Personal Data Protection)

Regulation (EU) No. 910/2014 on Electronic Identification and Trust Services for Electronic Transactions in the Internal Market (eIDAS Regulation)

► Establishes the European internal market for electronic trust services (namely, electronic signatures, electronic seals, time stamps, electronic delivery services and website authentication)

► Ensures that individuals and legal entities may use their own national electronic identification schemes (eIDs) to access public services in other EU countries where eIDs are available

► Most provisions were implemented by the Law on Electronic Trust Services No. 2155-VIII dated 5 October 2017

Regulation (EU) 2016/679 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) (GDPR)

► Applies to Ukrainian residents in case of the processing of EU residents' personal data by a controller or processor not established in the EU, where the processing activities are related to: the offering of goods or services, irrespective of whether a payment of the data subject is required, to such data subjects in the Union; or the monitoring of their behavior as far as their behavior takes place within the EU

► The Law on Protection of Personal Data does not fully comply with this Regulation because it was developed under the Directive 95/46/EC (which was repealing the GDPR) and has not undergone significant changes after the GDPR's adoption

► Defines 'personal data' (PD) as any information relating to an identified or identifiable natural person (a name, an identification number, location data) or to one or more factors specific to the physical, genetic, economic, cultural or social identity etc. Defines several roles responsible for ensuring compliance with GDPR (data controller, data processor and data protection officer), sets out the rules for protection of PD while its processing (for example, website user registration, cookies tracking, further storage of PD) and rules relating to the free movement of PD

► Defines 'controller' (the natural or legal person, public authority, agency or other body which determines the purposes and means of the processing of PD) and 'processor' (a natural or legal person, public authority, agency or other body which processes PD on behalf of the controller)

Regulation (EU) 2016/679 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) (GDPR) (Continue)

► Says that transfer of PD to a third country or an international organization without any specific authorization may take place to a country or a territory having an adequate level of protection according to the EU Commission

► Provides the grounds for processing of PD (consent of the data subject, performance of a contract, a legal obligation to which the controller is subject, vital interests of the data subject or of another natural person, performance of a task carried out in the public interest, legitimate interests pursued by the controller or by a third party)

► Prohibits processing of 'sensitive' PD revealing racial or ethnic origin, political opinions, religious or philosophical beliefs, or trade union membership, as well as processing of genetic data and biometric data for the purpose of uniquely identifying a natural person, information concerning health or information concerning a natural person's sex life or sexual orientation. Such data can be processed only in exceptional cases defined in Article 9 of GDPR (for example, the explicit consent of data subject processing is required: for the purposes of carrying out the obligations and exercising specific rights of the controller, to protect the vital interests of the data subject or of another natural person where the data subject is physically or legally incapable of giving consent, for the healthcare provision and public health issues)

► Provides the data subject with the right to erase PD ('right to be forgotten')

► Determines a scope of powers of supervisory authority (carry out investigations in the form of data protection audits, obtain, from the controller and the processor, access to all personal data, obtain access to any premises of the controller and the processor etc.)

► **Adequate level of data protection.** A transfer of personal data to a third country or an international organization may take place where the Commission has decided that the third country, a territory or one or more specified sectors within that third country, or the international organization in question ensures an adequate level of protection. Such a transfer shall not require any specific authorization

► The European Commission has the power to determine, on the basis of Article 45 of GDPR, whether a country outside the EU offers an adequate level of data protection. The effect of such a decision is that personal data can flow from the EU (and Norway, Liechtenstein and Iceland) to that third country without any further safeguard being necessary. In others words, transfers to the country in question will be assimilated to intra-EU transmissions of data

► At any time, the European Parliament and the Council may request the European Commission to maintain, amend or withdraw the adequacy decision on the grounds that its act exceeds the implementing powers provided for in the Regulation

► The European Commission has so far recognized Andorra, Argentina, Canada (commercial organizations), Faroe Islands, Guernsey, Israel, Isle of Man, Japan, Jersey, New Zealand, Switzerland and Uruguay as providing adequate protection

► Obtaining an adequacy of data protection decision for Ukraine will contribute to the development of its digital sector. There is an initiative to apply to the EU Commission and obtain a decision on the adequate protection of personal data within the technical assistance project supported by the MDT and the USAID Competitive Economy Program in Ukraine (CEP). The project is aimed at assisting the Parliament with initiating a strategic approach to obtain the adequacy decision for Ukraine within the next few years

► In addition, the Draft Law on amendments to the Law on Personal Data Protection, which will allow to apply for a decision on the adequacy of personal data protection for Ukraine is developing

2.3.6. Legislative Framework and Key Action Steps for Improvement
Current legislative framework and legislative initiatives in digital infrastructure

Law of Ukraine "On Electronic Documents and Electronic Documents Circulation" No. 851-IV dated 22 May 2003

► Establishes the framework for electronic document exchange as a set of procedures for creation, sending, storage, use and destroying of electronic documents that are performed using integrity checks and, if needed, with confirmation of receipt of such documents

► Determines an electronic document as a document in which the information is recorded in the form of electronic data, including mandatory elements of the document

► Provides that legal force of an electronic document cannot be challenged solely based on its electronic form

► Says that an electronic document can be converted into a visual form (display of the data it contains in human readable format)

► Provides for the original electronic document is the electronic counterpart of the document with the mandatory data, including an electronic signature of the author or a signature equated to the handwritten signature (other types of electronic signatures may be used on a contractual basis)

► Verification of the integrity of an electronic document is performed by verifying the electronic digital signature

Law of Ukraine "On Electronic Trust Services" No. 2155-VIII dated 5 October 2017

► Defines electronic signature as electronic data that are added by the signatory to other electronic data or logically connected with them and used by the signatory as a signature

► Governs different types of electronic signatures, including:

  ► Advanced electronic signature - electronic signature created as a result of cryptographic conversion of electronic data, using creation device and private key, which allows electronic identification of the signatory and identifies violations of the integrity of electronic data

  ► Qualified electronic signature - the advanced electronic signature which is created using creation device and is based on a qualified public key certificate (must be used by state and municipal authorities, state registrars and notaries)

► Qualified electronic signature has the same legal force as a handwritten signature and has the presumption of its conformity with a handwritten signature. Advanced electronic signature has a presumption of the integrity of the electronic data and the authenticity of the origin of the electronic data to which it relates

