



# Mayors for Economic Growth



**Market Research** of the  
**IT SECTOR**  
of economy in the Eastern  
Partnership countries

November 2019

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## List of Abbreviations

AI	Artificial Intelligence
API	Application Programming Interface
AR/VR	Augmented Reality/ Virtual Reality
BPO	Business Processes Outsourcing
CompTIA	The Computing Technology Industry Association
CRM	Customer Relationship Management
DX	Digital Transformation
EAP	Eastern Partnership
EGDI	Electronic Government Development Index
eID	Electronic Identification Document
EIF	Enterprise Incubator Foundation (Armenia)
ERP	Enterprise Resource Planning
EU	European Union
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GII	Global Innovations Index
GITA	Georgian Innovation and Technology Agency
GSI	Global Skills Index
HCI	Human Capital Index
HEIs	Higher Education Institutions
HDM	Harmonization of Digital Markets (EU program)
HTP	High Technology Park (Belarus)
ICT	Information and Communication Technologies
IDC	International Data Corporation
INSEAD	Institut Européen d'Administration des Affaires
IoT	Internet of Things
ISIC	International Standard Industrial Classification
IT	Information Technology
MNC	Multi National Company/Corporation
MOOC	Massive Online Open Course
NACE	Statistical classification of economic activities in the European Community
NRI	Networked Readiness Index
OECD	The Organisation for Economic Co-operation and Development
OSI	Online Services Index
PPP	1. Purchasing Power Parity 2. Public Private Partnership
PwC	PricewaterhouseCoopers
R&D	Research and Experimental Development
SaaS	Software as a Service
SME	Small and Medium Enterprises
STEM	Science Technology Education and Math
TELECOM	Telecommunication Sector
TII	Telecommunications Infrastructure Index

UN	United Nations
UN Comtrade	Repository of official international trade statistics
UNCTAD	United Nations Conference on Trade and Development
UX	User eXperience abbreviation
VC	Venture Capital
VET/TVET	Technical and Vocational Education and Training
WIPO	World Intellectual Property Organisation

## Executive Summary

### Purpose of the report

The current IT sector market overview in the Eastern Partnership countries is an analysis of the sector performance trends at large and the assessment of the region's competitiveness in it in particular. The report's main target audience is the local authorities in Armenia, Azerbaijan, Belarus, Georgia, Moldova, and Ukraine, which are prioritizing ITC sector as part of their local economies. The report aims to inform the beneficiaries about the trends, existing capacities, and underlying factors for the sector development. The recommended specific measures and steps available to the local level governments are highlighted in the colour text boxes in italics.

The study can also be a useful tool to inform policymaking by the national authorities, academia, national IT ecosystem players, business, donors, and other stakeholders in the field.

### Main findings

#### ICT market data and trends

Integration into the global value chains of the ITC industry is the essential task of national, regional or local IT industries due their highly tradable nature and growing potential for the Digital Transformation.

The global IT industry experienced stable growth in 2009-2018 and is projected to reach 5 trillion USD in 2019, and 6 trillion by 2022. Eastern and Central Europe markets account for 3% of it. The EaP region IT sector overall output represented only 0.3% of the global output in 2017. At the same time, the region's ICT services exports subsector accounted for 0.94% of the total global market share.

New emerging technologies are predicted to drive a dramatic acceleration in the industry growth, accounting for up to 50% of the overall IT sector growth. Currently they take 17% of the global IT market and shall grow to more than 26% by 2022.

Investing in the high technology infrastructure, relevant skills and competencies development, and technologies could result in leapfrogging the challenges and achieving better competitiveness for national and local stakeholders.

Recent trends in the ICT industry demonstrate a shift towards growth in software and services sectors and decline in ICT manufacturing and Telecommunications. This trend is also pronounced in the ICT sectors of the EaP countries.

*IT services and Software could contain the greatest potential for development in emerging markets, including the EaP region, further expanding the established successful practices, including IT, R&D and Engineering outsourcing. For regional leaders Ukraine and Belarus, the percentage share of ICT services reached 19.4% and 18.5% of their total international trade in services in 2017. For Armenia and Moldova, it accounted for 12.5% and 10% respectively.*

According to the official statistics, the overall volume of ICT sector output of the EaP countries was 14.24 billion USD in 2017, with Ukraine contributing to 56.6% of it, and Belarus - to 25%. The per capita ICT sector output calculation for the EaP countries puts Belarus in the frontrunner position with 375\$, followed by Armenia (182\$) and Ukraine (180\$), Moldova (155\$), Georgia (150\$) and Azerbaijan (99\$).

## International indexes

The report presents comparative data of the EaP countries performance according to several international indexes. The most holistic one, the Global Innovations Index (GII), measures the innovation capacity of individual countries based on sets of indicators that include ICT related components.

The GI ranking dynamics in 2014-2019 for the EaP countries is mixed with the overall average yearly rankings growing slightly, but residing in the mid-level range of 63-69. At the same time, each country records both globally competitive and very weak rankings in several, albeit different domains. The *ICT services exports* parameter demonstrate high rankings of several EaP countries led by Ukraine (11), closely followed by Armenia (15), Moldova (17), and Belarus (19). The *High-Tech Imports* parameter shows one of the lowest average rankings, and the *ICTs and business model creation* is the weakest rank on average.

## Recommendations summary

Local governments are advised to get familiarized with the current industry trends and take leadership in developing opportunities for the IT sector growth in their territories.

*Capacity building of local and regional decision makers in the IT policy design and implementation, creation of local ICT policy development process guidelines, aligned with the existing local economic development instruments is highly recommended.*

*Internet of Things and Smart City technologies could be suggested as best tech investment areas for local governments to consider.*

Local government could consider the strength of their national ICT sectors and best practices from the other EaP countries.

Armenia and Belarus are successful in R&D outsourcing, based on the traditionally strong Science and Engineering schools. The Venture Capital investments in Ukraine Tech companies and the number of deals are increasing. The Ukrainian IT talent pool is the largest in numbers and is more distributed across several IT clusters. Armenia has the most rounded-up system for IT business support and development with established stakeholders, presence of Multinational Companies and growing global outreach. Ukraine, Georgia and Armenia are actively developing their national Startup Ecosystems still focusing on the early-stage support. Moldova, Georgia and Azerbaijan have invested in e-Government solutions and expansion of e-services as the building pillars for the further Digital Transformation.

The growing availability of Startup supporting networks, funding and stakeholders in individual countries, cities and regions creates decentralized opportunities for engagement in the IT enabled Startup ecosystems. **Creating conducive environment** for ICT-enabled growth and innovation is probably the most feasible activity that Cities and Municipalities could undertake. Developing co-working spaces, meetup facilities, Techparks and FabLabs could be considered a meaningful activity line for the local governments willing to support rooted in the local assets but globally connected innovative economies.

Local governments are encouraged to cooperate with the national governments, businesses, academia, industry associations, international organizations in initiating and deploying the IT sector support projects.

**Investing in basic IT infrastructure** (e.g. broadband internet, Wi-Fi, information management systems) should help municipalities to better connect their residents, expand e-services user base, and improve the experiences of clients.

**Business support initiatives** can have two main directions: identifying and supporting local ICT businesses (computer service companies, startups, engineering, repair, small Internet Service Providers, etc.), and supporting active local business in engaging in Digital Transformation. Mapping and assessing the potential of Manufacturing and Agriculture sectors in adopting new technologies could also be considered where relevant.

**Investing in digital skills and entrepreneurship development**, also re-training of the workforce is strongly advised. That could include: supporting deployment of short-term courses in entry level practical IT specializations; cooperating with ICT clusters in attracting mentors and coaches; supporting existing VET institutions in improving their tech specializations; considering local, regional and national IT industry needs in matching skills development initiatives.

# 1. Introduction, methodology and definitions

## 1.1. Background

The development of the ICT<sup>1</sup> sector in the EaP countries has been influenced by multifaceted factors that usually cannot be limited to common denominators. However, considering geographical proximity and similar historical legacy, as well as ongoing joint initiatives and programs fostering connections and experience sharing, certain overall trends could be pointed out. Some of these common characteristics could be attributed to the mostly global nature of the IT sector and necessity to address global needs to ensure high-level of growth. That mainly is considered relevant to software products and services development, IT services outsourcing and nurturing IT startup economy.

Noting that national governments are often leading the efforts in ICT sector development, more sustainable growth is made possible through private sector uptake that is also influenced by the global trends. Certain regional and country specific landscape has been already established, and the report shall make an effort to take its snapshot outlining opportunities for willing local governments to put forward more pro-active initiatives that could leverage IT enabled economic development at the local level.

## 1.2. Three dimensions of the reporting sources

The study is based on desk research, requests for information and stakeholder information analysis. The official statistics for individual countries and its aggregations were referred as primary sources.

The growth of the IT sector and its influence on the economies and societies during the last several decades have been reflected in the emerged global surveys. Consortia of International Organizations teamed up with universities and think-tanks, and developed indicator systems that provide a methodological ground to comparing individual economies and regions. Focusing on a range of issues around IT, innovation or competitiveness, these instruments consolidate the data, opinion surveys and analyses from different sources and thus could be considered mostly reliable tools, especially in the medium-term historical perspective.

Regional surveys, targeting the subject of the current report - Eastern Partnership Countries, add more insights and common trends, that could be found useful for developing common platforms, sharing best practices and investing in cross-border cooperation. The regional dimension is mostly covered by the EU Initiatives, and the reports under Harmonisation of Digital Markets project are the main source of comparative information and benchmarking results against EU baselines.

The standardized EU Digital Economy and Society Indicators (DESI) have been also benchmarked in the EaP countries, and relevant recommendations for improvement of the related data collection have been outlined.<sup>2</sup> Those are mainly targeted at the national statistics offices, and other ICT policy stakeholders. However, improving the benchmarking system and aligning it with the EU practices shall help to plan more evidence-based strategies, projects and technical assistance programs at all levels – the region as a whole, countries, their regions and municipalities.

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<sup>1</sup> Information and Communication Technology and Information Technology terms are interchangeable for the purposes of this report

<sup>2</sup> <https://europa.eu/capacity4dev/higstep/documents> DESI study

National surveys often provide further details that are relevant for the national policy makers or businesses willing to invest in the IT economy. With the exception of national statistical yearbooks, they lack coherence with other regional reports or documents, so methodological uniformity could not be guaranteed. However, these reports could provide more recent and relevant data, cases and trends that are collected locally and seen through the preference lenses of the report authors or national stakeholders.

With Local Governments seen as the primary beneficiaries of the present report – National Surveys and statistics could provide practical insights to consider and adjust to the current and planned policies and strategies.

At the same time Regional and Global survey results provide common methodology and historical data, that could help better understand the tendencies and trends influencing the EaP countries as a whole. Regional and Global surveys data could also encourage national stakeholders to support Local Governments by matching their initiatives with infrastructure or human capital development programs.

Ongoing Regional support programs under the EU Eastern Partnership initiative create favorable conditions for further development of the enabling infrastructure and services, along with support to digital markets and trade. E.g. one of the key components of the assistance plan are supporting investments in digital infrastructure and loans for broadband.

The EU4Digital program aims at “focusing on harmonisation of roaming, promoting high-speed broadband internet to boost economies and expand e-services, and creating more jobs in the digital industry”.

Not only reports and policies, but programs like European initiatives of smart solutions for Cities and Local Governments aiming at promoting growth hubs beyond capitals could also serve examples that would support national growth and cohesion by reducing regional inequalities in the EaP Countries.<sup>3</sup>

### 1.3. ICT sector definitions

The definition provided by OECD for ICT sector is considered a common guideline to classification of ICT related economic activities: “The production (goods and services) of a candidate industry must primarily be intended to fulfil or enable the function of information processing and communication by electronic means, including transmission and display”.<sup>4</sup>

The EU NACE rev.2 classifications<sup>5</sup> for ICT sector provides a broad consolidation of ICT manufacturing and ICT services.

Current Eurostat definitions relevant to ICT sector<sup>6</sup> include:

- 1) Manufacture of electronic components
- 2) Manufacture of computers
- 3) Manufacture of communication equipment

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<sup>3</sup> Smart Cities, Smart Investment in Central, Eastern and South-Eastern Europe. A report by the EIB Economics Department. 2018

<sup>4</sup> [OECD Guide to Measuring the Information Society 2011](#)

<sup>5</sup> [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Business\\_economy\\_by\\_sector\\_-\\_NACE\\_Rev.\\_2](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Business_economy_by_sector_-_NACE_Rev._2)

<sup>6</sup> [https://ec.europa.eu/eurostat/cache/metadata/en/isoc\\_se\\_esms.htm](https://ec.europa.eu/eurostat/cache/metadata/en/isoc_se_esms.htm)

- 4) Manufacture of consumer electronics
- 5) Manufacture of magnetic and optical media
- 6) Wholesale of IC equipment
- 7) Software development
- 8) Telecommunications
- 9) Computer programming, consultancy and related activities
- 10) Data processing, hosting and related activities; web-portals
- 11) Repair of computers and communication equipment

The first five categories are consolidated in **ICT manufacturing** that is equivalent of **Hardware** in other classifications. The following six categories are consolidated under **ICT services** definition, however as mentioned above, **Telecom** and **Software** development are often measured separately in other classifications.

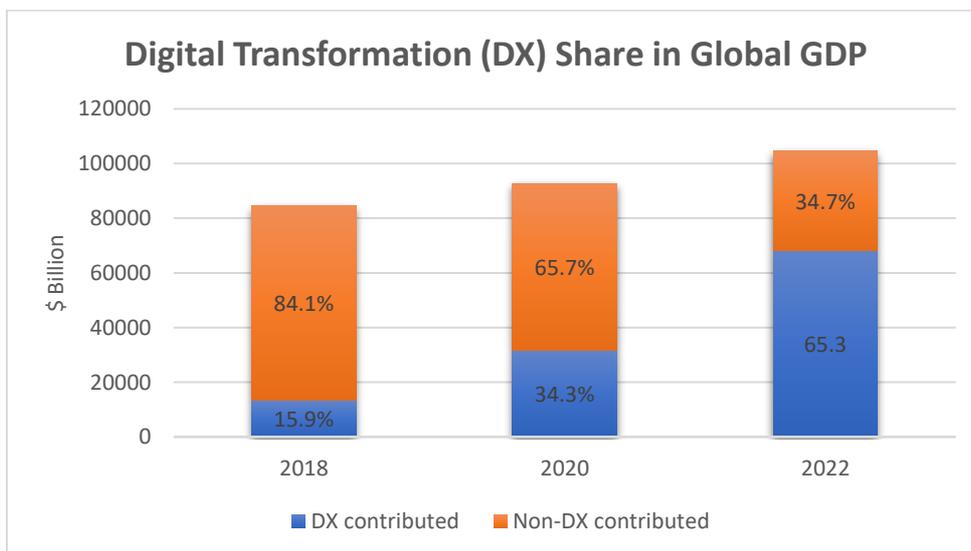
OECD aggregates ICT sector in 4 major groupings (based to ISIC rev. 4 classification): 1. Computer, electronic and optical products (or Hardware), 2. Software publishing; 3. Telecommunications; 4. IT and other information services.

## 2. ICT sector and Global Market trends

The last decade has coined new terms for information technology development trends. Information Society and Knowledge Economy, that have been actively conceptualized and discussed in the 2000s, have been succeeded by Digital Transformation and the 4<sup>th</sup> Industrial Revolution.

According to IDC analysis the forecasted Digital Tech's contribution to Global GDP shall overtake non-digital in 2021-2022, growing from current 15.9% share to more than 65% in 2022.

Figure 1 Digital Transformation share in global GDP



Source: IDC<sup>7</sup>

<sup>7</sup> <https://www.idc.com/promo/customerinsights?tab=topic-four>

The digital economy is often defined as comprising goods and services either produced by using digital technologies or containing them.<sup>8</sup>

Digital transformation paves the road for robust digital economies' formation. What are the most frequently considered for investment parts of digital transformation? The following 5 sub-categories got the highest percentage shares of the total IT spending forecast (i.e. IT market) for 2019 according to IDC research:

- Smart Manufacturing- 14%
- Digital Supply Chain Optimization – 9%
- Digital Grid -4%
- Digital Innovation -4%,
- Omni Experience Management<sup>9</sup> -4%.

Whilst forward looking projections predict inevitability of digital modernization, the trends analysis also discovers a positive impact of Information and Communication Technologies development on all economies. The positive correlation was recently reported between ICT investments and GDP growth for 59 developed, emerging and developing countries based on the data analysis for the period of 1995-2010.<sup>10</sup>

The ICT sector is considered a key determinant of the digital economy, “it is one of the few sectors that enable the creation of general purpose technologies, whose pervasiveness through the economy and society contributes to the digitisation of the economy”.<sup>11</sup>

## 2.1. Global ICT Industry Trends

The trends in the ICT industry since 2008 crisis demonstrate a shift towards growth in software and services sectors and decline in ICT manufacturing and Telecommunications. Namely, for OECD countries in 2008-2015: *Growth in the ICT sector is increasingly driven by software production and services, with the latter accounting for more than 80% of total ICT value added.*<sup>12</sup>

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<sup>8</sup> Adapted from Trends in the Information Technology sector. The Brookings Institution Report, Makada Henry-Nickie, Kwadwo Frimpong, and Hao. March 29, 2019

<sup>9</sup> Integrating customer experiences on different channel touchpoints, e.g. Mobile, Desktop, Physical.

<sup>10</sup> ICT and Economic Growth – Comparing Developing, Emerging and Developed Countries. Thomas Niebel. Discussion paper available at: <http://ftp.zew.de/pub/zew-docs/dp/dp14117.pdf>

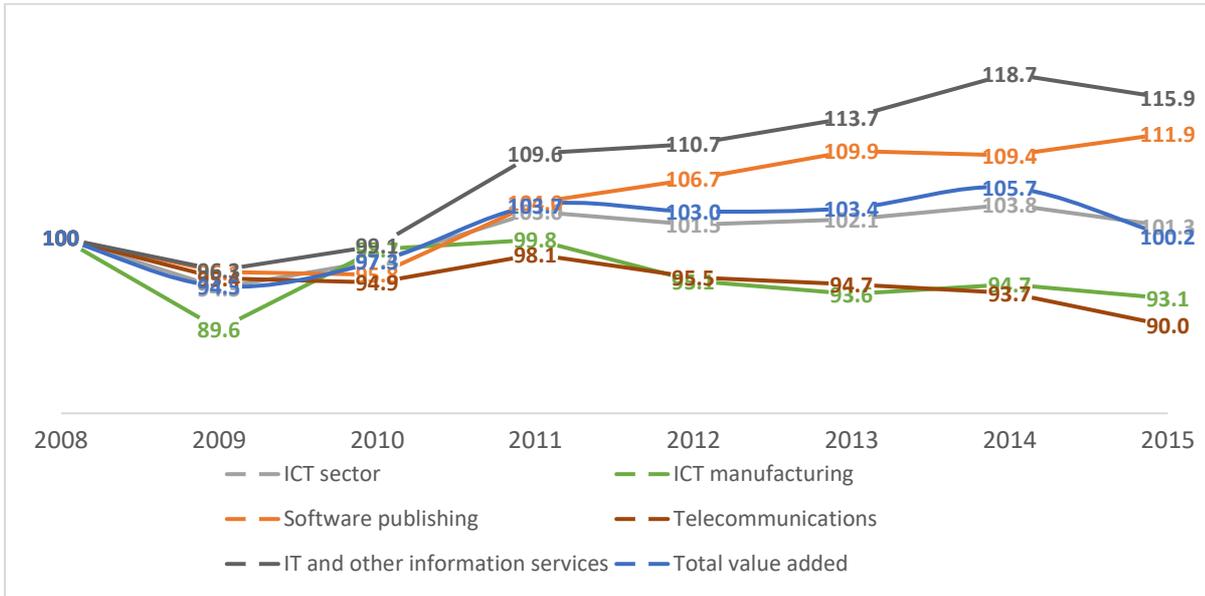
<sup>11</sup> Monitoring the Digital Economy & Society 2016 – 2021. European Commission DG Communications Networks, Content & Technology

<https://ec.europa.eu/eurostat/documents/341889/725524/Monitoring+the+Digital+Economy+%26+Society+2016-2021/7df02d85-698a-4a87-a6b1-7994df7fbeb7>

<sup>12</sup> <https://www.comptia.org/resources/it-industry-trends-analysis>

Figure 2 Growth in the value added of the ICT sector and its sub-sectors in the OECD area

USD current prices (2008 = 100)



Source: OECD Digital Economy Outlook. 2017 <sup>13</sup>

Analysis from another report identifies a similar trend for all countries, and shows that this shift from a hardware- to a software-centric level of growth is even more visible in developing countries, and is caused by wider mobile-cellular networks.<sup>14</sup>

## 2.2. The IT industry outlook

The worldwide IT industry turnover is projected to reach 5 trillion USD in 2019. United States is the largest tech market in the world accounting for 31% of total, followed by Asia with 26% and Europe with 19%. The Central and Eastern Europe Region accounts for 3%. Middle East and Africa cumulatively account for 5%, Latin America – for 6% and the Pacific - for 7%<sup>15</sup>

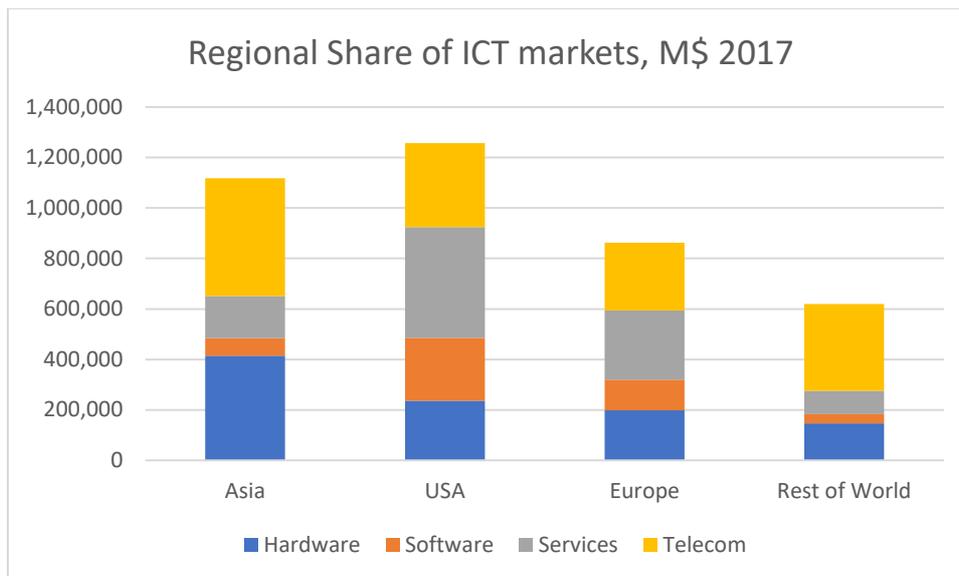
The consolidated regional share of traditional ICT sectors is presented below.

<sup>13</sup> <https://www.oecd.org/sti/oecd-digital-economy-outlook-2017-9789264276284-en.htm> p.116

<sup>14</sup> Trends in the Information Technology sector. The Brookings Institution Report, Makada Henry-Nickie, Kwadwo Frimpong, and Hao. March 29, 2019 based on International Telecommunication Union (2018). Measuring the Information Society Report, 2018

<sup>15</sup> CompTIA IT Industry Outlook 2019. P. 24.

Figure 3 Global ICT market regional share



Source: IDC global ICT spending forecast.<sup>16</sup>

The figure shows that IT services and Software sectors are much larger in US and Europe markets, and Telecom is largest in Asia that could be partially explained by the large population of the continent and almost universal mobile penetration. Hardware is largest in Asia due to leading production capacity of China and other countries. The projected further growth in IT services and Software and capitalizing on already established outsourcing markets in the region continue to create favorable opportunities for developing respective goods and services in CEE and EaP countries, delivered mainly through digital means.

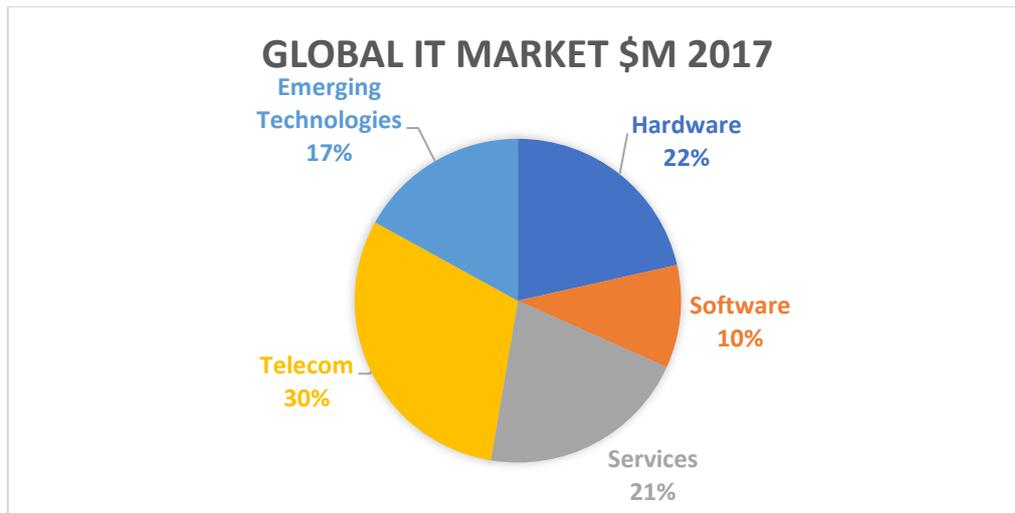
According to CompTIA, international trade remains a backbone of global technology market and “many countries eagerly import and export technology products and services from trade partners, enjoying the benefits of consumption and economic value creation.”

*Thus, integration into global value chains of IT economy is the essential task of national, regional or local IT industries. With Telecom markets and Hardware being dependent on Global trends and Multi-National Corporations, IT services and Software could contain the greatest potential for development in emerging markets, including the EaP region.*

The overall development trends analysis presented by IDC gives the following distribution of the global market between the *five* major IT sector categories. On top of four known sub-sectors of Hardware, Software, IT services and Telecom, which are considered traditional ICT, the fifth diverse category contains Emerging Technologies.

