MINISTRY FOR DEVELOPMENT OF ECONOMY, TRADE AND AGRICULTURE OF UKRAINE

STUDY

EXPORT STRATEGY FOR INFORMATION TECHNOLOGIES SECTOR

2019–2023

Trade with Ukraine

Ukraine NOW

CONTENTS

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The positions stated are actual as of the period that these stakeholders provided their input.

The full list of public and private stakeholders who contributed to the design of this Strategy is detailed in Appendix 1.

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EXECUTIVE SUMMARY

The Ukrainian IT Sector Export Strategy is a five-year endeavour and was defined through a consultative process between public and private sector stakeholders. The Strategy aims to transform Ukraine into an innovation-driven, universally recognized Tech destination, that delivers high value for the global economy. Achieving this objective will depend on the ability of industry and the Government to implement the activities defined in this Strategy. To achieve this Strategy's targets, stakeholders will need to coordinate actions, monitor progress and mobilize resources for its implementation. Creating an enabling business environment, providing marketing support and ensuring a sufficient number of highly skilled professionals are critical elements for growth and success.

Ukraine aims to become an innovation-driven, universally recognized technology destination that delivers high value for the global economy and to achieve further significant growth in revenue in the IT sector. With fast-growing export numbers, thanks to a variety of comparative advantages including highly talented professionals, the Ukrainian IT companies have expanded globally. IT is one of the few spheres where Ukraine has a competitive position in the global economy.

IT is a fast growing industry with high value that brings important export revenues. The share of the ICT (information and communication technology) industry in the country's GDP is about 3.4%. Over the past 10 years, IT exports increased significantly, growing on average by 20.7% annually. In 2018 the IT industry brought the country US$4.5 billion in export earnings, or almost 7.9% in total exports for 2018, according to the data of the IT Association of Ukraine.

The Ukrainian IT industry has seen substantial growth in the past decade and with its scientific background has great potential to continue to increase its export revenue. Ukraine's industrial history allowed it to have a pool of highly educated professionals with strong mathematical skills which constitutes an undeniable strength when it comes to computer science. By the end of 2017, the sector employed around 160,000 people. However, the fast-growing industry requires more skilled and highly specialized experts. This is a challenge that Ukraine, and almost every other country in the world, faces and it requires a unified approach to solve this.

The range of Ukrainian IT services and products is quite vast with various levels of complexity that can satisfy any client's demand, from small local businesses to large international corporations. Globally the IT industry is constantly evolving and new growing trends include IoT (Internet of Things), robotics, AI (Artificial Intelligence), cloud computing, big data analytics, three-dimensional (3D) printing and many others. These factors are already changing other industries – from how factories are designed and products are manufactured to how services are delivered. Ukraine also has a place in this rapidly developing market.

Ukrainian IT services and products are also actively being developed and have the potential to further diversify and strengthen the position of Ukraine in the global digital market. A number of large technology service companies are increasingly successful on the international market and continue to create an IT business ecosystem in Ukraine that is further used by emerging small companies and startups. However, there is a need to intensify moving up the value chain and to create more products and value-added services owned by Ukrainian companies.

The ability of the IT business ecosystem to adapt to urgent IT industry needs is the cornerstone for successful IT industry development. With a supportive regulatory framework in place, a predictable and transparent business environment, broadband access coverage, a high level of education and interaction, a positive perception of technology by citizens and the government providing enabling conditions for efficient and innovative IT business ecosystem development, the industry will be able to respond quickly and timely to all demands and challenges of the growing global digital markets.

A favourable educational environment, support for R&D, continuous investment in ongoing training for an evolving workforce remain the basis for continuing sector development. Engineers are an indispensable resource for this industry, although it requires professionals

in project management, marketing and sales, design, finance, human resources as well. Universities should be able to respond to industry needs in terms of specializations for emerging job roles, such as machine learning trainers and scientists, AI developers, industrial IoT engineers, robotics engineers and many others.

Ukrainian IT companies have earned a reputation for highly qualified professionals with strong technical education backgrounds and cost-competitive advantages, and Ukraine has become one of the first markets in Eastern Europe for services provided by Technology Service companies (TSCs) in terms of volume and value. Large, well-established global companies entrust Ukraine with their IT operations, including Microsoft, Oracle, Panasonic, Intel, Ericsson and others. However, full recognition of Ukrainian companies has yet to be achieved since the Ukrainian IT share in the global market currently stands at only 1%. Various factors contribute to the lack of investor interest. For example, foreign investors may have misconceptions and limited knowledge about the full potential Ukraine's developing IT industry and of the complex business environments there. In addition, they may not realize that it actually covers all developing segments of the global IT market, which impedes the attraction of capital, installation of main offices of IT companies in Ukraine and the presence of international experts and global companies to further boost industry expansion. Providing support to IT companies with promotion, marketing and sales, and building skills and capacities of IT professionals will improve overall industry performance and increase market outreach and the visibility of the industry.

To facilitate industry expansion, here are some of key interventions that should be prioritized:

- Create an enabling business ecosystem, removing barriers and updating outdated legislation will support larger technology service and product companies to sell locally and internationally;
- Foster the growth of technology startups as well as small and mid-sized technology service and product companies, thereby providing the industry with higher value and IP creation locally;
- Ensure highly skilled professionals gain practical skills at earlier stages of higher education and provide accessible programs for the latest IT technologies to satisfy growing market demand.

The following is a statement of the proposed vision and strategic objectives of this Strategy. This vision statement was agreed upon by all stakeholders of the IT industry in Ukraine:

Ukraine: an innovation-driven, universally recognized technology destination that delivers high value for the global economy

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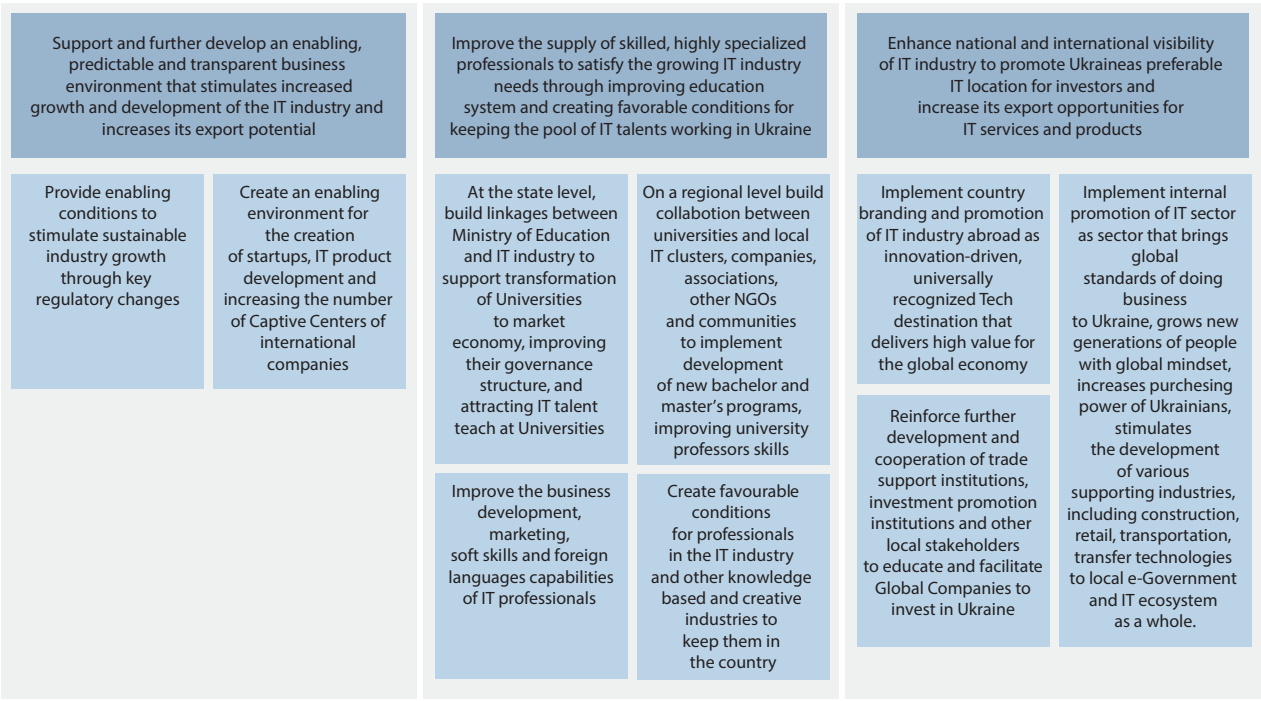
The strategic Plan of Action 2019–2023 (PoA) responds to this vision by addressing key constraints and leveraging opportunities in a comprehensive manner. Particular efforts will be made in the following strategic and operational objectives:



Coordinating activities, monitoring progress and mobilizing resources for strategy implementation will be critical to the successful achievement of these targets. A number of models to successfully implement these strategic objectives have been proposed by private companies through suggestions for industry-led initiatives in various areas in order to establish structured communication channels, regular meetings and a practical approach for the implementation of activities.

It is also important to note that the aim of the Strategy is not to create an increased workload for the government but to present the findings of the caps indicated by the IT community and where they see the need for continued growth in the technology sector. Industry representatives recognize that the government is not equipped to implement every suggestion put forward, but it can and should take the leading role in identifying partners from the ecosystem to carry out tasks that are not their responsibility.

DEFINITIONS USED IN THIS DOCUMENT:

The rapidly changing character of information and communication technology (ICT) goods and services has grown in tandem with the need for statistics and analysis to support and inform policymaking in this area. Since 1999, the OECD Working Party on Indicators for the Information Society has been providing statistical standards and developing definitions of ICT sectors and products, electronic commerce and ICT infrastructure. The Partnership on Measuring ICT for Development, including Eurostat, ITU, UNCTAD, the World Bank and other relevant UN agencies, helps countries to adopt the same statistical standards and definitions for the development of the information society worldwide.

Despite having a clear definition in international trade statistics, there are currently no agreed upon Partnership indicators for international trade in ICT services. The following are the definitions widely accepted by OECD countries, the European Union and the United National Statistical Commission. For the purpose of international harmonization of terms, the same definitions are used in this Strategy.

The ICT sector is the production (goods and services) of a candidate industry that must primarily be intended to fulfil or enable the function of information processing and communication by electronic means, including transmission and display.

Business ecosystem, starting at the boundary of the enterprise and ending at the border of the country and at the level of national institutions or regulations, is a composition of a network of for-profit organizations, such as buyers, suppliers, distributors, financial actors and certifying bodies, and non-profit institutions, such as education providers, standards-setters and chambers of commerce. It also includes local infrastructure, such as a high-quality local digital and transport infrastructure for digitally-driven technologies for international trade. This report therefore identifies IT business ecosystem as a large network that comprises all the players of the IT industry as mentioned above, including all companies that generate a part of their revenue from IT-related activities.

The digital economy is understood in this Strategy as the economic activity that is based on digital technologies, the backbone of which is hyper-connectivity that interconnects people, businesses, devices, data and processes that result from the internet, mobile technology and the internet of things (IoT).

The ICT infrastructure consists of all components that play a role in overall IT and IT-enabled operations, namely public switched telecommunication networks, internet and telecommunication equipment and facilities and services provided to the public (hardware and software).

IT services include any type of software development and implementation, content management and development, programming, application testing, IT consulting, IT support services and IT infrastructure management and maintenance[1].

This Strategy will emphasize the development of the IT sector, taking into consideration that Telecoms remain the basis of successful IT sector functioning. Most of the research in this report was concentrated on IT services and products, companies and market orientation.

IT companies are companies that generate the majority of their revenue from IT and Telecoms related activities or products. Below are the four categories of IT companies used in this Strategy to describe Ukrainian IT companies:

Product companies are companies that generate IT products that must primarily be intended to fulfil or enable the function of information processing and communication by electronic means, including transmission and display.

Services companies are companies that generate IT services that are defined in international trade as services, including telecommunications and computer and information services[2].

Captive centres are client-owned-and-operated service delivery centers typically in a non-domestic location that provide service resources directly to their organization[3].

Startups are high-tech companies in the early stages of operation, offering an innovative product or service.

Source: OECD (2011), UNCTAD (2015), ITC (2018) and others.

[1] UNCTAD's typology of ICT-based services.
[2] This definition was approved by the United Nations Statistical Commission at its 47th session in March 2016 based on a proposal by UNCTAD. However, Information services, currently included in the BPM6 standard component 9 Telecommunications, computer, and information services, are not part of the economic activities covered by the OECD's ICT sector definition. UNCTAD (2015). International trade in ICT services and ICT-enabled services. UNCTAD Technical Notes on ICT for Development No. 3, Geneva.
[3] Gartner IT Glossary. Available at: https://www.gartner.com/it-glossary/.

ACRONYMS AND DEFINITIONS

3D	3-dimentional
AI	Artificial Intelligence
APITU	Association of Enterprises of Information Technologies
APPAU	Association of Enterprises of Industrial Automation in Ukraine
AR	Augmented reality
BA	Business Analysis
B2B	Business-to-business
B2C	Business-to-consumer
BRDO	Office for effective regulation
BMZ	Federal Ministry for Economic Cooperation and Development
BPO	Business process outsourcing
CAGR	Compound annual growth rate
CES	Consumer Electronics Show
DDAPP	Digital Distribution Applications
EAM	Enterprise Asset Management
EBA	European Business Association
EBDR	European Bank for Reconstruction and Development
EIF	European Investment Fund
ESOP	Employee Stock Ownership Plan
ESU	Export Strategy of Ukraine
EPO	Export Promotion Office
EU	European Union
NPE	Natural person-entrepreneur
GDP	Gross domestic product
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
ICO	Initial Coin Offering
ICT	Information and communication technology
IDC	International Data Corporation
IP	Intellectual property
IMF	International Monetary Fund
INSEAD	Institut Européen d'Administration des Affaires
IoT	Internet of things
IT	Information technology
ITEA	IT Education Academy
ITC	International Trade Centre
ITO	Information technology outsourcing
ITU	International Telecommunication Union
KPO	Knowledge process outsourcing
LTE	Long-Term Evolution
M2M	Machine to Machine
mApps	Machine Applications
MESU	Ministry of Education and Science of Ukraine
MFA	Ministry of Foreign Affairs
MinFin	Ministry of Finance of Ukraine

NBU	National Bank of Ukraine
NGO	Non-government organisation
NLP	Natural Language Processing
OECD	Organisation for Economic Co-operation and Development
PoA	Plan of action
PM	Project Management
PwC	PricewaterhouseCoopers
R&D	Research and development
ROI	Return on Investment
RPA	Robotic process automation
SME	Small and medium-sized enterprise
SMEDO	Small and medium-sized enterprises Development Office
STEM	Science, Technology, Engineering and Mathematics
TISI	Trade and investment support institution
TOV	Limited liability company
TSC	Technology Service companies
UAH	Ukrainian hryvnia
UK	United Kingdom
UNCTAD	United Nations Conference on Trade and Development
USA	United States of America
UVCA	Ukrainian Venture Capital and Private Equity Association
VC	Venture capital
VR	Virtual reality
WEF	World Economic Forum
WIPO	World Intellectual Property Organization
WTO	World Trade Organization

INTERNATIONAL CONTEXT: AN INDUSTRY IN CONSTANT GROWTH THAT IMPACTS THE OVERALL ECONOMY

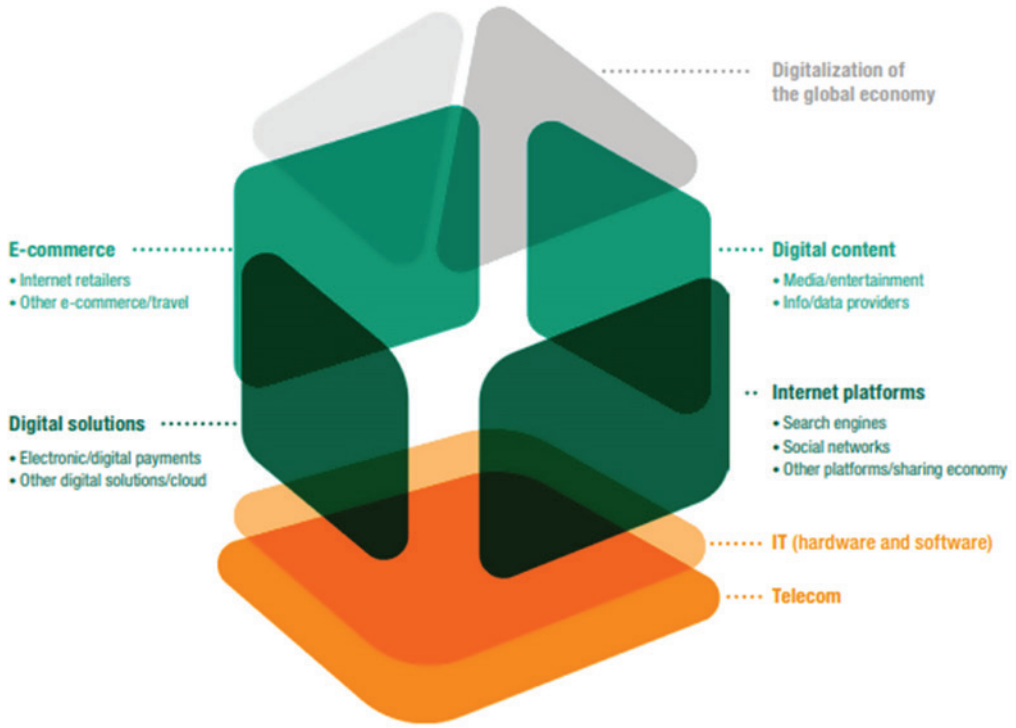
◇ The evolving global digital economy and ICT services exports increase

The information technology industry, which is growing tremendously on a global scale, plays a crucial role in the economy, not only as a source of potential revenue but also as a vector of crosscutting growth, introducing deep changes into different sectors of the economy. The economy has grown digital to the point where IT has become a strategic sector in many senses and it certainly provides new opportunities for trade and development. The competitiveness of most countries is now directly correlated with their ability to invest in this sector and to introduce innovations to production and management practices. In the years ahead, the digitalization of services and their performance by robots will heavily depend on new information technologies, namely software, hardware, information transmission and data storage.

Technologies such as IoT (Internet of Things), robotics, AI (Artificial Intelligence), cloud computing, big data analytics, three-dimensional (3D) printing and many others are already changing how factories are designed, products are manufactured and services are delivered. The same is true for all sectors of the economy, including agriculture, where IoT and robotics will have an increasing impact, particularly on the workplace and the skills that are in demand.

Creating a digital economy based on a digital sector with emerging digital services has become a global trend around the world given estimates of double-digit annual growth in several countries[4]. The capability of the Internet to facilitate commercial transactions, improve business processes and change business interaction and customer behavior proves unquestionably the unlimited opportunities of adopting digital technologies at all levels of manufacturing, governance and skills development. The digital economy comprises the entire business ecosystem, including internet platforms, digital solutions, e-commerce platforms, digital content producers and distributors, apart from IT and telecom providers (Figure 1).

Figure 1. The architecture of the digital economy



Source: UNCTAD

[4] Bukht R and Heeks R (2017). Defining, conceptualizing and measuring the digital economy. Development Informatics Working Paper No. 68. Centre for Development Informatics, University of Manchester, Manchester, UK.

With the rapid pace and adoption of technological advancements, there are a number of tasks that need to be addressed. One of the challenges of adopting technological advancements is to deduce how to organize the information received in terms of time management and figure how it must be used. The digital economy is evolving quickly and technological waves are coming at an increasingly faster pace. However, with this rapid rise of change comes grave concerns related to data privacy and security, as today's environment is increasingly dependent on data and how it is processed.

Box 1. Growing market opportunities for enterprises' digital transformation

IT spending, enterprise software and IT services continue to grow around the world and new technology adoption provides many more market opportunities for enterprises. To enable and enhance an enterprise's digital transformation, there is a set of technologies that can be implemented. A particular growth is expected in these technologies, which will facilitate the process for digital transformation:

- three cloud segments:
  - infrastructure as a service [IaaS]
  - integrated platform as a service [iPaas]
  - communications platform as a service [cPaaS]
- technologies that enhance the digital workplace:
  - workstream collaboration
  - workforce analytics
  - video message-oriented middleware (MOM)
- security technologies:
  - endpoint detection
  - endpoint response
- analytics (smart data discovery)
- storage (in-memory data grids)

Source: Gartner., Inc.

The use of ICT goods and services and their global production is constantly growing and is transforming trade, jobs and skills[5]. According to the estimates of the analytical centre, IDC, the current ICT spending is at US$4.8 trillion and is forecast to reach US$6 trillion by 2022. Another famous analytical centre, Gartner, gives more modest but comparable figures, and all market analysts are sharing the vision of continued growth of this market by 3–6% annually.

Analyzing in more detail the exact markets which are growing, we can see that the biggest growth of 8.3% and 4.7% is in the markets of Enterprise software and IT Services respectively, as compared to the 3.2% IT industry average (Table 1).

Table 1. Worldwide IT Spending Forecast (Billions of U.S. Dollars)

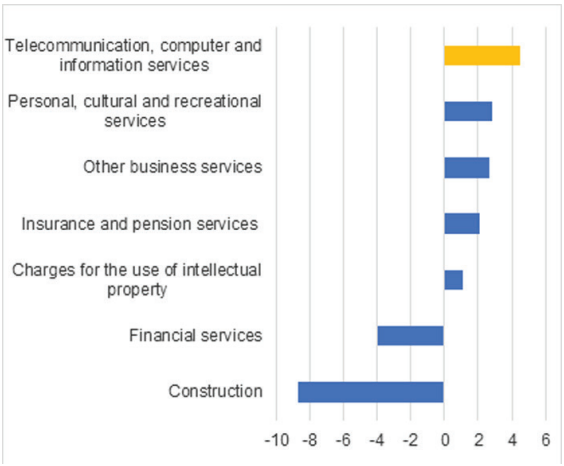
	2017 Spending	2017 Growth (%)	2018 Spending	2018 Growth (%)	2019 Spending	2019 Growth (%)
Data Center Systems	181	6.4	192	6.0	195	1.6
Enterprise Software	369	10.4	405	9.9	439	8.3
Devices	665	5.7	689	3.6	706	2.4
IT Services	931	4.1	987	5.9	1,034	4.7
Communications Services	1,392	1.0	1,425	2.4	1,442	1.2
Overall IT	3,539	3.9	3,699	4.5	3,816	3.2

Source: Gartner

[5] UNCTAD (2017e). The "new" digital economy and development. UNCTAD Technical Notes on ICT for Development No. 8, Geneva

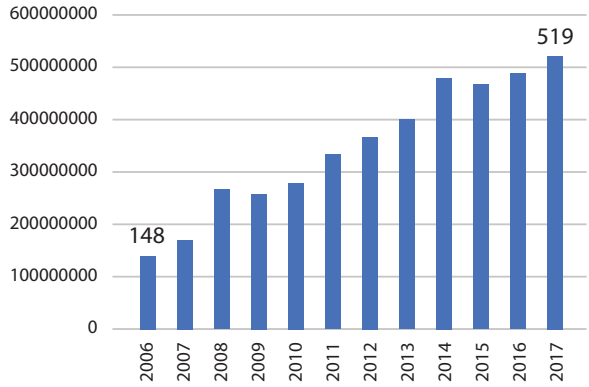
Global production of ICT goods and services totals at an estimated 6.5 percent of the global gross domestic product (GDP) and employs more than 100 million people in the ICT services sector[6]. ICT was the most dynamic sector among commercial services in 2016[7] ; it has a relatively strong increase of 4.5 percent (Figure 2). In the 2006–2017 period, the ICT compound annual growth rate was 11.02% (Figure 3). Increasing export value of ICT services stimulates growth of not only computer services but also e-commerce. According to UNCTAD, e-commerce sales worldwide in 2015 reached US$25.3 trillion[8]. World exports of computer services including hardware- and software-related and data processing services represents around 72 percent of ICT services in 2016 and is mainly concentrated in Europe, accounting for 62.6 percent of global exports, followed by Asia with 23.5 percent and North America exporting 6.1 percent (Figure 4)[9]. Infrastructure, access to the Internet and connectivity remain the key criteria to developing ICT services and increasing trade.