Law of Ukraine "On Electronic Commerce" No. 675-VIII dated 3 September 2015 establishes the procedure for carrying out electronic transactions using information and telecommunication systems and defines legal status of the customers, sellers and providers of supportive services (Internet services provider, registrar of domain names, owner of online stores that do not take part and have no responsibility on the purchase agreement)

Law of Ukraine "On Information" No. 2657-XII dated 2 October 1992

► Sets out the general rules for receiving, using, distributing and storing information, ensures the right to information and has guarantees for this right

► Determines the types of information and their regime (in particular, information with limited access: confidential, secret and insider information), sets out the rules of access to information

2.3.6. Legislative Framework and Key Action Steps for Improvement
Current legislative framework and legislative initiatives in digital infrastructure

Law of Ukraine "On Data Protection in Information and Communication Systems" **No. 80/94-BP dated 5 July 1994**

► Determines the procedure for access to information, the list of users and their powers, as well as the information processing conditions in respective systems

► Says that responsibility for ensuring the protection of information in the system rests with the system owner

► Conditions for processing of information stored in a system should be established by a system owner under the terms of contract with an information owner, unless otherwise provided by law

► Provides that state information resources and automated processing of information with limited access should be secured by the comprehensive system of information protection, namely the Integrated Information Security System (IISS), which provides for cryptographic and technical protection of information and should be certified by the State Service for Special Communications and Information Protection of Ukraine after the audit of respective system

► The requirements for ensuring protection of state information resources or information with limited access are approved by the CMU (Resolution of the CMU No. 373 dated 29 March 2006, new rules with technical regalement on protection will come in force in January 2022). These requirements:

  ► Say that a comprehensive information security system can be created by legal entity or executive authority which has a license or permit for the right to conduct technical protection of information

  ► Say that information protection at all stages of creation and operation of the system is carried out in accordance with the information protection plan

Law of Ukraine "On Protection of Personal Data" **No. 2297-VI dated 1 June 2010**

► Governs relationships concerning protection and processing of personal data using automated and non-automated means

► Aims to protect the fundamental rights and freedoms of natural persons, particularly the right to privacy in relation to the processing of personal data

► Establishes the grounds based on which the data processing can be carried out

► Prohibits processing of personal data on racial or ethnic origin, political views, religious or other convictions, membership in political parties and trade unions, criminal charges or convictions as well as data with regard to health or sexual life without the rationale provided in this law

Law of Ukraine "On Telecommunications" **No. 1280-IV dated 18 November 2003**

► Governs relationships arising between the market players in respect of telecommunication networks and the provision/consumption of telecommunication services. Defines telecommunication network and telecommunication service

► Defines the operators (may conduct activities in the area of telecommunications with a right to technical maintenance and operation) and providers of telecommunications (may conduct activities in this area but without such a right), as well as operators/providers with a significant market position (a case where operator/provider has an income share in the market of certain telecommunication services during the previous year that exceeds 25% of the total income of all operators and providers, or a case where services can be provided only in the network of a particular operator or provider)

► Says that the National Commission for the State Regulation of Communications and Informatization (NCCIR) analyzes the markets of certain telecommunication services and determines operators and providers with significant market power (Decision of the NCCIR No. 640 dated 11 December 2018 governs data collection for market analysis and assessment of the state of economic competition in the market)

► Draft Law "On Amendments to the Law on Telecommunications and Some Other Laws (On Monitoring the Quality of Mobile Services)" was registered with the Parliament on 4 December 2020

2.3.6. Legislative Framework and Key Action Steps for Improvement
Current legislative framework and legislative initiatives in digital infrastructure

Law of Ukraine "On Basic Principles of Cyber Security of Ukraine" No. 2163-VIII dated 5 October 2017

► In 2005 Ukraine ratified the Budapest Convention on Cybercrimes that provides the definition and rules for combating the crimes committed via the Internet and other computer networks (in particular, with infringements of copyright, computer-related fraud, child pornography and violations of network security) and procedures for search of computer networks and interception

► The law is aimed at implementing the Budapest Convention and lays down the legal and structural basis for protection of vital interests and rights of Ukrainian citizens and Ukraine's national interests in the cyber-space

► The objects of cyber-security are communication systems (regardless of their ownership status) that work with national information resources or those that are used in the interests of the government authorities, law enforcement and military bodies

► The law defines the basic infrastructure objects, which compose critical infrastructure of the country that needs the best possible cyber protection

Law of Ukraine "On Radio Frequency Resource of Ukraine" No. 1770-III dated 1 June 2000

► Has the rules related to rights, obligations and responsibility of the public authorities, as well as individuals and legal entities that use and/or intend to use radio-frequency resource of Ukraine

► Says that users of the radio frequency resource should obtain licenses for the use of radio issued by the National Commission for the State Regulation of Communications and Informatization (NCCIR)

► Says that the validity period of license for the use of radio frequency resources is set by the NCCIR and should not be less than five years

Law on the List of Permit Documents in the Area of Business Activity No. 3392-VI dated 19 May 2011 has provisions for conclusion on electromagnetic compatibility and permit for operation of a radioelectronic device

Law on Licensing of Certain Types of Economic Activity No. 222-VIII dated 2 March 2015 mandates to obtain licenses for provision of services on protection of cryptographic information (except for electronic digital signature services) and protection of technical information, as established by the CMU

Law of Ukraine "On Access to Construction, Transport, Electricity Facilities for Development of Telecommunication Networks" No. 1834-VIII dated 7 February 2017 sets out the rules of access to certain objects for the placing of technical means of telecommunications

Law on Employment No. 5067-VI dated 5 July 2012 provides special conditions for employment of foreign IT specialists (registration of a work permit for 3 years and absence of minimum wage requirements)

Law of Ukraine "On Amendments to Certain Legislative Acts of Ukraine on Optimization of the Network and Functioning of Administrative Service Centres and Improvement of Access to Administrative Services Provided in Electronic Form" (No. 943-IX dated 3 November 2029) provides for establishment of the Unified State Web Portal of Electronic Services and determines the powers of the CMU with respect to operation of such portal