<sup>16</sup> <https://www.idc.com/promo/global-ict-spending/regional-markets>

Figure 4 Global IT market breakdown by sub-sectors



Source: IDC

The currently leading sector is Telecom, followed by Hardware and Services, Software accounts for 10% and Emerging Technologies - for 17%. These new emerging technologies are predicted to drive a dramatic acceleration in the industry growth. Those include:

- Internet of Things (IoT),
- Robotics,
- AR/VR (Augmented and Virtual Reality),
- AI (Artificial Intelligence),
- 3D printing.

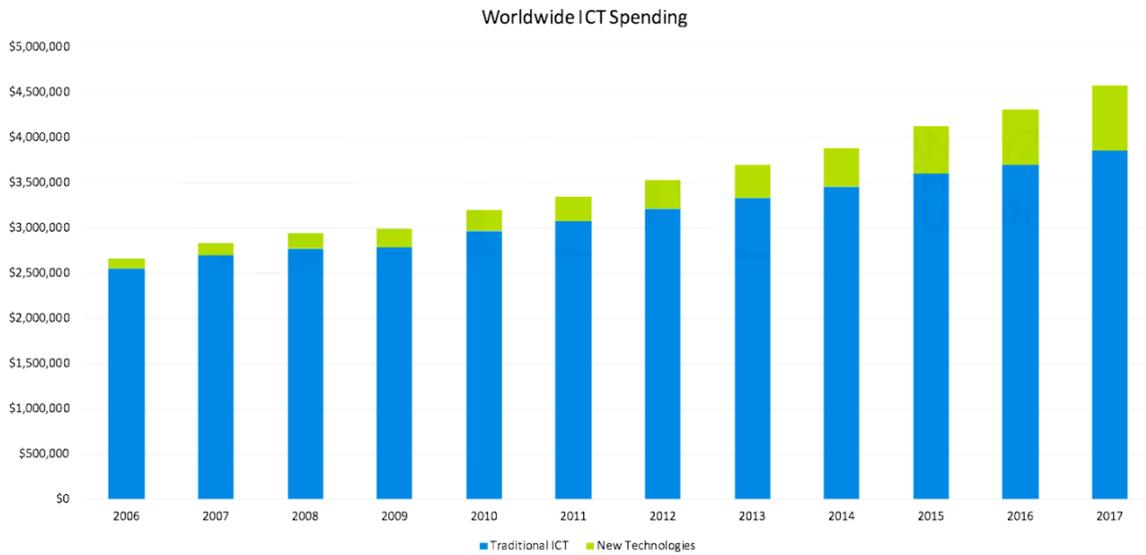
The global IT industry annual growth rate in the period of 2009-2018 was in the stable range between 3% to 5% and is predicted to be at 4% level in 2019.

The following chart demonstrates historical data showing the steady growth of the global IT market and the increasing share of the Emerging technologies in the period of 2006-2017 <sup>17</sup>.

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<sup>17</sup> IDC Global ICT spending overview. Idc.com

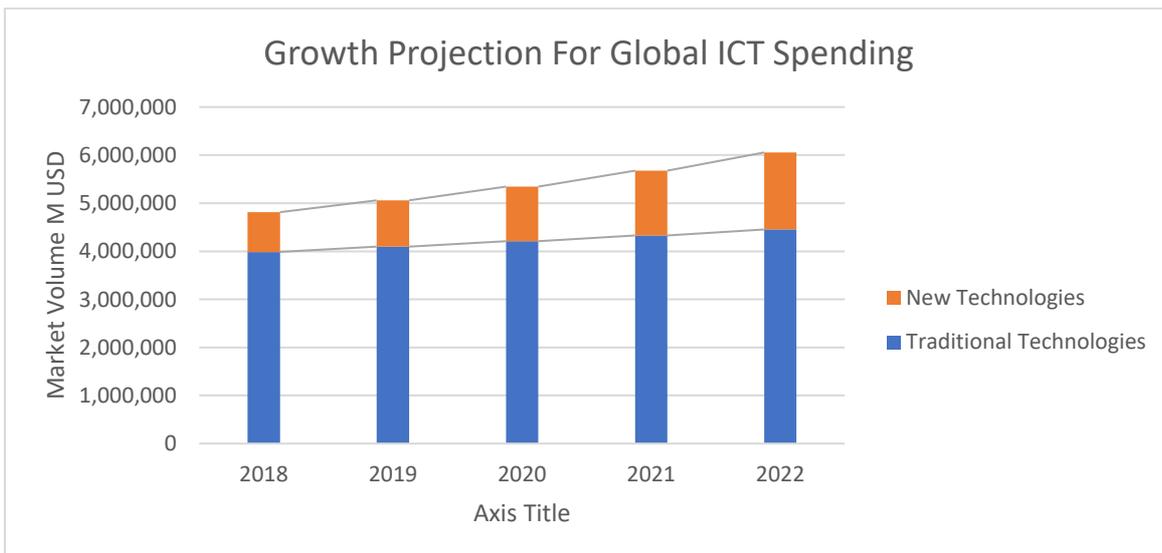
Figure 5 Global IT market dynamics 2006 - 2017



According to CompTIA Industry Outlook predictions, the Emerging Technologies could account for up to 50% of the overall IT sector revenue growth in the period of 2017-2022, outgrowing the GDP growth by 2-3 times, with other ICT sectors also growing at a slower rate, in line with the projected GDP growth.<sup>18</sup>

These trends shape the future of the industry and continue to contribute to digital transformation with the extended pace.

Figure 6 Global ICT market growth projection



Source: IDC<sup>19</sup>

<sup>18</sup> Ibid p.27

<sup>19</sup> ICT Spending Forecast. IDC. <https://www.idc.com/promo/global-ict-spending/forecast>

Developing markets might need additional time to adopt some of the new technologies. At the same time, the businesses and THE government in the new emerging markets have already started to focus on rapidly adopting the new technologies. Thus, local governments’ engagement with the new technologies could already include “aggressive smart city initiatives and integrating ICT with economic planning”<sup>20</sup>.

### 2.3. Emerging Technologies

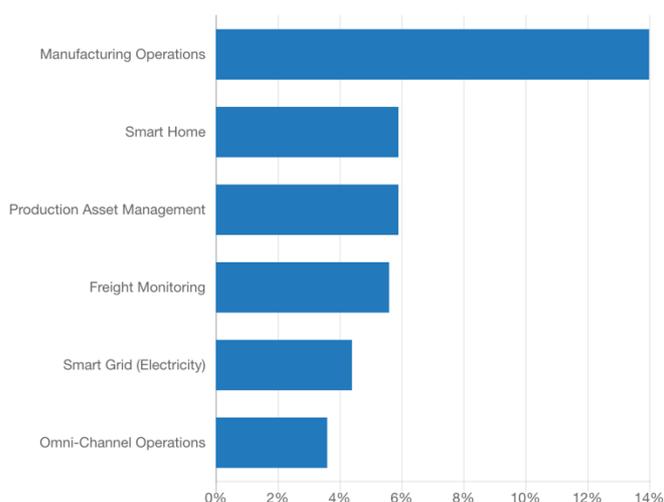
The IDC predicts that all growth in the so-called “traditional” IT technology spending will be driven by just four platforms: cloud, mobile, social and big data/analytics. At the same time, these growing traditional technologies leverage deployment of the new emerging technologies.

IoT holds the largest share of 1 trillion current market of the emerging technologies – 85% in 2017, distantly followed by Robotics with 14%, and AR/VR, Robotics and AI only at 1-2% - but still generating 10 B \$ globally. Other growing technologies include SaaS (Software as a Service), Big Data/Analytics, Enterprise Social Software, New Generation Security.

IoT spending is projected to reach 1 trillion USD in 2022. The 6 current most use cases for IoT sub-categories include:

Figure 7 IoT top use cases

Top 6 IoT Use Cases Worldwide by Share of Spending, 2019



Source: IDC<sup>21</sup>

According to one of the definitions, IoT represents a world where just about anything can be connected and communicate in an intelligent fashion.<sup>22</sup> Also, by connecting electronic devices over a network, IoT permits gathering information and allowing management of such devices through software applications to increase efficiency, enhance safety and sustainability<sup>23</sup>. The devices and

<sup>20</sup> Ibid

<sup>21</sup> [www.idc.com/promo/customerinsights](http://www.idc.com/promo/customerinsights)

<sup>22</sup> Techopedia definition at <https://www.techopedia.com/definition/28247/internet-of-things-iot>

<sup>23</sup> IT Strategic Roadmap for Moldova. 2017. By AVASANT.

systems being used in new ways with the help of IoT are: smart homes, smart cities' industrial internet, smart cars and smart wearables among others.

With the abundance of data provided by cheap IoT devices, local leaders could benefit from situational awareness and location intelligence allowing them to enhance citizen services. The examples of the innovative services include<sup>24</sup>:

- Pedestrian Safety improved by Internet-connected traffic sensors, and by emergency reporting through wearables;
- Advanced earthquake warnings leveraged by a system of connected ground sensors;
- Improved water quality enabled by embedded sensors;
- Smart cameras and emergency responders for public safety;
- Festivals and community events illuminated by programmable IP-based<sup>25</sup> LED lights.

*Investing in the new tech infrastructure, relevant skills and competencies development, and technologies could result in leapfrogging the challenges and achieving better competitiveness in the new emerging world. IoT could be the most attractive category in hardware spending and its rollout might be relatively easily scalable on the Local/Municipal or regional level.*

As cited by researchers, many definitions of smart cities appear in the literature on urban development, mobility and digital economy. That contains terminology from different approaches - particularly ICTs ("digital", "wired" or "information" cities), environment ("sustainable", "green", "eco" cities), knowledge ("learning" or "intelligent" cities)<sup>26</sup>.

The concept of the Smart City has recently been widely used and adopted as a trigger to upgrade urban economies through the increased efficiency gained by the widespread adoption of new technologies or, in other words, through Digital Transformation. A typical Smart City project usually includes smart meters, traffic management systems, emergency response systems, smart sensors, etc. However, emerging technologies and innovative business models are projected to play even more important roles in the future urban environments.

*IoT and Smart City technologies could be recommended as best investment areas for local governments to consider.*

### 3. International Trade trends in ICT Goods and Services

#### 3.1. Trade flows based on UN Comtrade data

The EaP countries' international trade data analysis was performed based on the UN Comtrade database consolidated data<sup>27</sup> and its derivative ICT subgroups provided by UNCTAD.<sup>28</sup>

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<sup>24</sup> GCN Industry insight available at: <https://gcn.com/articles/2019/01/24/local-gov-iot.aspx>

<sup>25</sup> Internet Protocol (IP) based address is assigned to smart LED lights and allows them to communicate over Internet

<sup>26</sup> Smart and Digital City: A Systematic Literature Review. A. Cocchia published at R. P. Dameri and C. Rosenthal-Sabroux (eds.), Smart City, Progress in IS. 2014

<sup>27</sup> UN Comtrade is a repository of official international trade statistics and relevant analytical tables

<https://comtrade.un.org>

<sup>28</sup> <https://unctadstat.unctad.org/EN/Index.html>

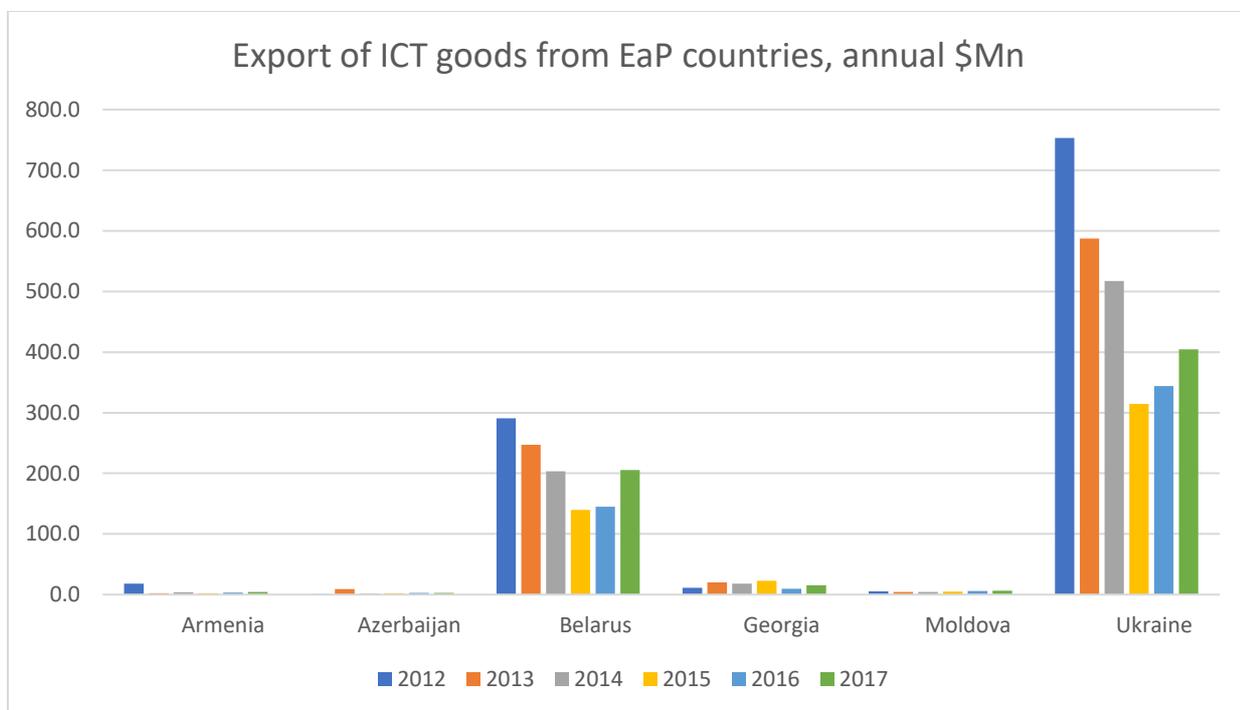
Considering the importance of tradable IT services and products, the UNCTAD provides consolidated data for ICT sector exports and imports for individual countries, regions and country groups.

The charts below show the volumes and percentage of ICT goods in the total trade for the EaP countries in five categories:

- A. Computers and peripheral equipment
- B. Communication equipment
- C. Consumer electronic equipment
- D. Electronic components
- E. Miscellaneous

It contains bilateral exports and, re-exports of information and communication technology (ICT) goods, aggregated at the ICT goods category level.

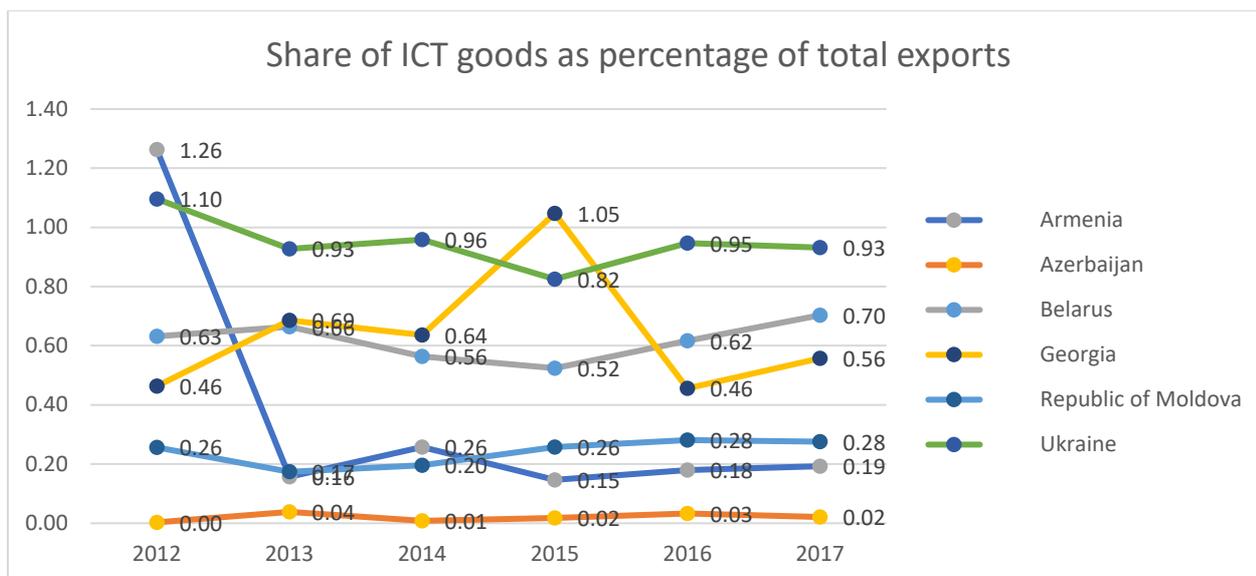
Figure 8 Export of ICT goods, EaP Countries



Ukraine is by far the regional leader in the ICT goods export volumes with \$ 404 MLN in 2017, followed by Belarus with 205 MLN\$. Georgia is a distant 3<sup>rd</sup> with \$15.2 MLN, and other countries export volumes were not exceeding 6 million USD.

At the same time, the share of the ICT goods as percentage of total trade of EaP countries ranges in a comparable, small interval, as seen from the chart below.

Figure 9 Share of ICT goods as percentage of Total exports

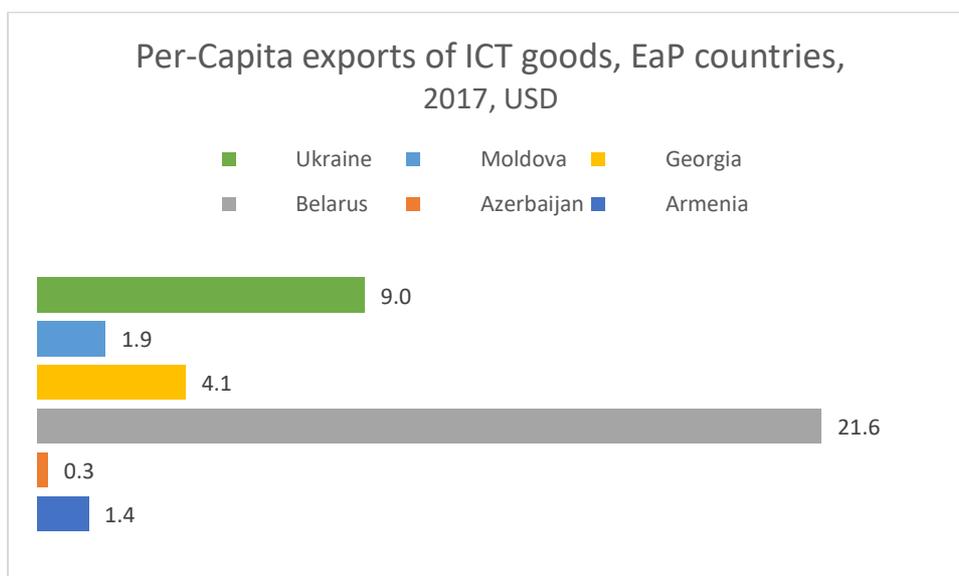


Note: the definition of ICT goods and categories is based on the UNCTAD 2018 updated classification, containing 94 codes.<sup>29</sup>

The chart also demonstrates that the ICT goods export does not represent the core economic activities of the EaP countries with indicators settling below 1% level for all 6 countries in 2017.

Another dimension allowing to compare ICT goods trade of the EaP countries is based on considering the per-capita factor. The below figure shows the results putting Belarus in a leader position in 2017 with 22\$ annual per-capita export of ICT goods, followed by Ukraine with 9\$ per-capita export.

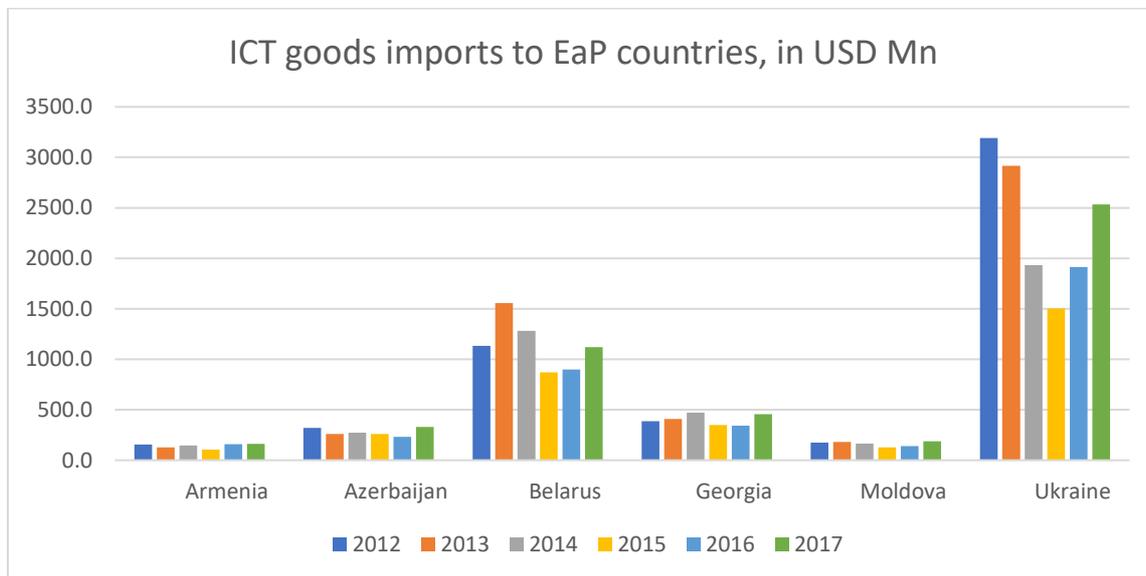
Figure 10 ICT goods per-capita exports, EaP countries



<sup>29</sup> UNCTAD and UNSD 2018. Updating the Partnership Definition of ICT Goods from HS 2012 to HS 2017, Technical Note No 10 Unedited, TN/UNCTAD/ICT4D/10. Available at: [https://unctad.org/en/PublicationsLibrary/tn\\_unctad\\_ict4d10\\_en.pdf](https://unctad.org/en/PublicationsLibrary/tn_unctad_ict4d10_en.pdf)

The ICT goods imports exceed exports in all the EaP countries. And this is in line with the fact that no significant Hardware production centers are present in the region. For Armenia, Azerbaijan, Georgia and Moldova the ICT goods exports constitutes only 1-3% of total ICT trade. For Ukraine and Belarus this indicator is slightly higher and stands at 14% and 16% respectively.

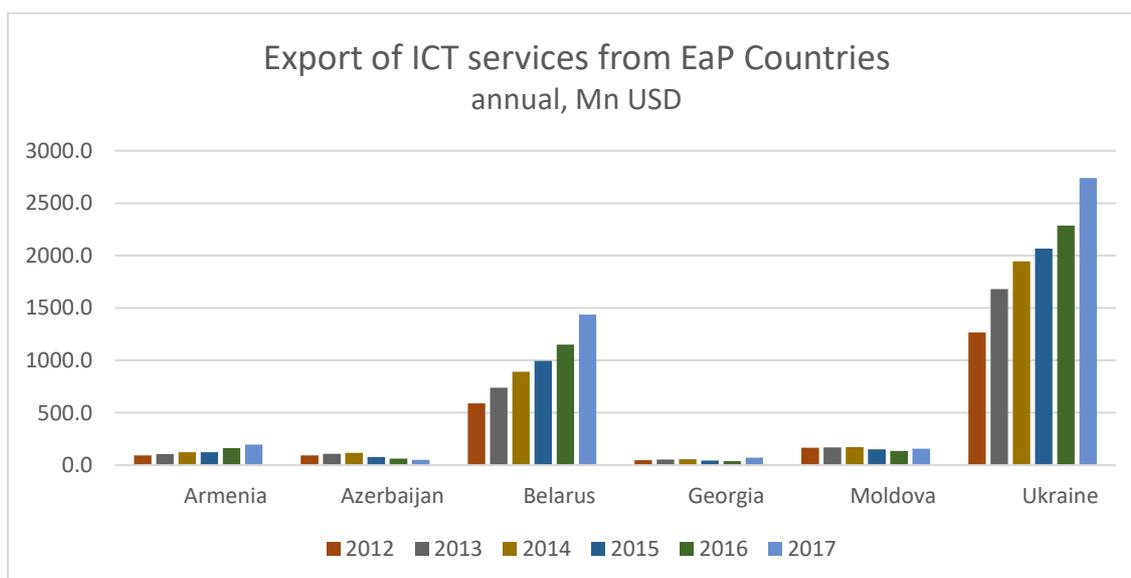
Figure 11 ICT Goods Imports dynamics to EaP countries



Source: UNCTAD

The UNCTAD data supports the observation that ICT sector growth and development for the region is linked to the ICT **services** trade and uptake. ICT services take a much higher volume and share in the EaP countries total exports. For Armenia ICT services exports amount to 98% of all ICT exports, for Moldova – 96%, for Azerbaijan – 95%, and for Georgia – 82%. For both trade volume leaders Ukraine and Belarus this indicator equals 87%.

Figure 12 Export dynamics in ICT services, EaP countries



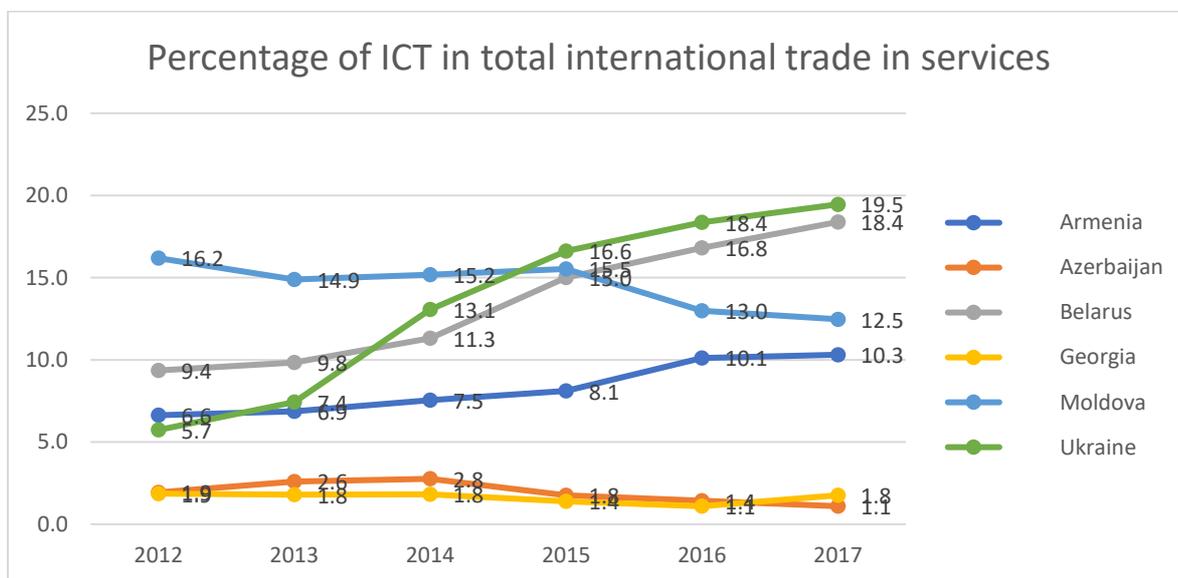
Note: ICT services are an aggregation of computer and telecommunications services, defined in a UNCTAD document<sup>30</sup>. Broadly it contains the following subgroups of services: Telecommunications, Software Publishing, Computer services including Data processing, repair of computers.