Figure 2. World exports of other commercial services by main category, 2016



Source: WTO, ITC and the UNCTAD estimates[10].

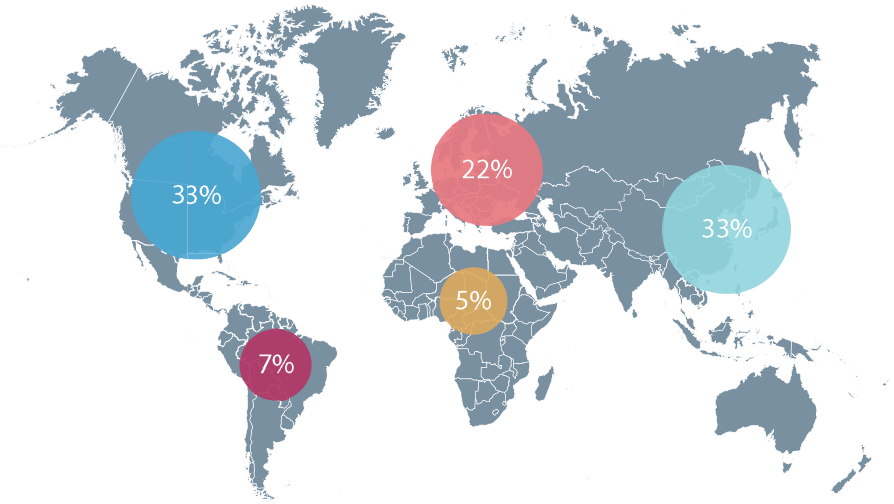
Figure 3. Exported value of global telecommunications, computer, and information services, 2006–2017 (US$ billion)



Source: WTO, ITC and the UNCTAD

Looking at the regional distribution of IT spending, we can see that the main markets are North America, Asia and Europe, with 88% of IT spending concentrated in these regions.

Figure 4. Regional distribution of IT spending



Source: IDC

[6] Analyses of trade in ICT services commonly include trade in telecommunications services and in computer and information services, using data from the IMF balance of payments statistics. However, as ICT definition varies and depends on each country, some of them do not report on all three components of ICT's commonly accepted components.
[7] World Trade Organization (2017). WTO Trade Statistical Review 2017. Washington, D.C. Available at https://www.wto.org/english/res_e/statis_e/wts2017_e/wts2017_e.pdf.
[8] Idem
[9] WTO-ITC-UNCTAD annual trade in services database. Sourced from Eurostat, the International Monetary Fund (IMF) Balance of Payments Statistics and from the Trade in Services by Partner Country dataset of the Organisation for Economic Co-operation and Development (OECD).
[10] WTO-ITC-UNCTAD annual trade in services database. Sourced from Eurostat, the International Monetary Fund (IMF) Balance of Payments Statistics and from the Trade in Services by Partner Country dataset of the Organisation for Economic Co-operation and Development (OECD).

◇ Key technologies transforming global economy

The major waves introducing significant technological advance have a huge impact on the economy. The IT industry is evolving constantly and new trends represent new patterns, benefits and challenges to overcome for the global trade.

Cloud Computing

The Cloud is greatly affecting the landscape of the IT ecosystem by changing the relationship to IT infrastructure. Cloud computing offers an innovative business model through which organizations can adopt IT without upfront investment, software licenses and other requirements. The Cloud taking the hardware out of IT infrastructure summarizes the underlying ambition of this technological advancement. Reducing hardware enables both economies of scale and unbeatable power for most players. As there is no need to own infrastructure per se, this pooling of IT resources greatly impacts the organization of IT services and makes it possible to bypass many of the hardware constraints that IT departments may face. However, it requires a favourable environment: broadband access and a solid, reliable telecom infrastructure. It also generates new constraints such as security management between ends of the digital chain.

From a macroeconomic viewpoint, the Cloud offers powerful computing at lower costs, better system redundancy and access to a wide range of tools and solutions. It is also shifting the most sought-after technical skills towards people with good analytical and security skills. The centralization of data also makes it possible to optimize the way in which data is used and how it interacts and encourages the development of new practices, such as Artificial Intellience (AI) and Business Intelligence (BI). Centralizing power greatly reduces infrastructure demand. The Cloud increases demand for bandwidth and level of service guarantees. It turns jobs that involve distributing physical products into resellers of services (managed service provider), while the marketing of subscription-based solutions is changing the business model of software publishers and some service companies.

The IoT

The IoT and eventually robotics will greatly reduce the competitive advantage of cheap labour and will shift human resource demands towards higher qualifications. The IoT is a term that has succeeded the term M2M (machine-to-machine) and defines any object that has the ability to interact and communicate with its environment over a telecom connection. The IoT is the result of smaller electronic components and increased access to telecom networks. These new possibilities that are given to objects turn a simple passive tool into an active one, which can adapt to the context by benefiting from substantial computing power without including heavy infrastructure and which is now more connected to its environment by sensors and means of communication.

The IoT, which is still in its infancy, will affect many segments of the economy, the first being agriculture, followed by health, retail, transportation, logistics, industry and energy. Smart Cities, Industrial IoT, Connected Health, Smart Homes, Connected Cars, Smart Utilities and Wearables are some examples of application of this technology. For instance, in the field of agriculture, by optimizing irrigation, treatment of crops and facilitating the harvest the expansion of connected objects will significantly alter the way that human capital is used.

From a macroeconomic standpoint, the development of IoT and robotics will be decisive as it will be possible to substantially optimize production costs. By reducing the labour required for a given yield, the competitive advantage that low labour cost countries now hold will diminish severely or even disappear altogether. This will be even harder to manage given that such an expansion might be accompanied by export pressure on food quality constraints and create normative barriers that only automated farms will be able to overcome in the future. In the IT ecosystem, the development of the IoT and robotics will increase telecom infrastructure needs for specific low-speed, wide-range frequency bandwidths (Lora, LoRa, Sigfox and NB-IoT). According to separate researches (Gartner Inc., Cisco and Ericsson), between 2015 and 2021 the IoT is expected to increase at a compounded annual growth rate (CAGR) of 23 percent and the number of objects that will be connected by 2020–2021 will be between 20.8 and 28 billion[11].

[11] Gartner Symposium/ITxpo IoT Forecast (2015), Cisco Visual Networking Index (VNI) Complete Forecast for 2015 to 2020 (2016), Ericsson Mobility Report (2016).

Robotic process automation (RPA)

The development of robotics will significantly impact societies and their relationship to work. This software-based solution to automate rules-based business processes that involve routine tasks, structured data and deterministic outcomes holds many possibilities for the future. Previously, most of the solutions were used on back-office business process operations in which the customer was not directly involved. The use of RPA has a number of benefits in terms of productivity, costs, speed and error reduction. RPA allows organizations to automate current tasks and does not require complex integration processes as RPA interacts with individual systems in the same way as a human user and robotic software can be rapidly modeled, with subsequent deployment of automation.

From a macroeconomic standpoint, the development of robotics will not just be a technological transformation, it will most likely also be a societal one. The development of miniaturization, AI and machine learning will give greater autonomy to robots, and to people as well. It will lead to the appearance of many new professions, substantially reducing unskilled labour needs while also affecting high value-added (or highly specialized) jobs. IT integrators and large service companies will be the big winners in this transformation, but it is also certain that many new professions will appear in this sector. Some economic sectors will be using the RPA for the majority of their operations, for instance, the finance sector will considerably increase their adoption of RPA growing from the current 19 percent to 73 percent of corporate controllers by 2020[12]. The growing market of robotic technology is expected to reach US$82.7 billion by 2020, registering a CAGR of 10.11% during 2014-2020[13].

Big Data

The convergence of the IT universe of telecoms and data is one of the factors accelerating the pervasiveness of technology in the economy and everyday life. Generated from numerous transactions, production and communication processes, big data is accelerating knowledge and value creation across society. Big data is the core of almost every digital transformation today. New analytical techniques and models are being developed to reveal the value provided by this data.

Big data solutions help predict product and consumer trends, expose product reliability and enable better customer services. It has the potential to increase efficiency, productivity and economic competitiveness. IT companies are rapidly deploying big data processing, storage and integration technologies on public cloud-based solutions. It is easier for SMEs to implement synergy between business process management and big data due to more inherent flexibility and shorter implementation periods. However, systematic human interaction remains important in order to implement and obtain the best results from big data analytics.

Artificial Intelligence (AI)

AI will increase the ability of technology to facilitate work but will reduce the need for human interaction within companies. The combination of the vast amount of data available and the constant increase in computing power have enabled the creation of so-called intelligent systems, which benefit from their ability to understand a wide range of variables in order to further contextualize the responses of automated systems. Artificial intelligence (AI) is an umbrella term that includes multiple technologies, such as machine learning, deep learning, computer vision, natural language processing (NLP), machine reasoning and strong AI. It is an information system that is inspired by a biological system designed to give computers the human-like abilities of hearing, seeing, reasoning and learning. AI has applications and uses in almost every industry and is considered the next big technological shift, similar to past shifts such as the industrial revolution, the computer age and the smartphone revolution. The time is approaching when it will be almost impossible to tell a dialogue with a robot from one with a human.

The development of Artificial Intelligence or Augmented Intelligence requires a considerable quantity of data, which is why the availability of data and data protection are considered to be one of the biggest threats in the 21st century. Big Data is driving the majority of use cases

[12] Gartner Inc., 2018 "How New Technology is Shaping the Controllership".
[13] Gunjan Malani Robotics Technology Market by Type and Application – Global Opportunity Analysis and Industry Forecast, 2013 – 2020.

where AI is being used to analyze large data sets. Big Data has been one of the key drivers in the advancement of AI and the growth of data will continue to advance AI and expand its usage across industries. However, vision and language are also gaining ground and should be seen as separate drivers, where the key goal is not necessarily the volume of data but the fact that machines are able to replicate and enhance human perception. Essentially, AI will be applied across a number of industries and domains due to its ability to analyze, visualize and communicate.

Currently, the trending AI Technologies are: Deep (Reinforcement) Learning, Autonomous Vehicles, Cognitive Computing, Commercial UAVs (Drones), Conversational User Interfaces, Enterprise Taxonomy, Ontology Management, Machine Learning, Smart Dust, Smart Robots, Smart Workspace, Transparently Immersive Experiences: 4d Printing, Augmented Reality, Brain–computer Interface, Connected Home, Human Augmentation, Nanotube Electronics, Virtual Reality, Volumetric Displays. Digital Platforms: 5g, Digital Twin, Edge Computing, Blockchain, IoT Platform, Neuromorphic Hardware, Quantum Computing, Severless Paas and Software–defined Security.

From a macroeconomic viewpoint, artificial intelligence will have a major impact on numerous industries and professions. At the outset, service jobs will be the most affected, but combined with robotics all human activities that require labour will benefit from the addition of AI. AI consumes many analytical skills and cloud services. It will therefore boost all activities related to cloud computing, high–powered IT infrastructure and data–related activities. Large consulting firms and the American technology giants will be key players in this shift (as well as Asian players such as Baidu and Alibaba). The global market for AI in 2015 was worth US$126.24 billion and is projected to reach a value of US$3,061.35 billion by the end of 2024 with 36.10 percent of CAGR between 2016 and 2024[14].

Three–dimensional printing (3D)

3D printing is changing the business model, production and trade patterns and is likely to have a large impact on consumer goods company supply chains. 3D printing enables companies to change from designing to manufacturing and is changing business models by creating new market opportunities, providing lower fixed cost and customized products for individuals instead of mass–produced, high fixed cost products for the mass market. Thus, 3D printing has a beneficial impact on finances by cutting production, inventory and manufacturing costs and it speeds up the innovation process by prototyping. 3D printing also allows new customer relationships with more agile personalized on–demand solutions and offers a disruptive technology that is enabling new businesses.

3D printing and manufacturing already produces industrial prototypes in the medical and healthcare domain, but has also started to have an application in the automotive and aerospace sectors, electronics and many others. According to Gartner, by 2021 20% of enterprises will establish internal startups to develop new 3D print–based products and services, and 20% of the world's top 100 consumer goods companies will use 3D printing to create custom products[15]. However, there are a number of issues that will be raised with 3D printing in the future, such as copyrights, industrial designs, trademarks, patents, protection of IP rights as well as industrial standards and even environmental concerns[16]. In addition, countries wanting to adopt 3D technology need to ensure a quality education in such areas as science, technology, mathematics and engineering[17].

Blockchain

Blockchain technology is a valuable tool that guarantees the traceability and validity of transactions, reducing paperwork and the administrative costs associated with processing. Traceability is guaranteed through a decentralized data structure that creates an encrypted digital ledger of transactions in stacks of sequential blocks. Each member can update the ledger to reflect the most recent transactions, thereby revolutionizing the way that products can be tracked and traced[18]. Being a tool for financial services sectors and expanding more and more into trade finance, a number of barriers to the adoption of blockchain exist for policy makers and businesses, including a certain quality of ICT infrastructure and legal

[14] Transparency Market Research (2016). Artificial Intelligence Market 2016 – 2024.
[15] Gartner (2017), Predicts 2018: 3D Printing and Additive Manufacturing.
[16] UNCTAD report 2017
[17] Idem
[18] ITC SMECO, 2018

and regulatory framework that is required for its adoption (the current regulatory base on financal markets does not allow for the efficient creation of tools for market regulation). It is also important that without optimized processes together with deep business models and their consensus, blockchain technology hinders much more than it helps. In addition, limited operational capacity of the institutions as well as low awareness of consumers about this technology restrains broader adoption of blockchain[19].

Overall, it is easy to see that every technological advancement is heavily dependent on the progress of other niches, and each interaction and development brings new possibilities and accelerates the process of making technology more present in daily lives and production processes. Given the acceleration of the changes and the future consequences of the end of Taylorism, which put human resources at the centre of the production system, the companies should be able to create the conditions that will enable them to succeed, and the policy makers should provide the conditions for empowering the business environment. The gain for economy and trade development are quite coherent, however not automatic. To support and promote trade and investment through digitalization, a stable infrastructure, appropriate regulation and the right skills at the institutional level should be in place.

The following table gives the overall understanding of the size and annual growth of these markets. Rapidly growing markets are very attractive for operating in.

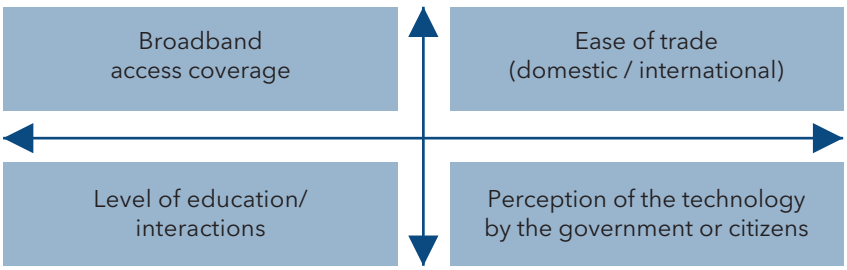
Table 2. List of the top products by value and potential for development

Market by technology	Value today US$ bn	Future value US$ bn	Growth/year	Source
Cloud	219 (2016)	410 (2020)	17%	Gartner
IoT	157 (2016)	457 (2020)	30.6%	Forbes
E-learning	165 (2015)	275 (2021)	7.5%	Orbis Research
Cybersecurity	137 (2017)	200 (2024)	5.6%	Cybersecurity Market by Solution
AI – Big Data	130.1 (2016)	203 (2020)	11.4%	IDC
Robotics	31 (2016)	237 (2022)	40.4%	Statistica
Machine learning	12 (2017)	57.6 (2021)	48%	Deloitte
Blockchain	0.339 (2017)	2.3 (2021)	62%	Statistica

◇ The four key growth factors of the technology sector within a country

There are four fundamental factors for enabling the business ecosystem and the development of new technologies within a country (Figure 5). The business ecosystem is particularly important for SMEs, startup creation and the integration of innovation. Large enterprises are often in a position to shape their business ecosystems, set up their own R&D centres and create training academies on their sites. This way a business ecosystem is forming the base for the entire sector as many startups and SMEs are a result of spillover effects from larger companies. However, to facilitate and support the easy development of enabling a business ecosystem, certain basic features should be in place.

Figure 5. Four key factors for the creation of enabling business ecosystem for IT sector development



Source: ITC

[19] Idem

Broadband access coverage

Broadband offers important benefits for economic and social development and can bring gains at the enterprise operational level and improve access to education and healthcare. Broadband access is now the basis of digital life. Broadband is not only speed or capacity of network data transmission but a wide array of capabilities, services and applications as well as technology configurations and platforms, all of which depend upon high-capacity interconnectivity among their components[20]. A number of features and components should be in place to develop a broadband ecosystem, such as infrastructure and services, end-user devices, software, application and content, IP rights, financial instrument, human skills and supportive regulatory regimes.

Ease of trade through digitalization

Information technology accelerates value creation, which implies that there should be an incentive system to enable the country to gain and use that resource for trade development. The digitization of the economy is accelerating trade and the government's structure should adapt to that acceleration and embrace this change. The shift from a physical economy to a digital economy will move added value into the realm of intangibles (software, services and data). In addition to creating value within the country, e-governance plays a critical role in reducing the burden of bureaucracy, increasing the efficiency of the government system and indirectly fighting structural imbalances.

A high level of education and industry interaction

A favourable educational environment and continuous investment in training the educational workforce should be in place as well as an encouraging social environment to avoid brain drain and to develop skills within their country of origin. Demand for technology talent continues to exceed supply worldwide, with leading IT firms offering job opportunities and actively recruiting candidates for technical positions. There is a need to have more prepared IT specialists who will incentivize enhanced processes in companies that can deliver improved quality.

Across various aspects of education, mathematics should be prioritized to ensure there will be sufficient numbers of engineers for the IT sector. Eighty percent of the jobs of the future do not exist yet and thus it is hard to predict whether an education system is designed to meet the needs of the future. Even so, it is crucial to encourage dialogue and interaction between the industry and the education system so it can adapt to the rapid change in industry needs. Curricula and training programs should already be developed for such emerging job roles as machine learning trainers and scientists, AI developers, Industrial IoT engineers, geospatial and mapping specialists, blockchain developers and engineers, digital designers, cybersecurity architects, penetration testers, user experience (UX) designers, solutions architects, full stack developers, technology project managers, robotics engineers, drone operators and technicians, among others.

A positive perception of technology by citizens and the government

A strong position of a state being IT-friendly with its active support in the change of people's perception of digitalization should improve collective awareness and foster economic gains of the digital economy. A government that puts up administrative barriers to the digitization of the economy will not only slow down unavoidable change but will also indirectly feed the fear of new technologies and set the country back. The role of the government in this is critical, through e-governance and active promotion of digitalization of the economy. Besides its financial benefits and efficiency, e-administration also plays a role in collective awareness of the need for a more digital economy and of the immediate benefits that it provides. Finally, all administrative barriers, such as excessive controls and high taxes, can only obstruct the country's economic development. It is better to plan for wealth creation and tax resulting flows than to enact taxes that create barriers to the creation of flows.

- The information technology industry is growing tremendously on a global scale and plays a crucial role in the economy, not only as a source of potential revenue but also as a vector of crosscutting growth.

[20] UNCTAD (2015). Internet broadband for an inclusive digital society. UNCTAD Current Studies on Science, Technology and Innovation No.11, Geneva.

- The use of ICT goods and services and their global production is constantly on the rise and it is transforming trade, jobs and skills, and access to information though the Internet, which not only increases access to knowledge but increases the GDP overall.

- The IT industry is continuously evolving; growing trends and technologies such as the IoT (Internet of Things), robotics, cloud computing, blockchain, AI (Artificial Intelligence), big data analytics, three–dimensional (3D) printing and many others are already changing how factories are designed, products are manufactured and services are delivered.

- With the rapid pace of technological advancement and its adoption, there are a number of tasks that need to be addressed, namely, to build an efficient IT business ecosystem, a supportive regulatory framework, broadband access coverage, a high level of education and interaction, and a positive perception of technology by citizens and the government.

- A favourable educational environment and continuous investment in training for the educational workforce and R&D remains the basis of future development of this sector.

- Ukraine also needs to pay particular attention to and place emphasis on these new technologies and directions as they are likely to shape the future of the entire global economy. Moreover, it is crucial to lay out carefully conceived strategies to develop every possible direction and reinforce the country's position.

NATIONAL CONTEXT: THE LEVEL OF IT INDUSTRY DEVELOPMENT IN UKRAINE

The Ukrainian IT industry is not yet one of the global leaders in the above–mentioned major trends but it has seen substantial growth in the past decade and with a strong scientific background, decent broadband base, abundant human resources and established education system, overall the country has great potential to increase its export revenue compared to other sectors, if it manages to resolve the issues outlined in this Strategy.

Some of the pioneers in Ukrainian IT export were IT outsourcing companies that enventually matured into value added solution providers. They became the main exporters of IT services and won universal recognition already back in 2012 when they first became acknowledged as the top outsourcing market in CEE according to the Ukrainian Hi–Tech Initiative[21]. It is also important to note the rapid growth of IT specialists, which soared from 25,000 in 2012[22] to 154,000 in 2018, according to the report of the biggest portal DOU[23] with 172,000 IT professionals in 2018 according to another data source[24]. Other parts of the ecosystem of IT industry are also gradually developing but their moment to really shine is yet to come.

Thanks to a number of competitive advantages, Ukrainian IT technology service companies have expanded globally. The total number of companies operating in the IT industry is difficult to calculate because many IT companies, particularly technology service companies, startups and product companies, have their headquarters outside Ukraine. According to the most recent report from the IT Ukraine Association, there are around 4,000 companies operating on the market of which approximately 2,300 are active in the labour market[25]. A software development report produced by AVentures in cooperation with other partners states that there are 245 IT service companies employing more than 50 employees, with 750 IT service companies in total[26].

Their presence on the growing global market improves the likelihood of increasing the market share of Ukrainian IT services and products organically, due to record growth rates

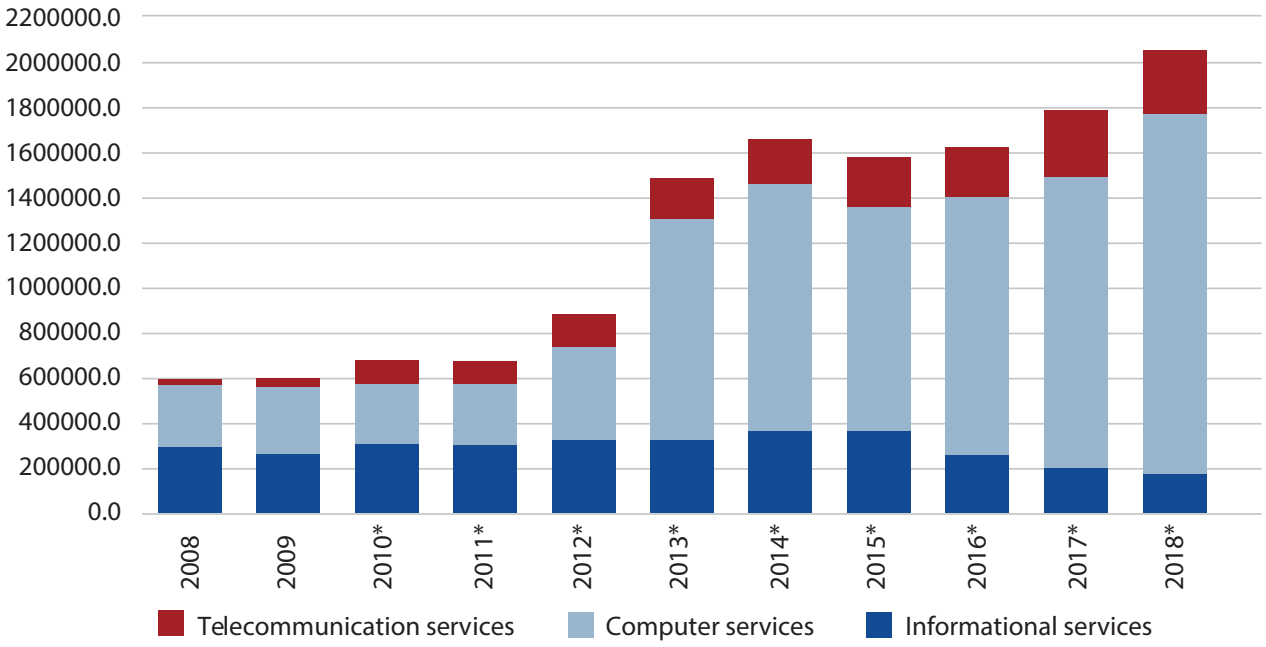
[21] Hi–Tech Initiative (2012), Exploring Ukraine IT Outsourcing–Industry.
[22] Idem
[23] https://dou.ua/lenta/articles/how-many-devs-in-ukraine-2018/
[24] AVentures, Aventis Capital, Capital Times. The ultimate guide to regional IT service capabilities Software development report in Ukraine, Poland, Belarus and Romania
[25] The development of Ukrainian IT industry (2018). Analytical report, IT Ukraine Association, BRDO, Forbiz, EU4Business.
[26] AVentures, Aventis Capital, Capital Times. The ultimate guide to regional IT service capabilities Software development report in Ukraine, Poland, Belarus and Romania

as indicated by the global IT market. It is notable that the area of new technologies shows the greatest growth, and is therefore not surprising that all types of companies, both service and product oriented, focus on exploiting the potential of these technologies.