Law of Ukraine "On Electronic Communications" No. 3014 dated 5 February 2020 (will come in force on 1 January 2022)

► Determines a broadband access network and a broadband Internet access service, has the rules on providing access to broadband Internet throughout the country

► Provides for exhaustive list of requirements for market participants and introduces consultations with market participants, as well as requirements for the ownership structure of telecommunication operators

► Establishes the National Commission on electronic communications and radio frequency spectrum as the successor of the NCCIR (provided by the Draft Law No. 4066 dated 7 September 2020)

► Provides the criteria for the terms of license to use radio frequency spectrum considered by the Commission, including promotion of innovation and investment

► Provides a possibility for customers to select a separate communication service (not as a part of the service package)

► Introduces mandatory consent for the end user to receive information and provides the possibility to unsubscribe

► Introduces the mechanism for extrajudicial settlement of disputes between consumers and service providers by the Commission

► Provides for implementation of provisions of the European Electronic Communications Code (EECC), which has absorbed the relevant provisions of Directives No. 2002/19/EC, 2002/20/EC, 2002/21/EU), regulates charges/fees and quality of services provision by providers and wide access of all target groups and territories to the Internet

2.3.6. Legislative Framework and Key Action Steps for Improvement
Current legislative framework and legislative initiatives in digital infrastructure

Strategic and policy documents

Concept on Development of Digital Economy and Society of Ukraine for 2018-2020 approved by Decree of the CMU No. 67-p dated 17 January 2018

► Outlines the principles of digitalization (including equal access to services, information and knowledge provided based on information and digital technologies and creation of advantages in various areas, focus on international and European cooperation)

► Provides for directions of digital development, including development of digital competencies, digitization of the real sector of the economy (in particular, Industry 4.0), implementation of digital transformation projects (concept of digital jobs, public security, education, healthcare, tourism, ecology and environmental protection, cashless payments, harmonization with European and global scientific initiatives, etc.)

► Sets out cooperation and development projects:

　► Interoperability and eServices (Interoperability Solutions for European Public Administrations 2, e-CODEX projects, e-Invoicing and the Single Digital Gateway)

　► Electronic identification (eID)

　► Development of open state data in Ukraine

► Certain measures from the Plan on Implementation of the Concept have not been implemented yet (e.g., development of the national program on hard and soft digital infrastructure, development and a list of digital rights etc.). Preparation of the updated Strategy and Plan on digital infrastructure is required

Strategy of Ukrainian Financial Sector Development in Ukraine until 2025 approved by Decision of the National Commission on Securities and Stock Market No. 797 dated 27 December 2019 provides for:

► Development of the FinTech market, digital technologies and regulator platforms, as well as development of the open architecture of the financial market and oversight

► Under the Strategy, development of the e-economy includes:

► Expanding market participants' access to public registers until 31 December 2024 (para. 5.4.1)

► Development of the NBU's BankID system in accordance with the defined key indicators (was implemented) (para. 5.4.2)

► Development of legal framework for cloud technologies in the financial market, including cash records, until 31 December 2024 (para. 5.4.4)

► Supporting transition of documents (on financial products, etc.) to the electronic form and supporting the transition to electronic circulation of documents between the market entities and public authorities until 31 December 2024 (para. 5.4.5)

Concept for Development of Artificial Intelligence in Ukraine adopted by the Decree of the CMU No. 1556-p dated 2 December 2020 aims to enable the use of AI technologies in public sector and main industries of the country, including cyber security and defense

Subsidiary regulations

Procedure on Work with Electronic Documents in Recordkeeping and Their Preparation for Transfer to Archival Storage approved by Order of the Ministry of Justice No. 1886/5 dated 11 November 2014

► Provides that companies should store their electronic documents in the centralized storage

► Says that after transfer of the electronic documents to the archive, the archive department should create archival electronic document. Creation of such document is completed by imposing a digital signature of the person responsible for creating such document

► Says that if entity stores accounting data in electronic form, it must provide such data in paper form during audits performed by the controlling authorities (e.g., tax authorities)

2.3.6. Legislative Framework and Key Action Steps for Improvement
Current legislative framework and legislative initiatives in digital infrastructure

Requirements for Advanced Electronic Signatures and Seals Based on Qualified Public Key Certificates and for the Provision of Electronic Trust Services Related to their Creation, Verification, Verification and Storage approved by Resolution of the CMU No. 193 dated 3 March 2020 establish the list of standards to define the requirements for advanced electronic signatures and seals

Regulation on the Quality of Telecommunication Services approved by NCCIR Decision No. 174 dated 15 April 2020

► Mandates operators and telecommunications providers to inform consumers on the quality levels of telecommunication services

► Determines the procedure for publishing information on the quality levels of telecommunication services, as well as the tests on indicators of the quality levels of telecommunication services

► Says that a list of indicators of the quality levels of telecommunication services subject to mandatory disclosure is determined by decision of the NCCIR before the beginning of the reporting year

Regulation on Electronic Interaction of State Electronic Information Resources approved by Resolution of the CMU No. 606 dated 8 September 2016 establishes a system of electronic interaction of state electronic information resources

Procedure on Interoperability of State Information Resources approved by Resolution of the CMU No. 357 dated 10 May 2018 establishes the procedures for electronic interaction between state electronic information resources and sets up the National Register of Electronic Information Resources, which contains information on all state information resources, including the owners, master data, terms of creation, current status, technical documentation on the specific registry, services for data exchange, etc.