The chart depicts ICT services’ total export volumes with two leaders Belarus and Ukraine having steadily growing export trade flow, reaching billions of USD. The overall volume reflects the comparative size of the tradable ICT services where Ukraine is leading the cohort with 2.74 Billion \$, and Belarus with 1.44 Billion \$ contributing together to almost 90% of total international trade in ICT services of the whole EaP region.

The total volume of the EaP region exported ICT services reached \$4.65 Billion that represented 0.94% of the global market of \$496 Billion in 2017.

It’s notable that not only the volumes but also the percentage of ICT services in countries’ total international trade have grown significantly for Ukraine and Belarus reaching almost 20% for each, as seen from the chart below.

Figure 13 Share of ICT in total international trade in Services, EaP countries

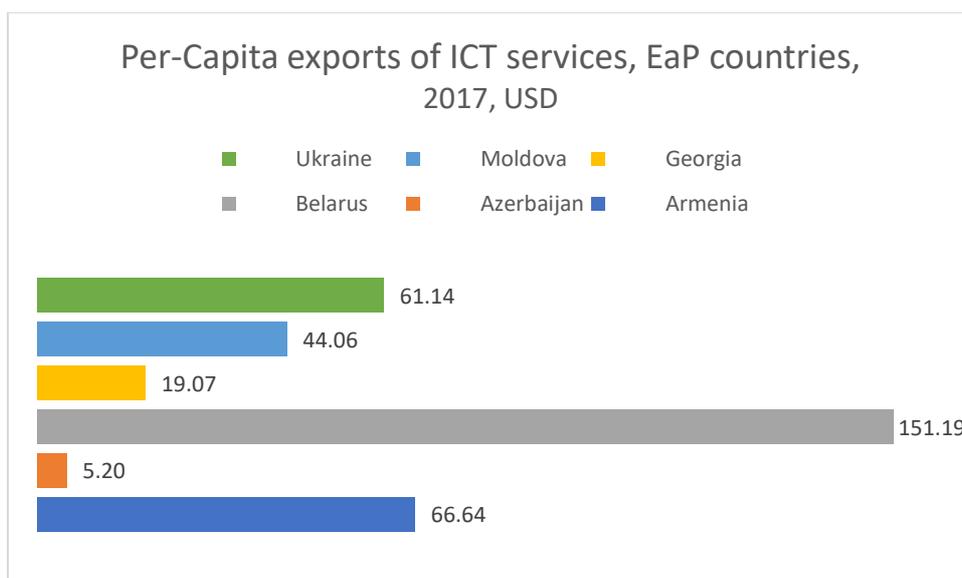


For Armenia the ICT services trade have also grown from 6.6 to 10 % , while in Moldova it has decreased, and in Georgia and Azerbaijan it is almost flat with less than 2% of the total international trade in services.

Per-capita exports of ICT services puts Belarus in a leading position in the region with 151 \$, followed by Armenia with 66 \$ and Ukraine with 61 \$. Moldova is in mid-range position with 44\$; Georgia and Azerbaijan lag behind with 19\$ and 5\$ respectively.

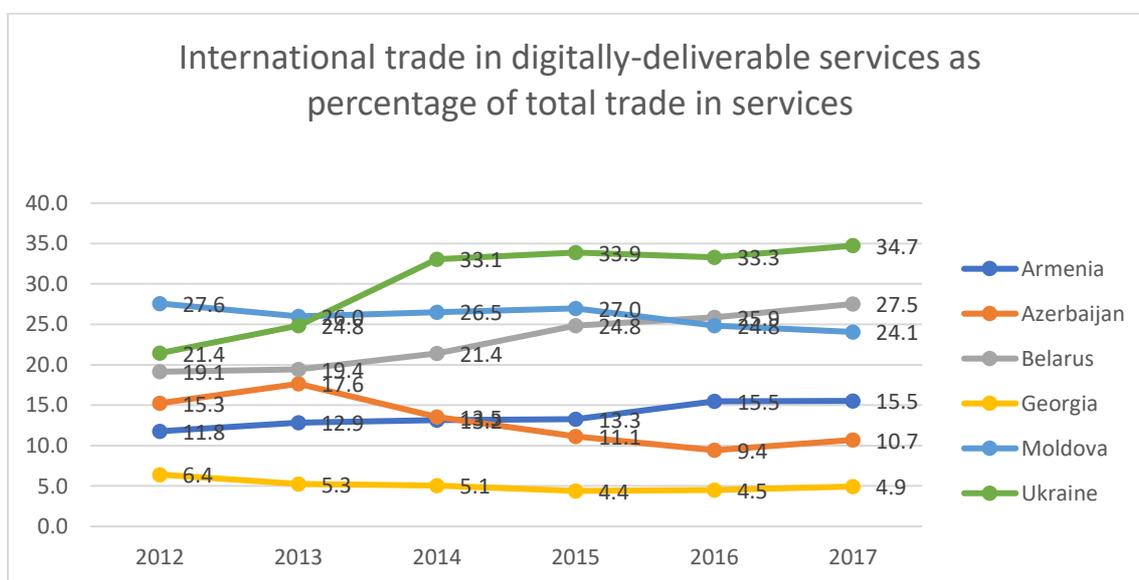
<sup>30</sup> UNCTAD, 2015. International Trade in ICT Services and ICT-enabled Services: Proposed Indicators from the Partnership on Measuring ICT for Development, Technical Note No 3 Unedited, TN/UNCTAD/ICT4D/03. Available at [https://unctad.org/en/PublicationsLibrary/tn\\_unctad\\_ict4d03\\_en.pdf](https://unctad.org/en/PublicationsLibrary/tn_unctad_ict4d03_en.pdf)

Figure 14 Per-Capita exports of ICT service, EaP countries



UNCTAD offers additional useful dimension for data comparison and analysis focused on a concept of ICT-enabled services. **Digitally-deliverable services** are an aggregation of insurance and pension services, financial services, charges for the use of intellectual property, telecommunications, computer and information services, other business services and audiovisual and related services. This classification expands the IT embedment in other sectors of economy and opens additional opportunities for its development.

Figure 15 Share of digitally-deliverable services in total international trade, EaP countries



Note: The digitally-deliverable services data is based on the concept of potentially ICT-enabled services as developed by UNCTAD in a technical note in 2015 as well as in a report of the 47th United Nations Statistical Commission in 2016.<sup>31</sup>

<sup>31</sup> UNCTAD, 2015. International Trade in ICT Services and ICT-enabled Services: Proposed Indicators from the Partnership on Measuring ICT for Development, Technical Note No 3 Unedited, TN/UNCTAD/ICT4D/03. Available at [https://unctad.org/en/PublicationsLibrary/tn\\_unctad\\_ict4d03\\_en.pdf](https://unctad.org/en/PublicationsLibrary/tn_unctad_ict4d03_en.pdf)

*As seen from the chart, Ukraine and Belarus are leading the EaP region with a growing share of digitally deliverable services reaching 35% and 28% respectively in 2017. Armenia demonstrates moderate growth to 15% in 2017 and Moldova a small decline to 25%. Azerbaijan settles at about 10% in 2017. And for Georgia the digitally delivered services trade has plateaued at the lowest level for the region -about 5% of whole trade in services.*

### 3.2. ICT sectors in individual EaP countries

The overall ICT sector volumes and trends of the EaP countries are evaluated in different reports. Armenia, Ukraine and Belarus measure key ICT industry indicators regularly, other country reports are also available through the Government, consultancy or donor supported projects' data. The National Statistics Offices have mostly updated the older methodology and harmonized the ICT sector industries definitions to European NACE rev.2 classifications that makes data comparison possible and valid. Other ad-hoc reports' methodologies vary, but allow for the higher level trends comparison.

The Armenian IT sector turnover is growing steadily, capitalizing on the constant growth of companies and the IT workforce. During the period from 2010 through 2018, the ICT industry's average annual growth rate amounted to 25.6 percent. In 2018 the total turnover of the ICT sector was estimated at 922.3 million USD<sup>32</sup>. The National Statistics Office ARMSTAT estimates the Information and Communication sector output at 532.3 million USD in 2017, and 502.3 million USD in 2016.<sup>33</sup> About 800 companies operated in the sector in 2018. The number of IT workforce in 2018 was 19500, with over 15 200 among them IT technical specialists, and the rest - management and business personnel. Computer chip design of some leading tech companies is performed in RD units hosted in Armenia.

In Azerbaijan, the IT sector is the second most profitable and second largest recipient of foreign FDI after oil and gas industry<sup>34</sup>. The government invested over 2 Billion USD in the IT development that has contributed to ICT expansion, connectivity and infrastructure growth and created more skilled workforce. In 2017, the total output of the ICT sector has grown from 899 million USD to 978 Million USD or 1.5% of GDP. The number of workers employed in ICT sector is 25600.

In Georgia, the ICT sector also grows, with telecom sub-sector accounting for half of the turnover. The ICT sector output has grown from 496 million USD in 2016 to 556 million in 2017, but it grew slightly slower than the GDP, declining from 3.9% in 2016 to 3.8% in 2017. The number of employees in the sector has grown from 19 700 in 2016 to 21 400 in 2017, representing about 3% of total workforce<sup>35</sup>.

The Moldovan ICT sector has been developing steadily since 2009. Its main focus is IT services that have also been one of the major drivers for Moldova's economic growth. The fast rise of the IT industry is linked to outsourcing services. IT accounted for 5.7% of Moldovan GDP in 2017, decreasing from steady 5.9% in the previous years, but increasing in the overall volume from 476 million in 2016 to 551 million USD in 2017.<sup>36</sup> The number of employees in the IT sector has grown from 19 000 in

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<sup>32</sup> Armenian ICT sector 2018. State of the Industry Report: Information and Telecommunication Technologies Sector in Armenia.

<sup>33</sup> Statistical Yearbook of Armenia-2018

<sup>34</sup> Information Society in Azerbaijan. Statistical Yearbook 2018. State Statistical Committee of the Republic of Azerbaijan

<sup>35</sup> Statistical Yearbook of Georgia 2018. National Statistics Office of Georgia.

<sup>36</sup> Moldova in Figures. Statistical Pocket-book 2018. National Bureau of Statistics of the Republic of Moldova

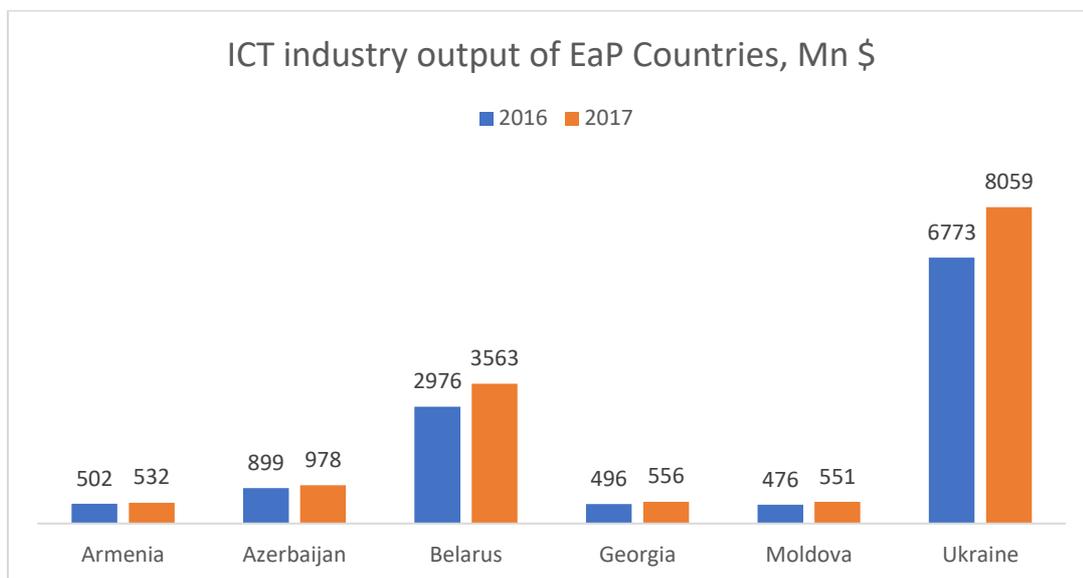
2016 to 20200 in 2017. Its IT services market has the estimated value of \$154.40 million with \$120.90 million originating from exported IT services.

The IT sector in Belarus sector has been experiencing stable growth during the last decade. Computer and IT services is the third largest service sector in the country, following transport and construction services, and the share of IT services is the second largest one in the total exports. The IT sector accounts for 5.1% of GDP. The ICT sector output has grown from 2976 million USD in 2016 to 3563 million USD in 2017. The High Technology Park has contributed to the total IT services exports with more than 1 billion USD. Foreign investments in the sector accounted for 509 million USD in 2017. The total workforce employed in ICT sector has grown from 85400 in 2016 to 92200 in 2017.<sup>37</sup> IT professionals count in the High-Technology Park resident companies is estimated at more than 30 000. The number of IT sector organizations has grown from 2.700 in 2016 to 3120 in 2017.

Ukraine is the leading country in the region by size and outputs of the IT market and by number of IT professionals. Its fast-growing IT services exports sector is estimated currently at 4 billion USD. The overall ICT sector output has grown from 6773 million USD in 2016 to 8059 million USD in 2017.<sup>38</sup> That accounted for 7.12% of GDP. There are about 4000 tech companies, and about 185000 professionals in the ICT sector, with about 160 000 estimated number of developers.<sup>39</sup>

The figure below provides the summary of the ICT industry output of the EaP countries in 2017.

Figure 16 ICT sector output, EaP Countries



The overall output of the EaP region countries ICT sectors is estimated at 14.24 Billion USD that is about 0.3% of total global ICT market value in 2017. However, as indicated above, for ICT services exports (that is mostly outsourcing), the region’s share in global market is 3 times higher with 0.94%.

<sup>37</sup> National Statistics Indicators of Digital Economy Development in Belarus. 2018. Belstat

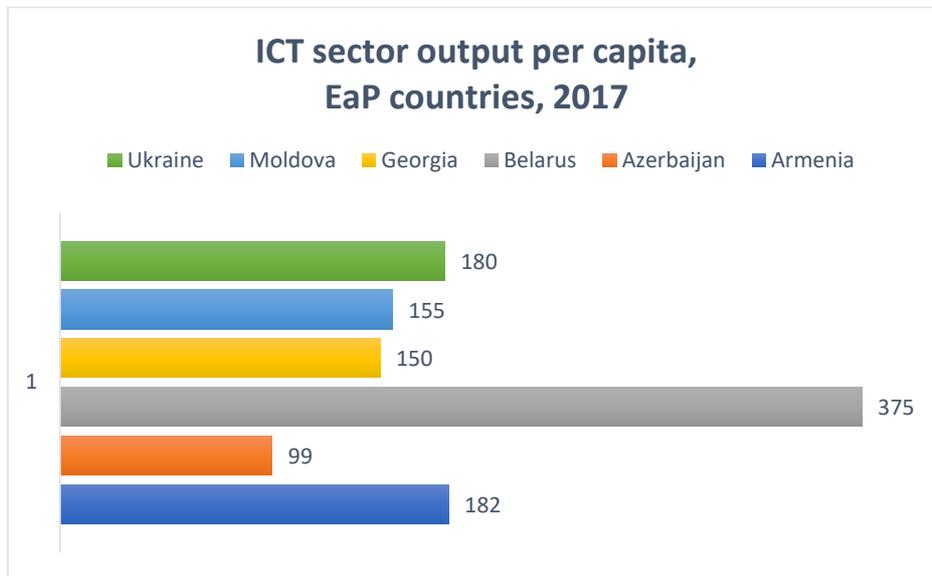
<sup>38</sup> State Statistics Service of Ukraine. National Accounts 2010-2017.

[http://www.ukrstat.gov.ua/druk/publicat/kat\\_u/2019/zb/02/zb\\_nru2017.zip](http://www.ukrstat.gov.ua/druk/publicat/kat_u/2019/zb/02/zb_nru2017.zip)

<sup>39</sup> DOU.UA

While in term of the volume the Ukrainian ICT output is a clear frontrunner, per capita calculation gives a different distribution putting Belarus in a leading position with ICT industry output per capita 375\$, followed by Armenia and Ukraine with \$180 per capita. Georgia and Moldova reside in a lower range with about 150\$, and Azerbaijan has the smallest ~ 100\$ per capita value of the IT industry output.

Figure 17 ICT industry output per capita, EaP countries



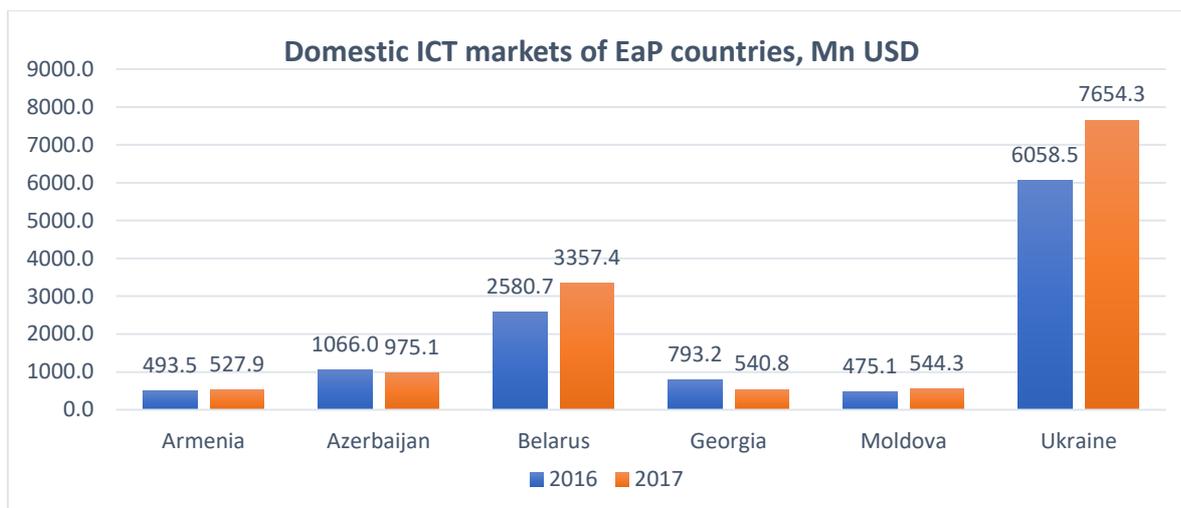
### 3.3. Domestic ICT Markets

Domestic ICT market, with the exception of Telecom, can be roughly estimated to represent 10% of the total ICT services market for leaders Ukraine and Belarus. The export orientation of the Software and IT services sub-sectors is also clearly identified in different country reports and analytics. The smaller number of local customers, and their small IT spending budgets (with the exception of the Financial Sector), has limited local IT services and Software industries’ interest to serve them.

*Export orientation should be considered during designing local level IT market support measures and ICT enabled economic development initiatives.*

The domestic markets size could be estimated by subtracting exports data from the total ICT sector output and adding imports data. The chart below shows the domestic market volume in the EaP countries in 2016 and 2017. It has been growing for Ukraine, Belarus, Moldova and Armenia, and shrinking for Azerbaijan and Georgia.

Figure 18 Domestic ICT Market Sizes of EaP countries



Domestic ICT markets mostly consist of Telecom services and ICT goods (Hardware). Local government hardware and Telecommunications spending is also included in these data. Local IT hardware production levels are relatively high only in Ukraine and Belarus, opening certain potential for municipalities to consider specific projects targeting ICT goods production.

### 3.4. Global Innovations Index

Development of the IT market is closely linked to the advancement of innovations, and especially IT or ICT enabled innovations. A half of Venture Capital funds in the US are invested in the IT related industries promising innovation-based exponential growth. Digital Technologies are impacting innovations nature as well. *“The direct way in which digital technology affects innovation is via an augmentation of existing tools, products, processes, and business models by embedding new technologies”*.<sup>40</sup>

Global Innovations Index is an acclaimed international ranking of individual economies created by a consortium of WIPO (World Intellectual Property Organisation), INSEAD and Cornell University.<sup>41</sup>

GII has been measuring the innovation capacity of individual countries based on sets of indicators that include ICT related components. At the same time, it provides a holistic approach to the environment and helps to plan development accordingly, as demonstrated from the methodology explaining infographics below:

<sup>40</sup> The Global Information Technology Report 2016. WEF, Cornell University, INSEAD. P.6

<sup>41</sup> <https://www.globalinnovationindex.org/about-gii#history>

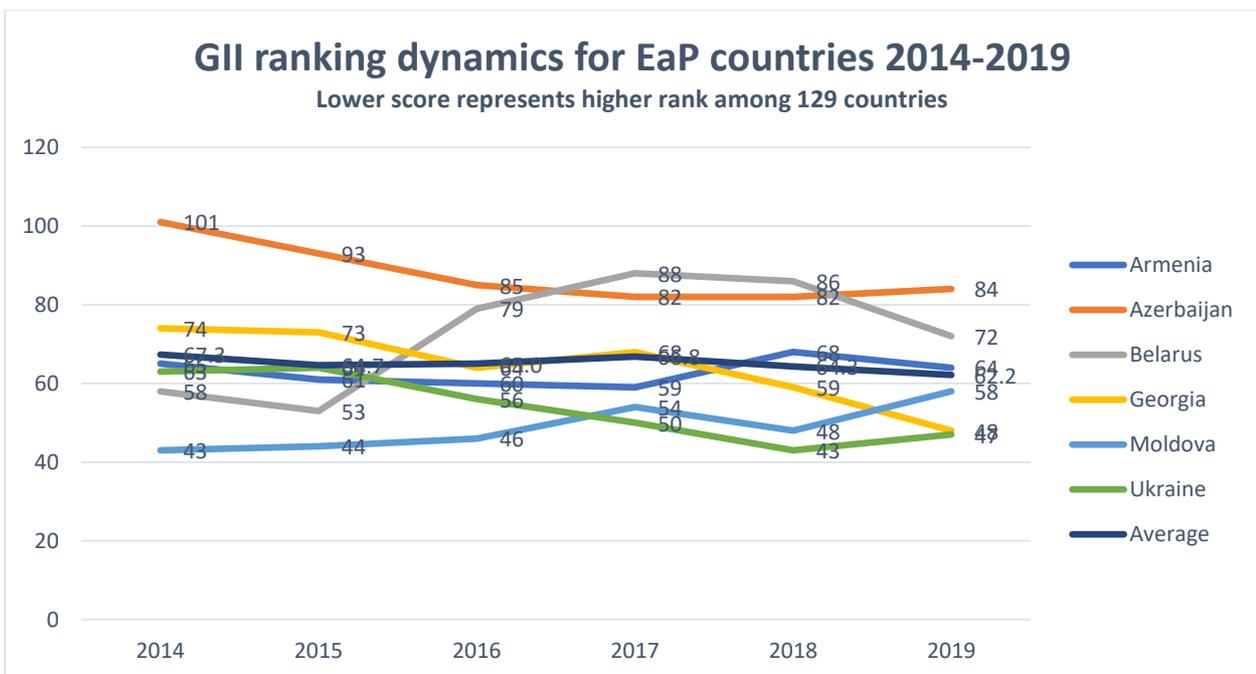
Figure 19 Global Innovation Index methodology infographics



As stated on the GII website: *The Global Innovation Index (GII) aims to capture the multi-dimensional facets of innovation and provide the tools that can assist in tailoring policies to promote long-term output growth, improved productivity, and job growth.*<sup>42</sup>

The data series of the index allows to compare the latest dynamics in the EaP countries' progress.

Figure 20 Global Innovation Index ranking dynamics, EaP countries



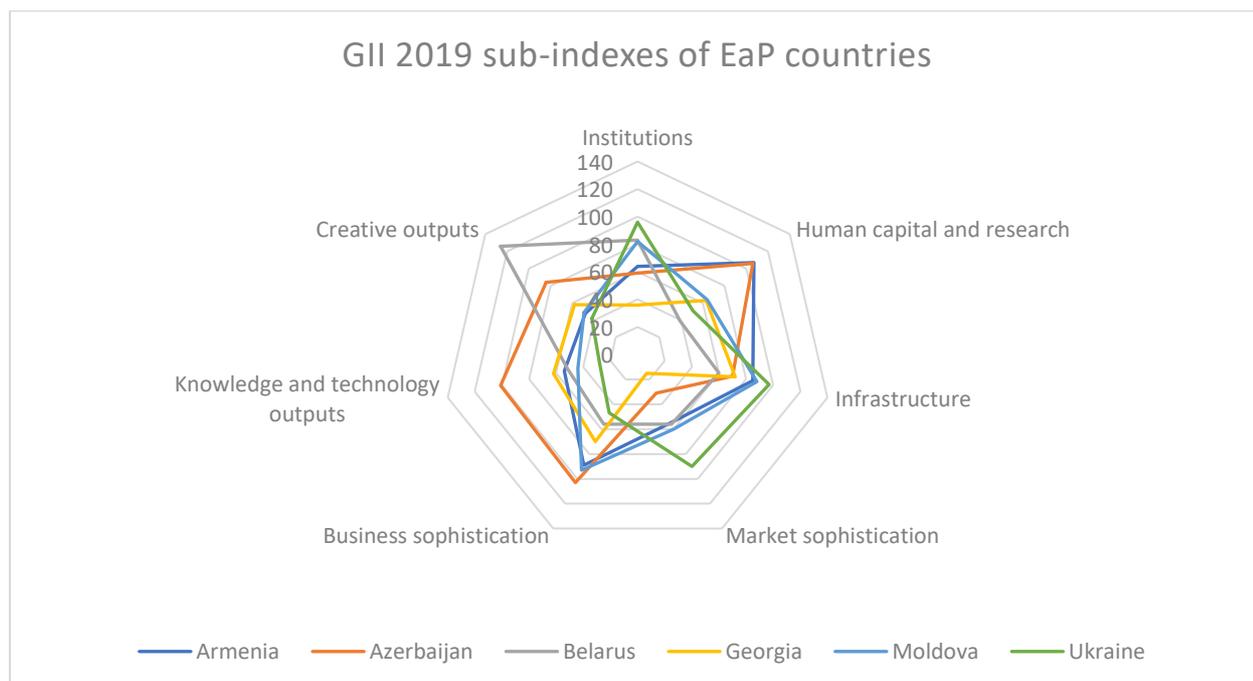
<sup>42</sup> Ibid

The ranking dynamics in 2014-2019 for the EaP countries is mixed with the overall average yearly rankings growing slightly from 67 in 2012 to 63 in 2019.