IoT (Internet of Things), robotics, cloud computing, blockchain, AI (Artificial Intelligence), data science, big data analytics, three-dimensional (3D) printing and many other new trends are all present in the country in some form and need to be strengthened, but not started from scratch. The IT sector has a good base as Ukraine has maintained a significant part of the scientific potential of the Soviet Union, with a number of scientific institutions and universities in each large city, complex industries such as machine building and the space industry, as well as significant achievements in the hi-tech sphere.

The country has developed and currently shows steady growth in the IT sector. Ukraine's exports have increased significantly over the past 10 years, growing on average by 20.7% annually according to the State Statistics Service of Ukraine (Figure 6). The ICT industry's share of total exported Ukrainian services in 2018 was 17.2% with a volume of US$2.04 billion, which is an increase of 19.8% compared to the same period the previous year. According to data from the National Bank of Ukraine, the export of ICT services was US$3.48 billion[27], which is 22% of the overall services exports. The industry goal is to further increase the volume of exports of IT services and support the growth of the product share.

Figure 6. Ukraine ICT services export, thousand US$



**Information for 2010–2013 is given without taking into account the temporarily occupied territory of the Autonomous Republic of Crimea and the city of Sevastopol; for 2014–2016, without taking into account the temporarily occupied territory of the Autonomous Republic of Crimea, the city of Sevastopol and part of the zone of the anti-terrorist operation; for 2017, without regard to the temporarily occupied territory of the Autonomous Republic of Crimea, the city of Sevastopol and part of the temporarily occupied territories in the Donetsk and Luhansk oblasts.*

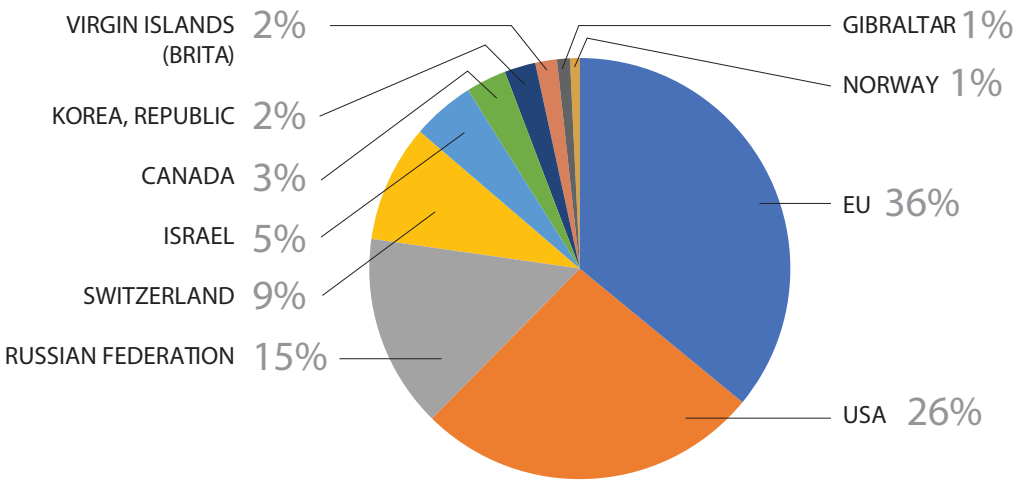
Source: State Statistics Service of Ukraine

IT Ukraine association gives even more optimistic figures of the size of exports: US$4,5 billion in exports of IT services in 2018 and 25% increase compared to 2017.

However, it is important to note that the actual amount of Ukraine's IT industry revenue would be much higher if the profits of all companies Ukrainian in origin registered in other locations were taken into account. According to the State Statistics Service of Ukraine, key export markets for Ukrainian ICT services are EU (including UK, Cyprus, Germany, the Netherlands, Ireland, Sweden), USA, Russian Federation, Switzerland, Norway, Israel, Canada and South Korea (Figure 7).

[27] Source of information: the site of the NBU (Dynamics of the balance of payments of Ukraine: Analytical Presentation Form)

Figure 7. Top importers of Ukrainian ICT services



Source: State Statistics Service of Ukraine

The landscape of the IT industry in Ukraine is varied as many companies offer a wide range of services. The IT sector has several subsectors, such as service, products, technological startups, captive centres and others, which are at different levels of development and require various solutions for further growth. In itself, the industry has a huge potential and is at the very beginning of its exponential growth. The right initiatives and further support from public and private stakeholders will allow the building of a strong ecosystem and the strengthening of global positions.

The efficient broadband connection and knowledgeable human resources have fostered industry growth. Multiple factors influence the industry's development, but the basis remains human capital and a well-developed infrastructure. The industry in 2018 employed more than 154,000 specialists and generated four times more jobs in related industries. The infrastructure, namely the high-speed internet which is the foundation of the industry, is quite efficient. Despite the fact that the mobile 3G and 4G internet was very slow to be adopted (4G/LTE was only introduced in spring 2018), broadband connection is now quite fast and of good quality. Ukraine was listed 42nd in the global rating of Internet speed in 2017[28]. Such market conditions stimulate extensive exports from the IT sector.

Further initiatives have already been implemented to develop the digital economy in-country and to support exports as well. One of the most notable is the Concept of the development of the digital economy and the society of Ukraine for 2018–2020.

Box 2. The Concept of the development of the digital economy and the society of Ukraine for 2018–2020

The main objective of the Concept, approved by the order of the Cabinet of Ministers of Ukraine dated January 17, 2018, is to implement an accelerated digital development scenario that is most relevant to Ukraine in terms of challenges, needs and capabilities. The key objectives of the Concept are:

- To eliminate legislative, institutional, fiscal and other barriers that hinder the development of the digital economy;
- To introduce incentives encouraging businesses and the economy as a whole to digitalize;
- To create and develop digital infrastructures as the basis for using the digital world's benefits in everyday life and a platform to achieve economic efficiency in general;
- To develop and deepen the digital competencies of citizens to ensure their readiness to make use of digital opportunities as well as to overcome associated risks;
- To provide broadband internet access to students at educational institutions of all levels.

[28] IT Industry of Ukraine report of the National Investment Council of Ukraine

The main results for implementing the Concept will be the achievements in 2020:

- 30th position in the Networked Readiness Index (WEF, 2016 – 64th);
- 40th position in the Global Innovation Index (INSEAD, WIPO, in 2016 – 56th);
- 50th position in the Global ICT Development Index (ITU, in 2016 – 79th);
- 60th position in the Global Competitiveness Index (WEF, in 2016 – 85th).

The local IT market remains rather small, even though more than half of the population has access to the internet. According to the State Statistics Service of Ukraine, more than 57% of Ukrainians had access to the Internet by the end of 2017. This figure has more than doubled since 2010 and experts forecast further stable double-digit growth in the next five years. At the same time, telecom services occupy more than 50% of the local market, a sign that the local IT market is undeveloped compared to other markets. The small local market for IT services can be explained by the limited financial resources in local companies for developing IT content and the cultural absence of buying digital services and valuing intellectual property, resulting in the high rate of pirate content still available and the lack of digital and management literacy. Additionally, the internet is not widely available throughout the country and businesses are not fully aware of how to use new digital technologies nor how to calculate ROIs from their implementation.

At the same time IT plays an important role in the Ukrainian economy and there is potential to double the volume of exported IT services in next two years. The size of the Ukrainian IT services market has increased by 2.5 times from 2011 to 2015, and has the potential to reach US$5.7 billion by 2020[29]. The figure for IT exports was estimated at US$4.5 billion in 2018, according to the IT Ukraine Association, and has provided significant inputs for the national economy in terms of budget revenues, foreign currencies, job creation, banking incomes, etc. Most of these achievements are due to rapid development and the success of Technology Service Companies, who were the first to enter the global market, learn how to operate there and build effective businesses based on exports.

Product companies and startups do not constitute a significant share of Ukraine's exports so far but there is great potential for growth in the near future provided favourable conditions are created for such growth.

In 2018 venture capital (VC) investment in Ukrainian IT companies increased 1.3 times compared to 2017 and reached its peak totaling US$336.9 million (115 contracts). The largest share of VC investments in 2018 by the number of deals was in software and online services, and by size of deals in hardware. Investments were also made in marketplace solutions, mobile, e-commerce and others[30].

The value of private equity deals in 2017 in Ukraine comprised US$126.7 million (14 deals), which is a significant growth compared to the previous three years when the average number of deals did not exceed three to four deals per year.

There are 33 private funds operating in Ukraine, namely:

- 19 venture capital funds
- 8 private equity funds
- 5 incubators and accelerators
- 1 corporate fund[31].

The new trend in attracting investments for Ukrainian startups is Initial Coin Offering (ICO). According to data provided, in 2017, 19 Ukrainian startups succeeded in attracting US$160 million with ICOs in 2017, making ICO the most popular throughout the e-commerce sector. However, due to the volatility of the instrument, the lack of trust and need to secure material assets, the number of deals in 2018 fell to four, and the amount of investments to US$58.3 million[32].

[29] PwC report
[30] Venture Capital and Private Equity Overview 2018 by UVCA (https://www.slideshare.net/UVCA/ukrainian-venture-capital-and-private-equity-overview-2018-141626280)
[31] Venture Capital and Private Equity Overview 2017 by UVCA https://www.slideshare.net/UVCA/ukrainian-venture-capital-and-private-equity-overview-2017-97295516
[32] Venture Capital and Private Equity Overview 2018 by UVCA (https://www.slideshare.net/UVCA/ukrainian-venture-capital-and-private-equity-overview-2018-141626280)

Crowdfunding platforms and grant programs are also considered an attractive source of funding for Ukrainian startups: US$429,000 in grants was received from Vernadsky Challenge and Horizon 2020, and US$2.1 million was raised by 16 companies on crowdfunding platforms[33].

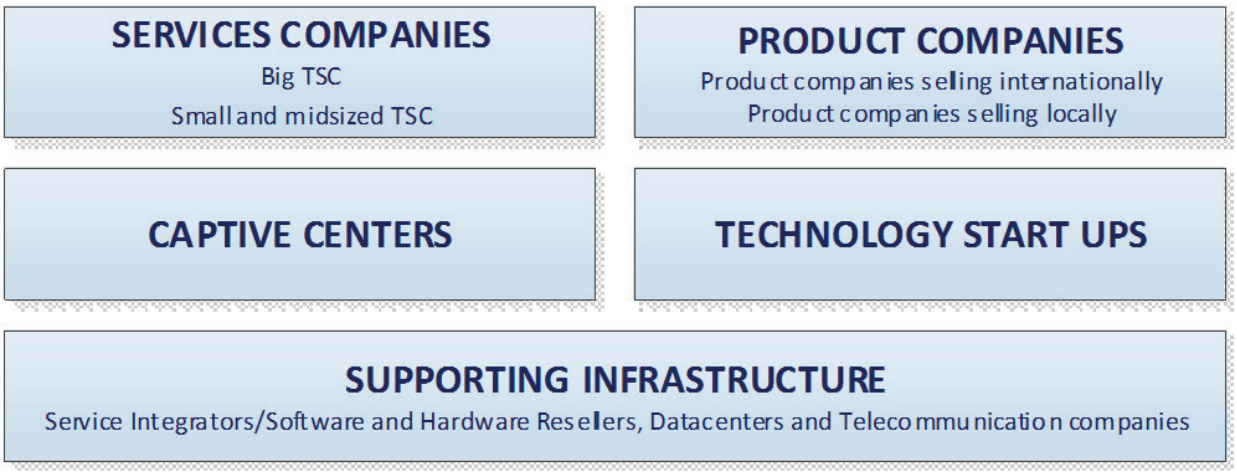
Further development of the Ukrainian IT ecosystem, legislation, support for startups by the state and investors at all stages of development will provide favourable conditions for the growth of Ukrainian startups and the entire IT sector.

The agility of the business ecosystem to adapt to urgent industry needs is the cornerstone for the development of a successful IT industry, especially one that is facing other challenges. The impact of policy and regulation in the IT sector is immediate due to the speed at which the sector is developing. Ukraine has appealing assets such as an established industrial economic base as well as a historically renowned educational system that prizes mathematics and engineering and is able to produce high–level skills. Ukraine's increasing involvement in the market economy and its central positioning in Eurasia are also favourable factors. However, there is a risk that its high–level education sector will be affected because skilled graduates go into the private sector to the detriment of the academic sector or migrate elsewhere to earn decent wages in line with their level of education. This risk is even greater because the age pyramid is unfavourable, with a large proportion of the population (and an even larger share of the teaching workforce) currently over the age of 50. Ukraine's ability to boost its IT development strategy will depend heavily on the ability of Ukrainian universities to systematically adapt to modern trends and proactively implement new approaches to attract talented students and teachers.

◇ Typology of IT companies

Ukrainian IT firms provide different types of services and their size varies from large technology service companies with vast experience to emerging startups[34] as shown below.

Figure 8. Typology of ICT companies in Ukraine



Source: Extended stakeholders consultations

◆ Technology Service Companies

Historically the IT sector started with the provision of IT outsourcing services, which initially were simple outstaffing models. Currently the range is quite vast, from outsourcing to fixed price and turnkey solutions of various levels of complexity, to services for a small foreign business requiring a programmer or a simple solution for their business to teams working and innovating for startups and large corporations. Top Ukrainian companies are servicing more than 100 Fortune 500 companies, offering industrial high load and elaborate solutions, consultancy on setting up business processes inside technological teams and doing high quality sophisticated software development, providing detailed HR services on developing employees and competing for large projects with Microsoft, IBM, Accenture and similar giants.

[33] Idem
[34] The number of companies by IT activity can be found in Annex.

There are small, mid-sized and large companies among technology service companies (TSCs). The size of companies in this area is traditionally counted by the number of people who work for them, both employees and individual subcontractors.

Big Technology Service Companies

These companies became very successful on the international market due to a number of reasons, including their early start in the 1990s, the introduction of the best and latest international management practices of software development, recruitment and HR management, and continuous investment in their offices and facilities to attract the best talents. They often have representatives and sales offices in target markets. This group currently provides the largest share of the country's IT exports and boasts world-renowned names among their clients, including Microsoft, Google, Deloitte, Panasonic, Intel, Lenovo, Oracle, Ericson, Ford and others. These companies make constant improvements to the volume of added value provided to clients by adding PM, BA and Delivery Management services, consulting on business aspects of the products developed and wrapping it increasingly into a more mature service offer by creating large and smoothly-working groups of rare talents (dedicated teams), taking all the risks of creating complete products for clients or even offering corporate solutions for end industrial or infrastructure clients. They are reaching the level of not competing with other outsourcers but rather with international system integrators and solutions providers.

These companies also became the catalyst for the entire ecosystem development. They are constantly improving the quality of their services and working on large and complex solutions. They educate within the company as well as via numerous corporate academia and universities, and have surrounded themselves with a large number of senior developers and managers who possess top-notch technology and management skills and experience. Such professionals at a certain level of their development are tempted to start their own business or join existing initiatives as managing partners, thus encouraging the startups and product segments of the ecosystem and sharing their knowledge, experience and entrepreneurial skills, which the market currently lacks to a large extent.

Therefore, the main positive effect of such companies in the IT ecosystem is increasing the educated workforce who are accustomed to working with international clients in English and using the latest approaches. They also pay a signifcant amount of taxes and share their management and technology experience with smaller companies at various conferences, forums and other similar events.

Currently, 50 companies provide work to more than 58,000 IT professionals. However, they are continually searching for talent since the demand for such services is considerably higher than the supply, forcing them to offer inceasingly competitive salaries. This makes their margin smaller, business harder, and provokes overheating of salaries and the drain of talent from less competitive companies. Still, such a level of competition makes the overall ecosystem stronger as it forces companies to search for new solutions and become more competitive in order to survive.

Small and Midsized Technology Service Companies

The overall number of IT companies was reached over 1,000 in 2015 and around 4,000 in 2018, according to a recent report . SMEs constitute up to 80% of this number. The entrance barrier to this business is very low. The minimum requirement is a team of developers and at least one international project. In most cases, these companies start when a freelance software developer takes an order that is too big for them and gathers a team together. These teams either have or develop good technological expertise, often beginning to specialize, not due to a conscious choice but because of their project's specificities. These companies are often fighting the hurdles of setting their sales channels as well as the development, operational and other management processes inside the company, and learn as they grow.

It is a dynamic area, with many companies starting, disappearing, trying various models of technology service business, becoming product companies or launching their startups inside a company. Quite often such startups are self-funded, with the "outsourcing part" financing the "startup part" until the company makes the choice of focusing on a new branch or product. The positive impact of these companies is that they provide many young entrepreneurs with their first experience of running a business that is easy to start but not so easy to maintain. These companies bring up a new generation of self-made people, earning their capital in an ethical way, using their own skills and brains and along with big technology service

companies, providing jobs to thousands of IT and non-IT specialists involved in this sphere. Small and midsized TSCs also quite often serve as a first job for university graduates whom they eventually lose in competition for resources to larger TSCs.

The adverse impact is partially the same as that of big companies – overheating the market and taking IT specialists from less competitive companies, as well as in some cases ruining the reputation of the Ukrainian brand by not employing top-level communications or providing poor quality of development.

Product Companies

A product-based company builds and sells software to a wide variety of customers abroad and on the local market.

Product companies, selling internationally

This group consists of well-established companies who have been working with international markets for a long time as well as comparatively young rising stars who started quickly and became leaders in their respective segments. What unites them is that they both succeeded in finding their business opportunity and a way to the market. What is different is that most of the new companies come from startups and are in the vast majority of cases registered abroad, with local centres acting as captive centres only and the capital, profits and IP located abroad.

Investors often refuse to invest in companies registered in Ukraine for a number of reasons and thus most of the product companies, with rare exceptions, are in fact no different by their legal form from the Technology Service Companies and international captive centers.

The positive impact of such companies is that they are involved in the full-cycle product development and employ not only IT engineers but also a whole set of additional personnel, such as marketing and sales specialists, customer support and maintenance staff, and many other roles required for the full cycle of product development.

An adverse impact is when a successful startup becomes a product company and takes the participating core team of scientists from their laboratories, leaving scientific laboratories without resources for further research.

Product companies, selling locally

Product companies selling locally are the most vulnerable of all. This group mostly consists of companies that have been on the market for a while, have created a product and are now gradually losing people and fighting for their existence, as they are in a tough market (Figure 9) and not able to maintain the same salary scale as Technology Service and International Product companies. They are also taking all the risks in terms of taxation, regulation, security, etc. At the same time, as these companies are operating only in the local market and do not have enough experience in international competition, they do not have same level of quality product or service quality as other large new companies do. These companies have a hard time when international competitors enter the market since the market size is small and the size of their software and services remains limited.

Figure 9. Structure of Ukrainian ICT, US$ billion

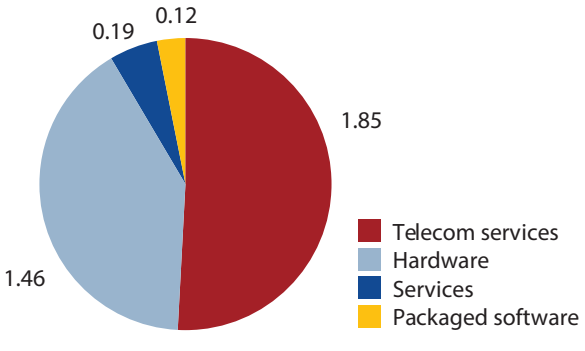
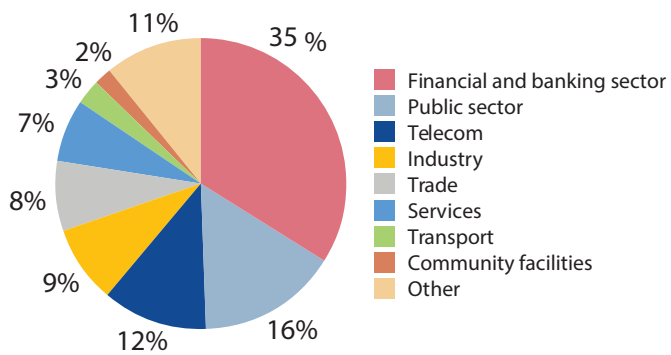


Figure 10. IT consumption structure in Ukraine, %



Source: IT Industry of Ukraine report of the National Investment Council of Ukraine

The largest consumers of ICT services in Ukraine are in the financial and public sectors (Figure 10). At the same time there is another trend of new products and services, which in most cases are copying international solutions, such as e-commerce (Rozetka), marketplaces (Kabanchik, Uklon), etc. Their models prove to be profitable but it will be a challenge to succeed in international markets as the respective niches are already occupied.

Their positive impact on the ecosystem is similar to that of international companies – they give the work directly to IT engineers and to the entire group as well that will be required for working with the product. They also give work to those engineers who do not speak English and it is their chance to work with quality resources in software development.

The negative impact is that despite working in the local market, they are not developing it because of the low level of services provided. This is why they cannot go abroad even though their intention is to access international markets.

Captive centres

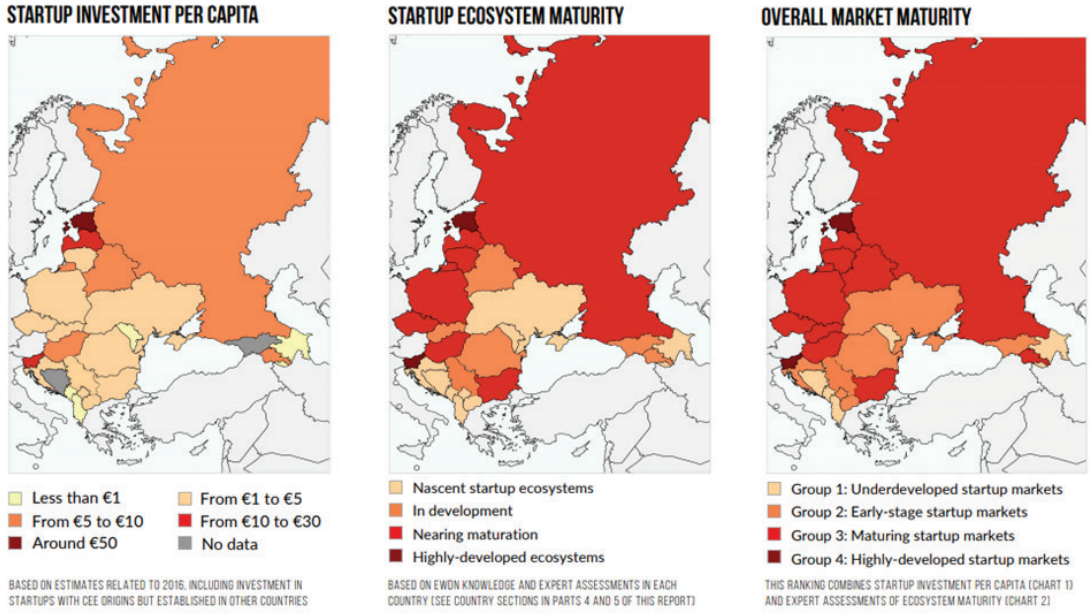
Captive centres are client-owned-and-operated service delivery centers typically in a non-domestic location that provide service resources directly to their organization[37]. Normally quite a large number of captive centres have R&D departments.