Regulation on National Register of Electronic Information Resources approved by Resolution of the CMU No. 326 dated 17 March 2004 defines the Register, its components (electronic registers, state and other mandatory classifiers, information systems) and funds

Requirements to Data Formats of Electronic Documents Flow within State Authorities approved by Order No. 60 of the State Agency for Electronic Governance of Ukraine dated 7 September 2018 determines data formats (according to the ISO/IEC 21320-1:2015) used in electronic documents and in the electronic document flow operated by the state authorities

Resolution of the CMU "Certain Issues of Documentation of Government Activity" No. 55 dated 17 January 2018 provides rules for recording administrative activity and interaction of state authorities in electronic form

Regulation on Data Sets to be Disclosed in the Form of Open Data approved by Resolution of the CMU No. 835 dated 21 October 2015 provides requirements for the format and structure of data sets to be published in the form of open data, the frequency of updating and the procedure for their publication, as well as the list of such data sets

Regulation on Electronic Money in Ukraine approved by Resolution of the Board of NBU No. 481 dated 4 November 2010

► Sets out the requirements for issuance and use of electronic money

► Sets out the requirements for creation and use of electronic wallets

► Outlines the procedure for the NBU revocation of its approval on the electronic money circulation

► Establishes the procedure for conducting transactions with electronic money issued by a non-resident issuer

Regulation on the Procedure for Registration of Payment Systems and Payment Infrastructure Participants and Operators approved by Resolution of the Board of NBU No. 434 dated 4 February 2014 establishes the procedure for approval by the NBU of the rules for payment system, the payment organization of which is a resident, and the procedure for approval by the NBU of the terms and procedure for operation of the international payment system in Ukraine, the payment organization of which is a non-resident

Regulation on the Procedure for Issuing Payment Instruments and Transactions with Their Use approved by Resolution of the Board of NBU No. 705 dated 5 November 2014

► Determines the issuance of electronic means of payment

► Establishes the procedure for carrying out operations using electronic means of payment

► Determines the peculiarities of mobile payment instruments' issuance and carrying out operations using such instruments

Regulation on the BankID System of the NBU approved by Resolution of the Board of NBU No. 32 dated 17 March 2020 sets out the for rules for operation of the BankID system for Ukrainian banks

EU4Digital Initiative aims to extend the European Union's Digital Single Market to the Eastern Partner states, developing the potential of the digital economy and society, in order to bring economic growth, generate more jobs, improve people's lives and help businesses. Through the initiative, the EU supports the reduction of roaming tariffs, development of high-speed broadband to boost economies and expand e-services, coordinated cyber security and the harmonization of digital frameworks across society, in areas ranging from logistics to health, enhanced skills and creation of jobs in the digital industry. The initiative aims to extend the benefits of the Union's Digital Single Market to the six Eastern partner countries and addresses the following six key policy areas: e-Health, e-Skills, e-Trade, Trust & Security, Telecom and Information, and Communication Technology Innovation. The Government launched implementation of the initiative in the said areas, in particular established the first medical electronic system e-Health which consists of several registers containing data on healthcare providers, pharmacies, doctors, patients, electronic medical records, healthcare procurement contracts. The guaranteed healthcare benefit package is rapidly developing and e-health functions should be improved and expanded accordingly (Resolution of the CMU No. 411 dated 25 April 2018)

CyberEast - Action on Cybercrime for Cyber Resilience in the Eastern Partnership Region 2019-2021 aims at adopting legislative and policy frameworks in compliance with the Budapest Convention on Cybercrime and related

instruments, provides for international cooperation on cybercrime and electronic evidence between law enforcement authorities and the private sector

Development of the Eastern Partnership Regional Roaming Agreement (RRA). In June 2020, the EU hosted an introductory meeting on RRA which is expected to be signed until early March 2021. This implies the ability of customers of mobile operators of Eastern partner countries (Armenia, Azerbaijan, Belarus, Georgia, Moldova, and Ukraine) to use mobile services while visiting any of the six Eastern partner countries. The RRA covers all mobile communications services (voice calls, SMS, mobile data transmission services) normally available to a roaming customer. It also reduces roaming charges for mobile users in the six Eastern partner countries (it is expected that retail prices of roaming services in the Eastern partner countries will be reduced by 87% for consumers in 2026)

2.3.6. Legislative Framework and Key Action Steps for Improvement
Current legislative framework and legislative initiatives in digital infrastructure

Decree of President of Ukraine "On Measures to Create Favorable Conditions for Development of IT Industry in Ukraine" No. 371/2020 dated 3 September 2020 requests the CMU to develop the draft laws to stimulate business activity in the IT within three months and take measures to improve the procedures for obtaining immigration and work permits for foreign IT specialists

Decree of the CMU "On Establishment of the Innovation Development Fund" No. 895-p dated 7 November 2018 and the Procedure for Use of Funds Provided in the State Budget to the Ministry of Finance for Functioning of the Innovation Development Fund approved by Resolution of the CMU No. 1110 dated 12 December 2018

► The Innovation Development Fund (Ukrainian Startup Fund) is financed by the Ministry of Finance of Ukraine and provides grants to eligible start-ups (those having high potential for entry into the international market or aimed at achievement of the strategic priority goals of innovation) on the competitive basis

► The grants are usually provided in the amount from USD 2 k to USD 75 k to the start-ups in pre-seed or early-seed stage in target sectors: AI, AR\VR, BigData, Blockchain, Cyber Security, Defense, Medical and Healthcare, Travel, FinTech, EdTech, Robotics, Professional Services, SaaS, Manufacturing, Ecommerce, IoT

► The Fund does not take any equity stake in start-ups

Charter of the State Innovative Financial and Credit Institution approved by Resolution of the CMU No. 979 dated 15 June 2000

► State Innovative Financial and Credit Institution (Invention Support Fund) was established to provide financial support for innovative activities of economic entities of various forms of ownership, as well as to attract national and foreign investment

► Provides the following services: consulting services, finding potential and providing financial support to innovation and investment projects based on the results of competitive selections

► According to the Invention Support Fund presentation dated 8 September 2020, there are certain plans to support inventors for 2021

Draft Law "On Amendments to the Tax Code of Ukraine and Other Laws of Ukraine on Doing Business by E-Residents" No. 4240 dated 20 October 2020 (is being considered by the Parliament) sets up a new "E-resident" system in "DIIA Portal" allowing foreign individuals to register as a tax payer, entrepreneur and pay taxes in Ukraine remotely. Sets out the rules regarding the status of e-residents, including certain restrictions (e.g., e-residents may provide only certain business activities and are not allowed to hire employees in Ukraine)

Draft Law "On Virtual Assets" No. 3637 dated 11 June 2020 (was adopted in the first reading on 2 December 2020 and is being prepared for the second reading in the Parliament)

► Streamlines regulation for the virtual assets market and its participants

► Defines a virtual asset as a set of data in electronic form, which has a value and exists in the system of circulation of virtual assets and can be the independent object of civil transactions, as well as certify proprietary and other rights on other objects

► Provides for extended list of forms in which virtual assets may exist (unsecured and collateralized virtual assets)