In the latest edition, Georgia has improved its ranking by 11 positions reaching 48<sup>th</sup> place for the first time. Ukraine continues to lead the region with 47<sup>th</sup> place, though losing 6 positions since last year. At the same time, Georgia and Ukraine scores differ in comprising major components – Innovation Inputs and Innovation Outputs. Namely, Ukraine has a high Innovations Output Rank - 36<sup>th</sup> and relatively low rank of Innovations Inputs at 82<sup>th</sup> place. Georgia, on the contrary, has low middle tier 60<sup>th</sup> place in Innovation outputs and higher rank in Innovation Inputs at 44<sup>th</sup> place. The latter reflects the 4 year efforts of the Georgian Government to develop innovation ecosystem through infrastructure and resources, and also by creating a business friendly environment, that resulted in top rankings in “Ease of Doing Business” ranking. Moldova and Azerbaijan declined in the latest rankings. In general, the region occupies a middle tier and further examination of sub-indexes gives a better understanding of the countries’ relative strengths and weaknesses.

The below chart demonstrates the relative strengths and weaknesses of each of the EaP countries in 7 sub-indexes of Global Innovations Index measured on the rankings scale (less is better):

Figure 21 Global Innovation Index sub-indexes ranking, EaP countries



Ukraine has the highest ranks in the region in Knowledge and Technology Outputs (28) and Creative Outputs (42). At the same time, it has lowest in the region ranking (96) in Institutions.

Azerbaijan has a high rank in Market sophistication (31) and a low rank in Human Capital and Research (106).

Georgia is the EaP Region leader in the Market Sophistication sub-group (15), that contains Doing Business scores and Institutions rankings (36). And it has the lowest ranking in Business Sophistication (91). Belarus is the strongest in Human Capital and Research (39) and the weakest in

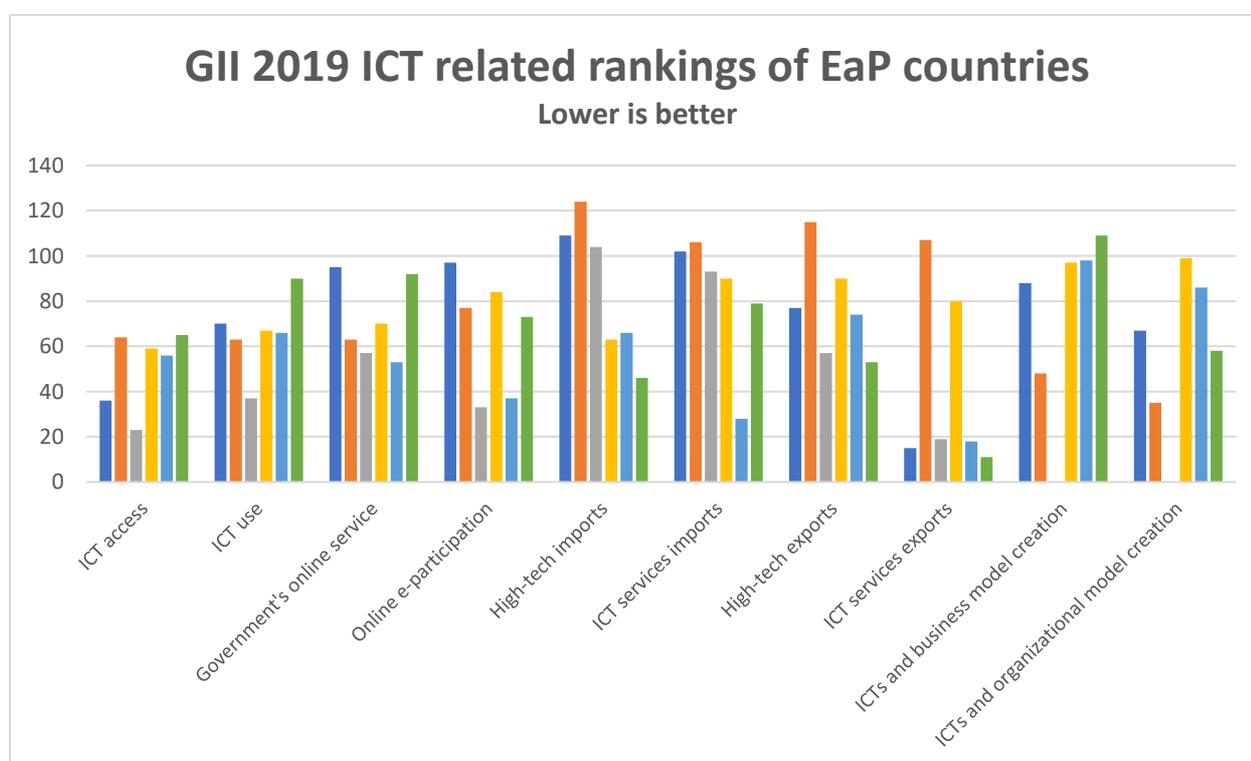
Creative Outputs (126). Moldova has the highest rank in sub-indexes in Knowledge and Technology Outputs (37), and low scores in Business Sophistication and Infrastructure (93). Armenia is not standing out among the EaP countries in any of the sub-indexes, its highest score is in Creative Outputs (48). It has scored the lowest in the region in Human Capital and Research (107).

Infrastructure, similarly to 2018 edition, remains the weakest point for the countries in the region with an average rank of 78.7, with the highest ranked Azerbaijan only on 60<sup>th</sup> place among the surveyed countries.

*Thus, investments in ICT core and enabling infrastructure are still viewed a viable intervention to consider at national or local scales.*

A more detailed picture of ICT and technology related rankings for the EaP countries gives additional insights to their capacity for technology-enabled innovation.

Figure 22 Global Innovation Index ICT related rankings



Ukraine has the globally competitive excellent ranking (11) in ICT services exports, closely followed by Armenia (15), Moldova (17), and Belarus (19). All countries have improved this indicator since 2018. Moldova has the highest in the region ranking in ICT services imports (28) that is considered a part of the knowledge absorption capability. Belarus is leading the region countries in ICT access (23) and ICT use (37). Moldova and Belarus provide the best Government online services in the region, (53) and (57) respectively. Azerbaijan has the highest score in the region in ICTs and organizational model creation<sup>43</sup> (35) with other countries significantly lagging behind in this component.

<sup>43</sup> This sub-component is the average answer on the question on the scale from 1-not to 7 – to great extent to the question: In your country, to what extent do ICTs enable new organizational models (e.g. virtual teams, remote working, telecommuting).

*This sub-index stipulates the role of the ICT as enabling a new, more efficient organizational setup and thus has a potential to be developed by investing in human capital and organizational capacity development.*

The chart above again clearly underlines the growing competitive advantage of the EaP countries in the ICT services exports. The four leaders, Ukraine, Armenia, Moldova and Belarus are all progressing and all have reached top 20. Even though Georgia and Azerbaijan are yet not that strong in the field, certain policies, investments and interventions could help record progress here. Georgia has improved its standing since 2018 in this sub-component from 90<sup>th</sup> to 80<sup>th</sup>.

High-Tech Imports shows one of the lowest average rankings for EaP countries with Azerbaijan (124), Armenia (109) and Belarus (104) worsening the rankings since 2018. The lowest average weakest rank for the region (88.0) is ICTs and business model creation. e.g. Ukraine has relatively high and medium rankings overall, but lags significantly behind in this sub-component (109).

What are the countries' best competitive rankings among all indicators?

- Armenia holds 2<sup>nd</sup> position among 139 countries in Growth Rate of GDP per person engaged.
- Azerbaijan holds 2<sup>nd</sup> position in the sample countries in Ease of Protecting Minority Investors.
- Georgia is #2 in 2 sub-components: Ease of Protecting Minority Investors and Ease of Starting a business; and #5 in Applied Tariff Rate, weighted mean and in Pupil-Teacher Ratio.
- Belarus is #1 in the World in the Percentage of Females Employed with advanced degrees; it holds the 6<sup>th</sup> position in Share of Science and Engineering graduates in all tertiary graduates.
- Moldova is #4 in Number of Utility Model Applications (per billion PPP\$ GDP) and #7 in Government Funding per secondary student as a percentage of GPP per capita.
- Ukraine has shared 1st place in Number of Utility Model Applications (per billion PPP\$ GDP); 2nd place in the Percentage of Females Employed with advanced degrees; 3rd place in Pupil-teacher ratio; 6th Place in Trademark Applications Count by Origin.

And what are the weakest points?

- Armenia holds the lowest 120 position in Intellectual Property Payments and also in ISO 14001 Environmental Certificates.
- Azerbaijan has the lowest ranks in High-Tech Imports (124) and High-Tech Exports (115);
- Belarus is # 126 in Creative Outputs pillar, and #115 in Credit.
- Georgia is only 109<sup>th</sup> in Logistics Performance and No 107 in State of Cluster Development.
- Moldova has also a low ranking of 124 in State of Cluster Development; #120 in Innovation Linkages, #116 in Environmental Sustainability and 115 in General Infrastructure.
- Ukraine has the lowest ranking – 125 in Political and Operational Stability, followed by 120<sup>th</sup> position in Environmental Sustainability and 115<sup>th</sup> in Investment.

The existence of some top rankings for EaP countries definitely contributes to the development potential of countries with certain sub-regional similarities. At the same time, very poor performance in other sub-components reveals the challenges that should be addressed and considered during the implementation of any level ICT strategies. Weak standing also means a potential for improvement.

With several indexes e.g. legislative environment and institutions, which should be addressed on the national levels, Human Capital development, Infrastructure and Business Sophistication, and Creative Outputs could be addressed at Cities and Municipalities levels with scalable projects, enabling environment, sharing best practices and developing partnerships.

Due to a complex and comprehensive nature of the GII report, it's impossible to address all weak points immediately, especially at the local level, however understanding the dynamics and key indicators could help plan more efficient interventions that are grounded in the reputable research.

### 3.5. Global Information Technology Report Network Readiness Index (NRI)

A series of Global Information Technology Reports containing a Networked Readiness Index were published by the World Economic Forum in 2001-2016.

The latest 2016 edition was published under the theme – Innovating in Digital Economy, and contains the data about 139 economies. The report considers Information and Communication Technologies (ICTs) a backbone of the ongoing 4<sup>th</sup> industrial revolution and recommends among others that - *encouraging businesses to fully embrace the powers of digital technologies should be a priority of governments. ...both the private sector and governments need to step up efforts to invest in innovative digital solutions to drive social impact.*<sup>44</sup>

Latest 2016 edition NRI contained 53 indicators for 139 countries, grouped into sub-indexes containing additional pillars. Namely:

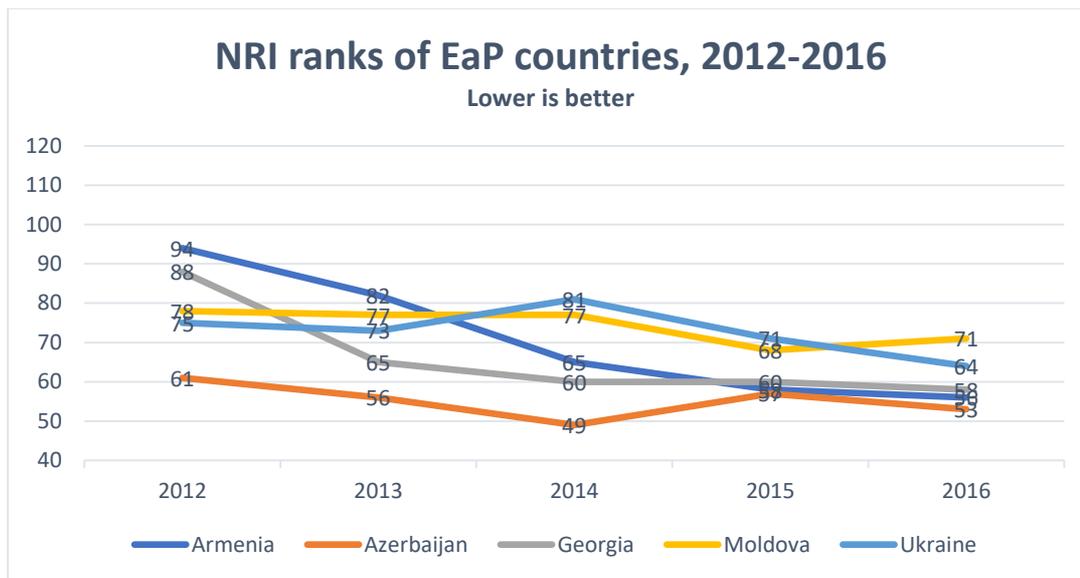
- A. Environment sub-index
  - 1st pillar: Political and regulatory environment
  - 2nd pillar: Business and innovation environment
- B. Readiness sub-index
  - 3rd pillar: Infrastructure
  - 4th pillar: Affordability
  - 5th pillar: Skills
- C. Usage sub-index
  - 6th pillar: Individual usage
  - 7th pillar: Business usage
  - 8th pillar: Government usage
- D. Impact sub-index
  - 9th pillar: Economic impacts
  - 10th pillar: Social impacts

The figure below demonstrates the EaP Countries' rankings dynamics among 139 countries.

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<sup>44</sup> The Global Information Technology Report (GITR) 2016. Preface, p.V

Figure 23 Networked Readiness ranking dynamics, EaP countries

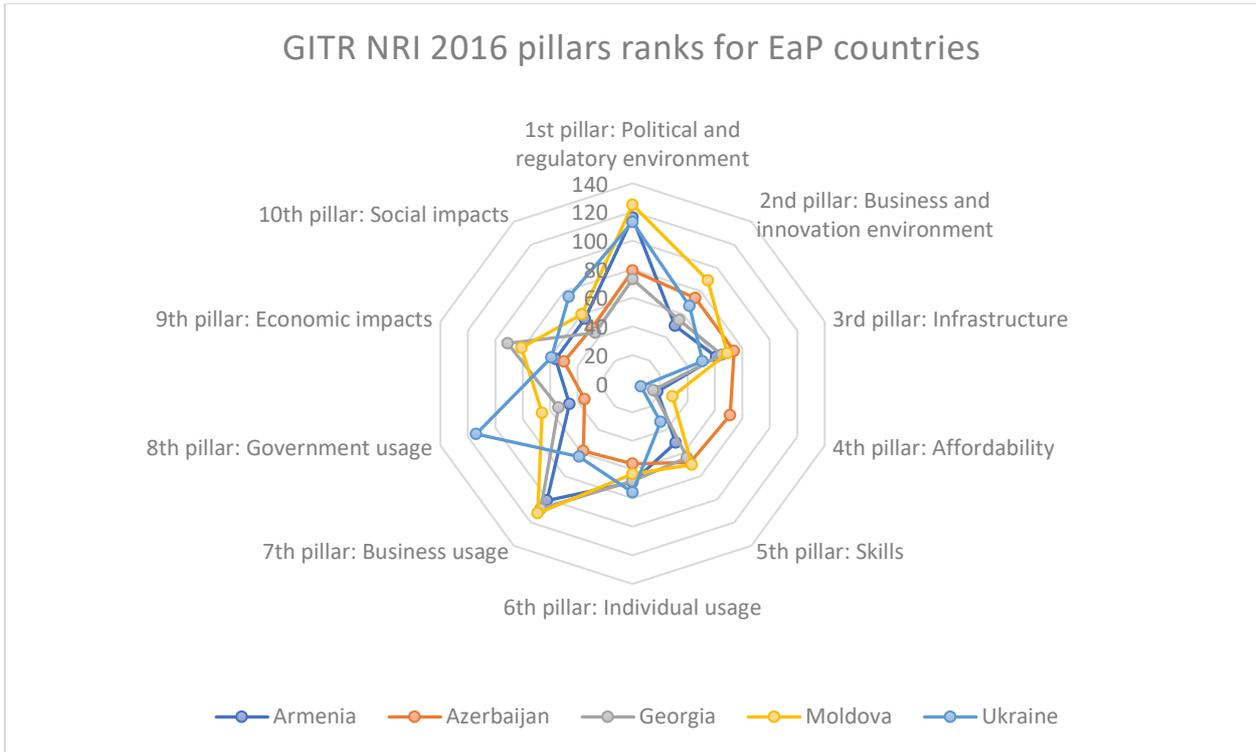


The analysis of NRI rankings shows that there is the overall positive dynamics for five EaP countries<sup>45</sup> from 2012 to 2016. For Armenia, Georgia and Moldova the progress was linear, some fluctuations observed for Ukraine and Azerbaijan, however all countries occupied higher ranking spots in 2016 in comparison to 2012. It's also noteworthy that the countries are grouped close to each other in the middle-tier, allowing to consider transferability of certain future policies and strategies between the countries.

The countries ranks' snapshot according to NRI ten pillars for 2016 NRI is provided below.

<sup>45</sup> Belarus is not the part of the report, similarly to other WEF rankings.

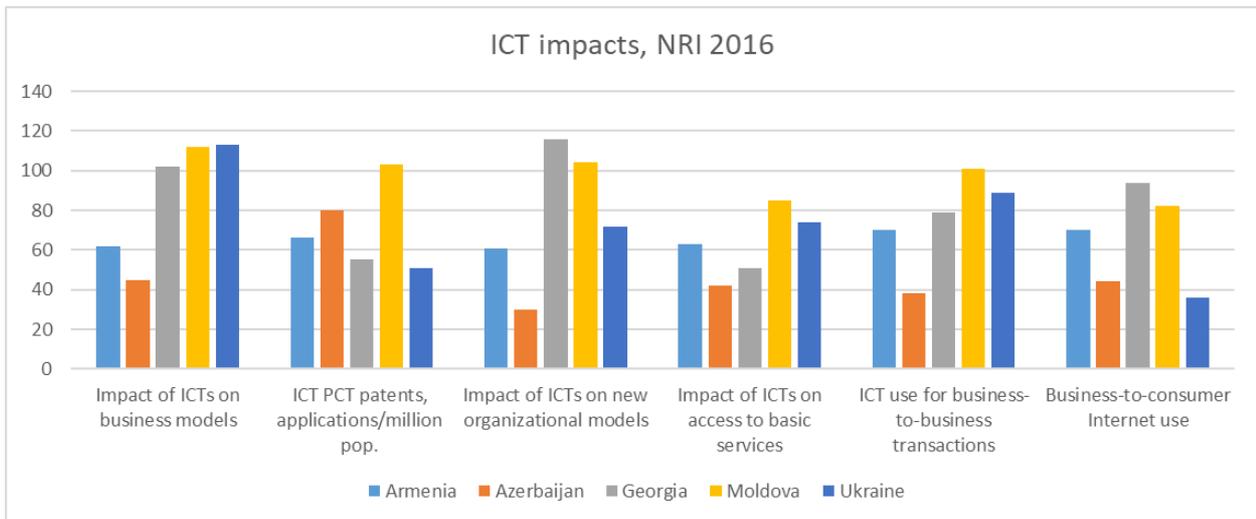
Figure 24 EaP countries ranking in Networked Readiness Index 10 pillars



The pillars radar chart for 2016 shows some apparent similarities of EaP countries. The strongest scores are demonstrated in the 4<sup>th</sup> pillar – affordability. Namely, Ukraine is ranked 6<sup>th</sup> among 139 countries, Georgia 15<sup>th</sup> and Armenia 18<sup>th</sup>. The weakest pillar was Political and Regulatory Environment with Moldova (125), Armenia (116) and Ukraine (113) all appearing in the last tier. The next weakest pillar is Business Usage with Moldova (112), Georgia (108) and Armenia (101) ranked below 100.

Grouping ICT impacts indicators gives another perspective of ICT enabled business environment development in the region’s countries.

Figure 25 ICT impact sub-indexes, EaP countries

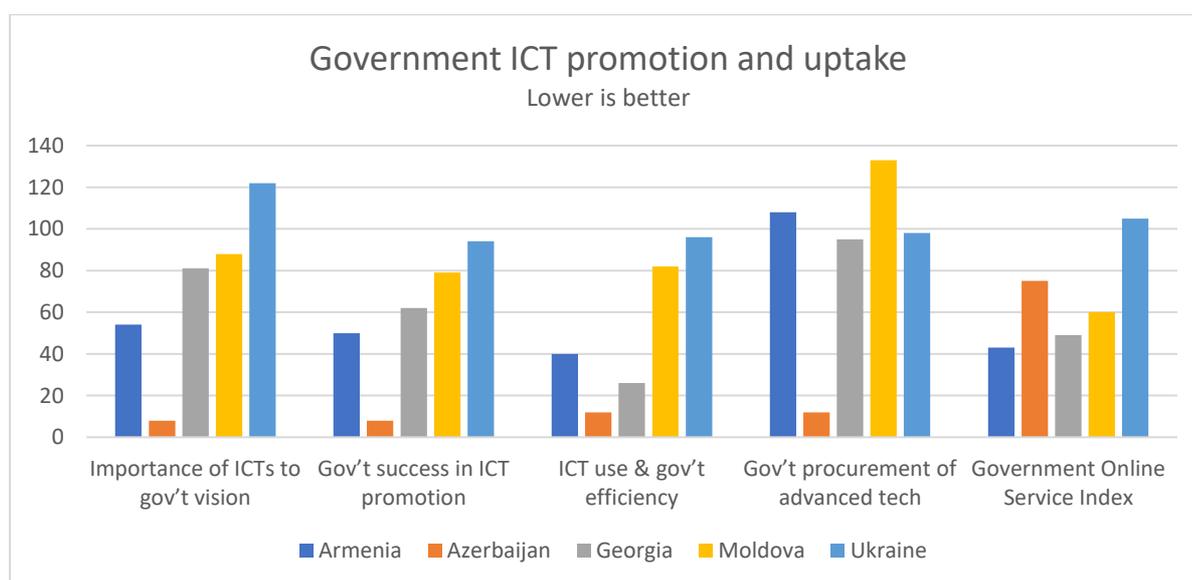


Azerbaijan shows the highest overall rates in the region almost for every indicator. It has the highest positions in: ICT impacts on businesses ranking 38<sup>th</sup> in ICT use for business-to-business transactions; 30<sup>th</sup> in Impact of ICTs on new organizational models; 42<sup>nd</sup> in Impact of ICTs on access to basic services. As for the most problematic area - Impact of ICTs on business models was still weakest in EaP region.

The next chart provides assessment of Government’s role and efforts in promotion of ICTs and technologies. This dimension contains the following indicators:

- Importance of ICTs to government vision
- Government success in ICT promotion
- ICT use & gov’t efficiency
- Government procurement of advanced tech
- Government Online Service Index

Figure 26 Government ICT promotion NRI rankings, EaP countries



Azerbaijan is a clear leader in the vision and promotion of ICTs in EaP region. Its scores are globally competitive in 4 out of 5 indicators. Namely: Azerbaijan is 8<sup>th</sup> in Importance of ICTs to gov’t vision and Government success in ICT promotion; 12<sup>th</sup> in ICT use & gov’t efficiency and Gov’t procurement of advanced tech. The latter category is considered important for innovation ecosystem development, but other countries with exception of Azerbaijan have very weak ranks, ranging from 95<sup>th</sup> (Georgia) to 133<sup>th</sup> (Moldova).

Relatively better standings in Government Online Service Index reflect the EaP countries’ efforts to design e-Government solutions and services, that were particularly articulated in the reporting period.

*Local governments can capitalize on the efforts made by the central government in ICT promotion, or design matching/alternative policies to promote ICT use or service on local level. Procurement of advanced technology could be linked to the attraction of investment or creating necessary infrastructure for local knowledge-intensive economy.*

#### 4. Global and regional markets in sub-sectors

## 4.1. Outsourcing

The outsourcing industry has been actively developing in the EaP countries during the last decade. Whereas Ukraine, Belarus and Armenia have already established their footprint in the global IT outsourcing market, Moldova and Georgia are catching up on a lesser scale. About 90% of software produced in High Technology Park of Belarus is exported mostly to Europe (49%), US and Canada (44%), and Russia/CIS (4%).

The established IT outsourcing centers have been gradually increasing the sales and also started to develop their own products and services.

## 4.2. IT and Business Processes Outsourcing, Technical support and maintenance

The outsourcing of Business Processes and IT services or products development often is considered a niche or workaround for the less developed countries to faster integrate into the global supply chains. Relevant trends shall be put forward from the available sources. Local governments could consider best examples and work with the national or international businesses and stakeholders to develop such facilities where possible.

Outsourcing is usually divided to IT outsourcing, Business Processes Outsourcing and Cloud services.

The IT/BPO global outsourcing market has got traction reaching 85.6 B \$ with IT outsourcing revenue of 62 B \$ and BPO – 23.6 Billion \$ and is projected to grow during the next years for IT outsourcing and 200 B \$ for Cloud computing, with the US customers covering 85% of it. About 31% of IT services were outsourced in 2017, with growth also recorded in healthcare and financial sectors.