There are over 100 captive centres in Ukraine with R&D activities. They belong to leading international companies and make an important impact on the IT ecosystem by introducing the high standards of software development of their parent companies and providing developers with high-level research tasks. Among the largest international companies with their own captive centres in Ukraine are Samsung, Siemens, NetCracker, Mallnox, Ericsson, Limelight, Huawei and Oracle. Opening new captive centres for international technical giants can bring other companies with them, which will have a positive effect on the business ecosystem overall.

Technology Startups

Technology Startups comprise an ecosystem that creates Product Companies competitive in global markets. The number of startups is constantly evolving and today there are more than 2,000[38]. However, the startup ecosystem is still far from being mature compared to neighbouring countries as Figure 11 shows.

Figure 11. Mapping of startups in Eastern Europe



Source: East-West Digital News[39]

[37] Gartner IT Glossary. Available at: https://www.gartner.com/it-glossary/
[38] IT Ukraine Association
[39] East-West Digital News (2018) Start-up investment and innovation in emerging Europe, available at http://www.ewdn.com/files/cee_report.pdf

More time is needed for startups to grow, and more access to capital and investment is required to develop this segment and improve ecosystem maturity. The main objective here is to provide conditions for the creation of more startups as the business ecosystem is constantly developing and many ideas are emerging and being tested. This will allow the building of a supporting ecosystem around it and will stimulate the development of more successful product and solutions companies.

The positive impact of the technological startups on the IT ecosystem is that they eventually become new product companies and also bring fresh ideas that change the entire market landscape. As developed markets show, such companies can reach record sizes in a short period of time, as in the case of such widespread phenomena as Unicorns: companies that become worth US$1 billion in less than five years. However it is generally acknowledged that less than 1% of startups that receive initial outside funding become billion dollar companies, therefore it is important to significantly increase the initial number of startups to increase the amount of Unicorns respectively. All this provides huge potential for transformation and a great opportunity for the whole economy, if the conditions for them to grow and, most importantly, stay in the country are created. In addition, a special culture of innovation, new ideas and entrepreneurship is created thanks to startups that in turn, give birth to more startups, including unicorns, and thus the sustainable self-reproducing and self-enforcing ecosystem is eventually launched.

Among the negative impacts is that these companies tend to take the talented scientists for their startup projects or move entire core teams with these scientists abroad, which results in these scientists no longer furthering scientific works. Another negative impact for the state is that once the startup is in a position to attract investment it is almost a requirement to register abroad. The Ukrainian business system is not responsive to further growth of the startup and investors refuse to put money into companies registered in a precarious location. For startups it is a minor problem as it is easy nowadays to register anywhere, and many locations are competing for these startups. However, Ukraine is losing the potential to keep and create or attract new startups.

Supporting infrastructure

Under a supporting infrastructure, all companies providing supporting software and hardware solutions are included.

Service or system integrators, software and hardware resellers

These are the companies that produce hardware and software systems for mainly local clients and are working with the largest vendors, such as IBM, Microsoft, etc. They are responsible for the provision of the full cycle, starting from networks and hardware and finishing with installing, customizing and integrating software systems. They are working mainly with the local market, though are interested in exporting as well.

Datacentres

There are a number of datacentres in the country. However, they are not currently exporting and are experiencing certain difficulties that prevent them from creating a successful international business. Among the obstacles is a lack of business development skills, understanding of cooperation, immature management and restrictions in legislation.

This strategy does not cover the needs of this subsector; the main focus of this document is on Service Technology companies, Product companies, Technological startups and Captive Centres as the main and most promising exporters.

Table 3. Summary of subsectors

Subsector	Description
Big Service Technology Companies	Currently the strongest section right now. They upgraded from purely outsourcing companies to something larger and with higher value, either as services for extending clients' teams, namely retention, teambuilding, personal development programs, establishing correct procedures inside the teams for highest productivity, etc., or services that provide solutions. For example, SoftServe is competing for clients with Microsoft, Luxoft is developing a system of automated driving for a large German automotive group. Thus, Service Technology Companies have become more and more a mature industry providing intellectual services.

Subsector	Description
Product Companies selling internationally	Second most promising group. From the sector development perspective there is an issue with the main offices of these companies being located outside Ukraine and so there is hardly any difference to the Service Technology Companies or Captive centres in terms of their organizational structure. Solving this problem might help to increase IT export figures.
Technological Startups	Startups are the rising stars according to the matrix of the Boston Consulting Group and they need an ecosystem to grow and flourish. It is important to provide state support for startups in order to help them develop in the country and to create the foundation for the startup ecosystem.
Small and Midsized Service Technology Companies	Small and Midsized Service Technology Companies either become more mature and stay as service companies or they master the product direction. These companies are already actively exploring options to transform to product companies due to high competition in the outsourcing sector and higher margins solutions and products with higher added value. They need support to help them grow in any of these directions. Letting them stay as they are and trying to use the algorithms of the old outsourcing model will not be beneficial for the economy.
Captive centres	Captive centres with R&D activities are already present in the country. However, to launch the true ecosystem move towards R&D we need many more of them. The conditions for these captive centres should be rethought to balance the competition for resources on the market, and assistance with persuading some big names such as Google or Amazon to open captive centres with R&D activities here in Ukraine is also required.
Product Companies, selling locally	This group consists of old local companies unable to export and fighting for existence in a limited local market, as well as new local companies that have launched successful products and services with respective niches in other markets, justifying their main focus on the local market.
System integrators and Datacenters	System integrators have being occupied considerably small export potential at the moment, just like datacentres; despite the high potential of the latter they are not consolidated nor searching for solutions to their business problems and do not have a good understanding of business requirements.

◇ Positions of key technologies transforming the global economy in Ukraine

Apart from analyzing types of companies, it is also important to see how well the Ukrainian IT market is integrated and responds to global challenges and requirements.

Cloud Computing

The Cloud is firmly and widely established as the main way to run infrastructure in Ukraine. Despite the fact that datacentres in Ukraine are not yet sufficiently developed, there is widespread use of international datacentres, both private and public clouds, for business purposes and to create applications and solutions based on the cloud approach.

The IoT and Robotics

The IoT and Robotics is actively developing in Ukraine. Having two older established industries, agriculture and machinery, both in need of IoT and Robotics solutions, there is a huge potential and market for developing this trend inside the country as well as a number of existing solutions that are currently exported by service companies. However, to enable and foster further growth in this direction, a state strategy for support might be required as this direction requires significant investment in the initial stages.

IoT is the most prominent market among new technologies in Ukraine. Today hundreds of startups develop their products and solutions in many segments of IoT and Industrial IoT, for local customers as well as for export.

There are around 200+ companies operating in this area, according to approximate estimations of the Association of Enterprises of Industrial Automation in Ukraine (APPAU). At least ten technical universities provide respective educational programs for students. Training in IoT is also implemented in many private schools and international programs in Ukraine. The main segments are: data analytics, sensors, platforms, software development, cloud services and connectivity. The companies are operating in such industries as Manufacturing, Energy, Home, Infrastructure, City and Agriculture.

All large service companies, such as Luxoft, SoftServe, Eleks, Ciklum and Infopulse, have IoT services and solutions in their portfolio. However, the business model of these companies is

service-oriented and despite the added value of services and solutions provided, few of their products are known in Ukraine and may be considered 'export products.' Smaller firms and startups also develop solutions that are positioned in various Product categories, namely:

- **Utilities: a-Gnostics**, predictive analytics software used in industrial IoT platforms that provides high-precision analytics of industrial equipment
- **Agriculture and Farming: smart Farming** – software solutions for precision farming and unmanned technology in agriculture
- **Retail: DDAPP** (Digital Distribution Applications) has developed a cloud platform for distribution (retail) automation
- **City and Utilities: Overvis** is an industrial IoT platform with ready-to-use services for many Industrial, City, Energy and Utilities applications
- **Energy and Utilities: Smartico** proposes smart energy counters based on IoT
- **Health: Cardiomo²** has developed an IoT device capable of monitoring health on a real-time basis
- **Manufacturing: Smart EAM** is a complete solution for predictive maintenance in manufacturing
- **Home: Ecoisme** is a smart system for monitoring the level of energy consumed in a house that sends the data to a smartphone via a mobile app
- **Construction/Home: PassivDom** proposes smart, energy saving and mobile home connected to IoT and developed with 3D/advanced materials technologies
- **Developer tools: Fractal Tools** is a specialized toolkit for developers of IoT solutions in both IoT and IIoT (Industrial IoT) applications.

These products have strong export potential and/or were initially developed for global markets. According to a survey from APPAU, 70% of developers have already considered export opportunities. More than 50% of IoT startups in B2C segments position their new products for global markets.

New innovation levels, cost reduction and energy saving are the three top values that developers consider in their innovation processes.

Three top challenges are a lack of investors, a lack of a strong ecosystem and issues of cyber-security. The most valuable partner respondents consider investors and funds, international vendors and R&D centres as their top challenges, while Ukrainian developers consider AI/machine learning and cyber-security area as the most needed skills.

These groups are specialized by vertical segment or product niches. There is no joint or united approach towards common issues such as cyber-security, the ecosystem, platforms, IoT stack and services, etc.

Regarding supporting ecosystem and infrastructure it should be mentioned that B2C and consumer-oriented segments are much faster in their evolution compared to industrial players. The former already have a developed infrastructure: several associations, many HUBs, incubators and accelerators. The latter only recently began their consolidation into the national Industry 4.0 movement, initially trying to attract and involve technical universities. There are no incubators or accelerators in Industrial IoT or similar technologies in Ukraine.

Ukrainian IoT developers have a strong and already-recognized potential in IoT products and solutions in Eastern Europe. The suggested positioning on the global arena may include vertical markets (Agriculture, Farming, Home, Health) and/or the development of IoT devices and solutions for cyber-security in IoT. The weak point is a low evolution speed in the development and integration of Apps and mApps (Manufacturing Apps) on worldwide recognized IoT and IIoT platforms[40].

Big Data, Machine Learning and Artificial Intelligence

Ukraine has two competitive advantages when it comes to Big Data and AI: a traditionally strong Mathematics background and more flexible legislation in terms of data, which

[40] Source of information among others; Analytical report IoT market in Ukraine, 8 Striking IoT Smart Devices Made In Ukraine, Industry 4.0 landscape in Ukraine, v1 (Ukr)

allows experiments and testing models. A natural result is that data Science and artificial intelligence are popular trends in Ukraine. More and more companies, both in IT and in marketing, banking, medicine, pharmaceuticals and retail, are working to introduce advanced analytics technologies, BI systems and machine learning technologies.

Most data science professionals work for large service technology companies. Thus, although the expertise remains in Ukraine, solutions are mainly created for foreign players. GlobalLogic, SoftServe, EPAM Systems, Luxoft, Ciklum and Sigma are the largest service technology companies in this market with a total number of employees involved in data science projects around 1,000.

Additionally, there are up to 500 experts in the field of AI in Ukraine who work both in scientific institutions and in private business. Solutions are being developed in the field of medicine, including the prevention of diseases of the cardiovascular system (Cardiomo, MAWI) as well as in the military–defense complex, for example, the use of drones in the territory of the Joint Forces Operation (Ukrspecsystems). The main problems surrounding the development of this industry in Ukraine is the inflexibility of universities and their slow speed of adoption of new programs on new technologies, which results in the lack of personnel on the market. The support of universities by IT businesses is also important for this sector.

Despite the fact that there are certain developments in this area and most of the successes of Ukrainian product companies and technological startups are connnected to AI solutions, the potential of this trend in Ukraine remains to be tapped through a well–thought–out strategy for its further development and reinforcement.

AR (augmented reality)/VR (virtual reality) technology

Like IoT, drones and blockchain, AR/VR technology is a dynamic, fast–growing segment in Ukraine. We have many talented service companies who enjoy internationally recognized ratings and reputations.

There are more than 50 companies operating in this area, according to APPAU, and at least ten technical universities provide respective educational programs. The main segments include VR, AR, Mixed Reality, Games, Virtual training and 3D development. The companies operate in such industries as: Retail, Games, Creative, Marketing, Manufacturing, Telecom and FinTech.

The main subsegments and industries in this segment are: education, healthcare, real estate, 360 video streaming and production, content distribution platforms, e–commerce, games, content studios and hardware. Companies operating in this segment are Sigma Software, N–IX, Boost–VR, Ciklum, 4A, Indium Lab, IT–Enterprise, Skywell, Sensorama and others. Many of these companies are experienced IT service companies from the early 2000s, with some of them being founded even earlier. It should also be noted that a growing share of companies in this segment are young startups.

The ecosystem in VR/AR is still at an early level of maturity. Developers are organized through meetups, conferences and clubs. A good example of a consistent approach to this type of networking is software development company Sensorama, as they offer such activities on a regular basis.

Three Ukrainian developers are in the top 15 firms worldwide according to Clutch.co (a leading technology trendwatcher): Program–Ace, weAR Studio and Sensorama Lab. Ukrainian developers have kept their high rating for the past few years and are ahead of many developed countries, including other Eastern European countries. This can be explained by the high concentration of two principal professions (skill sets) for VR/AR, namely creative artists (designers) and highly skilled programmers.

The export potential for this segment is quite high, especially for IoT and other new technologies. The main destinations are the US and Western Europe. However, a major problem concerns local registration in Ukraine: as soon as companies become well established on the international market, VR/AR developers try to relocate their head office to the country of their customers.

Three-dimensional printing (3D printing)

The most important feature of 3D printing in Ukraine is the absence of regulation and freedom for experimentation and testing models. There are a number of companies that are working in this sphere but full capacity has yet to be achieved.

3D (additive manufacturing) is not new but is an early phase of development in Ukraine. Notwithstanding the support from a large number of high schools, hubs and other ecosystem elements, 3D technology is evolving quite slowly because of low demand in the local market.

There are less than 50 companies operating in this area, according to APPAU, with more than twenty technical universities providing respective educational programs. The main segment is the consumer (not the industrial) market. These companies are operating in such industries as: jewelry, medicine, construction and manufacturing of spare parts (various segments).

Even though the first sales and initial local development have began in the early 2000s, the market is still small and limited for sellers of 3D printers. Many of them also provide services in 3D software application development. The most well-known providers are 3d factory, SmartPrint, Fabbers, 3dprinting, Imatek and 3dprinto. Few companies develop their own (Ukrainian) 3D printers (examples are Kwambio and Prusa), most are imported from China and Europe.

Two positive and export-oriented cases in this market are applications in 'Chervona hvylia' and Design Bureau 'Yuzhnoye.' The most famous and proved instance of this technology application is PassivDom. However, the opposite side of the success of PassivDom is its migration to the US together with its production.

As the main conclusion, it can be assumed that the export potential of Ukrainian in 3D printing is quite low and needs to be further developed in line with global trends.

Blockchain

Blockchain is a promising trend in Ukrainian IT. According to estimates, prior to the global boom of blockchain, Ukraine occupied up to 13% of the global market. This is not the case at the moment, after the market grew so rapidly, but Ukraine still has a strong knowledgeable community and a firm basis for further development in this direction, provided that favourable regulatory conditions are created for this trend in IT.

Globally, Ukraine is already renowned for several large projects of blockchain adoption at the governmental level, such as E-auction and the project with Bitfury. At the same time, there are a number of companies that have demonstrated efficient applications of blockchain technology as well as several talented professional blockchain developers. A number of large blockchain infrastructure projects already have offices in Ukraine. To maintain this trend, certain actions need to be taken such as: launching a methodical approach to educate blockchain developers, positioning Ukraine in the international arena as the right place to build a competent team, and ensuring a democratic approach in terms of legislative bodies. If such actions are taken, then the number and quality of projects implementing blockchain technology will systematically increase, thereby enabling Ukraine to take their place in the new global economy with confidence.

It is important to note that these technologies are used by all types of IT companies as outlined above. They are all vital in terms of increasing exports and therefore should be paid special attention, along with increasing the overall value of Ukrainian IT products and services created.

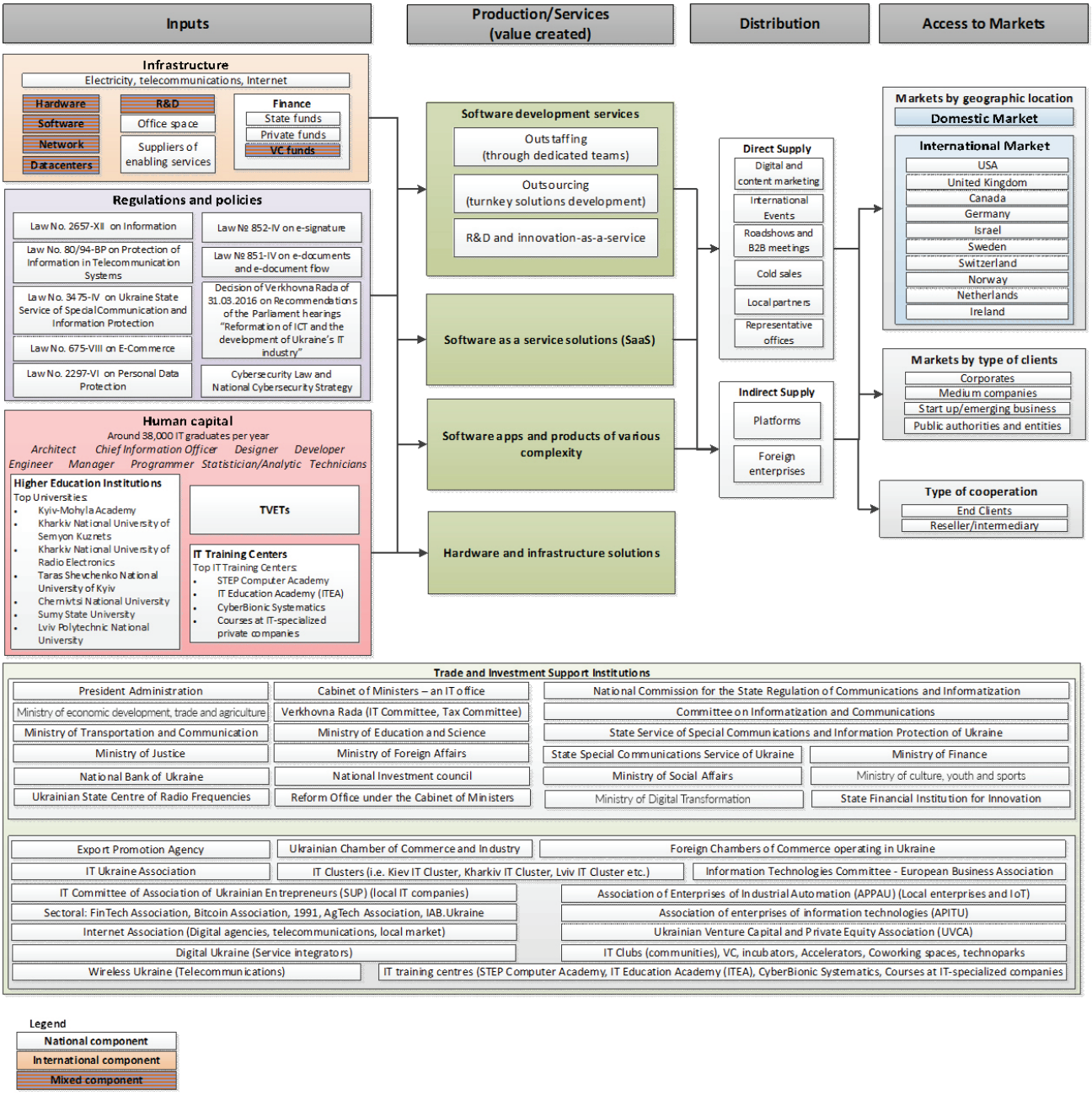
- IT is a fast growing industry with high added value that brings important export revenues, but many companies are not Ukraine-based because of barriers for operating a business in Ukraine, such as unfavourable taxation for hi-tech companies compared to other countries, difficulties in attracting investment to the high-risk location as well as existing high risks for capital and IP rights.
- The range of Ukrainian IT services is quite vast with various levels of complexity that can satisfy any client's demand, from a small foreign business to a large global corporation. IT products are also developing and there is great potential.
- The infrastructure is favourable for the sector development: broadband connection is quite fast and of good quality and Ukraine was listed 42nd in the global rating for Internet speed in 2017.

- A number of large companies became successful on the international market and have created an IT business ecosystem in Ukraine that small product companies and emerging startups also benefit from.
- There is a need to move up the value chain to create products and services of Ukrainian origin since this is the basis for further sustainable development of the IT market.
- Focus should be on supporting the most promising groups of large service technology and product companies as well as on growing the number of startups and captive centres, boosting the ecosystem and diversifying the IT export structure.
- Most of the new trends such as cloud computing, IoT and robotics, big data and AI, 3D printing and blockchain are present in the country and require strategy and favourable regulatory conditions for further development.

SECTOR DIAGNOSTICS

The business ecosystem analysis in Figure 12 and Table 4 provides a better understanding of the dynamics in and the issues affecting performance of the industry.

Figure 12. Business ecosystem of IT industry in Ukraine



Source: IT Industry of Ukraine report of the National Investment Council of Ukraine

Table 4. Summary of key constraints faced by IT companies in Ukraine

Compete	Connect	Change
Limited protection of IP rights due to a lack of law efficiency results in companies and IP products registered outside Ukraine, thus valuable assets often no longer belong to Ukrainian companies *Importance: high*	Limited national marketing and the overall global positioning of Ukraine does not project the image of a technology-driven and science-based economy, resulting in misleading perceptions for new clients and investors *Importance: high*	Limited availability of the required number of professionals due to rapidly growing industry demand *Importance: high*
Little predictability and unexpected frequent changes in legislative framework in legislative framework bear carry risks for industry development and planning *Importance: high*	Limited knowledge within local companies on how to market and promote their products impedes access to new clients and markets *Importance: medium*	Limited practical knowledge and skills hinder the transition to the workforce *Importance: medium*
Companies choose to have their main offices abroad due to legislative limitations and outdated or inexistent laws to adapt and use the latest information technologies restraint the sector expansion at the national level *Importance: high*	Limited market analysis knowledge, insufficient number of marketers and business analysts, and the lack of a strategy to target new markets inhibits the industry's promotion on the global market *Importance: medium*	Limited business development knowledge and skills on how to access new markets impede the business development of the companies *Importance: high*
Obsolete labour legislation restricts the hiring of professionals, forcing companies to use subcontractors instead; additionally, it limits the transition of students to the work environment, impedes internship opportunities and prevents professionals from teaching at universities *Importance: high*	Lack of industry "fixers" and no representation of the whole industry at the global level limits business opportunities for companies *Importance: medium*	An underdeveloped ecosystem and the limited number of techno parks and coworking spaces restrict opportunities for startups to generate and test ideas *Importance: high*
Obsolete legislation limits the ability of Universities to become flexible and financially sustainable and to respond quickly to market requirements *Importance: medium*	Insufficient institutional support does not facilitate the strengthening of the industry's image and access to new markets *Importance: medium*	A limited number of clusters and incubators due to inadequate resources and a lack of support for their development *Importance: high*
	Limited understanding of business models by scientists, lack of interest and limited resources result in weak links between industry and the scientific community *Importance: low*	Limited financial and infrastructural support and lack of a conducive environment to encourage startup creation *Importance: high*
	Limited collaboration between regional Chambers of Commerce and industry associations results in them working independently and not fulfilling the role of industry connectors with foreign markets nor taking the role of industry representatives abroad *Importance: medium*	Limited availability of funding mechanisms such as crowdfunding, seed capital, angel investors, micro VC, etc. makes it difficult to develop new initiatives *Importance: high*

Legend
- Firm capabilities constraints
- Business ecosystem constraints
- National environment constraints

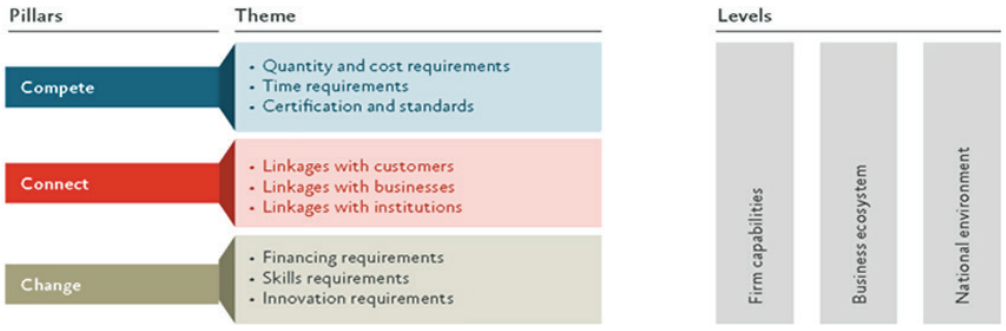
Focusing on the most pressing issues

Extensive stakeholder consultations, field visits and literature reviews have revealed constraints in the ICT sector that challenge its short- and medium-term growth. To ensure that the Strategy is efficient and precise, only the most critical bottlenecks to be addressed in this Strategy are detailed below.