► Determines the legal status of market participants, users of virtual assets and requirements for service providers related to virtual assets (state registration of certain activities)

► Envisages the types of intermediary services (virtual assets exchange, virtual assets transfer, custody and administration of virtual assets and virtual asset keys, and financial services related to public offer and/or sale of the financial virtual assets)

► Says that the virtual assets do not constitute a payment method in Ukraine

Draft Law "On Amendments to the Tax Code of Ukraine (on Taxation of the Supply of International Electronic Communication Services and International Roaming Services Provided by Electronic Communication Operators of Ukraine to Foreign Electronic Communication Operators)" No. 2041 dated 3 September 2019 (is being considered by the Parliament) provides for a zero VAT rate for the international communication services and international roaming services provided by electronic communications operators of Ukraine in favor of foreign electronic communications operators. The objective of this Draft Law is to increase the competitiveness of national operators

2.3.6. Legislative Framework and Key Action Steps for Improvement
Current legislative framework and legislative initiatives in digital infrastructure

DIIA City and tax incentives for IT companies

In 2021 there were numerous draft laws that aim to incentivize IT companies and digital economy development by providing a special legal regime for residents of DIIA City with respective employment conditions for IT specialists and tax benefits (the Draft Law No. 4303, its alternative draft laws 4303-1, 4303-2 and other drafts described below).These drafts got controversial feedback from the business.

On 19 February 2021 the Parliament's Committee on Digital Transformation recommended to return the Draft Law No. 4303 for redrafting to consolidate position from the main and alternative draft laws and eliminate inconsistencies.

The MDT is currently working on the alternative Draft Law No. 4303-д and the respective draft law on amendments to the Tax Code (they are not yet publicly available).

The possible economic consequences of the proposed tax incentives under these draft laws should be evaluated from different perspectives (including the budget balancing) to avoid setting unlimited and unreasonable guarantees for IT business. Respective amendments should be made to the dedicated regulations as well.

The draft laws are under the Parliament's' consideration and will be reportedly further revised:

► Draft Law "On Amendments to the Tax Code of Ukraine on Specifics of Taxation of Subjects of the IT Industry" No. 3933 dated 23 July 2020 and Draft Law "On Amendments to the Tax Code of Ukraine and Other Laws of Ukraine (on Measures to Stimulate Development of IT Industry in Ukraine) No. 3933-1 dated 10 August 2020 (is being considered by the Parliament) (are considered by the Parliament) set a temporary tax regime for IT companies and their employees that provides for 50% reduction of CPT rate or special CPT calculation base, 5% rate for personal income tax and 5% rate for unified social contribution for IT company employee, exemption from military dues

► Draft Law "On Measures to Stimulate Development of IT Industry in Ukraine" No. 3979 dated 11 August 2020 (is being considered by the Parliament) provides for measures to encourage development of the IT industry, including special tax regimes for IT companies and their employees and the possibility of choosing a contractual form of employment contract for employees of the IT industry. To get tax incentives the IT company should meet the certain criteria (requirements) and be included to the special register (Draft Law No. 3933-1 says that this register is managed by the tax authority, it is not yet clear whether there will be two separate registers or one register of IT companies for the proposed special regime). The

Committee on EU Integration of the Parliament concluded that the provisions of the Draft Law related to exclusion of IT companies support from the Law on State Aid to Business Entities are not in line with Ukraine's EU integration obligations

► **Draft Law "On Stimulating Development of the Digital Economy in Ukraine" No. 4303 dated 2 November 2020 (is being considered by the Parliament)** which establishes a special legal regime to encourage e-Economy development – Diia City, and governs the status of its participants. The regime will be established for 15 years, special tax incentives will be provided in the Tax Code (there is no link with the draft laws No. 3933 and No. 3933-1).The Draft Law provides for:

   ► The procedure for granting Diia City by the MDT. To get the status of Diia City resident, the legal entity registered under Ukrainian law should apply to the MDT and meet the defined by the Draft Law and MDT requirements

   ► The special form of staffing – GIG-contract, which combines social guarantees for employees and contractual business obligations. This contract is a special labor contract for IT specialists employment

   ► The range of agreements with negative obligations: non-disclosure (customers, employees or contractors undertakes to refrain from disclosure of confidential information of/on the Diia City residents), non-competition (contractor undertakes to refrain from competing against the resident), non-solicitation agreements (obligation to refrain from encouraging customers, employees or contractors of the other party to terminate the relationship with the Diia City residents)

   ► An exemption from translating the cross-border contracts with Diia City resident into Ukrainian

   ► Clarifies the regulation of intellectual property rights to objects created under the employment agreement and provides that payments to authors may be included to the salary

   ► The possibility to assign the functions of director to legal entity, which will allow foreign investors to hire professional management companies

   ► Stability-of-law guarantee for state support of IT companies for the 15-year period from the date of entry of the Draft Law into force. Considering the importance of this investment guarantee, it should be consistent, enforceable and properly aligned with all key dedicated laws in order to efficiently encourage investments

2.3.6. Legislative Framework and Key Action Steps for Improvement
Current legislative framework and legislative initiatives in digital infrastructure

Draft Law "On Amendments to the Criminal Procedure Code of Ukraine and the Criminal Code of Ukraine (on Improving the Procedure for Applying Certain Measures to Ensure Criminal Proceedings)" No. 2740 dated 15 January 2020 (is being considered by the Parliament) prohibits the seizure of devices or their components, as well as disruption of the operation of computers and other networks, if information is the object of criminal proceedings. Lays down the rule that material evidence without traces of a criminal offense, in the form of devices used for work or seizure of which may cause significant harm to their owner, should be returned to its owner

Draft Law "On Cloud Services" No. 2655 dated 20 December 2019 (was adopted in the first reading on 16 June 2020 and is being prepared for the second reading in the Parliament)

► Defines the concepts of "cloud computing", "cloud services", "cloud service provider", "user of cloud services", "cloud resources", "data center"

► Introduces the definition and the list of cloud services, as well as methods of their provision, sets out the requirements for the cloud services' provider for public customers

► Outlines the legal basis for the provision of cloud services and determines the essential terms of the contract for the provision of cloud services