According to Outsourcing Insight<sup>46</sup> the major trends in outsourcing to consider are:

Cloud Computing; Information and Data Security; Intelligent automation and Robotic process automation; rise in freelance and independent outsourcing services; high-tech call centers.

Whilst IT outsourcing sub-sector has contributed to the steady uptake of the outsourcing sector by consistent engagement of the IT talent and larger investments, Business Processes Outsourcing gets recently more attention as relatively easy for entry investments and shorter returns time. BPO is a highly competitive segment, and needs smart specialization and diversification in order to develop it. Traditional call centers are inevitably declining, losing to Chat-bots and AI. However, it is also projected to grow reaching 200 B \$ in 2022.

Another segment that is projected to grow significantly is Engineering R&D services Outsourcing. According to Market Study Report its global market size could reach \$ 650 B in 2025. Belarus and Ukraine are already participating in the segment, and strong STEM and Engineering education is a precondition to expanding capabilities to compete. Along with North America and Europe, Asia-Pacific region is becoming the largest market for ER&D services.

All the EaP countries except Azerbaijan have taken certain steps in outsourcing, Belarus and especially Ukraine considered leading destinations. Moldova has ongoing projects, and Georgia's IT outsourcing capabilities are not properly evaluated, but there are centrally managed initiatives of supporting BPOs through Enterprise Georgia program.

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<sup>46</sup> <https://www.outsourcinginsight.com/outsourcing-trends/>

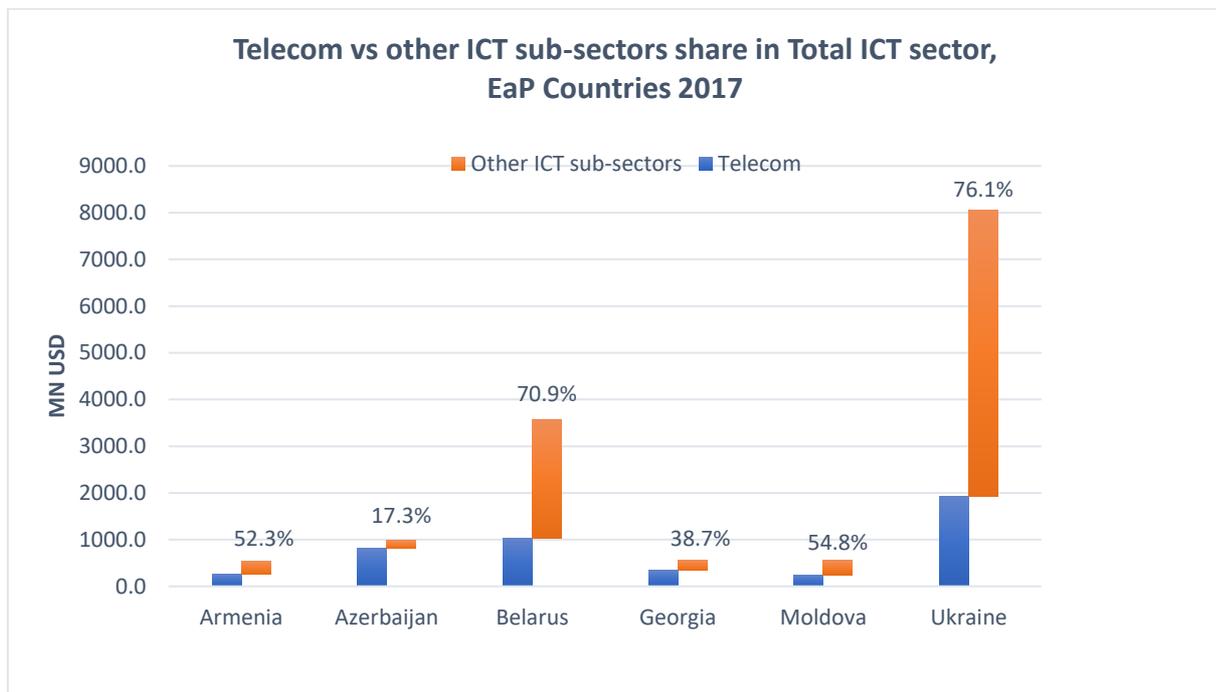
*Cities and Municipalities could work with businesses to complement their efforts and meet their needs in creating Outsourcing capabilities by providing infrastructure and resources.*

Telecommunications sectors in all EaP countries are established industries following the global trends. The Telecom providers’ revenue in dollar values has declined over the last 6 years.

At the same time, the number of broadband and mobile broadband subscriptions has grown steadily, reaching sufficient speeds and connectivity levels for considering the IT-enabled economy development.

The share of Telecom in overall ICT sector output differs from country to country.

Figure 27 Telecom and non-Telecom sub-sectors share in EaP countries



Note: Analysis based on - Yearbook of Statistics, Telecommunication/ICT Indicators 2008-2017; Statistical Yearbooks of EaP countries.

In Ukraine non-Telecom ICT sectors account of 76.1% of total ICT industry output, in Belarus – 70.9 %, while in Azerbaijan Telecom dominates the ICT sector with 70% and other ICT sectors contributing to only 17.3% of the total ICT sector output. In Moldova and Armenia, the Telecom share is less than 50%, and in Georgia - more than 60%.

This chart again demonstrates the strength of Ukraine and Belarus Software and IT services sub-sectors in both absolute values and share in overall ICT industry output. Better developed non-Telecom sub-sectors also provide better opportunities for the local ICT industry development. Unlike the Telecoms, these sub-sectors depend on a higher number of local stakeholders and a higher number of ICT specialists.

## 5. Regional Trends

Due to a highly interconnected nature of the IT industry, regional IT economies' common trends and requirements are mostly influenced by the global market trends analyzed above, and the readiness to integrate to the global value chains.

The fueling factors for regional leadership in certain sectors are a national initiative or policy, international cooperation frameworks, historical strength of the IT sub-sector, human capital development, connections to diaspora, etc.

According to the various indexes and country reports, Ukraine and Belarus could be considered regional leaders in IT business, followed by Armenia and Moldova. Georgian and Azerbaijan policy-makers have demonstrated strong commitment to the development of e-Government and e-services, however their IT business sector is less competitive.

In case of Ukraine and Belarus the larger size of the economy and IT workforce undeniably makes them better positioned for playing noticeable roles in parts of the global IT market, especially in the IT services outsourcing and more recently in Startups development.

Armenia continues to develop its IT business capitalizing on the historical computer engineering tradition, skilled workforce, presence of Multi-National Companies (MNCs), and strong connections with diaspora, that provides resources and access to markets. Some successful companies have managed to attract solid VC investment and reach a global recognition. E.g. Picsart – online photo sharing and editing platform, Sololearn – a free online/mobile learning platform offering coding classes, Betconstruct online gaming solutions company, and others.

Moldova is in the process of confirming itself as a competitive outsourcing destination that includes IT outsourcing. Some fintech startups have also proved successful.

Georgia is putting its efforts in creating a competitive innovation ecosystem, attractive business climate and expand on the e-Government services and solutions. Modernizing education and investing in e-skills development are also among the priorities of the Government.

Azerbaijan has also prioritized ICT sector development starting with the e-Government and e-services successful rollout, investment in education, and lately in Startup and IT entrepreneurship support.

The most common characteristic of IT sector in the EaP countries is positioning as outsourcing destination for software development and related services. Ukraine and Belarus are leading the trend with established IT clusters and highly qualified workforce. Many companies active in both countries regularly appear in the list of top 100 outsourcing companies. Armenia could also be considered an established outsourcing destination, with continuing growth in the number of IT specialists and innovative IT products and services. Moldova is growing in the similar direction and Georgia has been investing in Business Processes Outsourcing. Azerbaijan investments in the IT education might also lead it in this direction.

Another trend fueling the outsourcing market is a growing number of IT specialists. Again, Ukraine and Belarus have the largest number of IT specialists with a range of specializations. IT workforce is also growing in Armenia and Moldova, and at a slower pace in Azerbaijan and Georgia. There is certain regional competition, especially between Ukraine and Belarus, whilst Armenia is a sub-regional leader, with possible emerging competition from Georgia.

Considering the overall growth of the global IT market the outsourcing needs shall also grow, and more IT specialists shall be needed. Even if competition remains, the demand from Western markets and growing domestic markets shall keep the IT specializations competitive. However, negative

demographics and IT workforce salaries growth trends in some countries like Moldova could also endanger further expansion of outsourcing services.

Another common attribute of the IT industries in the EaP countries is their relatively small domestic size or share, with the exception of Telecoms. The export orientation is fueled by the mentioned above large share of outsourcing in the IT industry of the countries. The overall size of the domestic market shall also grow with the national digital economies' development as well as the increasing demand for IT services, however the export/global orientation of the EaP countries IT sectors (with the probable exception of Azerbaijan) shall remain the core defining factor in medium term.

The trend of developing own IT products and services, complementing outsourcing market is considered by analysts a healthy next step in maturing IT industries. Ukraine, Belarus, and on a certain scale Armenia and Moldova started to diversify their IT services portfolio with innovative own solutions.

Countries with higher quality IT workforce are offering R&D outsourcing services in software development, software and hardware testing, research, etc. These efforts are having spillover effects on the IT companies' capacity growth to develop own products and services.

Another common differentiating feature of the IT service industries in the EaP countries is their focus on quality products and services in contrast to some other global outsourcing destinations, and that already has leveraged the perception of region's outsourcing business to a higher level. This is mainly applicable to the leading companies in Ukraine and Belarus, who are represented in top 100 outsourcing companies list with 16 and 6 companies respectively. Moldova and Armenia could also provide good examples, and Georgian cases of higher-level IT outsourcing projects development are mostly anecdotal but confirmed.

Georgia, Moldova and more recently Azerbaijan have implemented sound e-Government projects. Significant part of the talented IT workforce was concentrated in Government in-house development teams in Georgia. Exporting reforms experience in e-Government is a specific niche market (currently successfully explored by Estonia). Georgian developers and IT project managers have been involved in pilot e-Government projects in other regions (Middle Asia, Middle East), and this direction still holds the potential to engage software development teams from Georgia and Moldova.

Ukraine's vibrant startup scene has also expanded to the new Civil Tech direction offering innovative solutions and applications serving e-Government and e-Democracy. More IT professionals and companies could be involved in further development or provision of e-services to citizens, and this is applicable on local levels as well. E-participation instruments on local levels could be developed by engaging local IT companies and professionals. Innovative informational or citizen reporting tools could be also considered.

Another sub-sector present in the regional IT outsourcing market is Business Processes Outsourcing. Georgia supports it on the central level through Enterprise Georgia Programme. In Moldova it has been an established business. If R&D offshoring support is a complex exercise, a Business Processes Outsourcing segment of the outsourcing market could be more attractive for local governments to consider.

*That is mostly acknowledged by the national level policy makers, and that should be also considered during developing local projects and IT strategies.*

National markets are often driven by the FinTech sector that has finances and customer base to develop or purchase core IT systems, applications and analytical tools. Other typical local software

packages include Accounting software, ERP, CRM, Document Management systems. IT services include integrations, ad-hoc projects, vendor specific software packages deployment, maintenance and administration. Web-development and web-design are also offered routinely in all the countries. Digital and Social Media marketing is also growing in all the markets. The niche market exists for e-Healthcare solutions<sup>47</sup>. Other country specific directions include Online gambling solutions (Georgia), Photo Design apps (Armenia), Game development (Belarus), Blockchain based products and services (Ukraine), e-Government applications (Azerbaijan), apps and API development (Moldova).

Brief snapshots of each country specifics are provided below:

According to EIF report: the Armenian ICT companies mainly specialize in embedded software development, semiconductor design, customized software, outsourcing, financial software, multimedia, web design, information systems, and system integration. Armenia has made significant gains in semiconductor design and the creation of related intellectual property.<sup>48</sup> International Companies open R&D centers in Armenia to support their products development, and also for integration of local innovative solutions.

Azerbaijan IT sector is one of the four target sectors of economic diversification in the country and is mostly driven by the government initiatives. E-Government and e-services solutions have been rolled-out, and e-education programs have been launched in schools and universities. The projected average annual growth rate of the IT market is 12% with the IT services and software to grow by 16%. Government digitalization, broadband internet and digital transformation of the private sector shall drive the growth.

Other trends include Satellite telecommunications development and opening of the Center for Study and Development of the cryptocurrency market and blockchain technology.

Belarus High Technology Park resident companies specialize in: outsourcing of services, development of customized technology solutions, development of customized products development and support of products for internal needs, development and support of proprietary products for enterprises, development of customized industry solutions, development and support of mass market products (more information on the HTP is presented in the next section).

Georgia's ICT sector has been active in core banking solutions, other financial software products and APIs, also in e-Government internal systems and e-Services development/implementation, systems integration, web-development and hosting, more recently it has been praised for Digital Marketing services and advertising, that are often exported.

Moldovan IT industry was successful in FinTech, BPO and Product Development, turn-key custom development, dedicated quality assurance, complete solution development, UX, etc.

The Ukrainian IT industry accommodates outsourcing, product development, FinTech, blockchain solutions, applications and platforms development, among many others, and a vibrant startup ecosystem (details are provided in the next section).

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<sup>47</sup> HDM e-Healthcare report.

<sup>48</sup> Armenian ICT sector 2018. State of the Industry Report: Information and Telecommunication Technologies Sector in Armenia. Enterprise Incubator Foundation. Eif.am

## 6. Country specific initiatives and policies

The following section contains profiles and presentations of successful cases from the EaP countries that are often articulated as pivotal and could have a potential for sharing and replication.

### 6.1. Belarus – High-Technology Park

Belarus leadership in quality IT outsourcing is attributed to the central government policy and high-level support to the creation of High Technology Park in 2006. Although having physical premises and facilities, HTP accommodates companies from other locations and offers exterritorial special beneficial regime for resident companies that applies throughout the country, and includes sound tax exemptions and liberal rules for doing business with foreign companies and currencies. The resident company could also be 100% foreign owned.

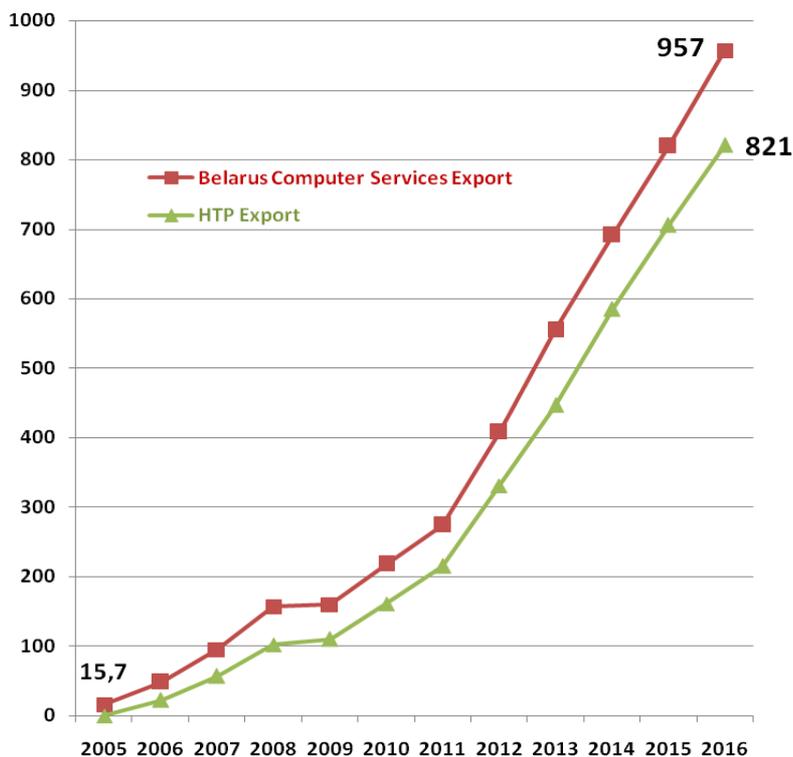
Experts emphasize 3 factors of Belarus HTP success:

- a. high-quality technical education,
- b. highly-skilled IT professionals, and
- c. government support for the IT industry.

During the last 10 years Belarus High-Tech Park became one of the largest IT clusters in Eastern Europe. Its 185 resident companies employ over 30 000 developers that contribute to about 30% of total ICT sector revenue and 85% of all Belarus Computer Services exports, that in monetary value exceeded 1 billion USD in 2017. The major share of 49% goes to North America, about 43% to Europe, and 5% to Russia and CIS.

The dynamics of the IT services exports by the HTP residents shows a consistent upward trend since its creation.

Figure 28 Belarus Computer Services Export dynamics with High Tech Park data



Source: HTP administration

Computer services export by the HTP reached 1.025 Billion USD in 2017, and continued to grow at 38% rate to estimated 1.414 Bn USD in 2018.

HTP residents can provide services in information system analysis, software design and development, IT consulting, audit, networks maintenance, database development, and information systems implementation and support, micro-, opto- and nanoelectronics, mechatronics, telecommunications, radio navigation and wireless communication, information protection, establishment of data processing centers, etc. Among the latest expansions to new fields after the adoption of Presidents' Decree "On Development of Digital Economy"<sup>49</sup> are mining, creation, acquisition, and alienation of cryptocurrency and creation of systems of unmanned vehicle control.

The HTP is specialized in High-Load Systems, IoT, FinTech, Cloud Computing, AR/VR, Machine Learning, Blockchain, thus making it fully engaged into the development of Emerging Technologies.

Custom software development has also become an important part of the IT industry in Belarus. Smartphone applications developed by the HTP residents are used by more than 1 billion people in over 150 countries. The largest success story was the MSQRD application, which was acquired by Facebook and became a part of its core apps offering. Another notable example is the online multiplayer game "World of Tanks" with more than 140 million active users across the world. Viber messenger, Maps.me and Juno have also originated in the HTP. Banking Software has also been developed in HTP covering about 80% of Belarusian banking sector, and also cooperating with international banks and financial institutions, e.g. Bank of America, Citibank, Barclays Capital, Deutsche Bank, London Stock Exchange.

<sup>49</sup> Full text available at: <http://law.by/document/?guid=3871&p0=Pd1700008e>

A business Incubator was established within HTP in 2015 to support IT startup creation and development.

Another important direction of HTP activities is supporting more than 60 joint research labs in Universities. They survey a channel for knowledge transfer to the higher education systems. Specialized educational courses developed by IT companies were integrated into specialized universities' curriculum. 20 branches of University departments of Computer Science are operating in HTP resident companies, providing practical training and guidance for future IT workforce.

Since 2010 High-Tech Park has also established its own IT Academy that provides high-quality short-term courses for adult and young learners.

Considering existence of other IT clusters in Grodno, Gomel and Brest, local governments could consider their proximity in designing IT sector development activities.

## 6.2. Armenian ICT sector

Armenian ICT sector development support has been more distributed among different stakeholders. The IT sector was supported by the Government policies, donor and private initiatives since 2000 with aim of making it a regional ICT hub. The Armenian diaspora also played an important role in connecting the developing IT sector with the world leading companies and markets.

Its notable that the first TechPark was created back in 2001, and Enterprise Incubator Foundation was launched in 2002 jointly by the Government of Armenia and the World Bank.

Special National Budget allocations since 2008 help Armenian IT sector to conduct IT industry research; organize industry-related events of local, regional, and international importance in Armenia, including exhibitions, forums, conferences, and competitions; co-finance joint projects and events.<sup>50</sup>

Another important factor is the established presence of multinational corporations and big IT companies in Armenia. The government supports the activities and projects of such companies as: Microsoft, Alcatel, Hewlett-Packard, Sun Microsystems, National Instruments, Mentor Graphics, Cisco, Intel, Synopsys, D-link, Siemens, Synergy, IBM, SAP and others.

The Engineering City in Yerevan – a PPP between the Government of Armenia and private companies provides full range of advanced equipment, research and prototyping labs, machine tooling and production facilities to its resident engineering companies in the high-tech sector.

It's noteworthy to mention the Microsoft Innovation Center (MIC) established in 2011. MIC focuses on the development of fundamental knowledge in SMEs, design of innovative ICT solutions and improving business knowledge. The focus on SMEs development contributes to the maturing and decentralization of the Armenian ICT business. Half of the 800 active companies in Armenia are located in the regions.

In line with regional engagement goals, Gyumri Technology Center gtc.am was opened in 2014 to support progress of the IT and high-tech development in Gyumri and Shirak regions, and Vanadzor Technology Center vtc.am was open in 2016 to serve Vanadzor and Lori regions.

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<sup>50</sup> Armenian ICT sector 2018. State of the Industry Report: Information and Telecommunication Technologies Sector in Armenia. P.41

Free economic zones and tax incentives are also established to support the IT sector development.

Another important contributing factor to the success of the Armenian IT sector is access to finance. Venture Capital dedicated to supporting Armenian companies has been available in the country since 2011, when Granatus Ventures started investments in startup companies, and in 2018 SmartGate VC Fund made its first investments.

### 6.3. Georgia: Government in-house digitization

Georgia's breakthrough to the information society is closely interconnected with the period of reforms in 2000s, that also resulted in the development of sound e-Government systems and applications. Due to the limited timeline and Government driven innovations, ICT sector development has been made mainly by in-house teams, developing state information systems and applications. They included national registries of population and property, e-treasury and e-budget, e-ID issuance back-office systems, e-customs, electronic tax declarations, government information services and applications, Document Management and HR systems, etc.

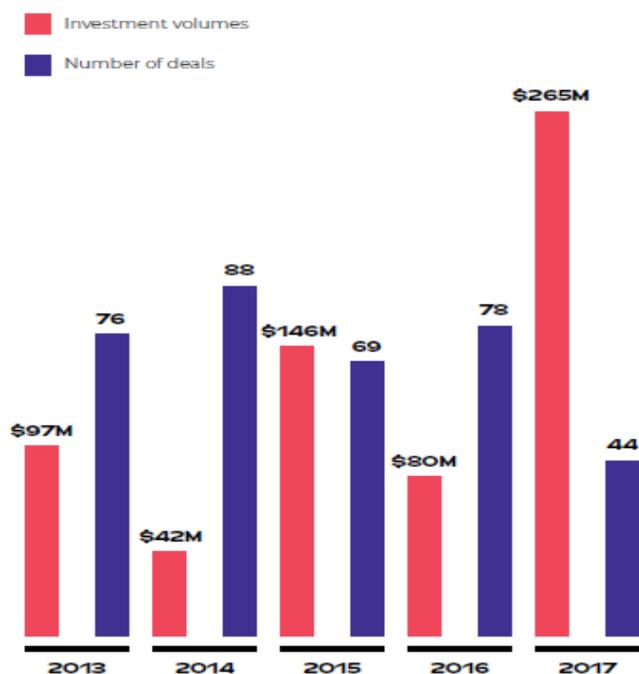
With customer base often spreading to all the citizens of the country, these ambitious projects have contributed to maturing of IT teams within several government entities mandated to provide respective services to citizens and businesses. The traditional IT business sector was mostly concentrated on Computer Hardware wholesale, systems integrations, vendor specific projects, web-development and hosting. Local governments were not covered by the first wave of massive e-government reforms, and thus the potential for capitalization on this experience scaled to the local levels still exists. Other countries could also benefit from Georgia success stories in e-government by designing similar programs that could be supported by the state or donor initiatives.

Only relatively recently the professional IT staff has migrated to private sector, and also new IT talent emerged in Digital Marketing/Media Industries and Startup Scene. This shift is partially attributed to the establishment of the Georgian Innovation and Technology Agency (GITA) aimed at supporting mostly high-tech and IT innovations through funding, mentoring, infrastructure development and networking. The Agency and other players have transformed the early stage IT business development and opened opportunities for its expansion to international markets. However, unlike other EaP countries, a vast majority of the Georgian IT startups still reside in a seed-investment stage.

### 6.4. Ukraine Startup Ecosystem

Ukraine is on the way to establishing a strong presence in the global startup ecosystem. About 290\$ million were invested in Ukrainian startups in 2018, and 265\$ in 2017. The recent dynamics of startup funding and deals is provided below:

Figure 29 Investment Volumes in Ukraine startups



Source: Unit City Report

A number of startups are considered to be on the way to becoming Unicorns (valued at least at \$ 1 billion). Most notable names include Grammarly - popular writing enhancement platform; Readdle – a well-known software and app development company; Poptop – an event planners and suppliers matching platform that has raised \$780 million; Genesis – high-tech companies building platform; MacPaw - an award-winning Ukrainian company providing software utility products for PCs and Mac computers, and others.

Ukraine is one of the 14 hotbeds of blockchain innovation according to the Blockchain Research Institute. In 2017, local companies raised US\$160 million in ICO (Initial Coin Offerings).

What contributes to Ukraine’s startup ecosystem dynamic success?

All needed components to make a startup ecosystem thrive are available and gain momentum. That includes active Venture Capital, and Venture Capital Association. Local Venture Funds like Aventures Capital, Chernovetskyi Investment Group, Horizon Capital, U.Ventures (created by USAID funded Western NIS Enterprise Fund), and others<sup>51</sup>.

The Business Angels Network estimates that Angel investors have invested into Ukrainian early stage startups 11 million USD during the last 3 years.

Strong technical education with more than 400 higher education institutions is producing more than 36 000 IT graduates per year. In addition, other people are also changing career tracks and switching to ICT thanks to numerous private tech schools and courses available across the country.

<sup>51</sup> Techecosystem Guide to Ukraine 2019. Unit City.

*Local governments in Ukraine and elsewhere could consider supporting or establishing IT/Tech Adult Education centers aiming at people willing to change specialization and enter IT related professions.*

The IT tech community is largely self-organized. Its largest online community dou.ua offers profiles of tens of thousands of developers and provides vacancies to them. According to its estimation, the total headcount of IT specialists in Ukraine has grown to 160 000 in 2018 <sup>52</sup>

The trend of opening R&D offices in Ukraine is supported by such companies as Wix.com, DataRobot, PlayTech and SimilarWeb. There are more than 110 R&D centers in Ukraine concentrating on telecommunications, software development and other fields. Kyiv, Dnipro, Lviv, Kharkiv, Odessa and Vinnytsia are other major locations for outsourced R&D with US companies having 45% representation, followed by EU and Israel.

The Startup and IT ecosystem is well developed across the country.