Constraints are identified following ITC methodology (Figure 13). They are cross-classified by three dimensions – policy, institutional and enterprise constraints.

- **Policy constraints** refer to legislative and regulatory bottlenecks that limit effective functioning of the trade support function in line with international best practice.
- **Institutional constraints** refer to supply-side issues relating to trade and investment support institutions (TISIs) and their service delivery to enterprises, specifically in terms of the capacities and resources available to institutions to achieve effective service delivery.
- **Enterprise constraints** refer to demand-side issues relating to the logistics infrastructure.

Figure 13. ITC framework for SME competitiveness



Constraints to Compete: Issues limiting the sector's capacity to compete in national and foreign markets. This includes challenges related to access to inputs, productivity, quality management, national infrastructure and compliance with standards, among others.

Regulation and legal issues

Limited protection of IP rights due to a lack of law efficiency results in companies and IP products registered outside Ukraine, thus valuable assets often no longer belong to Ukrainian companies

Ukraine has adopted several laws protecting IP rights, however, there are certain questions related to courts and their reliability and non-biased nature. Additionally, there is still a significant pirate content both in media and software and the question of IP rights protection remains problematic. Currently, there is a limited number of judges who understand the nature of IP rights. The IP courts require technical experts with proper intellectual property education. Additionally, the effectiveness of the patent system needs to be further investigated.

These constraints are addressed in PoA: 1.1.2

Low predictability and unexpected frequent changes in the legislative framework carry risks for industry development and planning

Limited predictability of tax changes and frequent amendments of the tax code hinders the industry's development and growth. The possibility of a flat tax anullment keeps companies in an unstable environment with unpredictable outcomes of such tax transformations. Lack of visibility affects the planning activities for companies' development and requires additional financial resources to fulfill their obligations vis-à-vis their long-term clients with multiyear contracts. Taking into consideration an unstable political and economic situation in Ukraine, the current flat tax rate of 5% used by companies de facto is an important advantage for the companies to do business through Ukraine and makes them competitive on the global market. This tax system was a reason for expanding the IT sector in Ukraine and still remains the main factor in their development and success.

In addition, ineffective investment laws result in limited investment protection and an imperfect system of protection of the rights of investors and minority owners, which also significantly hinders industry growth and the attraction of investment in IT.

These constraints are addressed in PoA: 1.2.1, 1.1.4, 1.1.12, 2.4.1

Companies choose to have their main offices abroad due to legislative limitations

There are a number of regulatory issues in legislation that force Ukrainian companies to register their main offices abroad as their main legal location. Among identified constraints, there are bureaucratic restrictions on accepting payments, inability to process smaller and numerous payments for applications from the App Store and other sites, absence of electronic money and consequently no PayPal or similar method, and lack of planning security checks, limited protection of IP rights and complicated processes of managing a company.

In addition, outdated or nonexistent laws to adapt and use the latest information technologies hinder sector expansion at the national level. A number of laws are either not in place, as is the case with electronic money (very limited regulation and extremely inefficient, which makes this instrument dormant), or outdated, as is the case with labour legislation that comes from Soviet times and restricts the IT sector development to a significant extent.
In addition, there is a worldwide competition of jurisdictions that compete for the opportunity to attract as many technological startups and mature companies as possible, and Ukraine is currently losing it to primarily systems with Anglo-American law, because they have a lot of experience and reliability in dealing with intellectual property.

These constraints are addressed in PoA: 1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.6, 1.1.7, 1.1.8, 1.1.10

Obsolete labour legislation restricts the hiring of professionals, forcing companies to use subcontractors instead; additionally, it limits the transition of students to the work environment, impedes internship opportunities and prevents professionals from teaching at universities

Many of the current regulations and restrictions come from the fact that Ukrainian labour laws date back to Soviet times, resulting in the current gig economy. This necessity to follow

outdated regulations forces many businesses to use subcontractors instead of employees for the sake of risk management and ease of administration.

The procedure of legally taking a student as an intern presupposes a number of bureaucratic procedures and most companies avoid these hurdles and risks. Students at the universities have limited exposure to the industry and there not enough connection with the actual industry, initiated by regional clusters in only a few universities. There are restrictions related to professionals teaching at universities without having the required degrees, even though their practical experience can be useful to the students and should be shared at the education level as often as possible.

These constraints are addressed in PoA: 1.1.3, 1.1.5, 1.1.11

Obsolete legislation limits the ability of universities to become flexible and financially sustainable and to respond quickly to market requirements

Universities have the right to receive money only for teaching and scientific work, which makes it impossible to officially launch any joint activities with businesses. Commercial education courses at universities are not competitive because of the high tax burden. Universities have no funds to purchase modern equipment as the prices are high, state money does not cover it and there is no other official way to earn money. The salaries of teachers are established by law and cannot be increased, leading to high losses in talented teachers who prefer working for businesses where more competitive salaries are on offer. Professionals from business are not officially allowed to teach at Universities, though often they have a greater knowledge in technologies than university teachers. Because of the requirement that compels a certain number of teachers to have degrees and the loss of young talented teachers, universities have to keep teachers with seniority who have a degree in order to fulfill the requirements, despite their lack of updated knowledge about the industry. This selection also leads to the impossibility of creating scientific teams and applying for grants. A small number of good scientists, as a rule, do not possess commercial knowledge.

These constraints are addressed in PoA: 1.1.5, 1.1.11, 1.2.2

Constraints to Connect: Issues restraining connectivity to suppliers, markets and clients. This dimension includes challenges related to market information, marketing, trade promotion, branding and trade agreements, among others.

Links with buyers

Limited national marketing and the overall global positioning of Ukraine does not project the image of a technology-driven and science-based economy, resulting in misleading perceptions for new clients and investors

There is no single coordinated marketing framework to support IT industry promotion. There is a limited understanding from public stakeholders and Diplomatic Missions of Ukraine of the industry's potential, and though the industry now has a single voice with a unified message to support marketing the country as a recognized IT destination, the messages are not coordinated, are non-systematic and success stories and achievements are not communicated sufficiently. In addition, there is a need to identify and share information on potential directions with national stakeholders and key partners and to develop separate strategies on developing the country's potential in new technologies (i.e. Data Science/AI, Robotics/IoT, Blockchain, Cybersecurity and AR/VR).

These constraints are addressed in PoA: 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.1.5, 3.1.6, 3.1.7, 3.1.8, 3.1.9

Limited knowledge within local companies on how to market and promote their products impedes access to new clients and markets

Local companies, namely small and medium sized, have limited resources and knowledge on how to market themselves. They often spend a lot of time developing a product and then do not know how to sell or how to promote it. Limited financial capacities to have a dedicated marketing person on board is one of the reasons. Other root causes also linked to limited marketing are a lack of self-promotion skills and the language barrier in some cases.

These constraints are addressed in PoA: 2.3.1, 2.3.2, 2.3.3, 2.3.4, 1.2.3, 1.2.7, 1.2.10

Limited market analysis knowledge, insufficient number of marketers and business analysts, and the lack of a strategy to target new markets inhibits the industry's promotion on the global market

Many companies have almost no information on their buyers and many are unsatisfied with the quality and price of the institutions providing information on potential buyers. Limited knowledge in the field of marketing strategies and brand communication, especially for small and medium enterprises, significantly hinders companies' promotion in the global markets. Many companies are often working on an ad hoc basis, with no plan of action and no profound market investigation.

Many companies have difficulty transferring small and medium outsourcing enterprises to product companies due to the lack of an integrated approach as well as the lack of institutions and organizations to support such companies. Small and medium TSCs in most cases are not even aware of the possibilities of transferring to product companies. They also do not have the skills to analyze the market and to make it fit, nor how to further product development and sales. With good methodological support, this type of company could become a powerful source of new startups and products.

These constraints are addressed in PoA: 2.3.1, 2.3.2, 1.2.7, 1.2.10

Links with suppliers

Lack of industry "fixers" and no representation of the whole industry at the global level limits business opportunities for companies

Currently, there are no trade missions and no business people employed by the industry who do systematic work on the markets. There are trade departments in Diplomatic Missions of Ukraine but diplomats have limited knowledge about the local Ukrainian IT business and its capabilities. There is no single understanding of the IT industry as well as no correct message to promote the industry internationally that can be used by public authorities traveling with trade missions. The larger companies have representative offices abroad but there are no professional sales people who could work for a group of companies on a systematic basis.

These constraints are addressed in PoA: 2.4.3, 3.1.6, 3.1.8, 3.1.9

Links with institutions

Insufficient institutional support does not facilitate the strengthening of the industry's image and access to new markets

There is a lack of trust and no regular communication links between state institutions and the business community which results in limited cooperation. At the same time, the industry itself is still in the early stages of its development, with clusters only recently emerging and associations covering only certain parts of the sector. In some cases, there are institutions overlapping, both for public and for business institutions, as for example IT Ukraine and Clusters doing similar activities, IT Ukraine and IT Committee of EBA, and numerous other NGOs often solving similar problems separately. In the public sector there are frequent conversations about the need for a single IT centre that will manage all IT–related questions as well as facilitate the digitalization of the economy and follow up on the implementation of the digital agenda of the government, which resulted in the creation of a Ministry of Digital Transformation

These constraints are addressed in PoA: 1.1.9, 2.4.3, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.1.5, 3.1.6, 3.1.7, 3.1.8, 3.1.9, 3.2.1, 3.3.2

Limited understanding of business models by scientists, lack of interest and limited resources result in weak links between industry and the scientific community

One of the main root causes of limited links between scientists and the industry is the lack of stimulating conditions for IT product development and IP creation at university R&D centres. There is no stimulation for the commercialization of inventions at the university level and the existing procedures of royalty sharing in legislation are not effective. Research centres and research itself receive no royalties for their inventions, which considerably discourages the scientists and results in almost no partnership with IT product development companies and startups to develop new ideas and transform them into products. Among other root causes there is a general decline in interest for science and inventions, limited R&D facilities

overall and no institutions that specialize in popularizing and supporting domestic scientific research, providing technical assistance to scientists and startups, promoting the formation of a positive image of scientists and entrepreneurs associated with the scientific field, and spreading news about science and innovations.

These constraints are addressed in PoA: 1.1.2, 1.2.9, 2.1.3, 2.1,7

Limited collaboration between regional Chambers of Commerce and industry associations results in them working independently and not fulfilling the role of industry connectors with foreign markets nor taking the role of industry representatives abroad

Limited connections between Chambers of Commerce (local and foreign) and associations operating in Ukraine do not allow joint planning of market development and promotional activities. Ukrainian Chambers of Commerce do not have any foreign branches, so by default cannot currently serve as industry connectors. The industry has been growing strongly by itself, however, trade support institutions effectively delivering services to exporters could assist with spreading information about Ukraine abroad and also help in creating more business connections.

These constraints are addressed in PoA: 3.1.3, 3.1.6, 3.1.7, 3.1.9, 3.3.1, 3.3.3

Constraints to Change: Issues limiting the sector's capacity to change, innovate and tap into emerging trends. This dimension relates to challenges in accessing trained/skilled labour, institutional support for innovations, investment promotion, corporate social responsibility, youth and women's employment, among other issues.

Skills requirements

Limited availability of the required number of professionals due to rapidly growing industry demand

As in many other countries, the demand for IT professionals in Ukraine is much higher than the supply and it continues to grow. The supply of skilled, highly specialized professionals to satisfy the growing IT industry's needs is a key priority to ensure market growth. There is limited communication and an information gap between enterprises and educational institutions to identify the disparity of skills, develop new curricula and implement new courses for the fast-growing industry demand. An efficient mechanism for the systematization and identification of needs for skills from business along with regular communication is not established. The industry should be actively involved in the creation of a master's degree in IT and courses should be arranged to go from a basic IT level to advanced and advanced to expert. In addition, the introduction of courses for project management and business development related to the needs of the IT industry is highly required.

At the same time, management specializations lack courses on technologies of a modern digital business, which a startup ecosystem requires. Dual education is another area where there are implementation problems due to legislation barriers.

Specific programs introducing digital specialties for the latest technologies into the corresponding curricula of specialized educational institutions should be implemented. Initial specializations have already been introduced into some universities, for example, Kharkiv Polytechnic University – Data Science curriculum, Lviv Polytechnic National University – System Engineering (Internet of Things) and Artificial Intelligence Systems. However, more programs in agritech, fintech, robotics engineering and other specialized areas for the newest technologies are needed to satisfy growing industry needs.

The following constraints are addressed in PoA: 2.1.1, 2.1.2, 2.1.3, 2.1.4, 2.1.5, 2.1.6, 2.1.7, 2.1.8, 2.4.2, 3.2.2

Limited practical knowledge and skills hinder the transition to the workforce

There is a big gap between the theory taught at the universities and the practical knowledge that the industry requires. The speed of development of the technologies is so fast that they quickly become outdated, universities have difficulty changing and adopting programs to new trends and embracing the latest practical advances. This is partly because universities cannot offer competitive salaries to their professors and many of them choose to work for the IT companies instead. The practice of combining these two activities is not yet common.

The following constraints are addressed in PoA: 1.2.9, 2.1.3, 2.1.5, 2.2.2

Limited business development knowledge and skills on how to access new markets impede the business development of the companies

There is limited knowledge and understanding of how to create a business plan, launch a business, attract investment or present a project idea at the company level among SMEs and startups. This problem begins with a lack of entrepreneurial aspects and skills in working with finance and is further aggravated by the lack of educational courses for sales and marketing and business development, both generally as well as particularly for IT. There are no university specializations on digital marketing and sales in IT, which creates a huge gap between needs and possibilities. Limited financial resources at SMEs and startups limit the possibility of getting acquainted with target markets, their ways of thinking and doing business.

The following constraints are addressed in PoA: 1.2.3, 1.2.7, 1.2.10, 2.3.1, 2.3.2, 2.3.3, 2.3.4

Innovation requirements and infrastructure

An underdeveloped ecosystem and the limited number of techno parks and coworking spaces restrict opportunities for startups to generate and test ideas

The current business ecosystem lacks communication channels to exchange demand and supply information, thus startups have difficulty finding out about market niches and needs of end clients while accelerators have difficulty finding quality startups. The insufficient number of techno parks and coworking spaces, especially in the regions that would include facilities such as conference halls, meeting rooms, innovation and training areas, in addition to the small number of incubators (with support staff and equipment) and an insufficient volume of seed and pre-seed investment capital, limits the speed of creating new startups and developing existing ones. Lack of cheap or free spaces for events and an insufficient number of international speakers hinders spreading ideas and sector development in line with the world's best practices. The current development of UNIT.City and iHUb in Kyiv and IT District in Lviv are the first steps to supporting the development of an efficient business ecosystem for IT development.

The following constraints are addressed in PoA: 1.2.2, 1.2.4, 1.2.5, 1.2.6

A limited number of clusters and incubators due to inadequate resources and a lack of support for their development

There are no state programs for encouraging cluster development and no financial support is provided from the government or supporting organizations. Clusters are trying to develop their business models based on fees from their members, which is quite challenging, taking into account the general immaturity of the market and the lack of cooperation and long-term planning from a majority of companies, especially small and midsized.

The following constraints are addressed in PoA: 1.1.5, 1.1.9, 1.2.7, 1.2.8, 1.2.9

Limited financial and infrastructural support and lack of a conducive environment to encourage startup creation

Startups lack financing at seed and pre-seed stages as well as knowledge about real business needs, marketing and business development. Limited infrastructure for the development of incubators and accelerators as well as limited connections to invite inspirational speakers to share industry knoweldge hinders the development of startups. Overall the entrepreneurial culture in Ukraine requires reinforcement and development from the earliest stage possible as startups that become successful often move abroad.

The following constraints are addressed in PoA: 1.2.1, 1.2.2, 1.2.3, 1.2.8, 1.2.9

Financing requirements

Limited availability of funding mechanisms such as crowdfunding, seed capital, angel investors, micro VC, etc. makes it difficult to develop new initiatives

Financial incentives or other additional technical support for IT companies and ecosystem development is quite limited. Supporting government-funded mechanisms for pre-seed, seed and round A companies are highly required. On the other hand, potential foreign investment is also quite challenging as foreign investors have limited knowledge about the

potential of the Ukrainian IT industry and often have an inaccurate image about the country as a destination. Foreign investors frequently do not know how to enter the country and there is still a very weak Venture Capital infrastructure and no public resources to explain whom to contact and how to start working in the market.

The following constraints are adressed in PoA: 1.2.3, 1.2.8, 2.3.2

THE WAY FORWARD

◇ Vision

Industry stakeholders developed the following industry vision for the Ukrainian IT industry:

Ukraine: an innovation-driven, universally recognized technology destination that delivers high value for the global economy

◇ Strategic orientations

Technological priorities for Ukraine

The strategic technological priorities of Ukraine have been defined in order to address the international growth potential and to meet the fundamental needs of the Ukrainian economy. To do so, a number of different aspects have been considered, such as the impact on the economy from various types of companies, technology's potential for development, the contribution of the newest technologies to the country's competitiveness and overall economy, the ability to acquire or develop the necessary skills and the targeted foreign markets and their needs in line with top technologies.

We shall start by analyzing the impact of the existing types of companies in various aspects of the country's economy (Table 5).

Table 5. Potential contributions to the country's economy

Vertical/Contribution	To possible revenue from export	To local IP value	To the country's competitiveness	To a better education of Ukrainian IT Specialists
Technology Service Companies (ITO, KPO, BPO)	*****	**	***	*****
Captive Centres	*****	–	**	***
Products and Technological Startups	****	*****	*****	***
Datacentres	***	*	****	**
Other IT linked services (System integrators and hardware/software resellers)	**	*	****	***
Telecommunications	**	–	*****	***

Source: ITC, based on stakeholder consultations and additional desk research

It is clear that each type of company has a different set of benefits for the economy, but since the goal of this strategy is to increase exports and innovative potential and enforce IP creation, the Strategy focus is on Technology Service Companies, Captive Centres and Products, and Technological Startups.

Another parameter for identifying the orientation for strategic industry development is the ability to develop the necessary skills both for types of companies and also for growing promising technologies in the country (Table 6).

Table 6. The ability to acquire or develop the necessary skills

Markets / sectors to develop	Present position in Ukraine	Requirements for growth	Benefits
Technology Service Companies (ITO)	*****	Visibility in tax systems	***
Technology Service Companies (KPO)	**	Strong expertise in some	**
Technology Service Companies (BPO)	**	Good Telecoms infrastructure, education in other cultures, favourable labour regulations, more attractiveness to foreign clients	Usage of strong workforce, leads to KPO
Captive Centres	**	Good education systems, favourable business environment, competitive location	Strong contribution to exports
Products and technological startups	*	Larger domestic market, incentive to develop IP, environment favoring investment, legal protection of innovation	Sustainable IT businesses, operating on global markets
Datacentres, cloud technologies	*	Good telecom infrastructure/ political stability, good security environment, management maturity, open market for land	Reduction of external dependencies
Other IT linked services (System integrators and hardware/ software resellers)	**	Good telecom infrastructure, good custom conditions, protection of capital in the country	Support for local economy, strong contribution to exports
Telecoms	**	Country vision and separation between public initiative and private sector	Strong impact on all economy and education
IoT & Robotics	*	A local market, industry knowledge, AI mastered	Very strong on local economy (Agritech, Industry)
E–learning	*	Young people to be educated or a continuing educational policy	Important if aligned with a strategy for education
Cybersecurity	***	High degree in mathematics	Wide market/ high value market
AI – Big Data	*	High calculation possibility, high degree in mathematics and IT/ machine learning mastered	Reduction of external dependencies
Machine learning	–	Data availability – high calculation possibility	Reduction of external dependencies, valorization of data production
Blockchain	****	High degree in mathematics, Cyber Security mastered	Wide market/ high value market
3D printing	*	Equipment and investments for further development	Enhancing the development of IoT and Robotics

Source: ITC, based on stakeholder consultations and additional desk research

The above table provides a good overview of the current status of the development of different types of companies and promising global technologies, and provides information about what it will take to improve these positions. We have good starting positions with Service Technology Companies that need stable and comprehensible tax systems, as well as good positions in Blockchain and Cybersecurity. Product Companies and startups require a domestic market to grow, together with solving the problems of lack of investment capital and inadequate regulations, and most of the technologies require a high level of skill in mathematics.

◇ Market priorities for Ukraine

In the field of new technology, the intangibility of products and services overcomes physical borders but there remain other types of borders – related to countries, culture, language, politics and economies as well as the competitiveness of Ukraine. The ability and benefits of being able to reach a market depends on multiple factors, such as demand, price competitiveness, cultural proximity, technological capacity or infrastructure and the indirect contribution to the country's development (Table 7).