► Determines the peculiarities of the provision and consumption of cloud services by public authorities and local governments, personal data processing and information protection

Draft Ukraine's National Broadband Strategy and Plan of Measures for Strategy (published for public discussion on MDT's official website on August 2020) provides for:

► Development of a draft law on the regulator of the broadband policy

► Development of a plan of measures to create a system for monitoring the quality of mobile services and Internet access, as well as for fixed broadband access

► Establishment of 5G technology development centers

► Targeted assistance to make the Internet available to disabled persons
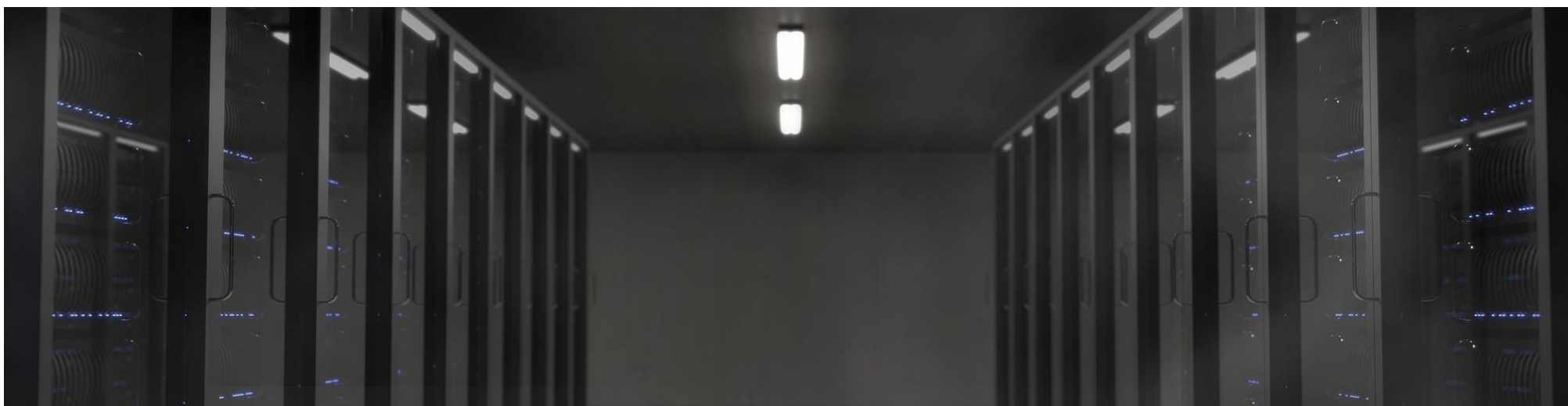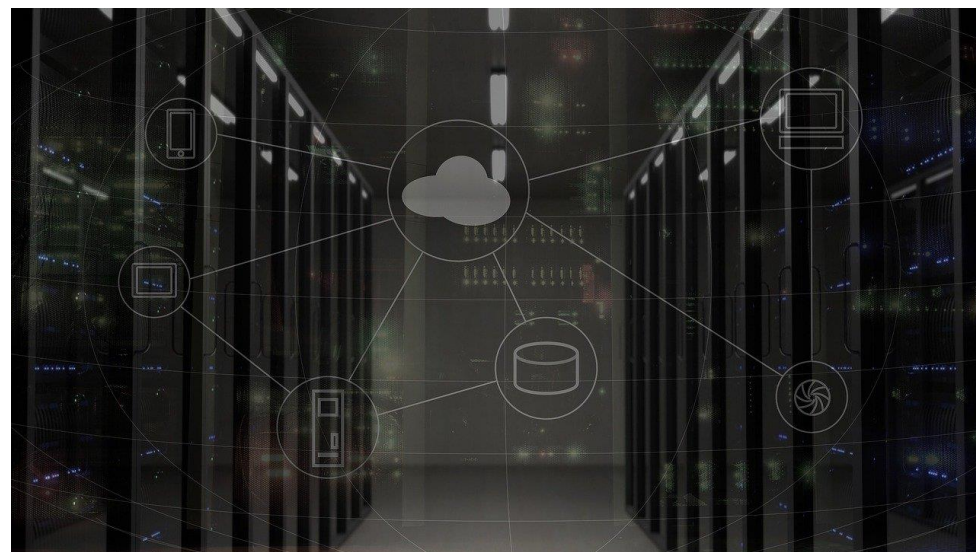
2.3.6. Legislative Framework and Key Action Steps for Improvement
Legal barriers to entry (1/4)

Absence of interoperability (interconnection) between state registers

► State authorities need to exchange the information with different state registers or databases (e.g., public procurement, electronic declaration system, single customs window). Electronic interconnection of state systems is not streamlined efficiently for the purposes of provision of different public services. This is not in line with the requirements of the Law of Ukraine "On Administrative Services" regarding the prohibition to require information or data from other authorities if such information/data was already provided

► According to European Commission Digital Government Factsheet 2019 – Ukraine, more than 135 state information resources (registries) are owned by more than 40 state authorities in Ukraine. According to the calculations based on analysis of the 23 registries, the state spent an average UAH 21 million (approximately EUR 713,000) per year on the maintenance of each registry. The report also highlighted the issues in interconnection of base registries and lack of proper identifiers (low level of distribution of the digital ID numbers among citizens and lack of identifiers in the existing state registers)

► Existing regulations on state register interoperability are not fully enforced yet. Resolution of the CMU No. 606 dated 8 September 2016 establishes a system of electronic interoperability of state electronic information resource and Regulation No. 357 dated 10 May 2018 describes the mechanism of interoperability. The state information systems can currently share information through the TREMBITA service which is voluntary to join. Due to lack of interoperability, not all administrative services are available in the electronic form, which may result in the paper submission requirements for business. Given that not all registers are interconnected, the processing of a respective application to the state authority may take extra time required for the manual check of documents. Such additional unjustified steps, in-turn, lead to the delay in providing the necessary public services, for example, issuance of permits. The law does not currently have the unified rules on interoperability.