There are more than 50 co-working spaces and hubs spread across 20 locations, with largest numbers in Kyiv, Lviv, Dnipro, Kharkiv and Odessa.

Digital Innovation, AR/VR, prototyping, and full-cycle hardware production are operational and active.

*Contributing to the creation of co-working, meetup spaces and hubs in their municipalities could be considered another viable and welcomed initiative for local authorities. The universal model of startup ecosystem development has no boundaries and these foundational pillars of entrepreneurial and startup ecosystem could be considered feasible and yield results in a relatively short period of time.*

Business accelerators are also available; 6 corporate acceleration programs were launched since 2015 leveraging Ukrainian companies' ability to capture and develop markets. E.g. 1991 Open Data Incubator led by serial entrepreneur Viktor Gursky is a non-commercial incubator that supports big data startups.

A number of Tech Events serve experience and knowledge sharing of different professional IT communities like software developers, .NET developers, Java developers, internet marketing, IT service, mobile, VR and AR, SaaS, testing, banking, blockchain, investors, entrepreneurs, etc.

Communities and networks provide live interaction and exchange opportunities for tech professionals and entrepreneurs.

It's important to note that large IT industry players are constantly showing interest to the local startup scene and have made several big acquisitions over the last couple of years. Google has purchased Viewdle, the local facial recognition company; Snapchat has acquired Lookserly, which does a real-time facial modification of photos; and Oracle has bought Maxymiser, a provider of cloud-based software for marketers.<sup>53</sup>

## 6.5. Moldova IT sector and outsourcing uptake

The Moldovan IT sector is relatively small in size but its steady increase has resulted in growing share of national GDP and exported services. IT has accounted to 5.7% of Moldova's GDP. "With an average increase in exports of 0.7 percentage points annually since 2009, the IT services have been one of

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<sup>52</sup> <https://dou.ua/lenta/articles/jobs-and-trends-2018>

<sup>53</sup> <https://magazine.startus.cc/ukraine-making-waves-global-startup-ecosystem/> 01.03.2019

the major drivers for Moldova's economic growth (with a 4.5% increase in real GDP in both 2016 and 2017)."<sup>54</sup>

Moldovan IT companies have been contributing to a variety of products and services to the US and European companies in Fintech, Automotive and Telecoms through outsourcing.

The combined IT services market was estimated at 154.4 million USD in 2018, growing from about 107.5 million USD in 2016. The domestic market size has grown from \$27.5 million to \$33.5 million, and exported services have increased by 50% from around \$ 80 million to \$120.90 million.

The increasing migration to Cloud technologies in the domestic market shall increase the demand for IT consulting and support services.

*Local Governments could embark on moving to cloud technologies, considering significant cost saving and overall trends. The capacity to provide necessary deployment and support services exists in every country.*

Another indirect impact of the growing IT sector is an increased demand for the IT and technical education services segment.

*By providing infrastructure/facilities and promoting IT education locally, municipalities could contribute to the skilled labor market development.*

The IT services related outsourcing used to be a key growth segment, but due to the projected market saturation, other segments of outsourcing that include creative industries (game development, video creation/editing, graphic design) and R&D and Engineering services are considered as having a higher growth potential. Business Processes Outsourcing as a complex convergence of specializations could also be projected to grow, based on the workforce shift toward IT related specializations.

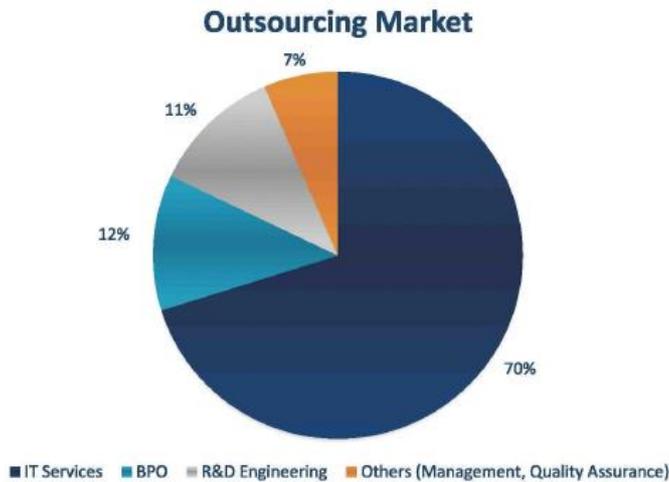
*BPO could be considered another sector having some potential to be supported by local governments. Support from the central governments or industries is necessary; however, for local workforce local governments' support could represent a viable alternative for re-specialization and entering the IT industry.*

The current structure of the outsourcing market in Moldova is provided by IDC.

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<sup>54</sup> Moldovan IT Players Priming for Worldwide Presence study by IDC. 2019

Figure 30 Moldova Outsourcing Market sub-sectors share



In addition to outsourcing, Moldovan IT companies are specialized in:

“Package implementation and support, turn-key custom development, dedicated quality assurance, complete solution development, embedded or specialized systems development, and web and mobile development, including UX and branding.”<sup>55</sup>

The latest developments in the Government support to IT innovation include the passing of the “Virtual IT Park” law in 2018. While offering competitive tax incentives, the law was successful in attracting IT companies that currently amount at 380. Eligible activities include software development, data processing, IT consulting, hardware management, R&D, animation, digital design.

At the beginning of 2019 Moldova opened another digital innovation center in the M4EG signatory city of Balti, thus creating a regional hub for upskilling young people. That could be considered a significant asset for the cities’ IT-related plans implementation.

#### 6.6. Azerbaijan: Government driven growth

ICT was declared the second most important sector of the Azerbaijani economy, and investments into infrastructure, e-services and digital solutions have leveraged the country’s rankings to the highest in the region in the Network Readiness Index. E-Government spending contributed to the bulk of the IT sector development and its dynamism creates some potential for further innovations and investment attraction. Local municipalities could consider faster integration into the available online service systems and upskilling their population to become more frequent and competent digital users, but also to expand their online activities. Currently the state e-government portal offers 442 e-services of 26 state agencies.<sup>56</sup>

Similarly to Georgia, fully digitized back office e-services are offered in Azerbaijan through physical visits to service agency offices spread across the country. At the same time, digital signature opportunities have expanded to the mobile ID, and its uptake by business organizations for online transactions and e-commerce is another positive trend.

<sup>55</sup> Moldovan IT Players Priming for Worldwide Presence study by IDC. 2019

<sup>56</sup> <http://mincom.gov.az/en/view/pages/10/>

The government has opened several technological parks offering tax breaks and exemptions. Lately, the establishment of a top-quality Research and Development Center for High Technologies under the Ministry of Transport, Communications and High Technologies has enabled the country to develop research-intensive products focusing on nanotechnology, artificial intelligence, biotechnology and neuro-electronics.

In recent years, supporting startups has also become a priority for Azerbaijan's efforts to develop a competitive digital economy. The State Fund for Development of Information Technologies has funded hundreds of startups in the field of software, applications, R&D, high technology, air navigation and e-payments. Clean technologies<sup>57</sup> connected to Oil industry also gain momentum. The online payment system Golden Pay is steadily expanding and servicing Azerbaijani businesses in conducting online transactions.

The most recent development is a collaborative project "From Idea to Business" that aims to: conduct startup tours in Baku and regions with the view of providing support to the expansion of the startup movement and the implementation of new innovative ideas of citizens.<sup>58</sup>

Another social innovations and startups support program Innoland is hosted by the State Agency for Citizens Service and Social Innovations and includes an Incubator, an Accelerator, Co-working and virtual residency, IT training and an Education Center.

The NextStep innovation center provides Education Mentorship and incubation programs to early stage companies helping them in development of Minimal Viable Product, grow revenue streams and access the global market. Sup.az intensive 3-month accelerator program offers startups access to capital, mentorship, customer acquisition and product development.

*Government support to the ICT sector uptake and a Startup ecosystem development creates a favorable resource for local governments to consider in their IT roadmaps. Availability of these resources and expertise could help unlocking local IT talent and enabling digital transformation.*

## 7. E-Governance – e-services and their influence on local IT market

### 7.1. UN e-Government Development index for EaP countries

As several Local Governments have prioritized the use of e-governance services on the local level, a short analysis of the state-of-play and development opportunities shall be presented based on the UN e-Government Development Index<sup>59</sup>, country specific reports and expert observations. E-Government development could have an indirect effect on the uptake of internet economy and e-services development in general, particularly in local e-commerce, smart-cities and e-solutions for tourism. Local authorities could also consider best practices for innovation in e-services, smart-city IT solutions<sup>60</sup> and Green economy.

E-Government uptake has accompanied the Information Technology revolution spreading out to all countries during the last 2 decades. While in the early 2000s the world Internet population was just

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<sup>57</sup> Clean technology (clean tech) is a general term used to describe products, processes or services that reduce waste and require as few non-renewable resources as possible. <https://whatis.techtarget.com/definition/clean-technology-clean-tech>. Occasionally interchangeable with Green, but is more often than Green referring to the new technologies.

<sup>58</sup> <http://i2b.az/en/view/index/>

<sup>59</sup> <https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2018>

<sup>60</sup> Examples could be provided from Estonian Smart City cluster hub <http://smartcitylab.eu/solutions> and other sources.

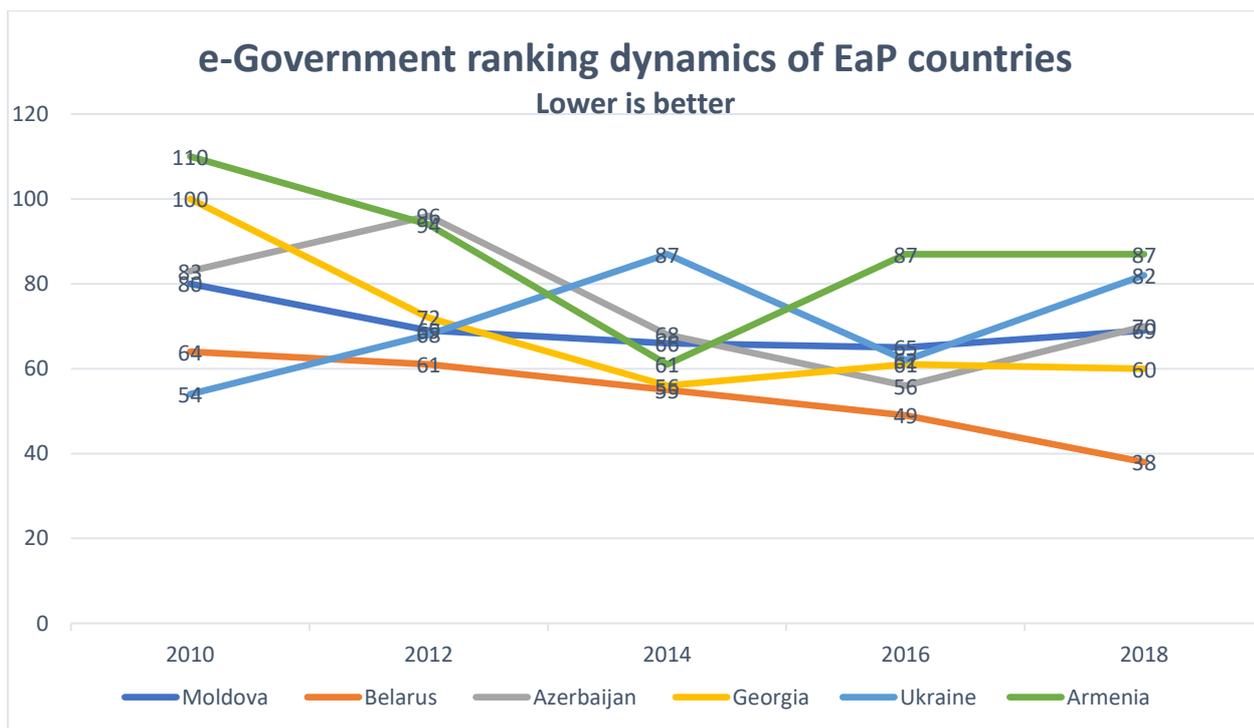
5.8%, according to the current conservative estimations it has grown tenfold to reach 57.3% with growth recorded in every country.<sup>61</sup> The raise of universal connectivity is further bolstered by the mobile penetration rate, that is higher and more inclusive than desktop computer technology. While investing in infrastructure has been an important Government function in order to keep up with the technological progress, the existing rate of connectivity allows the governments to better provide their services, expand outreach channels and collect feedback from the citizens through digital channels – in other words – developing e-Government.

The e-Government policies, tools and innovations have been rolled-out in developed and developing countries alike at a steady growing pace. The UN e-Government index measures the progress made by countries thorough biannual surveys and publishes a comparative ranking based on 3 sub-components: Online Services Index (OSI), Telecommunication Infrastructure Index (TII) and Human Capital Index (HCI).

According to the latest (2018) report: *All 193 Member States of the United Nations had national portals and back-end systems to automate core administrative tasks, and 140 provide at least one transactional service online.*<sup>62</sup>

Overall indexes and ranking of the EaP countries among 193 States have been improved since 2010 as seen from the chart below.

Figure 31 UN e-Government ranking dynamics, EaP countries



Belarus has a linear progress during the last decade climbing to the high-performing group of countries with index above 0.75 in 2018. Georgia has progressed from 100<sup>th</sup> position in 2010 to 60<sup>th</sup> in 2018 due to significant efforts in e-Government development. Moldova has demonstrated

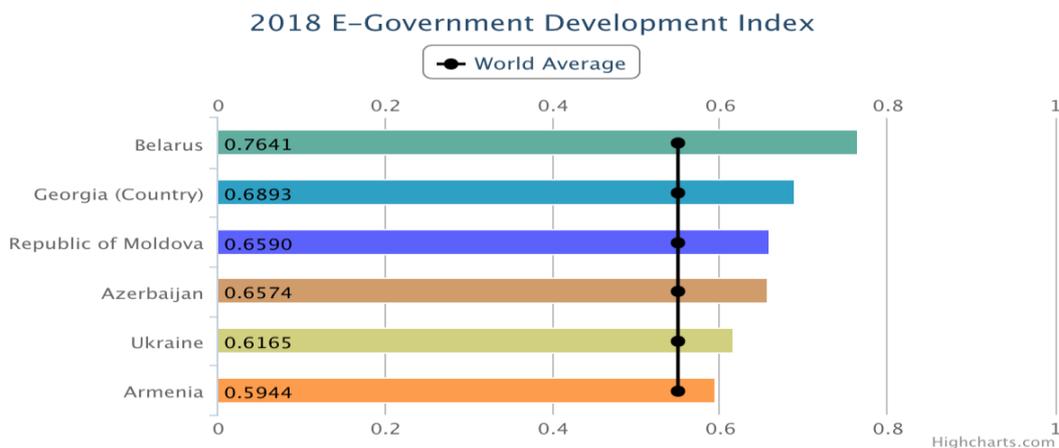
<sup>61</sup> <https://www.internetworldstats.com/emarketing.htm> for June 30<sup>th</sup>, 2019

<sup>62</sup> UN e-Government Survey 2018 <https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2018>

moderate overall improvement settling at 69<sup>th</sup> place. Azerbaijan, Ukraine and Armenia have mixed dynamics.

The current (2018) index values normalized in the range of 0 to 1 put all the countries above the World Average.

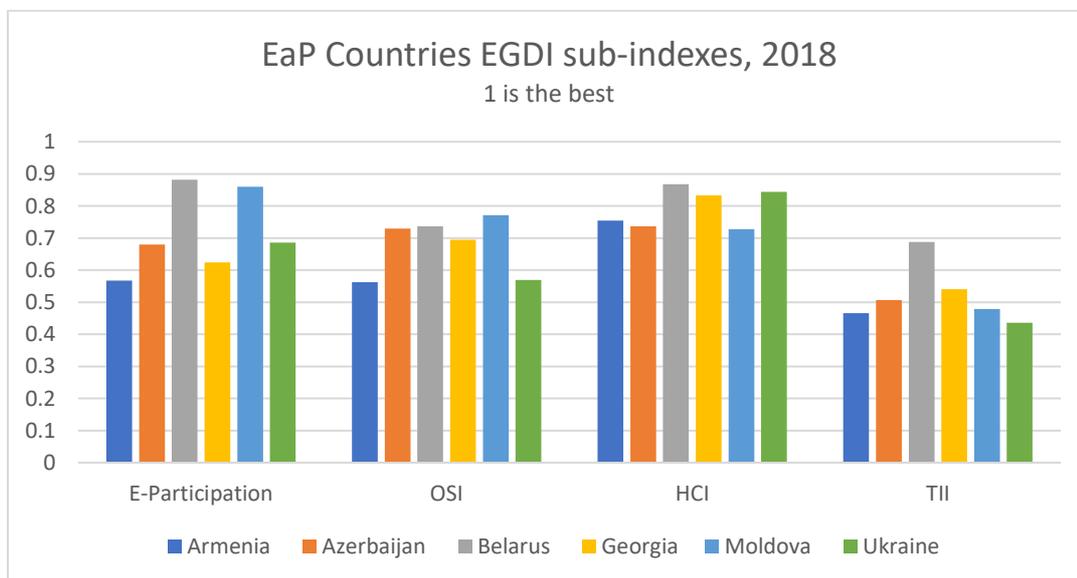
Figure 32 EaP countries 2018 e-Government Development Index values



Source: UN E-Government survey 2018

The more detailed sub-indexes comparison provided below also includes e-Participation index measured separately.

Figure 33 EaP countries E-gov Development Index sub-indexes



Online services index (OSI) value that might be the most important component for local Governments to consider capitalization on, shows relatively even middle-tier results for Moldova, Georgia, Belarus and Azerbaijan reflecting the countries’ central Government policies to invest in developing and expanding e-services to citizens implemented during the last decade.

Another indicator – Human Capital Index (HCI) shows groups of 3 countries with relatively higher index - Belarus, Ukraine and Georgia and relatively lower index: Armenia, Azerbaijan and Moldova. Belarus is the leader, which is reflected at the 21<sup>st</sup> place in the World, followed by Ukraine at the 31<sup>st</sup>

place, and Georgia at the 37<sup>th</sup>. Investing in IT skills and education at local levels could increase the digital literacy and competence levels necessary for the efficient implementation of IT projects or developing digitally savvy local businesses.

The e-Participation index gives a different picture. It reflects countries' government efforts to provide their citizens with online tools to participate in governance. There are 2 clear leaders – Belarus and Moldova positioned at 33<sup>rd</sup> and 38<sup>th</sup> places respectively.

*E-Participation is often considered the most efficient at the local Government level, where a variety of proved tools and instruments exist to engage citizens in decision making. Be it e-petitions, e-consultations or e-budgeting. Shall it be considered a priority for local government to focus on, specific projects could be designed and supported from different sources, including donors, central governments, consultancies, EU funds, or own budgets.*

## 7.2. Innovation Support through State Procurement

Government could promote innovation not only by specific programs, but also by supporting procurement of innovative products.

Specific legislative changes are initiated in Georgia to include a term of innovative procurement, and develop relevant regulations and tools. Public Procurement of Innovation (PPI) is an established practice in European countries.

Local governments could consider innovative procurement in their regular purchases, that could include any sector of the economy. Innovative procurement tools were launched in Ukraine based on the Blockchain technology. These solutions are scalable to the local governments' level, and could not only bring fiscal benefits, but promote the image of local government as innovation supporters.

## 8. Startup and ICT innovation ecosystems and enabling services

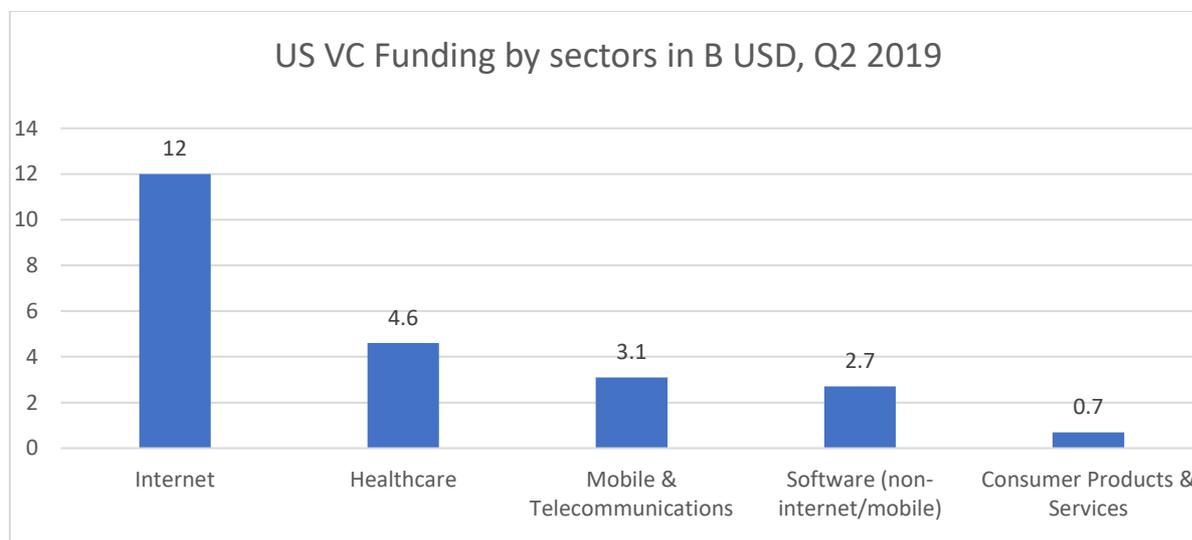
Another global trend that has funneled resources of international, regional and state actors to rapid IT/digital growth is support of Startup Ecosystems that often are mostly targeting the development of disruptive/transformational IT services, applications or software. Some local governments are already involved in that trend (e.g. Tbilisi Spark Accelerator, Sevan Startup Camp). Others could consider a relatively low-hanging fruit with spillover implications to the IT-enabled local development.

The Startup support and development, initially associated with the leading technological innovation clusters like Silicon Valley, US East Coast, or Israel, has become a common policy line in many countries and sub-national entities. The ultimate goal of a technology or high-tech startup is to convert the precious new idea into a running business that could be either rapidly converted into a profitable enterprise under the founders' ownership or could be supported by seed-funding and later by VC funds in exchange to share appropriation. Israel even emerged as a self-proclaimed Startup Nation. The Startup ecosystem itself might be not profitable in the short run, however it's aiming at high valuations and big exits. Also, the known success stories fuel the expectation that it could contribute to the country's integration into the digital economy and global supply-chains.

What are the most recent global trends of the Startup industry?

The dominant US venture capital deals have been concentrated in the Internet, Mobile and Telecom, as well as Software sectors, along with Healthcare. VC backed Internet companies alone got more than half of the total VC funding in Q2 2019.

Figure 34 US Venture Capital Funding volumes



Source: PwC / CB Insights MoneyTree™ Report Q2 2019<sup>63</sup>

The successes, high returns and a growing number of so-called unicorn companies (valuated to cost at least 1bn \$, there were 167 such companies backed by the US VCs as of Q2 2019) keeps the Startup endeavors attractive to both newcomers, Angel Investors, Venture Capital and serial entrepreneurs. The US VC funding is projected to grow to 120B \$ in 2019.

According to the PwC report, latest trends show that:

- Internet, Software and Mobile outpace other sectors.
- Startups selling Internet SaaS (Software as a Service) solutions dominate deal activity.
- FinTech and AI attract the most deals, followed by Digital Health and HR Tech.

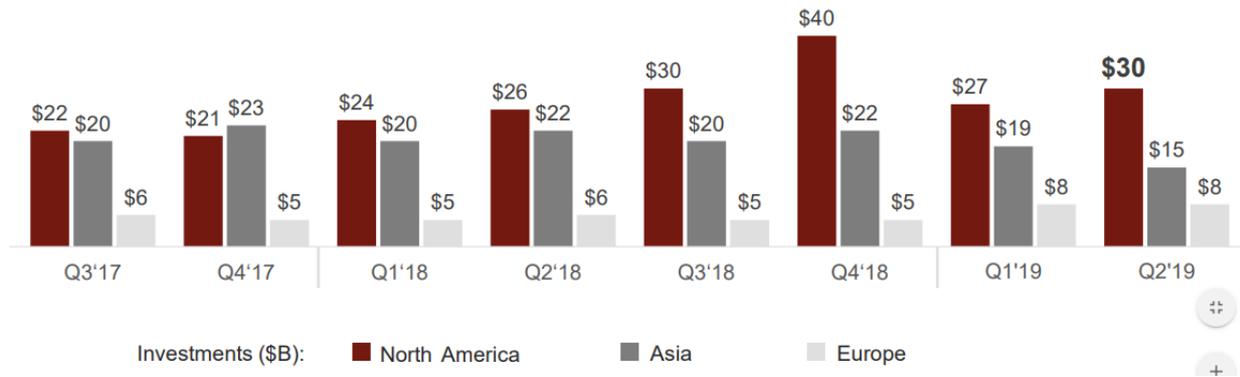
According to the PwC report, the US funding equals or exceeds that in Asia and Europe combined starting from 2018.

Global VC funding volumes are estimated at Billions USD.

<sup>63</sup> <https://www.pwc.com/us/en/moneytree-report/assets/moneytree-report-q2-2019.pdf>

Figure 35 Global Venture Capital funding dynamics. US, Asia, Europe

## Global dollar funding: North America, Asia, and Europe



Source: PwC / CB Insights MoneyTree™ Report Q2 2019<sup>64</sup>

This funding fuels the global Startup economy, attracting scores of beginner entrepreneurs that are often engaged in co-working spaces, tech-parks, accelerators, incubators that are considered foundational building blocks of Startup ecosystems, and are becoming widespread in almost any country or territory.