Table 7. Market opportunities for the IT sector

Products/ Solutions/ Services chosen	Logic	Existing markets	Market to be developed	Speed Short-term ROI Long-term ROI
Increase Ukraine's ITO capacity and added value of these services	**Target clients:** European and American businesses seeking high skill levels **Why?** Europe and the United States have a significant lack of engineers, which is likely to continue. **How?** Ensuring visibility and stability with respect to taxes, strengthening the education sector, developing levels of expertise by seeking out projects in high value-added industries that relate to key technologies: Security, blockchain, IoT, or the financial/insurance industry.	US / EU	US / EU / JAPAN / ISRAEL / SOUTH KOREA	Speed: High ST ROI: High LT ROI: Medium
Be more attractive for foreign manufacturers' captive centres	**Target clients:** European, American, Japanese and South Korean businesses that want to have an inexpensive base in Europe **Why?** The internationalization of large companies requires that their expertise centres be closer to their markets. This affords them greater flexibility in their development strategy and access to quality labor. **How?** By developing clear communication concerning Ukraine's benefits and promoting Ukraine's image through a two-tier approach: local support for a new site assisted by a client already there, and sales missions abroad assisted by the Ukrainian diaspora.	SOUTH KOREA / GERMANY	US / EU / JAPAN / SOUTH KOREA	Speed: Medium ST ROI: Medium LT ROI: High
Develop the country's ability to create products in addition to selling services	**Target clients:** Ukraine's key markets for its traditional economy: agriculture and industry. Markets where acquired skills can be monetized: Security, blockchain, FinTech, gaming, energy, etc. **Why?** Value creation in IP allows for sustainable development and is less subject to competition than software development services. It also helps to keep highly skilled labor inside the country and reduces the brain drain. **How?** By creating a financial environment favourable to entrepreneurs (capital gains, venture capital, etc.) while visibly protecting intellectual property.	The primary market is local or regional owing to cultural and geographical proximity	US, EU, Markets of developing countries	Speed: Slow ST ROI: Low LT ROI: Very high

Products/ Solutions/ Services chosen	Logic	Existing markets	Market to be developed	Speed Short-term ROI Long-term ROI
Develop KPO (Key Processes Outsourcing) businesses in key sectors	**Target clients:** Banking, securities and insurance, contract research and biotech, engineering design **Why?** KPO activities will complement current ITO activities and help make export business more profitable. By focusing on certain key sectors, this will both move towards IP creation in promising sectors for Ukraine as well as protect ITO-related activities from the vagaries of competition. **How?** By encouraging subsidiaries and developing vertical/ITO sector agreements. By internationally promoting Ukraine's expertise in very specific sectors (Banking, Insurance, Engineering design, Security, Agritech) and requiring little cultural skill.	Europe	US	Speed: Short to Medium ST ROI: High LT ROI: High
Develop e-governance solutions	**Target clients:** Domestic market first, then foreign **Why?** Ukraine needs to become more agile and develop e-governance skills. This development is a requirement. It involves turning this constraint into an opportunity and making it an exportable skill. This will also help bolster Ukraine as an expertise cent. **How?** Ensure that the companies chosen for e-governance development are able to package and export their products once deployed. Prioritize local companies to develop and deploy solutions.	Local / Regional	UK, EU, developing countries	Speed: Medium ST ROI: High LT ROI: Medium
Develop the skills of the future (Robotics/IoT) in key sectors (Agriculture and Industry) for the Ukrainian economy	**Target clients:** Domestic businesses first, then international **Why?** When developing an IP-generating activity it is important to be able to rely on a known customer base. Ukraine's economy is heavily focused on agriculture and industry, two sectors that will be severely affected by the development of robotics and the use of connected objects. It is therefore important that R&D and development efforts be supported in these sectors. **How?** It is necessary for the Government to support technological investments in these sectors. The assistance may come in the form of lower taxes for innovative projects, co-financing or encouraging dialogue and discussions between different sectors and the technology industry. The program could also be promoted through calls for innovation or invention contests.	Europe / MENA	US, Asia	Speed: Medium ST ROI: Medium LT ROI: Very high
Increase big data and analytics skills	**Target clients:** International and Ukrainian businesses. **Why?** Ukraine has the skilled labour needed to operate in this field. Once these technologies have been mastered they become a source of derivative revenue and can strengthen Ukraine's economic independence. **How?** Skills alone are not enough, expertise and experience are also needed. First, universities must develop courses that focus on these subjects and promote them internationally. To achieve this we recommend a group of masters bringing together several universities in order to have a critical mass and a greater communication	Ukraine / Central Europe	Central Europe / EU / USA	Speed: Medium ST ROI: Medium LT ROI: High

Products/ Solutions/ Services chosen	Logic	Existing markets	Market to be developed	Speed Short-term ROI Long-term ROI
	impact. Data centre activities should also be strengthened and international players should be encouraged to locate their own data centres in Ukraine.			
Develop and ensure the future in terms of qualified human resources	**Target clients:** Ukraine, neighbouring countries. **Why?** With the development of AI and continuous digitization of economies, the demand for engineers will only grow. Developing domestic demand, strengthening the needs of foreign companies that will set up shop in Ukraine, all in an unfavourable demographic environment, will inevitably lead to a labour shortage that will indirectly harm the competitiveness of current activities. **How?** Special attention must be paid to education in mathematics, by optimizing current instructional methods to meet international best practices. To achieve this, professors must be valued in order to encourage them to stay in their career. Technical education (technicians) must not be ignored in order to develop the resources available at all levels for the sector's needs. Special master's degrees in priority technologies must be created or, if they already exist, strengthened. Additional emphasis must be placed on more solid English language training in schools. In order to strengthen both the teaching capabilities and the visibility of Ukrainian universities abroad, it is worthwhile questioning the efficiency of the growing number of universities in Ukraine (more than 300), or 6.6 universities for every million residents, compared to 4.9 in Germany, 1.9 in the UK, and 1 in France. These universities must join together in order to pool their resources and increase their international visibility, becoming a university hub within the region.	Ukraine / Central Europe	Developing countries	Speed: Short ST ROI: High LT ROI: Very high

Source: ITC, based on stakeholder consultations and additional desk research

To support the IT industry development, targeted efforts will be required in the most promising areas:

- ITO and KPO, the capacity and added value of which should be increased and further developed;
- Developing and ensuring the future in terms of qualified human resources;
- Increasing the attractiveness of Ukraine as a location for foreign manufacturers' captive centres;
- Developing the country's ability to create products in addition to selling services.

We should focus on the following areas:

- e-governance solutions;
- developing the skills of the future (Robotics/IoT) in key sectors (Agriculture and Industry) for the Ukrainian economy;
- big data and analytics skills.

Further parts of the Strategy, referenced in Table 7, provide more details on the suggested activities.

THE STRATEGIC FRAMEWORK

The strategic objectives define the main thrusts that will guide Strategy implementation to achieve the vision laid out by the industry. The PoA will respond to the vision by addressing the sector's constraints and leveraging opportunities in a comprehensive manner. To this end, particular efforts will be made along the following strategic orientations:

Strategic objective 1: Support and further develop an enabling, predictable and transparent business environment that stimulates further growth and development of the IT industry and increases its export potential.

Despite unprecedented industry growth during the past ten years, with CAGR more than 20% annually, and the adoption of a number of regulatory documents for innovation development and digitalization of the economy, there is a huge need for a systemic and policy-oriented approach. Ukraine needs to improve the legislative and regulatory framework in support of industry development and to ensure conducive conditions for efficient IT business ecosystem development. A favourable regulatory environment, including deregulation of foreign trade and foreign exchange operations, stimulating fiscal policy, regulation of intellectual property protection issues, updated labour legislation and providing mechanisms, facilities and opportunities for ideas creation through integrated startups and R&D centres, are among the key areas to ensure the sustainable growth of the IT industry in Ukraine.

This strategic objective will be achievable through two operational objectives:

- Provide favourable conditions to stimulate sustainable industry growth through key regulatory changes;
- Provide an enabling environment for the creation of startups and IT product development, and increasing the number of captive centres of international companies.

Strategic objective 2: Improve the supply of skilled, highly specialized professionals that satisfy growing IT industry needs through improving the education system and creating favourable regulations to keep the pool of IT talent working in Ukraine.

Human capital is the basis of the industry and highly skilled professionals will lead industry development. Improved coordination between the educational environment, business and civil society will contribute to solving the issue of the skills gap and provide more opportunities for students getting professional experience during their university studies.

One of the biggest achievements of the industry so far is creating a unique ecosystem with practically no migration from the country. The ever-increasing global competition for IT professionals in Western Europe, USA, Canada and other countries and regulation risks of losing a third group of private entrepreneurs with significant tax increases for IT professionals could have a dramatic impact on people migration: a risk which should be avoided.

At the same time, enhanced business-development, marketing capacities, soft skills and advanced language skills of employees will facilitate the industry moving forward.

This strategic objective is composed of four operational objectives:

- On the state level build collaboration between the Ministry of Education and the IT Industry to support the transformation of universities to market economy, improving their governance structure and attracting IT talent to teach at the universities.
- On the regional level build collaboration between universities and local IT clusters, companies, associations, other NGOs and communities to implement the development of new bachelor's and master's programs and improving university professors' skills.
- Improve the business development, marketing, soft skills and foreign languages capabilities of IT professionals.
- Create favourable conditions for professionals in the IT industry and other knowledge-based and creative industries to keep them in the country.

Strategic objective 3: Enhance national and international visibility of the industry to promote Ukraine as a preferable IT location for investors, and create more export opportunities for IT services and products

Defining a strong message for Ukraine and promoting this narrative through marketing, mobilizing for resources at a national and international level and facilitating the entrance of clients and investors to the country are some of the key priority areas for successful industry expansion.

Expanding the image of Ukraine as an innovation–driven, universally recognized technology destination that delivers high value for the global economy through marketing campaigns abroad, communication from public authorities, commercial attachés and diplomats and additional promotional activities such as international events, B2B meetings, events and networking activities, will increase the industry's visibility at the global level, facilitate market access and improve the building of strong international business relationships.

This strategic objective is composed of three operational objectives:

- Implement country branding and promotion of IT industry abroad as an innovation–driven, universally recognized technology destination that delivers high value for the global economy.
- Implement internal promotion of the IT sector that brings global standards of doing business to Ukraine, fosters new generations of people with a global mindset, increases the purchasing power of Ukrainians, stimulates the development of various supporting industries and the IT ecosystem as a whole.
- Enforce further development and cooperation of trade support institutions, investment promotion institutions and other local stakeholders to educate and facilitate global companies to invest in Ukraine.

◇ Institutional adjustments

Trade and investment support institutions (TISIs) are crucial to supporting companies' efforts to expand their performance and to increase exports. TISIs assist SMEs to improve their competitiveness and help them connect to value chains[41]. They provide essential intelligence on trade development and support enterprises through training, tools and assistance to find adequate market entry channels and international partners. The quality of a country's business ecosystem hinges on the quality of each of its TISIs.

These institutions, presented in Box 3, are divided into four main categories: policy support, trade services, business services and academia and civil society. They are the drivers for future industry growth although certain issues of capacity and resources must be addressed to ensure their efficient support of the sector.

Box 3. TISIs

Policy support These institutions represent key ministries and authorities responsible for influencing or implementing policies affecting the sector	• Office of the President of Ukraine • Cabinet of Ministers of Ukraine – an IT office • Verkhovna Rada of Ukraine (IT Committee, Tax Committee etc.) • National Commission for the State Regulation of Communications and Informatization • Ministry of Transportation and Communication of Ukraine • Ministry of Economic Development, Trade and Agriculture of Ukraine • Ministry of Foreign Affairs of Ukraine • Ministry of Education and Science of Ukraine • Ministry of Justice of Ukraine • Ministry of Social Policy of Ukraine • Ministry of Finance of Ukraine • Ministry of of Culture, Youth and Sports of Ukraine • National Bank of Ukraine • National Investment Council (EBDR funded) • Reform Office under the Cabinet of Ministers (EU funded) • EU delegation • State Financial Institution for Innovation under the Cabinet of Ministers

[41] GInternational Trade Centre (2017). SME Competitiveness Outlook 2017: The Region – A Door to Trade. Geneva. Available from www.intracen.org/publication/SME-Competitiveness-Outlook-2017---The-region-A-door-to-global-trade/.

	• Committee on Informatization and Communications • Ministry of Digital Transformation of Ukraine • State Service of Special Communications and Information Protection of Ukraine • Ukrainian State Centre of Radio Frequencies • Hi-Tech Office
Trade support These institutions or agencies provide a wide range of trade-related services, public and private stakeholders of the sector	• State Institution "Export Promotion Office" • State Institution "UkraineInvestment Promotion Office" • Diplomatic Missions of Ukraine • Ukrainian Chamber of Commerce and Industry • Foreign Chambers of Commerce operating in Ukraine
Business support These are associations or major representatives of commercial services providers used by exporters to effect international trade transactions	• Foreign Diplomatic Missions in Ukraine • IT Ukraine Association (Service companies) • Information Technologies Committee – European Business Association (IT Committee of EBA) (Big Service companies) • IT clusters (i.e. Kyiv IT Cluster, Kharkiv IT Cluster, Lviv IT Cluster etc.) • IT Committee of Association of Ukrainian Entrepreneurs (SUP) (local IT companies) • Sectoral: FinTech Association, Blochchain Association, AgTech Association, IAB.Ukraine • Association of Enterprises of Industrial Automation (APPAU) (Local enterprises and IoT) • Digital Ukraine (Service integrators) • Association of enterprises of information technologies (APITU) • Wireless Ukraine (Telecommunications) • Internet Association (Digital agencies, telecommunications, local market) • Ukrainian Venture Capital and Private Equity Association (UVCA)
Academia and civil society These institutions are not explicitly engaged in the sector's trade-related activities. They are opinion-leaders representing specific interests that have a bearing on the sector's export potential and socio-economic development	• Universities • Technical Vocational Educational Institutions • IT training centers (STEP Computer Academy, IT Education Academy (ITEA), CyberBionic Systematics, Courses at IT-specialized private companies, etc.) • IT clubs (communities) • VC, incubators, accelerators • Co-working spaces, techno parks • Ukrainian diaspora (Canada and other countries)

Some key institutional adjustments will be required to unlock sector growth. **These changes are crucial in the areas of sector coordination and regulatory adjustments.**

Box 4. Institutional adjustments

Institutional adjustment	Ways to implement
Improve coordinated approach to promote the industry at national and global levels	Industry promotion is one of the key elements for successful industry expansion, increased investment and export growth. Enhanced national and international visibility of the industry will be possible by creating an IT promotions team that will become responsible for the country's promotion. This team should include MFA, Ministry for Development of Economy, Trade and Agriculture of Ukraine, EPO, UkraineInvest and business associations and clusters. Its key responsibilities will be to coordinate promotional activities between public and private stakeholders and organize promotional events and activities in Ukraine and abroad. *This point is addressed in PoA: 3.1.1*

Institutional adjustment	Ways to implement
Expand perception of the IT industry	Developing the right message about Ukraine's IT Industry and promoting it among relevant stakeholders, international partners and inside the industry is crucial. The message should highlight the position of IT Industry Ukraine as an industry with experience, expertise and a growing industry potential. *This point is addressed in PoA: 3.1.2, 3.1.3*
Strengthen academia and industry links	Building collaboration between enterprises and educational institutions will allow for the identification of the skills gaps and overall improving the supply of skilled, highly specialized professionals to satisfy growing industry needs. A systemized and regular communication and information-sharing platform will allow the development of new curricula and programs to follow the latest technological skill needs of the industry. *This point is addressed in PoA: 2.1.1, 2.1.2*
Adopt the best model to manage innovation and IP rights	It is essential to adopt the best model to support innovation development. Currently, there are a number of departments within different Ministries (Ministry of Education and Science, Ministry for Development of Economy, Trade and Agriculture of Ukraine) that are partly responsible for innovation and IP creation. This model must satisfy industry demand in IP creation by supporting innovation with required mechanisms. State Finance Institution for Innovation, additional funding to support innovation, should also be utilized by building strong direct links with the industry. *This point is addressed in PoA: 1.2.1, 1.2.9.*
Study the possibilities of increasing the effectiveness of the National Academy of Sciences via reforming	The structure of the National Academy needs to be reorganized as it is no longer effective. It is recommended that sciences and scientific centers connect more with universities and locate the joint research and development centers there, and ensure sufficient funding to the agency which will be responsible for these centers and implementation of research results to applied projects. *This point is addressed in PoA: 1.2.9*
Give Clusters more support on the regional level	Develop a system of financing cluster initiatives via regional budgets to increase regional interaction with business and also to be able to implement the Strategy in regions, assigning clusters with tasks from the Strategy. *This point is addressed in PoA: 1.1.9*
Optimize the work of the Ukrainian Chambers of Commerce, adopt a more international approach and best practices of international Chambers of Commerce	The work of Ukrainian Chambers of Commerce should be analyzed, optimized and brought in line with the tasks and aims of the current Strategy. *This point is addressed in PoA: 3.1.9, 3.3.1.*
Optimize legislation to give more freedom and flexibility to universities	Make an audit of all legislation of Ukraine in the education sphere and develop a set of recommendations to create more flexible conditions for universities *This point is addressed in PoA: 1.1.5, 1.1.11*

◇ Regulatory amendments

In order to stimulate and enable sustainable growth in the IT industry, a number of regulatory amendments need to be implemented. Key adjustments to be carried out are summarized in Box 5.

Box 5. Regulation adjustments recommendations

Regulation adjustment	Rationale
Provide predictability and stable fiscal policy to stimulate the development of a transparent business environment	Absence of stability and predictability in law creates risks for industry development and planning. For sustainable development, industry needs both stable and predictable tax rules and competitive tax rates to ensure its growth and competitiveness on the global market. Absence of this decreases potential foreign investment and the number of projects for Ukrainian IT companies. If changes are to take place it should be communicated 6 months in advance the latest. Adopting transparent law with a sustainable tax model will ensure predictability and will support the industry development and growth. *This point is addressed in PoA: 1.2.1., 2.4.1.*
Implement dividend (holding) taxation and capital gains tax	Dividend (holding) taxation and capital gains tax can facilitate the creation of a favourable tax environment for returns on investment and income from business (for example, Cyprus, Malta, Emirates, Ireland). Further opportunities should be explored through analytical study to present the best business model. *This point is addressed in PoA: 1.2.1.*
Adopt IP box model preferential taxation for companies that receive income from the sale of intellectual property	Preferential taxation for companies that receive income from the sale of intellectual property (IP box model) will provide an opportunity to keep IPs in Ukraine in cases where it is not necessary to incorporate in a particular jurisdiction of another country. Then it will not be necessary to transfer IPs to other jurisdictions in order to receive tax preferences and will encourage companies to stay in Ukraine (as, for example, companies are doing in Cyprus, Malta and the Emirates), and accordingly to market the company as Ukrainian in the global market (and not Cypriot, Maltese or Emirate). Opportunities should be explored through an analytical study to present the best business model. *This point is addressed in PoA: 1.2.1.*
Soften foreign currency earnings	Revisit foreign currency legislation applicable to IT–industry; further introduce sector liberalization in order to enhance sector development, entry to new global markets and strengthening market position globally. *This point is addressed in PoA: 1.1.1.*
Improve investment policy and revise respective legislation in regards to minority owners' protection	Investors are looking for sustainable conditions to establish their businesses or to invest in Ukraine. They should be granted adequate investment protection of their rights as investors, including minority owners. Several areas should be explored to provide an encouraging environment for investors: • State insurance of investments (state guarantees the investment depending on the amount and degree of risk); • Ensuring the protection of the small investor; • To provide a rationale for the review of the dispute in IT–related cases, where one party is a foreign entity/person, under the Common Law (English or US); analysis should include suggested approaches and the projected efficiency; to revisit respective legislative acts; to develop and conduct training on the nuances of the IT–disputes review under the Common Law by the arbitration or other court; • Introduction of the "BeInvestor" program, whereby individual entrepreneurs can use a certain amount of their annual taxes to invest in any innovative business or startup (similar to the UK program); • Introduction of the Innovation Encouraging Program whereby businesses can use a certain amount of their annual taxes on their own innovation and R&D, incubators, accelerators or startup support programs (tax incentives for innovative businesses). *This point is addressed in PoA: 1.1.4.*
Provide stimulating conditions for IT product development and IP creation at university R&D centres	Provide stimulating conditions for IT product development and IP creation at university R&D centres by introducing commercialization of inventions at the university level and reinforcing royalties for research centers/researches. *This point is addressed in PoA: 1.2.9.*

Regulation adjustment	Rationale
Transfer government-owned properties (unused buildings of factories, etc.) for long-term lease on preferential terms and transparent grounds	Allocate government-owned properties as shared space for startups with the relevant infrastructure by transferring complexes from the state property fund (i.e. unused factories, buildings, etc.) through the PPP mechanism for long-term leases on preferential and transparent grounds. To do so, develop a mechanism for transferring unused buildings on the balance of state enterprises and cities to IT communities for creating local ecosystems. *This point is addressed in PoA: 1.1.5.*
Develop a mechanism of legal cooperation between business and universities	Include in the regulations for public/private cooperation regulations regarding the use of university properties as part of Venture Studios, instituting evening education courses and accepting money from business via a transparent official model; this would increase the budget of universities and allow paying of higher salaries to teachers and buying new and modern equipment. *This point is addressed in PoA: 1.1.5, 1.1.11.*
Further simplification of the employment (and creation of individual entrepreneur status) for foreigners	**Obtaining a work permit** The Government has made a decision to amend the procedure for the issue, exchange, cancelation, transfer, withdrawal, return to the state, invalidation and the abolition of a temporary residence permit (Resolution dated July 18, 2018, No. 651). According to the changes, foreigners and stateless persons who, in accordance with the laws and international treaties of Ukraine, are not obliged to obtain a long-term visa for the issuance of a temporary residence permit and have received permission to work not later than 30 days from the date of the last entry to the territory of Ukraine, have the right to apply for a residence permit without leaving Ukraine. This will allow: • reduction of time and financial expenses of foreigners who receive a certificate for temporary residence without a long-term visa, in case of employment in Ukraine; • reduction of expenditures of business entities in the field of IT, employing foreigners and stateless persons; • creation of favourable conditions for attracting highly skilled personnel (foreigners) to the IT industry. On 6 March 2019 Cabinet of Ministers of Ukraine adopted Resolution No 368 "On Amendments to Rules Related to ObtainingVisas to Entry Ukraine for Stay of Transit", whereby the regulator finally introduced a possibility to obtain long-term visas (type D) on the territory of Ukraine, The foregoing Rules became effective on 26 June 2019[42]. Thus, onwards long-term visas may be obtained on the territory of Ukraine by applying to the consulate department of the Ministry of Foreign Affairs of Ukraine. Such a possibility is provided to foreigners and staless persons having the right to entry Ukraine without visa based on the Ukrainian law or international agreement. Registration of the status of individual entrepreneur by foreigners: To register as an individual entrepreneur, a foreigner first needed to obtain a residence permit. Thanks to the joint work of representatives of the members of the Finance and Legal Committee of the Association "IT Ukraine" and experts of BRDO, the Ministry of Justice of Ukraine issued an explanation regarding the definition of "Place of residence/location of an individual entrepreneur." From now on, for registering an FOP, foreigners do not need a residence permit and the address can be confirmed by other documents; for example, a real estate lease agreement located in Ukraine[43]. There is a need to communicate better and raise awareness among the authorities and companies about this.

[42] IT Ukraine Association website – https://itukraine.org.ua/en/
[43] IT Ukraine Association website – https://itukraine.org.ua/en/

Regulation adjustment	Rationale
	However, the problem with the address is wider and is still a problem in other situations, for example, if a person is not registering as a FOP they still need to show a registered address to obtain the permit. This could be further solved either by a systematic rethinking of the whole notion of an address, giving all the population the right to be registered in places of their actual residence, or provide such a possibility to foreigners in the same way that it was provided to Inner Displaced Persons from ATO areas. *This point is addressed in PoA: 1.1.10.*
Enhancing the protection of intellectual property rights	Bring the system of intellectual property rights protection in accordance with the modern world standards. Enhance the **IP infrastructure** to provide favourable conditions for IP creation and protection. High Council for Justice approved the number of judges in the Supreme Court on Intellectual Property on July 31, 2018. To continue the process of enhancing the protection of IP rights, the following steps are required: • Finalize the competition for a set of judges in the Supreme Court on Intellectual Property. • Approval of the composition and commencement of work of the High Court of Intellectual Property[44]. *This point is addressed in PoA: 1.1.2.*
Introduction and popularization of ESOP model	With an Employee Stock Ownership Plan (ESOP) model, employees and business owners have a personal interest in the development of the company due to the increase in the value of its shares. In UKRAINE, the ESOP model is absent. According to the IT Ukraine association, implementation and popularization of this form of corporate ownership in Ukraine can create additional motivation for employees and consequently an increase in productivity. The first step will be to develop the legal framework for this initiative. In addition, it is necessary to provide information support to media initiatives, business representatives, public opinion leaders and the public[45]. *This point is addressed in PoA: 1.2.1.*
Standardize processes by introducing international standards and improving the law on electronic money	As the IT industry is developing at a faster pace than any other industry, it is crucial that regulations keep up with it. This involves a number of international standards that should be introduced into legislation on e-documents and circulation thereof (in paticular, for coding/decoding, cryptography and crypto keys as well as standards for paperless exchange). The law on electronic money should be amended to facilitate international transactions, including the position that the issuer does not have to be a bank and the limit of 62,000 UAH per year should be increased. **Article 15 of the Law of Ukraine "On Payment Systems and Money Transfers in Ukraine" dated 5 april 2001 No. 2346-III** **Regulation on E-Money in Ukraine approved by NBU Board Resolution No. 481 of 4 November 2010** *This point is addressed in PoA: 1.1.7*
Update legislation on labour	There is an urgent need to adopt a new labour code. The existing Labour Code of Ukraine, No. 322-VIII, was adopted on December 10, 1971 and is quite outdated. A draft of a new labour code was developed in 2014 but has not yet been adopted. The following needs particular attention in regards to IT industry development: • More flexibility in labour regulations to hire and fire employees; • The requirements for lecturers, professors and rectors at University need to be relaxed;

[44] IT Ukraine Association website – https://itukraine.org.ua/en/
[45] IT Ukraine Association website – https://itukraine.org.ua/en/

Regulation adjustment	Rationale
	• A possibility of getting the right to run scientific and pedagogical activity in the IT field for specialists with significant experience, who do not have a degree; • The possibility for offsite postgraduate study for working professionals; • Integration of the duality of education to make it possible to use the work of students (internships, etc.); • Take into account the particularities of the new trend of labour organization, i.e. the gig economy. *This point is addressed in PoA: 1.1.3.*

◇ Initiatives for practical implementation of the Strategy in the ecosystem

The current Strategy comprises not only the regulatory changes and recommendations in areas where the removal of barriers will provide the biggest impact on the industry, but also identifies domains in which launching practical initiatives driven by business and supported by the government would be most fruitful as well.