► The Draft Law "On Public Electronic Registers" No. 2110 dated 10 September 2019 establishes a single interoperable system of public electronic registers (the Registry of Registries) and the list of main registers, as well as uniform requirements for creation, maintenance and liquidation of registers. The Draft Law provides for using the interoperability system and has the rules for preventing duplication of data in the existing registries, as well as ensures the right of citizens to have free access to information contained in the registers and prohibits public authorities from requesting the overlapping data existing in several registries

► The dedicated law (for example, the Draft Law "On Public Electronic Registers") needs to be adopted to set out the uniform rules on the system of electronic interoperability of state resources

2.3.6. Legislative Framework and Key Action Steps for Improvement
Legal barriers to entry (2/4)

Lack of legal framework on cybersecurity

► Ukrainian integrated system of information protection and other security standards are outdated. Certain provisions of Budapest Convention on Cybercrime have not been implemented in the Criminal Procedure Code of Ukraine (there are no definitions for electronic evidence and traffic, there is no specific preservation procedure, there is only partial disclosure of traffic, there are no special provisions of data production orders, search and seizure procedure is only partially implemented etc.)

► Within the past three months there were 22 million of recorded cyber incidents in Ukraine according to the information from the National Security and Defense Council of Ukraine

► In EU there are different security certification schemes for IT products. The European Commission and the European Union Agency for Cybersecurity are working on an EU-wide certification framework (i.e., a single common scheme for certification). The EU Cybersecurity Act sets out the process for approximation with this framework

► The EU Security Union Strategy 2020-2025 focuses on fostering security in Europe, including cybersecurity. By the end of 2020, the European Commission plans to complete the review of the Network and Information Systems Directive and adopt a new Cybersecurity Strategy

► Dynamic update or implementation of new standards and practices in the national regulations is associated with the cutting-edge challenges in IT industry. There are already several examples of such approach. MDT conducted Bug Bounty challenge for DIIA, which identified certain vulnerabilities described in the Report. DIIA City has also undergone the penetration tests by EPAM

► It is important for investors in digital sector to work under the adequate level of cyber protection and be sure that their data will not be stolen from the state information resources

► Ukraine needs to refine its legal framework for cybersecurity, primarily by

implementing the relevant provisions of the EU Cybersecurity Act and the EU common cybersecurity certification rules in the national legislation (e.g., the requirements for cyber protection of critical infrastructure objects)

► To follow recent EU practice, a creation of the national cybersecurity agency responsible for the policy shaping and pooling investment in cybersecurity research, technology and industrial development, could contribute to development of cyber defense measures. Such agency will be in close cooperation with the EU-one thus achieving the required degree of approximation between the two legal regimes
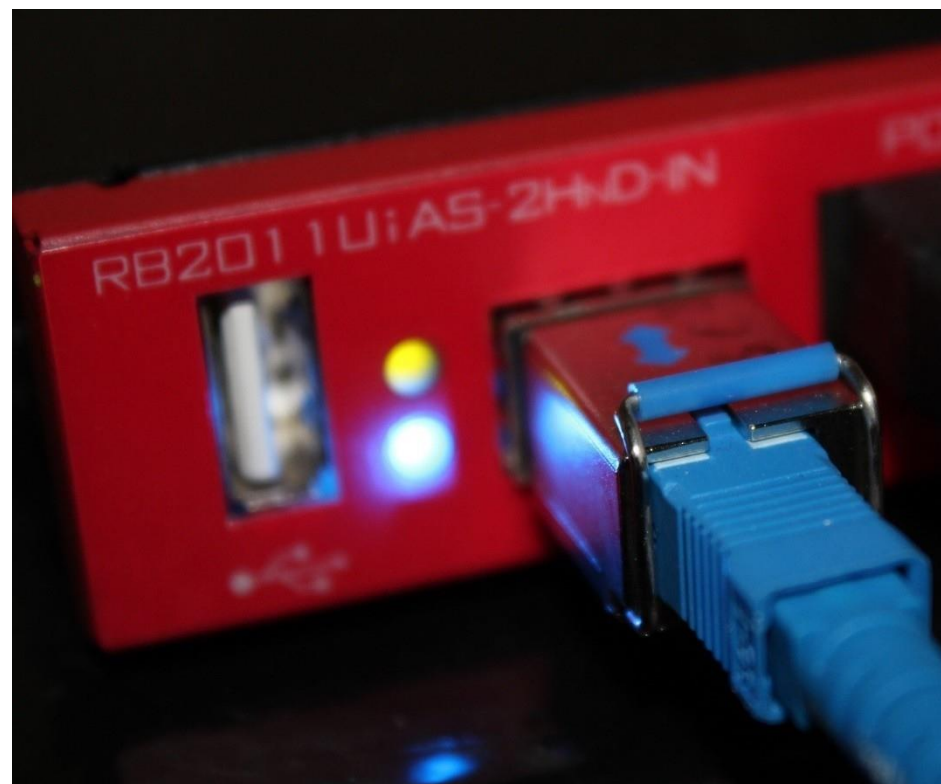
2.3.6. Legislative Framework and Key Action Steps for Improvement
Legal barriers to entry (3/4)

Lack of legal framework and incentives on broadband access to Internet

► There are no official definitions for the "Broadband access (broadband) to the Internet" and "high-speed electronic communications network" and no respective measures to ensure access for users to them in the Ukrainian legal framework. The minimum speed of broadband access is not determined by law either. In practice, the speed varies depending on the service providers. The Internet consumers in the rural, depressed or mountain regions have limited or no access to the broadband Internet. Under the MDT's data, more than 17,000 settlements are not covered by optical networks

► Due to the increased fees charged to the Internet providers by the infrastructure owners for setting the broadband network on their property and complicated negotiation procedures, the development of Internet, especially in the rural areas, is impeded. Draft Law No. 4118 dated 18 September 2020 provides for reductions in the fee base, limiting the contractual framework and removing regulatory obstacles in leasing infrastructure for the broadband access to Internet. The Internet Association of Ukraine supports this Draft Law

► The MDT developed the draft of the National Broadband Strategy and Action Plan for implementing such strategy (published for a public consideration) which identify specific steps and timeframes for widening the national broadband network

► Development of an appropriate program to fund and encourage operators to create and increase their broadband network could be considered to ensure the universal broadband coverage

► The authorities need to simplify and clarify the legal mechanism for providing operators with access to the required infrastructure for expanding the broadband Internet network on the national level (for instance, by adoption of a Draft Law No. 4118 dated 18 September 2020) and provide the tangible incentives for the Internet operators doing business in the remote and/or rural areas