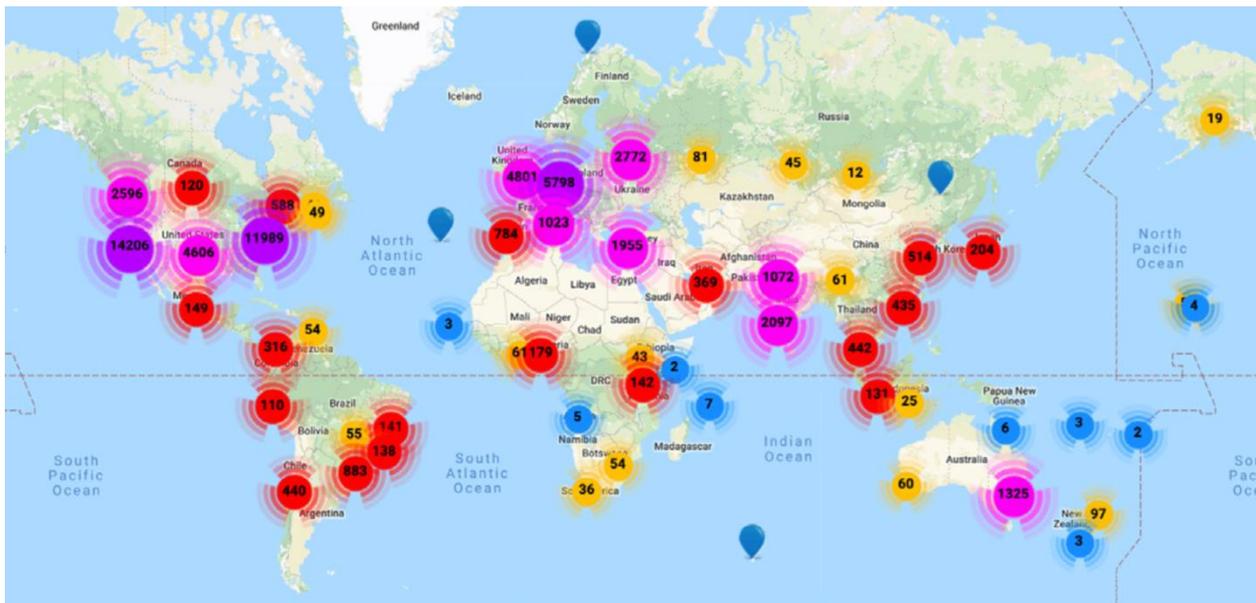
Other key factors contributing to Startup ecosystem success are availability of networking, support organizations, mentorship opportunities and enabling business environment.

What are the global condensation centers for Startup development?

The chart below shows the visualization of Startup counts of 100 countries and 1000 cities based on the analysis of 50 000 data points performed by Startupblink.

<sup>64</sup> Ibid

Figure 36 Startup Ecosystem global clustering infographics



Source: Startupblink startup ecosystem rankings 2019 <sup>65</sup>

The global startup ecosystem map shows, along with the US West and East coasts clusters, one large center around Berlin, and next tier Startup ecosystem centers in UK, Turkey, India, Australia, Midwest US, and Estonia.

The closest to the EaP startup region is Estonia, that is not surprising for the digitally savvy nation that also has produced 4 Unicorn tech companies: Skype, Transferwise (money transfer), Bolt (former Taxify) and Playtech (gambling software).

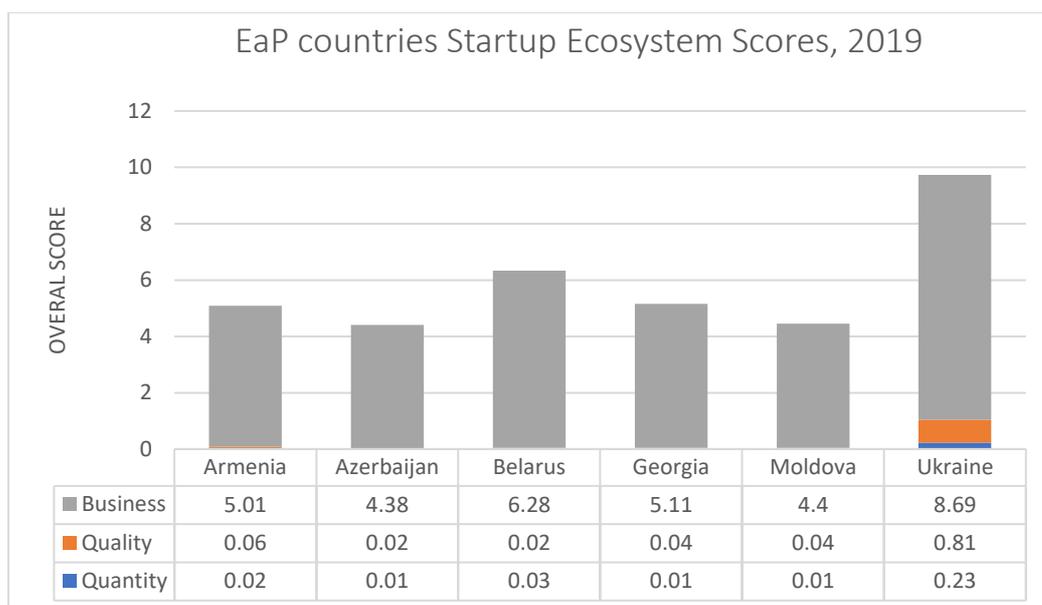
As for the index scores, combining Quantity Score, Quality Score and Business Score the US remains the clear leader with a distant second, UK, achieving only 36% of the US total score of 44. The following top ten countries (Canada, Israel, Australia, the Netherlands, Sweden, Switzerland, Germany and Spain) reside in a relatively close range – with scores between 12 and 16.

Among the EaP countries, Ukraine and Belarus have the best developed Startup ecosystems. Ukraine occupies #31 in the index and Belarus #55. Georgia, Armenia, Moldova and Azerbaijan got comparable scores and are positioned at 62, 63, 67 and 68 places. <sup>66</sup>

<sup>65</sup> <https://report.startupblink.com>

<sup>66</sup> Startupblink startup ecosystem rankings 2019 <https://report.startupblink.com>

Figure 37 EaP countries Startupblink Startup Ecosystem Scores



Note: Quantity Score, Quality Score and Business Scores are combined in the overall score represented by the vertical bars. The methodology available at <https://report.startupblink.com>

In Ukraine, the startup growth momentum is reflected in high number of High-Tech startup support programs and initiatives attracting a large number of innovators and IT startups, also mentioned in the previous section. The capital city Kiev is ranked number 34 globally as a vibrant Startup hub. Odessa, Lviv, Kharkiv and Dnepropetrovsk are also notable innovation hubs. There are more than 1000 startups around the country and several success stories of high-value exits – acquisitions of startup IT companies by large corporations.

Belarus is ranked #55 in StartupBlink Startup Ecosystem rankings. Its success is connected to extraordinary talent pool of local developers and IT professionals and contribution of High Technology Park described above to the development of innovative products and solutions. The capital city Minsk is placed at 181th place among best Startup hubs.

Georgia has started its systematic efforts in building a national startup ecosystem with the support of the World Bank Genie project. Georgian Innovation and Technology Agency was established in 2014. Technology Parks and Community Innovation Centers were built across the country. Co-working spaces and seed-stage support programs emerge. The number of tech startups accounts for a couple of hundreds, with almost all being stuck in the early stage of development, though. The specialization ranges in AI, AR/VR, Big Data and service companies. In 2019 Georgia has climbed 7 positions in Startupblink rating, reaching the 62th place with the capital city Tbilisi ranked at #311.

The Armenian startup ecosystem, ranked #63, is mostly connected to the capital city Yerevan, that has progressed by 36 positions in the Cities rankings to #159. Innovation and Entrepreneurship is supported by the Armenian government, and the Armenian startup ecosystem is based on a healthy ICT business and bottom-up entrepreneurial activity supported by several VC funds with connections to the Armenian diaspora.

Moldova has also progressed in 2019 rankings reaching the 66<sup>th</sup> place, mainly due to improved international ratings. Its small but talented startup community has produced several success stories that include a FinTech startup SaltEdge aiming to innovate financial sector and create an open financial market place. The capital city Chisinau is ranked #216 globally having a potential to progress

due to the existing talent pool, attractive geographical location, low cost of living and high internet connection quality.

Azerbaijan has joined the Startup ecosystem support trend relatively recently through the Government policies aiming to promote entrepreneurship and the ICT sector. The goal of the Social Innovations Center is to build a first unicorn company in Azerbaijan. Another competitive sector is Cleantech, with CO<sub>2</sub> Catalyzer startup getting international exposure in 2017. Baku occupies #302 spot in global rankings, and is believed to have a potential to progress to becoming a regional hub.

Another important contribution to the EaP ICT innovation state of play analysis is the EaP countries' ICT innovations study (2018) that has attempted to assess relative strengths and weaknesses of the EaP countries Startup and innovation services. In overall, it concluded that the relative strength of ecosystems is concentrated on providing the resource base to innovative entrepreneurship, networking opportunities, and the start-up stage, while the later stages of the innovation process remain very weakly serviced. The report also articulates the relative lack of systemic approach towards certain components considered important stages for Startup companies development process.

The analysis shows that the support to the full lifecycle of Startups development provided by the Armenian startup ecosystem is the most pronounced and rounded. However, other countries also could capitalize on their strengths and opportunities.

## 9. Leading sectors of economy

Quite often it's not only the Technology sector but other leading sectors of the national economies that could have a great potential and elasticity to accommodating ICT solutions for growth, or in other words, digital transformation. The IT-enabled development of different industrial sectors could be more dynamic, competitive and productive to some local economies than investing in the IT sector itself.

As Manufacturing was identified as the most prepared sector to absorb digital transformation opportunities, specific industrial sectors in each economy, and more specifically in each Municipality, should be analyzed for their potential of integrating existing and emerging digital technologies.

More commonly approachable and cross-cutting sectors are Agriculture and Tourism.

Agri-tech initiatives were piloted by the newly created associations and other startup supporting organizations during the last years in forms of organizing dedicated Hackathons, Ideathons, and contests in order to design and develop innovative tools for the digital advancement of the sector.

The most common solutions are related to use of IoT and Big Data in the sector.

Similarly, innovation in Tourism has also gained attention recently through regional competitions and networks. The simplest form of Tourism innovation is related to improving the ICT infrastructure and access to technologies and tools. Specific eCommerce platforms could be developed, however enhancing digital skills of Tourism entrepreneurs and service providers shall allow them to better utilize the existing global marketplaces (such as Booking.com and AirBnB). Relevant programs exist on the central level, but nothing prevents cities and municipalities from considering relatively low-cost investment in short term basic training in e-Commerce, digital/social media marketing, and e-payments, in addition to improving local Tourism entrepreneurs' skills in online tax reporting and financial accounting.

More focused initiatives could be related to developing digital tourist maps and applications offering first impressions or virtual experiences targeting specific segments (e.g. virtual tours of a specific landmark in several languages).

Similarly, considering upgrades of existing Museums, Landmarks and attractions to offer digital experiences could be another relatively straightforward initiative to implement, with different levels of scalability linked to available resources. It could be started with Audio Guides, and expanded to AR/VR Apps and location based informational services, or interactive screens with customized content.

## 10. IT workforce development

### 10.1. IT occupations trends

The IT workforce development is often considered key to the success of the IT economies. Learning examples from the leaders of EaP region could serve as a motivation for Local Governments that have higher education institutions or community colleges in their territories or in close proximity. Even without access to such institutions, launch of IT specializations short vocational programs could also be considered a meaningful intervention in the local workforce development.

Harmonization of Digital Markets report emphasizes the importance of the digital skills coordinated development. It advocates for considering harmonization with Grand Coalition for Digital Jobs by establishing national and local coalitions across the region.

*That could mean launching support funding mechanisms, which could be considered by the local governments willing to invest in the IT sector development.*

According to the report: better coordination with the EU would accelerate innovative learning and teaching, increase the number of ICT specialists, foster digital entrepreneurship, provide certification of digital skills and improved digital literacy.<sup>67</sup>

Whilst the overall development of Digital Skills is a necessary precondition for Information Society advancement, specific IT skills play an important role in serving fast changing needs of the global technology industry.

The IT workforce could be divided in two categories: technology professionals working in technology companies, and those working across other sectors of economy in different roles: IT support, network engineering, software development, etc. e.g. for the US - 44% work in Tech Industry and 56% work in other industries.

Additionally, there is a cohort of Technology Business Professionals (that could be also IT professionals) that are working in tech companies and are supporting development and delivery of the IT products throughout the economy.<sup>68</sup>

Numerous surveys and report during the last 2 decades have demonstrated growing demand for the IT-related skills. The EU has introduced a “digital skills gap” term acknowledging the projected gap of almost a million of IT jobs in EU.

Among IT specializations, the record employment growth was recorded in 2010-2018 in the US for:

- Software Developers, Applications

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<sup>67</sup> Harmonisation Of The Digital Markets In The Eastern Partnership study report. 2015. HiQSTEP project. P.34

<sup>68</sup> CompTIA Industry Outlook 2019. P 31

- IT Support Specialists
- Tech Occupations, Other including Business Intelligence Analyst, IT project managers
- Systems Analysts
- CIOs / IT Managers
- Industrial Engineers
- Mechanical Engineers
- Web Developers
- Cybersecurity Analysts
- Network Architects

And entirely new specializations emerge along with the development of the new industries and emerging technologies that include, among others:

- AR/VR object designer
- 3D Printing Engineer
- Robotics process automation engineer
- Distributed ledger technology/ Blockchain developer
- Machine learning trainer / scientist
- AI developer/Industrial IoT engineer.

## 10.2. Global Skills Index

The newly launched 2019 Coursera Global Skills Index covers 60 countries, comparing and ranking skills levels based on the data of Coursera 38 million learners<sup>69</sup> in 3 categories: Business Skills, Technology Skills, and Data Skills. All of them are fundamental skill domains of the future.<sup>70</sup>

According to the GSI report - *Two-thirds of the world's population is falling behind in critical skills, including 90% of developing economies.*<sup>71</sup>

The developing economies mostly lag behind in all 3 skills domains with some exceptions. The old model of exporting goods produced by the low-skilled labor is less competitive, however the technological innovation opens doors to new growth models<sup>72</sup> (e.g. MOOCs – Massive Online Open Courses) and thus creates opportunities to obtain globally competitive high-tech skills.

What are the Competencies measured by the GSI?

**Business** domain contains:

- Accounting, Finance, Marketing, Sales, Management and Communication.

**Technology** domain consists of:

- Computer Networking, Operating Systems, Human Computer Interactions, Databases, Security Engineering, and Software Engineering.

**Data Science includes:**

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<sup>69</sup> Coursera Global Skills Index 2019. The Coursera Global Skills Index (GSI) assesses the skill proficiency of learners in each country and industry (entity) and measures which skills are trending around the world.

<sup>70</sup> Coursera Global Skills Index 2019. P.4 <https://www.coursera.org/gsi>

<sup>71</sup> Ibid. p.5

<sup>72</sup> Ibid

- Math, Statistics, Machine Learning, Data Management, Statistical Programming, Data Visualization.

Only 2 countries from the EaP region (Belarus and Ukraine) were included to the first GSI report. However, their performance also gives some indications of the regional trends.

In business skills Belarus occupies the 38<sup>th</sup> position with 37% score, and Ukraine holds #49 (out of 60) with 19% measured against the leader Finland with 100%. At the same time, in the Technology domain Belarus holds the 6<sup>th</sup> place with 92%, that is a praised achievement by the report authors. Belarus even holds #1 spot with 100% in databases sub-score and a very high score of 97% in Software Engineering sub-score. Ukraine holds a mid-tier 31<sup>st</sup> place with 49% in the Technology domain.

The third domain of Data Science skills is serving emerging technologies like AI, Big Data, IoT, Cloud, VR/AR, etc.

In this domain Belarus holds the 26<sup>th</sup> place among 60 surveyed countries with 58%. Ukraine is in the 33<sup>rd</sup> place with 46%.

Its notable that Belarus has a very high 97% score in math, reflecting its high quality engineering and math higher education output.

Another index, more focused on the developed talent and based on the analysis of tens of thousands of coding challenges for 5 million programmers - Hacker Rank<sup>73</sup> gives Ukraine 11<sup>th</sup> place globally with 88.7 points from 100.

Less representative Topcoder IT developers' community competitions<sup>74</sup> ranks Ukraine #6, Belarus at #7 spot, and Georgia at #16.

### 10.3. Industries with high potential to adopt new technologies

In addition to the country scores, Global Skills Index outlines and ranks industries on their preparedness to disruption brought by the 4<sup>th</sup> industrial revolution, powered by Automation and Artificial Intelligence.

According to the report, the best positioned industries to take advantage of the new emerging trends are: Manufacturing, Technology and Telecommunications.

Manufacturing is ranked #1 in Technology and Business domains, and #4 in Data Science. The examples of Manufacturing embracing innovation include automation of the production linked to global supply chains.

*Local Government could focus on the Manufacturing sector digital transformation building on the available legacy/historical industry presence or considering new industries development (e.g. electric vehicles production).*

Technology industry is ranked #1 in Data Science, and only 5<sup>th</sup> in Business domain, indicating the necessity to invest in Business skills of employees, especially among young/startup companies on their path to sustainable growth, market fit and productivity.

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<sup>73</sup> <https://blog.hackerrank.com/which-country-would-win-in-the-programming-olympics/>

<sup>74</sup> [https://community.topcoder.com/stat?c=country\\_avg\\_rating](https://community.topcoder.com/stat?c=country_avg_rating)

This interconnection gap between IT and Business skills of technology companies' staff is outlined in other reports (for example, **HIQSTEP ICT Innovation and Start-Up Ecosystems Study Report, January 2018**) and could serve a ground for policy and strategy interventions also at Local Governments Level.

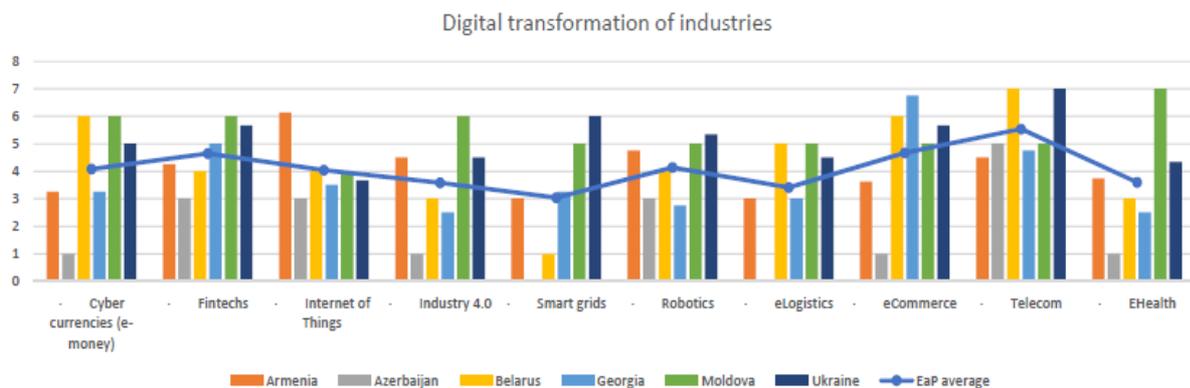
#### 10.4. Knowledge of modern technology trends by employees

An additional important dimension of assessing the IT knowledge is awareness and knowledge by the ICT and non-technology businesses employees of basic and modern technology trends shaping the Digital Transformation and 4<sup>th</sup> industrial revolution. According to the EaP countries ICT innovations study<sup>75</sup>, employees' knowledge of the following technologies/trends are assessed as poor or average (below 4) on the 7-digit scale and needs substantial improvement:

Artificial Intelligence, Robotics, Crypto currencies, Internet of Things (IoT), Distributed ledgers and blockchain, Smart grids, VR/AR, Gamification, Smart Contracts, e-Logistics. Also e-Health and omni-channel<sup>76</sup> user experience management.

A more detailed illustrative breakdown of specific industry trends knowledge by employees reveals differently accentuated picture for the EaP countries assessed on the 7 digit scale with 7 being the best.

Figure 38 Knowledge of Digital Transformation Industries by EaP countries workforce



Industry 4.0 is a quite familiar term for employees in Moldova and not known by Azerbaijani workers. Internet of Things is popular among Armenian workforce, Smart grids are best known for employees in Ukraine and least know to workers in Belarus. Employees of all countries have relatively better understanding of Telecoms and eCommerce (with the exception of Azerbaijan). Knowledge of eHealth is also below average in all countries apart from Moldova<sup>77</sup>.

#### 10.5. ICT workforce of the EaP countries

The understanding of a competitive need for qualified IT workforce has been acknowledged and partially addressed in all the EaP countries, but there are different players and stakeholders in each

<sup>75</sup> ICT Innovation and Start-Up Ecosystems Study Report. HIQSTEP project. 2018

<sup>76</sup> Omni-channel user experience refers to seamless integration of all shopping platforms – be it online, mobile or physical for more intuitive and fluid shopping.

<sup>77</sup> ICT Innovation and Start-Up Ecosystems Study Report. HIQSTEP project. 2018

country, and different growth rates. Different institutions play leading roles. Universities produce better prepared for the jobs IT graduates in Belarus, Ukraine and Armenia. Government digital skills development programs are contributing to the foundation of more competitive IT workforce in Georgia and Azerbaijan. Self-education and industry certification (non-formal education) play an increasingly important role in mastering IT specializations.

The Ukrainian IT industry, including clusters and associations, is largely self-organized and decentralized with a relatively larger number of players.

About 75,000, or 24%, of all university students in Belarus are specialized in STEM (Science, Technology, Engineering and Mathematics) disciplines, including some 70 IT specializations. The number of annual graduates with the IT specializations on average is more than 4 thousand.

Short term courses are provided by companies and different organizations. The IT Academy of the High Technology Park is popular due to its connection to High Tech Resident companies and very high (more than 90%) employability rate of its graduates.

In Ukraine, about 150 Higher Education Institutions offer IT specializations with annual graduation of 23000 specialists.

HEIs and private institutions cooperate in providing demanded short-term courses. The estimated number of short-term IT professional courses graduates ranges at about 35 000 per year. The IT education is well expanded to online courses, engaging hundreds of thousands listeners.

In Armenia, with about 1700 graduates annually, 10 000 students are studying IT specializations mainly in seven major universities with 82% on Bachelor degree programs, 16% on MA and 2% on Postgraduate. The competition and quality have risen. The most popular specializations include Computer Science, Applied Math, IT, Information System Security, Microelectronics.<sup>78</sup> The current number of students is considered not sufficient to meet the industry demand.

Specialized professional skills development courses are also offered by different organizations including Microsoft Innovation Center Armenia, Synopsis Inc. Educational Centers, TUMO center of Creative Technologies, and notably 2 regional Technology Centers in Gyumri and Vanadzor.

In Georgia IT specializations are offered in 24 institutions including Universities and Colleges. Popular programs are Informatics, Computer Science, Computer Engineering. The overall IT student population is about 6500 with 82% of students in Bachelor programs, 14% in Master and 4% in Doctoral Programs with annual average number of graduates reaching 1100.<sup>79</sup>

Vocational schools and short term IT training centers offer a variety of specializations better tuned to the industry needs. The main focus, however, is on offering the entry-level specializations, e.g. in network support or basic web-programming.

Moldova is considered to generate good amount of IT talent based on its technical education tradition and solid IT sector. About 1500 students graduate from Moldovan universities with degrees in computing and IT.<sup>80</sup> And 5000 more in Engineering specializations. Shorter term IT courses are also available through partnerships, private providers and establishment of Tech Park.

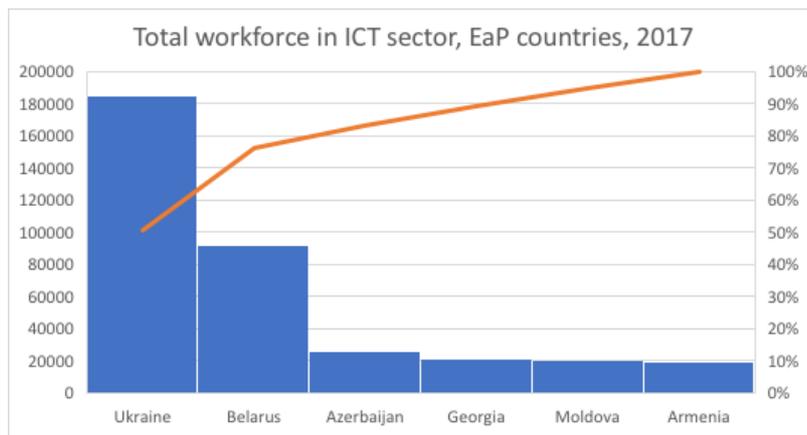
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<sup>78</sup> Armenian ICT sector 2018. State of the Industry Report: Information and Telecommunication Technologies Sector in Armenia. P.27

<sup>79</sup> Innovation and Technology in Georgia 2017. Annual Report. USAID/G4G

<sup>80</sup> IT Sector Strategic Roadmap for Moldova. USAID, ATIC 2017. Prepared by AVASANT.

Figure 39 ICT sector total workforce, EaP countries



The blue bars represent the total number of employees in ICT sector in each country, and the orange line provides a cumulative percentage of the countries ICT sector workforce in total number of EaP ICT sector employees.

The one common characteristic of the IT education and IT workforce development in the EaP countries is a more sophisticated industry demand that is not fully met by the Higher Education Institution graduates. Even with more advanced IT industries in Ukraine and Belarus, IT companies need to cooperate with Universities in preparing custom courses, or participate in on-the-job internship programs that better prepares future IT workforce to employment.

Another common denominator is a growth in the number of entry level IT courses that aim at preparing at least an entry level freelancer that would further develop skills by self-education, and gain experience at freelancer platforms.

And the third factor that is often critical to startup IT companies' success is relevant business, and more specifically technology business skills.

*Acknowledging the growing demand for IT professionals even entry-level investment in short-term courses in basic programming, network support or social media marketing, also in tech business skills/tech entrepreneurship development at local levels would be beneficial to employment and growth opportunities on local, regional and national levels.*

## 11. R&D trends brief presentation

Some national success stories are based on strong R&D institutions/clusters that were historically present or purposefully developed. However, recent studies and reports found this underlying layer of Innovation activity in poor shape.

Apart from the Engineering R&D trends presented in the Outsourcing section the overall R&D process in the EaP region is considered underdeveloped.

Applied research commercialization levels, and Business Participation in R&D are quite low in all the countries.

Opportunities related to the participation in Horizon 2020 program are yet underutilized, and the capacities of EaP countries universities to absorb the R&D funding is also quite limited.