Thus, the Plan of Action 2019–2023 includes both regulatory adjustments and practical activities. A number of models to successfully implement industry strategic objectives are proposed. The described models correspond to the world's best practices.

For launching these initiatives, it is recommended to create a Program Office.

Functions of the Program Office:

- Develop the business models of the initiatives described below;
- Identify in the ecosystem and create partnerships with private players and NGOs that are already doing some of the work and have the power and ability to fulfil the required functions;
- Develop together with the above a vision, a set of goals, strategic and operational objectives, action plans and KPIs to measure their performance and have control over the process;
- Empower partners with financial means who would be gathered from donors, international funds, government and big corporations participating in the program;
- Apply a lean approach and growth-hacking methodologies when working with partners, allowing quick experimentation, assessment of results and model changes until an efficient way to fill gaps and solve problems is found and established.

Team Structure of the Program Office:

- Two leads from the Public and Private sectors who understand the ways and procedures of both spheres;
- An international expert or a group of experts with experience in building such ecosystems for continuous mentorship and support;
- Specialists in Growth Hacking with a good understanding of management, models and industry;
- A marketing and communications manager who will communicate with all parties regarding the activities;
- A partnerships manager who can find and manage the players in the ecosystem and is able to lead the support of the initiatives;
- A group of supporting experts and stakeholder teams.

Below is a brief summary of proposed initiatives:

#	Name	Brief description	Best examples worldwide
1	Corporate Partner Network Activity 1.2.6	Network of 100+ corporates and multinationals actively involved in strengthening the ecosystem, working together as a well-connected community of innovation managers, startup liaisons and dedicated ambassadors. Launching customers, partners in initiatives and distribution channels for TechUkraine.	- Innovation Club, Paris - Munich Network - Startup Amsterdam Corporate Partner Network
2	TechUkraine Portal Activities 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.1.7,	Portal that acts as a guide for the Ukraine Tech ecosystem: website, social media and campaigns. A brand that frames and strengthens the ecosystem.	- Digital, New York - Startup Delta.org - https://en.munich-start-up.de/
3	TechUkraine Pavilion Activities 2.4.4, 3.1.4, 3.1.8, 3.1.9	Presence during international events with a concept where all stakeholders can present themselves and grow stronger via a "label" (Eg. TechUkraine) and logistics (Pavilion, side-events, speaking slots, etc.)	- Ukraine House Davos - Ukraine Tech pavilion at CES
4	Scaleup Program Activities 2.3.1, 2.3.2, 2.3.3, 2.4,3, 3.1.9	Program for fast growing scaleups: education, international network, mentoring. Creating the first wave of Ukraine Tech Giants.	- Future50, UK - ScaleupNation, The Netherlands
5	Startup Incubator Program Activities 1.2.1, 1.2.3, 1.2.7, 1.2.8	Public/private 'Company Maker' program, activated in cities across the country. Based on Stockholm's STING success story. Alternative for 'accelerator' programs and co-established with the incubator Hubs (e.g. Unit.City, Platforma)	- STING (Stockholm Innovation and Growth)
6	Startup in-Residence program Activity 1.2.5	In-house incubators for governmental bodies and cities. Cities as a launching customer. Education program for civil servants. Including a Startup Liaison Network.	- StartupinRes, San-Francisco - Dubai model - UK model
7	Policy & Grants Platform Activities 1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 1.1.10, 1.1.11, 1.1.12, 1.2.1, 1.2.2, 1.2.3, 1.2.4, 1.2.5, 1.2.6, 1.2.7, 1.2.8, 1.2.9, 1.2.10, 2.4.2., 3.2.2, the strategy implementation overall	Design and initiate policies that strengthen the ecosystem and bring more capital and talent. Set up an organization that lobbies for and designs new policies and activates grants (European/international).	– Dutch startup association – specific policies, Startup NL agenda – Startup Visa – Startup Chili
8	Tech Transfer Program Activities 1.1.5, 1.1.11, 1.2.9, 2.1.1, 2.1.2, 2.2.2	Stimulate technology transfer and entrepreneurship at universities - venture studio's, demonstrator labs. Teach entrepreneurship and modern skills.	– venture studio Stanford – New York City model – IXAnext – Leuven
9	National Strategies on Key Leading Technologies Activities 2.1.4, 2.1.5	Set up National programs for AI, CyberSecurity, Robotics and Blockchain that establish a strong foundation for research and entrepreneurship for these technologies. Claim interdisciplinary topics.	– Vector Institute Toronto – UK AI Strategy – ICAI labs, The Netherlands
10	Business Skills Program Activities 2.1.6, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 3.3.2	Support training and educational programs that activates more "hustlers" and "hipsters" that is, having entrepreneurial skills. Also making "hackers" more "business model driven"	– Growth Tribe Academy

#	Name	Brief description	Best examples worldwide
11	Breakthrough Technologies Zones Activities 1.2.2, 1.2.4	Set up free zones and urban laboratories for breakthrough technologies (e.g. autonomous driving). Facilitate and support these clusters to make entrepreneurship thrive.	– Autonomous driving free-zone, Poland-Dubai startup zones – StartupDelta BreakThrough Team
12	TechUkraine Global Mentor Network & boot camps Activities 1.2.9, 1.2.10, 2.3.1, 2.4.3, 3.1.9	Facilitating boot camps to connect internationally with launching customers, peer-entrepreneurs and potential capital. Set up a mentor network in key cities and countries.	– La French Tech – Swiss House in SF – DutchBasecamp network
Additional Suggested initiatives:			
13	Tech Education Platform Activities 2.1.1, 2.1.2, 2.1.8	Communication and information sharing platform in order to: 1. Gather the needs of companies and identify current and forecast hard and soft skills gaps for the next five years and publish the findings in an annual industry report; 2. Together with Ministry of Education and Sciences develop new curricula of specializations; 3. Update the register of professions and include new ones; 4. Develop and communicate the requirements of business to sets of skills possessed by IT professionals of various specializations coming from universities;	
14	Digital Skills Program Activities 3.2.2	Promote the digital skills development and professions among schoolchildren, students and the working population	
15	English Speaking Country Activities 2.3.4	Organize courses, introduce incentives for learning English at all levels	
16	IT Reps Abroad Activities 2.4.3, 3.1.6, 3.1.8, 3.1.9	Build connections with diplomats and establish public and private IT representatives for Ukraine abroad	

To achieve the vision and strategic objectives discussed, a solid, actionable and realistic strategic PoA is required. This is provided below and constitutes the heart of this Strategy.

The PoA is structured along the three strategic objectives and their respective operational objectives. For each objective, the PoA outlines detailed activities and their implementation modalities, which include:

- Priority level: Priority one is the highest and three the lowest;
- Start/end dates: the desired timeframe of the activity;
- Targets: Quantifiable targets that allow completion monitoring of the activity during the implementation stage;
- Leading implementing partners: One single accountable lead institution per activity (the institution can restrict itself to an oversight and coordination role but also can have a technical role);
- Supporting implementing partners: Any institution that should be involved at any stage of an activity's implementation;

PLAN OF ACTION 2019–2023

1: Support and further develop an enabling, predictable and transparent business environment that stimulates increased growth and development of the IT industry and increases its export potential.							
Operational objective	Activity	Priority	Start date	End date	Targets	Leading implementing institution	Supporting implementing partners
1: Support and further develop an enabling, predictable and transparent business environment that stimulates increased growth and development of the IT industry and increases its export potential.	1.1.1. Ensure easier flow of money and **remove barriers in currency regulations according to best worldwide practices** Analyse results of the current regulatory updates to regulations and further soften foreign currency control rules to provide better business management for long-term planning and investment and to increase the attractiveness of Ukraine for investors. The following activities are required but not limited to: • Ensuring the possibility for individual exporting entrepreneurs and businesses to transfer the money in currency to their own personal accounts; • Ensuring the possibility of accepting payments from the App Store and other similar sites on the basis of public-offer contracts without invoices and contracts; • Implementing best practices by removing the need to show agreements and invoices each time foreign funds are deposited into an account for a TOV (Limited liability company); • Eliminating the need to pay in foreign currency and obtain goods during one month only with fines in case of delay; • Easing payments to companies abroad (for example, paying for events); recommend setting a limit on the sums of up to US$10,000. Linked to initiative # 7: Policy and Grants Platform	1	01/04/2019	01/10/2019	– Foreign currency control rules adjusted to market needs	NBU	Ministry for Development of Economy, Trade and Agriculture of Ukraine, Ministry of Finance, Hi-tech office Ukraine, BRDO, IT committee EBA, National Investment Council, IT associations and clusters
	1.1.2 Strengthen IP rights to stimulate companies to create and keep IP in Ukraine Bring the intellectual property rights in accordance with the modern world standards. Enhance **IP infrastructure** to provide favourable conditions for IP creation and protection. Conduct a deeper analytical study on how to achieve it. Among others consider the following actions:	2	01/04/2019	31/12/2019	– The judges selected; – IP rights strengthened – We are excluded from the black list	Ministry for Development of Economy, Trade and Agriculture of Ukraine, Supreme Court of Ukraine	National Investment Council of Ukraine, IT association, Digital Transformation Institute, National office of Intellectual Property,

Operational objective	Activity	Priority	Start date	End date	Targets	Leading implementing institution	Supporting implementing partners
	• Ensure that any legal case resolved on IP protection issues is widely communicated in order to show the state's willingness to demonstrate its effective role in this area; • Improve the patent registering system and make the system of royalty collecting more transparent; • Resolve the question of Ukrainian patents not being accepted worldwide by collaborating with WIPO; • Develop a set of measures to eliminate pirate content on all levels by providing licensed software in state companies; Linked to initiative # 7: Policy and Grants Platform						State Finance Institution for Innovation, UkrPatent, High Council of Justice
	1.1.3. Modernize labour regulations (gig economy, freelancers, entrepreneurs, creative professionals) Allow more flexibility in labour regulations, specifically to: • Ensure new labour regulations take into account the requirements of a gig economy, that they work for freelancers and satisfy the needs of creative industries; Linked to initiative # 7: Policy and Grants Platform	1	01/04/2019	31/12/2019	– Labour Regulations updated, a new Labour code adopted	Ministry of Social Policy	Ministry for Development of Economy, Trade and Agriculture of Ukraine, Hi Tech Office Ukraine, National Investment Council, BRDO, IT committee EBA, IT associations and clusters
	1.1.4. Improve investment policy and regulations Improve investment policy and revise respective legislation in regards to minority owners' protection. The following is recommended but not limited to: • Analyze the work of local offices on investment support in every region and develop a set of measures to improve their work based on this analysis; • To provide a rationale for the review of the dispute in IT–related cases, where one party is a foreign entity/person, under the Common Law (English or US); analysis should include suggested approaches and the projected efficiency; to revisit respective legislative acts; to develop and conduct training on the nuances of the IT–disputes review under the Common Law by the arbitration or other court. As a pilot model, choose one place, set it up, identify and then implement the best model for the rest of the country. • Introduce the "BeInvestor" program whereby individual entrepreneurs can use a certain percentage of their annual taxes to invest in any innovative business or startup (similar to the UK program);	2	01/01/2020	31/12/2022	– Pilot project with beneficial conditions to attract more investors implemented – Analytical study for the improvement of local investment units presented	Ministry of Finance and Ministry for Development of Economy, Trade and Agriculture of Ukraine,	UVCA, Associations and Clusters, regional administrations, regional Investment offices, UkraineInvest

Operational objective	Activity	Priority	Start date	End date	Targets	Leading implementing institution	Supporting implementing partners
	• Study the possibility of creating the Innovation Encouraging Program whereby businesses can be further encouraged to develop their own innovation and R&D, or finance incubators, accelerators or startup support programs (with tax incentives for innovative businesses). Linked to initiative # 7: Policy and Grants Platform						
	1.1.5. Create regulations that facilitate the cooperation of business with the state in the area of IT communities, incubators, technology transfer centers at universities and similar activities Conduct a deeper analytical study on how to achieve this. Consider the following actions: • Include ICT sector as one of the types of activities for PPP; • Create direct regulation enabling cooperation between business and universities with protection of investment; • Allow free cooperation without creating legal entity. • Allow renting more than 200 square meters of state property for Science use at universities; • Implement a simplified mechanism of privatization of unused buildings of state enterprises; Linked to initiative # 7: Policy and Grants Platform	1	01/04/2019	31/12/2019	– PPP and concession regulation updated with the stated recommendations	Ministry for Development of Economy, Trade and Agriculture of Ukraine	MESU, State Property Fund, National Academy of Sciences, Digital Transformation Institute
	1.1.6. Standardize processes on crypto technologies Standardize processes by introducing international standards: • Introducing international standards into legislation for coding/decoding, cryptography and crypto keys as well as standards for paperless exchange; Linked to initiative # 7: Policy and Grants Platform	2	01/01/2020	31/12/2021	– International standards adopted	Ministry for Development of Economy, Trade and Agriculture of Ukraine	Digital Transformation Institute, Blockchain Association, FinTech Association, Ministry of Infrastructure
	1.1.7. Amend e-money regulation Improve the law on electronic money transfers: • Amend the law on electronic money to facilitate international transactions, including a position that the issuer need not be a bank, and increase the limit from 62,000 UAH per year. Linked to initiative # 7: Policy and Grants Platform	2	01/01/2020	31/12/2021	– Regulation on e-money to facilitate electronic transactions amended	NBU	Ministry for Development of Economy, Trade and Agriculture of Ukraine, Ministry of Infrastructure, Digital Transformation Institute, Blockchain Association, FinTech Association

Operational objective	Activity	Priority	Start date	End date	Targets	Leading implementing institution	Supporting implementing partners
	1.1.8. Achieve conformity with EU technical regulations and EU standardization, metrology, accreditation, conformity assessment procedures and market surveillance systems Transpose the corpus of European standards (EN) as national standards, including the harmonized European standards, the voluntary use of which shall be presumed to be in conformity with legislation for **Radio equipment and telecommunications terminal equipment,** as listed in Annex III, paragraph 2.20 to the EU–Ukraine Association Agreement. The List of EN standards for transposition is published in the Official Journal of the European Union, C 92, Volume 61 of March 9, 2018 (2018/C 092/05). Commission communication in the framework of the implementation of Directive 1999/5/EC of the European Parliament and of the Council on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity, and Directive 2014/53/EU of the European Parliament and of the Council on the harmonization of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC (publication of titles and references of harmonized standards under Union harmonization legislation). Linked to initiative # 7: Policy and Grants Platform	1	01/04/2019	31/12/2020	The corpus of European standards (EN) as national standards	State Service of Special Communi-cation and Information Protection of Ukraine	The Administration of the State Service for Special Communications and Information Protection of Ukraine, Ministry of Finance, APITU, TELAS, Telecom Chamber of Ukraine, EBA Consumer Electronics Committee
	1.1.9. Study the possibility of providing support to clusters at the regional level to make them a tool of enforcement for the whole ecosystem of regions. Create a model, test it on IT clusters and scale to other industries as needed. Linked to initiative # 7: Policy and Grants Platform	1	01/04/2019	31/12/2019	– Analytical study conduct-ed, best model created	Ministry of Communities and Territories Development of Ukraine	Ministry for Development of Economy, Trade and Agriculture of Ukraine, Regional Administrations and Municipalities, Associations, IT clusters, other NGOs
	1.1.10. Ensure easier flow of workforce into the country Study ways and methods to make it easier for foreigners to stay, live, work and do business in the country. Consider the following actions: • opening visa D from the country and its prolongation; • making the address the person's actual address, not their official registration	1	01/04/2019	31/12/2019	– Migration rules revised and optimized – the flow of migrants on high added value positions to the country increased	Ministry of Social Policy	Ministry for Development of Economy, Trade and Agriculture of Ukraine, Hi Tech Office Ukraine, National Investment Council, BRDO, IT committee EBA, IT associations and clusters

Operational objective	Activity	Priority	Start date	End date	Targets	Leading implementing institution	Supporting implementing partners
	• lowering the barrier from 100,000 to a feasible amount for small investors to obtain a temporary residence permit and to run a business in Ukraine. Linked to initiative # 7: Policy and Grants Platform						
	1.1.11. Optimize legislation to provide more freedom and flexibility to universities both in terms of finances and curricula Make an audit of all the legislation of Ukraine in the education sphere and develop a set of recommendations to create more flexible conditions for universities. Linked to initiative # 7: Policy and Grants Platform	1	01/04/2019	31/12/2019	A set of rec-ommendations and a road-map on their implementation developed and executed	MESU	Universities, Associations and Clusters
	1.1.12. To implement a set of measures (including legislative ones) to protect the IT business from unlawful interference in its work from the side of controlling and law enforcement authorities. In particular, at the legislative level, exclude the possibility of abuses by representatives of state bodies during fiscal inspections or criminal investigations. (Draft law "Masks of the Show Stop" in the register number 9484). Linked to initiative # 7: Policy and Grants Platform	1	01.06.2019	31.12.2019	A set of measures is realised	Verkhovna Rada of Ukraine	Cabinet of Ministers, Prosecutor General's Office, IT Ukraine, other associations
1.2: Create an enabling environment for the creation of startups, IT product development and increasing the number of captive centres of international companies	**1.2.1. Balance the financial regulations to enable the development of a strong fiscal environment to keep Ukrainian startups, product companies and captive centres of international companies in Ukraine, and attract foreign startups and other businesses to come and do business in Ukraine** Prepare an analytical study presenting the best tax conditions for all ecosystem players, with a focus on providing better conditions for startups and product companies and ensuring the predictability and further support of the industry development and growth. This study should contain but not be limited to the following: dividend holding tax, IP box regime, social contribution, capital gains and a simplified personal tax, ESOP model. Consider possibilities of benefits for early-stage tech startups and alignment in investment preferences between international and local investors. Adopt transparent laws with sustainable tax model on the basis of this study.	1	01/04/2019	31/12/2019	– Analytical study present-ing the best suitable tax model finalized and passed to the government	Ministry of Finance	Ministry for Development of Economy, Trade and Agriculture of Ukraine, UVCA, IT Ukraine and other industry associations, State Statistics Service of Ukraine

Operational objective	Activity	Priority	Start date	End date	Targets	Leading implementing institution	Supporting implementing partners
	Additionally ensure that statistics and analysis of IT-sector data are timely collected, analysed and disseminated to support and inform policy making and provide relevant information for industry players. Linked to initiative # 7: Policy and Grants Platform						
	1.2.2. Support the transformation of state and municipal property into new innovation districts Allocate government-owned properties as shared space for startups with relevant infrastructure by transferring complexes from the state property fund (i.e. unused or neglected factories or other state buildings, etc.), through PPP mechanism for long-term lease on preferential and transparent grounds. The allocated premises to go to the IT associations and Clusters or other verified and trusted IT NGOs across Ukraine. This shared space for startups to include conference hall, meeting rooms, innovation and training area (following the example of iHUb in Kyiv, IT District in Lviv). Linked to initiatives # 5 and 12: Startup Incubator Program and Breakthrough Technologies Zones and Support	2	01/01/2020	31/12/2022	– Facilities provided by the government for the creation of shared space for startups – Investment proposals developed – Tendering process started	Ministry for Development of Economy, Trade and Agriculture of Ukraine	State Property Fund, Regional Municipalities, EBA, 1991
	1.2.3. Organize the provision of financial support for startups during early stages Prepare an analytical paper suggesting possibilities for **financial incentives or other additional technical support** to IT companies and ecosystem development. Consider options such as: • Creating different supporting government-funded mechanisms for pre-seed, seed and round A companies; • Creating a Fund of Funds initiative (linked to 1.3.1); • Introducing tax balance and other incentives for local business retention, including regional development for IT companies. Linked to initiative # 7: Policy and Grants Platform	1	01/04/2019	31/12/2019	– An analytical paper with concrete financial and technical support for IT companies development finalized and passed to the government	Ministry of Finance	Ministry for Development of Economy, Trade and Agriculture of Ukraine, UVCA, startup associations, IT Ukraine, IT Committee of EBA

Operational objective	Activity	Priority	Start date	End date	Targets	Leading implementing institution	Supporting implementing partners
	1.2.4 Create special breakthrough technology zones Determine key issues and present a model for the way forward for development of regions with **special zones and breakthrough technology hubs for the IT industry**. For this: • Revise the development plans of large cities (Kyiv, Kharkiv, Odesa, Dnipro, Lviv) in order to provide innovation infrastructure zones on a competitive basis; • Launch a pilot project on a particular territory for a certain period; to apply Common Law to the disputes arising from IT, which shall be reviewed by a court established/explicitly designed for the pilot project; to aggregate and assess the results of the pilot project and respective recommendations thereunder; • Create infrastructure to manage English –American law, in particular, create respective courts; • Identify promising breakthrough technologies that can be further developed and tested in these areas, appoint fixed technologies to certain areas, prepare a global marketing campaign about such opportunities to attract interested companies worldwide; • Pass the supervision of such areas to regional clusters and local authorities; • Ensure proper financing. Linked to initiative # 11: Breakthrough Technologies Zones & Support	2	01/01/2020	31/12/2022	– Proposal to develop special zones for the development of a technological business ecosystem finalized	Ministry of Communities and Territories Development of Ukraine	Ministry for Development of Economy, Trade and Agriculture of Ukraine, Regional administrations, municipalities, IT Ukraine and other IT associations, clusters
	1.2.5 Initiate digital transformation of state companies and cities State companies and cities should become the first customer and support for innovative businesses and the state should be the biggest consumer of innovation. For this: • Create the development strategy of state companies which includes a digitalization strategy; • Raise awareness about progress already made, present success stories of the first pilot state incubators and continue building digital transformation economy through collaboration of state enterprises and IT industry/startups; • Organize a digital transformation team that will help companies get ready for such transformation;	2	01/01/2020	31/12/2021	– A state digital transformation team created – Events organized – List of state companies ready for digital transformation created	Ministry for Development of Economy, Trade and Agriculture of Ukraine	Ministry of Communities and Territories Development of Ukraine, Regional State Administration, City State Administration, National Investment Council, 1991, Digital Transformation Institute,

Operational objective	Activity	Priority	Start date	End date	Targets	Leading implementing institution	Supporting implementing partners
	• Build strong links with key industries (i.e. agro processing, machinery, space, energy, infrastructure) by introducing, promoting and educating about industry needs and raising awareness of business opportunities though public events; • Make a list of state companies that are ready for such transformation; • Launch new pilot projects for other enterprises and other sectors; • Organize annual deal-making conferences between state enterprises and private companies, the focus of which would be to present success stories, share experiences and communicate new needs. Linked to initiative # 6: Startup in-Residence program				– Pilot projects with at least 3 more state companies launched – Regular communication via conferences established		Innovative Nation, APPAU, Associations, IT NGOs and IT Clusters
	1.2.6 Facilitate digital transformation of private companies by industry (focusing on key areas critical for Ukraine: agriculture, healthcare, retail, logistics, machinery, fintech). Develop and implement digital transformation and corporate innovation programs for private companies. For this: • Analyze local resources and create a digital opportunity map; • Support the initiative that corporations can give part of their taxes to sponsorship of accelerators, startup programs or R&D; • Create models in which a list of reliable executors who help startups in their activities to get easier access to money grants; • Develop and implement programs that allow easier access of startups to corporations; • Create a model and launch the corporate partner network, connect to similar initiatives worldwide. Linked to initiative # 1: Corporate Partner Network	2	01/01/2020	31/12/2021	– Digital opportunities map created – Initiative to support corporations spending money on Innovation adopted – Models that ensure easier access of startups to corporations created – Corporate partner network initiative launched	NGOs	Digital Transformation institute, Innovative Nation, Unit.City, 1991, Associations, Clusters
	1.2.7. Create boot camps and incubators that provide young entrepreneurs with assistance for opening and running an IT startup with the focus on regional outreach For this, consider creating models that will: • Connect to international initiatives; • Attract investment from donors to finance first initiatives;	1	01/04/2019	31/12/2021	– First boot camps launched – Incubators at universities created	NGOs	Ministry for Development of Economy, Trade and Agriculture of Ukraine, Regional Adimitrtations, Ministry of Communities and Territories Development of Ukraine, Universities, Associations, Clusters