► There should be a definition for "Broadband access to the Internet" in the law (for example, by adoption of the Draft Law on Electronic Communications). The minimum speed of broadband access needs to be determined (for example, under OECD Broadband Subscriptions Criteria (2015) a minimum speed is at least 256 kbit/s), or a clear procedure for defining such speed, with appropriate standards ensuring efficiency of electronic services, should be set out

2.3.6. Legislative Framework and Key Action Steps for Improvement
Legal barriers to entry (4/4)

Lack of integration into the EU Digital Single Market

► **Lack of mutual recognition of electronic signatures.** Under the Law of Ukraine "On Electronic Trust Services", the electronic signatures provided in foreign countries are recognized in Ukraine if:

   ► A qualified provider of electronic trust services of a foreign state meets the requirements of this Law, which should be confirmed by the central certification body (or certification center in a banking system) or

   ► A qualified provider of electronic trust services is included into the Trust List of the other state with which Ukraine has executed a relevant bilateral or multilateral international agreement

► To include foreign country in the Trusted List the MDT shall conclude international agreement on the mutual recognition of electronic trust services (Regulation No. 60 dated 23 January 2019). None of mutual recognition agreements are executed yet. As a result, electronic signature on a contract duly accepted, for instance, in France will not be treated as such in Ukraine. This may further cause problems in various day-to-day business transactions

► On 10 April 2020 Ukraine was selected to participate in the pilot projects under the EU4Digital program involving assessment of the adaptation of Ukrainian legislation and the technical implementation of requirements in the field of electronic trust services with Estonia and Moldova to ensure transborder interoperability of qualified electronic signature

► For the proper integration of Ukraine into the EU Digital Single Market, its rules for electronic documents and procedures should be in conformity with the EU legislation

► Ukraine needs to simplify the electronic authorization and implement globally accepted electronic signatures in private and public areas (including public procurement, business/investment processes and transactions).To achieve this objective, Ukraine needs to execute respective international agreements on mutual recognition of electronic signatures and/or to implement respective international/EU standards on electronic signatures in its national law

► **Absence of obligatory unified standards.** In Ukraine, the international standards are applied on a voluntary basis, unless their application is required by law (Law of Ukraine "On Standardization"). Such standards can be adopted in their original language and may not be available in public domain. For example, the EU Standard for electronic invoicing was adopted by the State-

Owned Enterprise "Ukrainian Research and Training Center for Standardization, Certification and Quality" (a national standardization body) by means of endorsement (in English) and is not publicly available. Quite often the standards are not updated on the regular basis even after endorsement, which means that they may not keep pace with the original EU standards in terms of necessary amendments. Difference in the text of the same standards in Ukraine and EU can be misleading for investors and businesses in various areas. To facilitate enforcement of standards on digital instruments, it is advisable to make the use of Ukrainian Standard for e-Invoicing mandatory for public authorities in public procurement (this should correspond to the respective EU standard) and further adopt the national standards on electronic services aligned with EU/other applicable international standards

► **Requirements for electronic documents in Ukraine differ from the common international practices**. In Ukraine, the electronic documents have to be presented in human readable (visual) format and in the Ukrainian language for accounting and tax purposes. The obligatory "paper" format for certain types of commercial documents may require additional expenses and time for starting business in Ukraine. Comprehensive legislative changes are required in order to align Ukrainian legal framework and practices related to e-documents with EU legislation and global trends (for example, there was a pilot project on e-consignment in 2019- 2020)

► The steps to approximate Ukrainian business environment to the global common practices should be properly elaborated and taken. This may include, particularly:

   ► Harmonization with the global best practices and standards (including EU legislation) for the introduction of interoperable electronic identification

   ► Introduction of certain standards in circulation of electronic documents in the law (for example, standard for electronic invoicing) and timely updates of the existing national standards in line with the original International Organization for Standardization (ISO) or EU standards

   ► Joining the EU digital programs (for example, e-CODEX and e-Invoicing)

   ► Easing the requirements of Ukrainian regulations (including tax and accounting rules) on electronic documents and electronic commerce, as well as their approximation to EU requirements and international practice

Annexes

Benchmarking Indices and Limitations

Annexes
International foreign investment conferences and other industry events

Event	Attendees	Place	Next dates	Description
INBOUND	Executives of large international companies	Virtual event	07-10 September 2021	The discussion of digital experiences
Adobe Summit	Executives of large international companies	Virtual event	13-15 April 2021	The discussion of digital experiences
Digital Summit	Senior-level marketers of large international companies	Virtual event	TBA	The conference is focused on digital marketing and marketing technologies
#DMWF Europe	Senior-level marketers from companies located in Europe	Virtual event	23-24 November 2021	The conference is focused on digital marketing and marketing technologies
Digital Transformation Europe	Business leaders and technology innovators	Virtual event	25 February 2021	The conference is focused on the digital transformation of the businesses
Gitex Technology Week	Business leaders and technology innovators	Dubai, UAE	17-21 October 2021	The conference is focused on the latest technological developments like 5G, AI, and many more
CES	Executives of large international companies	Virtual event	11-14 January 2021	The conference is focused on the latest technological developments like 5G, AI, and many more
Internet World Expo	Executives of large international companies, industry experts	Postponed	8-12 March 2021	The conference is focused on the latest technological developments like 5G, AI, and many more
Innovation Realized Summit	Selected executives of large international companies	Singapore	April 2021	The conference is focused on discussion of how digital technologies can be used to optimize the business processes
Channel Partners Evolution	Various participants of telecom industry like suppliers, vendors, investors and company representatives	Las Vegas	02-05 November 2021	The conference serves as a bridge between investors and companies in the telecommunication industry
Channel Evolution Europe	Various participants of telecom industry like suppliers, vendors, investors and company representatives	London	TBA	The conference serves as a bridge between investors and companies in the telecommunication industry
ITU Digital World	Governments, investors and companies from telecommunication and related industries	Ha Noi	2021	The conference connects governments, investors and telecommunication industries
International Telecoms Week	Various participants of telecom industry like suppliers, vendors, investors and company representatives	Virtual	TBA	The conference serves as a bridge between investors and companies in the telecommunication industry

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