There are some positive steps taken by the central governments or business. That could be the creation of the World Class R&D center in Azerbaijan, or the establishment of the World Class biomedical laboratory in Georgia – Richard Lugar Public Health Research Center. However, this direction yet has to gain traction for local governments to consider possible cooperation opportunities. One example that might create spillover effects on local economic development is building of a large Technology University near Kutaisi in partnership with Munich Technology University (TUM).

A strong modern R&D institution or University could not only produce skilled graduates, but could also leverage development of VET courses and specializations tuned to the needs of local economies.

## 12. Environment – free IT/Economic zones, tech parks, etc.

Another opportunity to capitalize on is local tech-parks, innovation centers, free economic zones and other facilitative instruments that could become hubs for attracting talent, knowledge sharing and innovative products/services development.

Usually, Free Economic Zones are created by the top-down decisions. However, active local demand, willingness and readiness to co-invest in them could create necessary conditions for making that happen.

Tech-parks and other innovation support technical facilities are being established in all the EaP countries. Investing in such infrastructure and equipment is considered a precondition for the digital/IT skills development and launching new IT businesses or innovative startups.

Aiming to promote startup companies formation and new job creation, Armenia adopted and enacted the Law on State Support to Information Technology Sphere such as tax privileges for newly established and startup entities, including a 0% profit tax rate and a 10% income tax rate.

In Belarus the special tax regime established in Belarus HTP offers following benefits to its residents:

- exemption from corporate profit tax;
- exemption from VAT on the sale of goods or services or the transfer of property rights;
- exemption from land tax (up to three years)
- exemption from real estate tax on properties which are in the HTP;
- personal income tax rate of 9% is applied to the income of an HTP resident's employees
- the social security contribution calculated based on the average salary in Belarus;
- payments by the HTP residents to foreign companies in the form of dividends, royalty, and interest are subject to withholding tax at a rate of 5%;
- the lease rates for state-owned immovable property are half the general rates;
- other exemptions.

In Azerbaijan the government also established several technological parks, including one in Sumgait, that offer tax breaks and exemptions for companies. Namely:

- Exemption for seven years from the date of registration in these parks from profit/income, land, and property tax for resident legal entities and private entrepreneurs.

- VAT exemption for import of equipment for construction, scientific research works, and other activities in these parks for seven years or an indefinite period, depending on the nature of these activities.<sup>81</sup>

Georgia has established a virtual IT free economic zone, with specific exports benefits and exemptions, however its effectiveness has been decreased since the introduction of universal profit tax exemption system in case of profits reinvestment. In addition, Georgian Innovation and Technology agency operates a network of regional TechParks and Innovation Centers providing mentoring services, 3D printing and prototyping equipment for startup companies and individuals.

Moldova has enacted the Law on Information Technology Parks offering all residents performing 8 types of IT related economic activities a single uniform tax of 7% that covers:

- Corporate income tax;
- Withholding tax on payroll paid to the personnel;
- Mandatory social security charges;
- Mandatory medical insurance charges;
- Local taxes;
- Real estate tax;
- Motorway tax on vehicles registered in the Republic of Moldova

The 7% uniform tax is payable monthly. IT Park provides a “virtual regime” allowing its properly registered residents to perform operations remotely.

Ukraine has a diverse and decentralized Startup Ecosystem presented above, that has benefited from periods of tax exemptions and TechPark-based growth. New policies and approaches are expected to be deployed to contribute to more systemic support to its development.

Development of special zones and TechParks largely depends on the central authorities. At the same time, available good practices, especially within the countries, could serve examples for local governments to consider and follow.

### 13. SWOT analysis

Considering the gathered data and findings a SWOT analysis was performed outlining more or less common characteristics for the EaP region countries. Further analysis for individual countries could provide more detailed picture or trends, that should be considered in further applications of the study results and recommendations.

Strengths:	Weaknesses
<ul style="list-style-type: none"> <li>• Positive traction of IT services sub-sector</li> <li>• Growing demand for quality and diverse outsourcing from key markets</li> <li>• Good math and engineering education tradition</li> </ul>	<ul style="list-style-type: none"> <li>• In overall the small scale of national economies and domestic markets</li> <li>• Lack of systemic approach to ICT policy development</li> <li>• Not fully sufficient level of digital infrastructure – especially in the regions</li> </ul>

<sup>81</sup> <http://taxsummaries.pwc.com/ID/Azerbaijan-Corporate-Tax-credits-and-incentives>

<ul style="list-style-type: none"> <li>• Existing positive examples (startups success, TechParks, deals)</li> <li>• Willingness of central or city governments to invest in IT and Innovation</li> <li>• Global Mindset of young people</li> <li>• Moderate or low workforce cost</li> <li>• Growing availability of talent</li> <li>• University / IT industry successful cooperation examples</li> </ul>	<ul style="list-style-type: none"> <li>• Uneven development and concentration of opportunities, resources and talent in smaller countries, especially in the regions</li> <li>• Poor digital awareness and adoption rates by SMEs, especially in the regions</li> <li>• Lack of understanding of digital transformation and technological trends by policy makers of all levels</li> <li>• Insufficient IT specialists supply</li> <li>• In general -Outdated university IT specialization programs</li> <li>• Poor entrepreneurial, business skills of Startups staff and new companies</li> <li>• Limited power of local governments (with the exception of capitals and large cities)</li> </ul>
<p>Opportunities</p>	<p>Threats/Challenges</p>
<ul style="list-style-type: none"> <li>• Central government support to IT sector and innovation</li> <li>• Donor support</li> <li>• Growing availability of Venture Capital and seed capital</li> <li>• Emerging Angel investors</li> <li>• Interest from global MNCs to EaP region</li> <li>• Own products development capability</li> <li>• Attractive image of IT/developer/Startupper;</li> <li>• Re-qualification of workforce from other sectors of economy</li> <li>• In general, positive global economic outlook</li> <li>• Improved environment for foreign talent and investment attraction (e.g. liberalized tax and visa regulations)</li> <li>• Local/City level IT/Smart projects feasibility</li> <li>• Improving investment climate and doing business indexes</li> </ul>	<ul style="list-style-type: none"> <li>• Insufficient interest to digital transformation of businesses and organizations</li> <li>• Lack of cross-industry cooperation</li> <li>• Lack of IP protection guarantees and trust to the system</li> <li>• High-cost of innovation IP protection for local inventors</li> <li>• Lack of genuine R&amp;D</li> <li>• Rising costs of workforce</li> <li>• Saturation of markets (especially outsourcing for smaller countries)</li> <li>• High Dependence on foreign markets</li> <li>• Geopolitical risks</li> <li>• High infrastructure costs especially for introduction of disruptive technologies</li> <li>• Negative migration trends</li> <li>• Competition between neighboring countries</li> </ul>

## 14. Gaps analysis and recommendations

A general and specific gaps analysis in meeting local or external customer demands and reaching markets maturity was performed based on the available data, report findings and the SWOT analysis. The proposed instruments, solutions and actions lines could be further accommodated to the needs outlined in the needs assessment of Cities and Municipalities.

### 14.1. Gaps

Several gaps areas were mentioned in the study, and in other reports. In the international rankings gaps are normalized against the leading performer, in regional rankings – average baseline practices often serve as a guideline.

It has to be noted that even after implementing dynamic measures, the overall gap between the developed and developing countries' IT industries and innovation support frameworks might persist. Thus, not only “catching up” approach, including leapfrogging or rapid advancement is recommended, but also better matching global IT industry needs and aligning with the international value chains could be strongly advised.

#### **E-Commerce**

The Region has achieved on average about a halfway compliance towards the harmonisation of practices with the EU in eCommerce for SMEs.

The biggest common gaps of the Partner Countries are related to the legal provisions and frameworks assuring consumer rights, and on-line dispute resolution system for e-commerce transactions.

E-Commerce has shown an upward dynamic recently, and Local Governments could take action in identifying local businesses willing to incorporate e-Commerce in different ways.

#### **Skills**

Overall, a skills gap to address the challenges of digital transformation and benefit from its opportunities exists in all the EaP countries.

It is recommended to work with companies in national and local coalitions, using the same model as the Europe's Grand Coalition for Digital Jobs, and focus particularly on the young workforce. Local governments could capitalize on the locally available mentorship and training resources, as the skills development initiatives exist on the central government level or through donor supported programs.

#### **ICT innovation and infrastructure ecosystems**

The existing national innovation systems in the EaP countries are fragmentary and incomplete in comparison with the European best practices. Only a few mechanisms for encouraging innovation activities are applied in the EaP countries with varying efficiency levels. In spite of the relatively large number of innovation-enabling organisations, there is still a gap in providing services for start-ups and innovative companies in general, especially on post-seed stage of development.<sup>82</sup>

#### **Small Local Markets**

Domestic ICT markets, especially for ICT innovations are held back by the lack of demand, limited ICT usage and low incomes. That is even more articulated on the Municipalities level, as the larger spenders in the national economies represent Financial and Telecom sectors with cross-country operational scales.

#### **Poor engagement of other sectors of economy**

The existing IT businesses are not targeted at the needs of particular branches of economy and parts of the value chain.

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<sup>82</sup> ICT Innovation and Start-Up Ecosystems Study Report. HIQSTEP project. 2018.

Other sectors of economy lack a digital innovation framework and still lack the recognition of the ICT as a strategic sector.

## 14.2. Recommendations

Cities could accelerate their economic growth by investing in creating conducive environment for digital transformation of businesses, organizations and public administration systems. The holistic approach of envisioning the process as improving the ICT ecosystem of the city or municipality could be more productive allowing to overcome their weaknesses and transcend geographical boundaries. Engaging local business, especially SMEs is another important policy development line.

Recommendations could be grouped widely into **Policy/strategy areas, Businesses support, High-Tech and Infrastructure investments, Skills Development, and enabling environment creation.**

**On the policy level** the creation of local ICT policy development process guidelines, aligned with existing local economic development tools is highly recommended.

On the operational scale level, the EaP Region flagship support initiatives are also recognizing the potential of the City/Municipal level for piloting converging and harmonization initiatives. The HDM study recommends that harmonization initiatives should preferably focus on enterprises and municipalities, where concepts can be tested locally.<sup>83</sup>

Pilot projects in information services development would show immediate benefit for SMEs and customers that use these services.”<sup>84</sup> E.g. Developing an e-Commerce trading platform that allows SMEs to conduct their digital trade activities across the Region and the EU is recommended and perceived a catalyst for the digital transformation.

Local e-Government services development could be also recommended. E-Services frameworks and initiatives could capitalize on the existing central government services and available expertise. E-Democracy initiatives are less knowledge- and capital intensive and could be developed in partnership with Civil Society organizations or donors.

**Business support initiatives** can have two main directions: identifying and supporting local ICT businesses (computer service companies, startups, engineering, repair, small Internet Service Providers, etc.), and supporting active local business in engaging in, or at least considering Digital Transformation. Support mechanisms could vary, but might include development of shared/co-working spaces, establishing networks, consulting councils, providing infrastructure contributions to digital infrastructure development (e.g. wi-fi hotspots, high-speed internet). Other industries (e.g. tourism) could benefit from City/Municipality commitment to creating digital services, maps, visualizations, marketplaces, etc. Mapping and assessing the potential of Manufacturing and Agriculture sectors in adopting new technologies could also be considered.

Attracting large national and international IT companies could also be recommended in case there is a local potential – University, ICT or an adjacent sector cluster, innovative manufacturing projects, legacy industrial infrastructure that could be redeveloped, or an emerging startup community.

**High-tech and infrastructure investments** should consider improving basic physical and digital infrastructure, considering Smart City projects, especially IoT and Big Data analytics. Smart transport

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<sup>83</sup> Study on the Harmonisation of the Digital Markets in the Eastern Partnership. P.38

<sup>84</sup> Study on the Harmonisation of the Digital Markets in the Eastern Partnership (2015).P.36

project and, to some scale, support smartgrids could yield future benefits. On the operational level that could include partnerships with the established companies in the field, donor supported initiatives, considering best EU and international practices.

Modernising basic IT infrastructure for local governments back-office operations and implementing Information Management Systems could also help advancing the digital agenda.

**Skills development** is the core underlying factor for the globalized knowledge economy and digital transformation. Even though municipalities in the region are less engaged in the secondary education provision, primary and TVET education interventions are also considered important endeavors. Partnering and supporting TVET institutions on the territory for upgrading their connectivity, developing opportunities for internships and incentivizing connections to business communities, could be considered sustainable steps in ensuring local economic development, and also in preventing negative migration trends to larger cities or abroad. Pre-school level interventions could include developing of special early stage programs in understanding STEM subjects and innovation, based on the curriculum created in leading popular science centers (e.g. Copernicus science center in Poland).

Specific IT skills development could also be supported by pilot initiatives, including training centers and companies experienced in upskilling the unprepared applicants in Social Media Marketing and basic Web-Programming. Other initiatives could include creating own IT labs and creative development centers (e.g. TUMO center in Yerevan).

**Enabling environment creation** is probably the most feasible activity that Cities and Municipalities could undertake to promote ICT-enabled growth and innovation ecosystems. Creating co-working spaces and meetup facilities could prove especially appealing to younger generations and digital nomads<sup>85</sup>. Connection to local assets – like University, Library, Landmark, touristic attraction could complement the selling point of such innovation infrastructure.

Further initiatives might include organizing special events in ideas development concerning local needs or topic, that would take the form of conferences, Hackathons, Makeathons, competitions, camps, etc. The example of the Sevan Startup camp could be applied and replicated.

Providing physical spaces for business incubators could also considered a viable activity.

### **Specific recommendations for digital transformation of Cities and Municipalities**

More specific and detailed recommendations that expand on the proposed above framework were developed by the Strategic Policy Forum on Digital Entrepreneurship<sup>86</sup> and PwC. According to the Blueprint for cities and regions as launch pads for digital transformation, there are four major directions where local governments and especially cities can concentrate its efforts of supporting digital transformation and IT business.

- 1) Ensure Leadership and collaboration for smart governance of the local digital ecosystem
- 2) Invest in Digital skills and entrepreneurs to accelerate the digital transformation process
- 3) Provide Access to data and technologies for applied solutions to local challenges
- 4) Consider Key infrastructures and investments for digital launch pads<sup>87</sup>

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<sup>85</sup> Digital nomads are a type of people who use telecommunications technologies to earn a living and, more generally, conduct their life in a nomadic manner. Ref: Wikipedia

<sup>86</sup> A forum established by DG Internal Market, Industry, Entrepreneurship and SMEs in 2016

<sup>87</sup> Blueprint for cities and regions as launch pads for digital transformation. Strategic Policy Forum on Digital Entrepreneurship/ PwC 2016

Second-tier cities could be leveraged to higher levels of economic integration and digital development following existing good practices and tested strategies.

*Some municipalities would prefer one or two of the mentioned directions depending on their current digital maturity, strategic directions and opportunities, or design a specific mix, tailored to their needs.*

The below infographic provides a condensed roadmap of available opportunities that is not exhaustive but gives the bird-eye view of the process.



Source: PwC Analytics

### What is understood under the first direction – **Leadership and Collaboration?**

- First, it is creating a forward-looking strategy with a shared vision that is considered a precondition of success. The important part of the strategy could be building on the territories' economic assets and existing plans. This could enable digitalization of the leading industries and creating a reference focus. The Smart Specialization Strategy initiative launched in the EU could provide a good reference.

*City mayors could lead and "own" digital initiatives, however the involvement of local businesses and academia (if available) in developing the strategic directions is strongly advised.*

*Considering examples from Ukraine, civic tech and citizens could also play the "shaper" role of the local digital initiatives.*

- The second pillar is building partnerships that could take different forms, such as: PPPs, Subcontracting, Research cooperation, Technical cooperation, Technical Assistance, Manufacturing agreement, etc.<sup>88</sup> Also, innovative collaboration platforms could emerge involving business leaders, non-profit sector and city government to implement certain project, e.g. gather around smart city programs or city branding strategy.

<sup>88</sup> Ibid

- The third pillar is collaborating across sectorial boundaries by engaging representatives of different industries and territories with twofold goals – to transform organizations and transform territories through cross-sector digital ecosystem.<sup>89</sup>

Activities under the second direction concerning **Digital Skills and Entrepreneurs** have already started in certain locations across EaP region. It has three main pillars.

- First, transforming local population into digital talents that envisages rethinking digital education strategies, creating partnerships to train digital workers and reskilling local workforce.
- Second, development of entrepreneurial culture, that means – investing in entrepreneurship programs in adult/vocational learning; develop entrepreneurial culture in local companies and probably in public administrations, and actively promote it through media engagement. Development of entrepreneurial culture might require cultural shifts and time, however in a sense it is an imperative of not only a digital age, but also of the dynamic interconnected knowledge economy of the 21<sup>st</sup> century. Wider understanding of entrepreneurship that expands from business entrepreneurship to social entrepreneurship, academic entrepreneurship, societal entrepreneurship and cultural entrepreneurship could be better communicated to younger people, encouraging them to take risks, map opportunities, collaborate and share in teams, develop trust.
- The third pillar - attracting global digital talent, or digital nomads, could also be attributed to the country level efforts (e.g. Moldova, Georgia) and thus could be correlated with them. It contains measures to retaining local digital talents, creating favorable conditions for attractive new talent (co-working spaces, meetup and conference facilities, or academic programs where applicable, etc.) and building a strong local brand.

The third direction concerning **accessing data and technologies** to address local challenges is mainly based on the Smart City concept and e-government/e-services solutions.

- The properly developed and implemented Smart City strategy could drive innovation in companies and catalyze economic growth. Key technologies that currently are considered under Smart City initiatives are:
  - public and private transportation infrastructure
  - Internet of Things (IoT)
  - Broadband connectivity
  - Smart personal devices
  - Cloud computing
  - Big data analytics
  - Smart grids
- Second pillar – providing access to open data has its pros and cons, however it is considered a good practice in the new era of accountability and openness. That includes maintaining Open Data portals, encouraging businesses to develop applications based on the Open Data, ensuring increased transparency and better participation in local government decision making and service delivery.
- The third pillar – providing access to digital innovation – has been more accepted and implemented across Europe and the EaP region. It mainly means creating spaces to access,

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<sup>89</sup> Ibid

develop and test innovative solutions/new technologies (e.g. Fabrication Laboratories – FabLabs), and to popularize and encourage digitalization among local SMEs and individual entrepreneurs.

The fourth direction is related to ensuring and sustaining **Key Infrastructure development** that includes both physical and digital infrastructure;

- First, this means a solid physical infrastructure. Physical infrastructures refer to the stock of cost-efficient and intelligent infrastructure such as urban mobility systems, energy, water supply systems, sewerage systems and solid waste management systems which are all integrated through technology. This is often considered a critical pre-condition for all further digital transformation initiatives, be it innovative business development, talent attraction, investment attraction, or societal innovation.

*This dimension considers at large IoT and Smart solutions, Physical shared spaces and high-speed internet.*

- The second pillar is securing investments in Digital Infrastructure. As infrastructure costs a lot, it is advised to consider new financial or business models, and also to tap into underutilized opportunities of dedicated donor funding. Examples from around the world like the US Cities Innovation Technology Investment Initiative or Innovation Venture funds in Ukraine, provides reference points for local government willing to boost digital/innovative infrastructure.
- The third pillar is ensuring sustainability of local investments in digital infrastructure. Creating Fab-Labs and shared development spaces for businesses proves successful. Another strategy could include advocating for and creating special Economic Zones that have proved efficient in economic revitalization of certain territories.

Is there enough capacity to properly plan and implement all the recommended actions?

Apparently, understanding all the promises and opportunities of the new disruptive and rapidly emerging technologies needs preparation and knowledge upgrade.

ICT Innovation and Start-Up Ecosystems Study Report has identified the following largest gaps of policy-makers' and state organizations knowledge of technological trends:

- Artificial intelligence
- Big Data collection, aggregation, analysis, visualisation services
- Cyber currencies (e-money)
- Distributed ledgers and blockchain
- eHealth
- Fintech
- Industry 4.0
- Open API
- Open Data
- Smart contracts

*In order to increase awareness and understanding of all concepts, trends and advance tools of the digital transformation process HDM ICT innovations report recommends to consider special **training for policy makers**, including local governments, especially in the practical development of digital innovation policies and fostering technology and innovation driven economic growth.<sup>90</sup>*

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<sup>90</sup> ICT Innovation and Start-Up Ecosystems Study Report. HIQSTEP project. 2018. P 235

*The tentative list of topics and training structure should include familiarization with digital policy basic instruments and tools used by international organizations and players; practical application of the digital technologies, such as unlocking opportunities of digital technologies in:*

- *Enabling self-employment and increasing employment*
- *Cost saving and increasing productivity of other sectors of economy*
- *Creating innovative business models with high value added*
- *Increasing earnings of state organizations by delivering services to citizens and businesses*
- *Increasing efficiency of governance processes and e-democracy.<sup>91</sup>*

*In addition, familiarization with current and emerging technology trends is recommended.*

The gaps for specific countries are also measured and would be considered as a reference when developing relevant capacity building initiatives.

*The training topics could be adjusted to Cities and local government specific needs and expectation levels.*

## 15. Conclusions

### 15.1. Trends summary

The main findings of the study demonstrate the overall steady growth of ICT markets and IT industries in all the EaP countries. Following the global trend, Software Development and IT services are the most dynamic contributors to the IT sector development in the region.

Overall, the ICT industry output of the region is estimated at 0.3% of global ICT market in 2017. At the same time, tradable ICT services originated in the EaP countries contribute to almost 1% of global ICT services trade. Projected growth of the global ICT industry for the next five years including the Outsourcing sub-sector, provides a positive outlook to the ICT sector further growth in the region, and good opportunities for IT businesses to better integrate into the global value chains.

The ongoing wave of Digital Transformation of all industries in developed economies has to reach the region yet. Established cooperation with international companies could allow selected IT businesses in EaP countries to gain new knowledge, launch pilot projects, and further develop their own products and services.

Venture Capital steady spending and high concentration in the US and Europe attracts all globally competitive startups. Increased competition is a challenge, but the growing availability of Startup supporting networks, funding and stakeholders in individual countries, cities and regions creates decentralized opportunities for newcomers to better understand the system and engage to IT enabled Startup economy.

Regional ICT industry leaders Ukraine and Belarus are considered solid and reputable IT outsourcing destinations for customers in North America and Europe. Armenia and Moldova have also established their footprint on the list of Outsourcing destinations. Belarus success could be mainly attributed to the state policy support and sound IT/Tech education system tuned to the industry requirements.

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<sup>91</sup> Ibid. P. 476

Armenia and Belarus are successful in R&D outsourcing, based on the traditionally strong Science and Engineering schools. The Venture Capital investments in Ukraine Tech companies and the number of deals are increasing. The Ukrainian IT talent pool is the largest in numbers and is more distributed across the countries several IT clusters. Armenia has the most rounded-up system for IT business support and development with established stakeholders, presence of Multinational Companies and growing global outreach. Ukraine, Georgia and Armenia are actively developing their national Startup Ecosystems still focusing on the early-stage support. Moldova, Georgia and Azerbaijan have invested in e-Government solutions and expansion of e-services building pillars for the further Digital Transformation.

Domestic markets mostly consist of Telecom sub-sector and imported ICT goods. Local customers (with exception of Finance and Telecom) do not play significant role in Software and IT services sector development in EaP countries, and this trend shall persist.

Software products, platforms and solutions originated in EaP countries are gaining global recognition. The number of examples is not large, however, the high-profile success stories are considered meaningful achievements and benchmarks to capitalize on (e.g. Viber, MSQRD, Picsart). The successful sub-sectors include Gaming, Instant Messaging and Communication, FinTech, Digital Art, Gambling, Artificial Intelligence, Ride Sharing, Health, others.

## 15.2. Further actions

The recommendations for local government are presented throughout the report and in the recommendations section. The recommendations could be widely grouped to Policy/strategy areas, Businesses support, High-Tech and Infrastructure investments, Skills Development, and Enabling environment creation. Their brief summary and possible further actions are provided below.

Local governments are advised to get familiarized with the current industry trends and undertake efforts to analyze opportunities for the IT sector development in their territories. Certain capacity development in IT policy design could be also considered reasonable.

The most promising emerging tech directions, which are beneficial particularly for the “second-tier” cities, are IoT (Internet of Things), Smart City applications.

Investing in basic IT infrastructure (e.g. broadband internet, Wi-Fi, Information management systems) should help municipalities to better connect their residents, expand e-services user base, and improve the experiences of visitors.

Some municipalities with historically strong Manufacturing industries and to the certain extent – Agriculture and Tourism, could consider supporting Digital Transformation projects in these industries. This could be achieved by cooperating with the central authorities, directly with the industry representatives, national and international business promoting organizations, investment promotion agencies, etc.

Developing co-working spaces, meetup facilities, Techparks and FabLabs could be considered another meaningful activity line for the local governments willing to support innovative Startup economies. These facilities provide local and visiting innovators with conducive environment for

conceiving and developing creative projects often connected to IT business. The key enabling factor in this endeavour is proper mentorship and sufficient initial capacity of the mentioned facilities' staff and moderators.

Investing in digital skills and entrepreneurship development, also re-training of the workforce is strongly advised. Often, quality IT courses are only available in larger cities. At the same time, it's possible to provide training facilities locally and attract coaches and mentors to train first local trainers. Properly designed entry level practical IT specializations (Digital Marketing, Network support, Basic web-programming) often do not require a long time to master. Supporting existing VET institutions in IT/Tech specializations improvement and better tuning to the industry needs could also be recommended.

Developing local e-services became more feasible with the recorded progress of the national e-government initiatives. National stakeholders and agencies could help prepare and launch such initiatives. The first steps could include deployment of Document Management Information Systems, State Property Databases, municipal transportation management systems, e-democracy applications, etc. Engagement of local businesses in developing specific solutions is also advised.

It's important to acknowledge that creating ad-hoc or permanent cooperation frameworks to implement IT sector support initiatives on local levels might be critical to their success. The better local residents, businesses, associations or communities are involved in the design and implementation of the policies, the more sustainable outcomes could be achieved.

Local governments could cooperate with the national governments, businesses, academia, industry associations, international organizations in initiating the IT sector support projects. Bi- or Multilateral cooperation within M4EG network, or other cross-border networks is also possible.

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