Operational objective	Activity	Priority	Start date	End date	Targets	Leading implementing institution	Supporting implementing partners
	• Ensure State financing for later stages that will be used to create such incubators at universities; • Create more initiatives, oriented to industrial high-tech or specialized for other segments. Linked to initiative # 12: TechUkraine Global Mentor Network & boot camps						
	1.2.8 Create the Fund of Funds to support startups at early stages The Fund of Funds is an instrument that is used worldwide to raise capital in a venture capital and investment ecosystem, providing access to early-stage investment for startups. The Fund will participate in identifying priority areas for investment, involving institutional investors (such as EIF, EBRD) that do not invest in individual companies. In the future, the attracted capital will be reinvested into local venture funds on a competitive basis, increasing the amount of future investment in innovative companies during the early stages. Creation of the Fund of Funds is accompanied by: • attraction of additional resources for financing of venture business; • a significant reduction of risks for the state in case of creation of joint funds with private foundations; • attraction of specialists in asset management with international experience; • stimulating competition in the investment market by supporting more funds; • the formation of positive influences at the macroeconomic level, creation of additional jobs, which, as a result, will stimulate GDP growth. Creating a Fund of Funds requires research to determine what legislative changes are needed in order for this mechanism to work. Priority steps for establishing the Fund of Funds include review and approval of the legislation on the functioning of this mechanism of financing in Ukraine, as well as determining the availability of sufficient venture capital for this project and the study of opportunities for attracting additional funding. Linked to initiative # 5: Startup Incubator Program	2	01/04/2019	31/12/2021	– Fund of Funds created and functioning	Ministry of Finance	Ministry for Development of Economy, Trade and Agriculture of Ukraine, UVCA, National Investment Council of Ukraine

Operational objective	Activity	Priority	Start date	End date	Targets	Leading implementing institution	Supporting implementing partners
	1.2.9. Launch Tech Transfer at universities Provide stimulating conditions for IT product development and IP creation at university R&D centers. Study the possibilities of increasing the effectiveness of the National Academy of Sciences through reforming, rethinking its structure for better performance of the function of development, ensuring the functioning of science and the combination of science and business. For this: • Create on the basis of universities research and development centers that would be joint projects of research and scientific institutes and respective specialized universities to strengthen innovative potential; • Transform unused buildings and premises of National Academy of Sciences of Ukraine and Universities to be space for incubators, technology business incubators, R&D labs and science parks via PPP model; • Launch Labs, Incubators, Entrepreneurship courses, Student investment funds, Mentoring Network. Identify a unit or set of ecosystem players who would be driving these initiatives and also promoting science locally and Ukrainian science worldwide; • Provide stimulation for commercialization of inventions at the university level by introducing royalties for research centers/researches. For this select one university, do a test model case to identify the best model and then implement it in other universities; • Create a database of scientific inventions on the regional and national levels. Clusters with universities should gather this information on the regional level and it should then be aggregated at the national level on a platform. Print and disseminate the most notable scientific cases at local and national events; • Develop partnership programs for scientists/university teachers with IT product development companies and startups to develop new ideas and transform them into products. Linked to initiative # 8: Tech Transfer Program	1	01/04/2019	31/12/2023	– Tech Transfer Initiative with supporting activities launched and activated – Big research institutes united with respective universities, academy of Sciences becomes Consultative Agency – Unused spaces of NAN transformed into startup incubator spaces – Database of scientific inversions gathered and made public – Partnership programs developed – Mechanisms of royalities and licensing created	MESU	National Academy of Sciences of Ukraine, Center for Innovation development, Agency of European Innovations, Faculty of Computer science of UKMA, The National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", IT associations and clusters

Operational objective	Activity	Priority	Start date	End date	Targets	Leading implementing institution	Supporting implementing partners
	1.2.10 Create and scale international mentoring programs that provide assistance to companies with their further growth For this, attract experts and study international experience and then create a sustainable model. Linked to initiative # 12: TechUkraine Global Mentor Network & boot camps	1	01/04/2019	31/12/2023	– 1 industrial program – 4 programs for various areas	NGOs	Ministry for Development of Economy, Trade and Agriculture of Ukraine, EPO, SMEDO
2: Improve the supply of skilled, highly specialized professionals to satisfy the growing IT industry needs through improving the education system and creating favourable conditions for keeping the pool of IT talent working in Ukraine							
2.1: At the state level, build linkages between the Ministry of Education and IT Industry to support transformation of universities to market economy, improving their governance structure and attracting IT talent to teach at universities	**2.1.1. Create a concept of a structured education/business communication system** Create a concept describing the processes of establishing a regular dialogue between industry, academia and state on two levels: **Strategic, and Operational/Regional** (Link to the National Agency for Higher Education Quality Assurance). Linked to initiatives # 8 and 13: Tech Transfer Program and National Education Platform	2	01/04/2019	31/12/2023	– An analytical study and a model of cooperation on all levels created and agreed upon	Ministry of Education and Science	Ministry for Development of Economy, Trade and Agriculture of Ukraine, IT associations and clusters, EBA, IT Ukraine
	2.1.2. Launch the Strategic communication and information sharing platform. Its tasks include: • Create a sustainable model to support the transformation of universities to the market economy; • Consider using the best international practices, including online courses and supervised/blended learning; • Help improve the governance structure and general rules of teaching at universities; • Optimize the process of cooperation and identify the areas of responsibility on Science, Technology and Innovation at the state level and decentralize it; • Gather the needs of companies and identify current and forecast hard and soft skills gaps for the next five years; publish findings in an annual industry report;	2	01/04/2019	31/12/2023	– Regular meetings held to identify and implement required activities to satisfy growing industry needs	Ministry of Education and Science	Ministry for Development of Economy, Trade and Agriculture of Ukraine, IT associations and clusters, EBA, IT Ukraine

Operational objective	Activity	Priority	Start date	End date	Targets	Leading implementing institution	Supporting implementing partners
	• Together with Ministry of Education and Science develop new curricula for specializations; • Update the register of professions and include new ones as needed; • Develop and communicate the requirements of business to sets of skills possessed by IT professionals of various specializations coming from universities; • Introduce courses for increasing management maturity of TOP management at universities, invite TOP executives of IT companies to teach such a course; • Run educational courses for teachers at universities to increase their practical knowledge of new technologies. Link to the National Agency of quality education. Linked to initiatives # 8 and 13: Tech Transfer Program and National Education Platform						
	2.1.3. Modernize regulations on labour, high education and science to enable cooperation between business professionals and universities Allow more flexibility in labour regulations, specifically to: • Revise the requirements for lecturers, professors and rectors at universities; • Allow professionals with long-term experience in the industry to teach at universities without a scientific degree; • Allow the possibility for offsite postgraduate study for working professionals; • Integrate the duality of education to make it possible to use the work of students. Linked to initiative # 7: Policy and Grants Platform	1	01/04/2019	31/12/2019	– Labour Regulations updated, a new Labor code adopted	Ministry of Social Policy	Ministry for Development of Economy, Trade and Agriculture of Ukraine, Hi Tech Office Ukraine, National Investment Council, BRDO, IT committee EBA, IT associations and clusters
	2.1.4 Conduct a study, identify potential directions and create separate strategies for developing the country's potential in new technologies, such as Data Science/AI, Robotics/IoT, Blockchain, Cybersecurity, AR/VR Make sure these strategies cover the question of supplying the industry with a sufficient number of Specialists on new technologies. Linked to initiative # 9: National Strategies on Key Leading Technologies	2	01/04/2019	31/12/2020	– Strategies on Data Science/ AI, Robotics/ IoT, Blockchain, Cybersecurity and AR/VR created	Ministry for Development of Economy, Trade and Agriculture of Ukraine	MinFin, MESU, Private Academia and Universities, Associations and Clusters

Operational objective	Activity	Priority	Start date	End date	Targets	Leading implementing institution	Supporting implementing partners
	2.1.5. Conduct an audit and adjust master's courses, focusing on business and advanced technological skills. Learn the best practices and implement courses on new technologies in all relevant universities. Consider adding courses and creating laboratories on: Data Science/AI, Robotics/IoT, Blockchain, Cybersecurity, AR/VR. Linked to initiative # 9: National Strategies on Key Leading Technologies	1	01/04/2019	31/12/2019	– Courses on new Technologies developed together with the industry and are available nationwide	MESU	State and Private Academia and Universities, New Technologies Associations and Clusters
	2.1.6. Organize and run courses for teachers at schools and universities on all IT-related specializations to improve the level of technological training and teaching of new technologies nationwide Organize internships and educational tours to leading international universities for teachers to learn more about best practices and enhance their current level of knowledge on the subject. It is essential for teachers to improve their knowledge on the courses they teach, and upgrade their professional skills in this time of rapid technological change.	1	01/04/2019	31/12/2019	– Courses launched nationwide – teachers mastery of new technologies significantly increased	MESU	State and Private Academia and Universities, New Technologies Associations and Clusters
	2.1.7. Develop a National Strategy for Educational Services in the IT field, improving the quality and competitiveness. Become an Educational Hub for Eastern Europe.	1	01/04/2019	31/12/2019	– The Strategy is developed and implemented	MESU	State and Private Academia and Universities, New Technologies Associations and Clusters
2.2: On a regional level, build collaboration between universities and local IT clusters, companies, associations, other NGOs and communities to implement development of new bachelor and master's programs, improving university professors' skills	**2.2.1. Establish cooperation of regional business associations and clusters with Education on a local level** At this stage, regional IT clusters, in close cooperation with strategic level organizations, are working with deans and other university staff. Their tasks are to develop and launch educational programs, responding to regional needs by turning them into company internship and industry conferences, renovating computer laboratories, providing learning and internship opportunities for students and enabling access to professionals. They also help with finding the right professionals for teaching courses, working with teachers on their permanent upgrade and synchronization with the latest technological advances. (Link to the National Agency of quality education). Linked to initiatives # 8 and 13: Tech Transfer Program and National Education Platform	2	01/04/2019	31/12/2023	– University programs up and running – University professors have all the right knowledge to teach new technologies	MESU	Regional Administrations and Municipalities , IT associations and clusters

Operational objective	Activity	Priority	Start date	End date	Targets	Leading implementing institution	Supporting implementing partners
	2.2.2. Organize project based learning Develop and support privately-led pilots for new educational models introducing project-based learning, faster, more interactive and flexible studies, by creating science parks in universities and company representative offices with senior specialists and managing groups of students. For this: • Enabling, enhancing and facilitating the conception of projects offered to students by IT businesses as a major teaching approach; • Allow wider access to the exposure of the IT business for university students and faculties through guests speakers from business; • Open IT faculties for students for projects proposed by businesses; • Organize regular idea exchange events for companies, faculty members and students; • Allow for the creation of a body of faculty members responsible for regular contacts with clusters, with the aim of collecting and directing project ideas to university students; • Ensure universities have effective personnel who will work with local clusters, associations and companies to provide good internships for the students. Consider creating a database of students with identification of a possible focus of studies for easier matching to the right companies/projects; • Allow for continuous exposure to the ICT industry for faculty members to improve their practical skills and understanding of new trends and technologies by introducing regular quarterly, half-yearly or yearly sabbaticals, when faculty members can go to companies and upgrade their practical skills, and creating obligatory post-doc research for PhD faculty members Linked to initiative # 8: Tech Transfer Program	3	01/01/2021	31/12/2022	– Privately-led pilots for new educational model introduced – Students learning on the basis of real projects – ICT faculty open for cooperation – Events with regular idea exchanges organized, faculty members responsible for regular contact with clusters appointed – Sabbaticals introduced – Obligatory post-doc research introduced	NGOs	Ministry of Culture, Youth and Sports of Ukraine, Ministry of Social Policy, Ministry of Education and Science, IT associations and clusters

Operational objective	Activity	Priority	Start date	End date	Targets	Leading implementing institution	Supporting implementing partners
2.3: Improve the business development, marketing, soft skills and foreign language capabilities of IT professionals	**2.3.1 Enhance marketing and sales skills of IT Professionals** Introduce Courses on Marketing and Sales in schools and universities. Additionally, introduce online studies, coaching programs (donor funded), exchange programs, interaction with business schools via workshops and courses, and run networking events with other countries. For all types of companies it is recommended that special IT Sales and Marketing certified programs are launched, schools to train sales staff, in cooperation with business schools in all universities. Additionally, for different types of companies, the following is recommended: • **Technology Service Companies:** online training programs involving international experts (easy access/no time limit), coaching by international experts, exchange programs with international companies (up to a month of work in another country); • **Product companies:** gaining international expertise and sharing experience through membership and partnership in international product associations and companies; • **Captive centres:** business development and business analysis skills through education; • **Technology Startups:** Acquisition of international expertise and experience exchange through membership and partnership in international product associations, organization of meet-up and networking events, international mentorship programs. Linked to initiative # 10: Business Skills Program	2	01/01/2020	31/12/2021	– Coaching programs launched – IT Sales and IT marketing specializations introduced – List of product associations created and conditions of participation described	MESU and Universities	Ministry of Culture, Youth and Sports of Ukraine, Ministry of Social Policy, Ministry for Development of Economy, Trade and Agriculture of Ukraine, IT associations, clusters and NGOs
	2.3.2 Improve entrepreneurship and business skills • Create, develop and enhance academic entrepreneurship culture by communication of existing opportunities and popularization via media; • Share success stories via media; • Add business education courses to university programs and launch nationwide programs of boosting entrepreneurial skills; • Establish and develop entrepreneurial Startup Schools or Entrepreneurship Clubs at universities with mentors and incubation programs; • Provide support to organize more boot camps; • Provide grants for business education to most promising entrepreneurs;	2	01/01/2020	31/12/2021	– Assistance to develop entrepreneur-ship and business skills provided	MESU	Ministry of Culture, Youth and Sports of Ukraine, Ministry of Social Policy, Ministry of Education and Science, NBU, IT associations and clusters, Digital Transformation Institute, 1991, Unit. City

Operational objective	Activity	Priority	Start date	End date	Targets	Leading implementing institution	Supporting implementing partners
	• Establish connections with international communities. Have regular experience-sharing communication with them at universities and at clusters/ respective communities; • Launch nationwide programs of financial education for early stage investors (NBU – financial education); • Reinforce crowdfunding platform. Linked to initiative # 10: Business Skills Program						
	2.3.3. Improve soft and people skills • Initiate meditation programs in schools and universities as well as lessons on ethics and communication; • Establish course on negotiation and communication practice courses, financial literacy programs, history of great ideas, critical thinking, business ethics, business acumen; • Include courses on soft skills in university programs. Linked to initiative # 10: Business Skills Program	2	01/01/2020	31/12/2021	– Meditation, ethics and communication practices introduced into schools – Courses on the development of personal qualities included in university programs – Practical courses on trust in negotiations, communication, critical thinking and ethics for the general population organized	MESU	Ministry of of Culture, Youth and Sports of Ukraine, Ministry of Social Policy, 1991, IT associations, clusters, and other NGOs
	2.3.4. Improve English-speaking skills • Stimulate universities to compete for the world's talent by introducing more English tuition programs; • Organize English courses for teachers under the supervision of the Ministry of Education; • Improve English programs in schools, increase their volume to 5 times a week and provide better quality learning materials, using American or British handbooks. Linked to initiative # 10: Business Skills Program	1	01/04/2019	31/12/2021	– English level of practical skills increased	Ministry of Education and Science with support of business community	Ministry of Culture, Youth and Sports of Ukraine, Ministry of Social Policy, IT associations and clusters

Operational objective	Activity	Priority	Start date	End date	Targets	Leading implementing institution	Supporting implementing partners
2.4: Create favourable conditions for professionals in the IT industry and other knowledge-based and creative industries to keep them in the country	**2.4.1. Create special tax conditions to maintain and enforce the current trend of IT industry development and set a moratorium on further changes to the IT taxation regime.**	1	01/04/2019	31/06/2019	– Stable, predictable and favourable tax environment for IT and creative industries – Migration of IT professionals reaches the lowest in the past 10 years	MinFin	Ministry for Development of Economy, Trade and Agriculture of Ukraine, Tax Committee of Verkhovna Rada, IT Committee EBA, IT Ukraine
	2.4.2. Develop further plans to keep our intellectual resources in the country and to bring back those who have left Conduct a study of reasons for the brain drain. On the basis of this study, create a plan of resolving the most pressing issues to further strengthen the trend of keeping our intellectual resources inside the country.	2	01/01/2020	31/12/2021	– The plan developed – Migration not more that 1% – New trend of expats coming back established	Ministry for Development of Economy, Trade and Agriculture of Ukraine	Ministry of Culture, Youth and Sports of Ukraine, Ministry of Social Policy, Ministry of Education and Science, IT associations and clusters
	2.4.3. Develop a National Program for the Creation of World Ukrainian Networks. Develop a national program of work with various Ukrainian diaspora and foreign communities to create an international Ukrainian lobby to help companies from Ukraine gain access to foreign markets and strengthen the country's international experience through Ukrainians living abroad. Create in key IT locations (Berlin, San Francisco, Tel Aviv, Shanghai, Bangalore, London, Vancouver, Paris, New York, Amsterdam) Ukrainian homes that will systematically unite the community, help to enter external markets and access valuable contacts regularly to conduct PR for the country and to communicate the benefits of doing business with Ukraine and in Ukraine.	1	01/06/2019	31/12/2021	– New trend of expats cooperating with the country is established	Ministry for Development of Economy, Trade and Agriculture of Ukraine	Ministry of Culture, Youth and Sports, Ministry of Social Policy, Ministry of Education and Science, IT associations and clusters

Operational objective	Activity	Priority	Start date	End date	Targets	Leading implementing institution	Supporting implementing partners
3: Enhance national and international visibility of IT industry to promote Ukraine as a preferable IT location for investors and increase export opportunities for IT services and products							
3.1: Implement country branding and promotion of IT industry abroad as an innovation-driven, universally recognized Tech destination that delivers high value for global economy	**3.1.1. Gather IT promoting teams who will take responsibility for the country's promotion** This team should include delegates and experts from MFA, Ministry for Development of Economy, Trade and Agriculture of Ukraine, EPO, UkraineInvest, clusters and business associations representing various segments of the IT industry. Its key responsibilities will include coordination of promotional activities of public and private stakeholders and organizations of events and activities, the aim of which is the country's promotion. The main points are: • to involve all key ecosystem players and establish regular dialogue with them; • create a working sustainable model for driving this initiative for the next five years and gather the financial support; • to start by creating a web portal with all information gathered in one place; • to use social networks for communication in both English and Ukrainian; • to organize regular conferences/workshops for better connection to the ecosystem players. Linked to initiative # 2: TechUkraine Portal	1	01/05/2019	01/07/2019	– IT promotion team established – A plan for the first year of their work developed	Ministry for Development of Economy, Trade and Agriculture of Ukraine	EPO, Ministry of Culture, Youth and Sports of Ukraine, MFA, UkraineInvest, UVCA, IT Ukraine, IT Committee EBA, Clusters, Unit. City, Media, Digital Transformation Institute, Global ambassador on IT, 1991, TechUkraine team
	3.1.2. Develop the right message to promote Ukrainian Tech internationally For this, gather all available communication about Ukrainian Tech, assess it, identify key messages, create a narrative and communicate it to all the stakeholders. The narrative should be in line with and expand the vision developed by the industry in this strategy: "Ukraine: innovation-driven, universally recognized Technology destination that delivers high value for global economy." Additionally, introduce a slogan promoted by all stakeholders, maybe "Breadbasket of great ideas." For this: • Develop a general all-inclusive narrative, covering all technology sectors of Ukraine; • Define a segment-specific message and identify the "Ukraine offer" narrative that will be sold to foreign countries; • Define key directions in technology, focus on industries and develop separate messages for each;	1	01/06/2019	31/12/2019	– All current messages gathered and analyzed – The right message and sales pitch developed and communicated to the authorities and relevant stakeholders- (investment and IT) – Value proposition developed	Ministry for Development of Economy, Trade and Agriculture of Ukraine	EPO, Ministry of Culture, Youth and Sports, MFA, UkraineInvest, UVCA, IT Ukraine, IT Committee EBA, CLUSTERS, Unit.City, 1991, TechUkraine Team

Operational objective	Activity	Priority	Start date	End date	Targets	Leading implementing institution	Supporting implementing partners
	• Design the template for success stories with a unified structure; • Produce a common banner for communication based on this Strategy's vision and ensure that the logo of this communication is visible on all the sites of the sector for export; Message highlights the position of the IT industry of Ukraine as an industry with experience and expertise and not as a country serving as a resource/supply of cheap labour. Linked to initiative # 2: TechUkraine Portal						
	3.1.3. Develop and realize the plan of the country's promotion as a technology destination The plan is developed by the TechUkraine Team in close collaboration with other industry and public representatives. The following steps are required: – Prepare the materials: • As a first step, create a benchmarking report comparing other countries and adjust messages accordingly to use and market our competitive advantages; • Develop promotional materials, catalogues of companies by industry segments, use the export brand for such communications; • Prepare the right sales pitch messages for the authorities in each industry segment and share with all ministries. In order to enlarge market outreach, target a few priority markets and groups of companies operating together (potential end-user, IT company and investor) to clarify the definition of an "offer"; • Make lists of events for participation and prepare concepts of Ukranian stands and promotional materials; • Develop the communication and PR platform, unite promotion agents and publish key messages as well as regular industry updates; – Identify the audience; – Share the message: • Identify all exporting businesses, institutions and others involved with export, share the developed narrative, identity graphics and other promo materials, create procedures of regular information exchange; • Get in touch with business schools to delegate resources for trade shows abroad as part of their internship;	1	01/06/2019	31/12/2019	– The plan of country's promotion as technology destination developed – The concept of brand promotion developed and roles and interactions defined – The communication and PR Platform of Ukraine developed – Success stories gathered and regularly shared	Ministry for Development of Economy, Trade and Agriculture of Ukraine	EPO, Ministry of Culture, Youth and Sports, MFA, UkraineInvest, UVCA, IT Ukraine, IT Committee EBA, Unit.City, 1991, TechUkraine Team, IT Clusters

Operational objective	Activity	Priority	Start date	End date	Targets	Leading implementing institution	Supporting implementing partners
	• Distribute information, promotional materials and catalogues of companies so that the Diplomatic Missions of Ukraine can organize B2B meetings, events and networking, roadshows, etc.; • Cooperate with local and international reviews and media and make sure that the right messages are shared through these channels. Share success stories and case studies. Monitor and manage the information flow about Tech Ukraine permanently; • Promote IT entrepreneurship and innovative Ukraine via conferences, e.g. Startup Awards, Investment conferences; • Position IT sector through trade missions; – Increase promotional content: • Cooperate with all exporting partners and create on a permanent basis various content in video, text and game formats; • Gather, structure and share success stories and case studies of companies in the context of countries, platforms and products, and publish testimonials of our foreign partners. Linked to initiative # 2: TechUkraine Portal						
	3.1.4. Help make local events international Raise awareness, emphasize and support local events on the international stage. For this: • Create the list /calendar of events; • Ask organizers of such events to provide content for press releases; • Promote the events through pre- and post-press releases in local and international media, social media networks, messages for authorities on trade missions and state visits; • Organize separate marketing campaigns to promote the events and raise awareness for them; • Event organizers to work with local authorities to prepare cities for an influx of international guests; • Have at least one big event in Kyiv. Linked to the initiatives #2 and #3: TechUkraine Portal and Tech Ukraine Pavillon	2	01/01/2020	31/01/2021	– Major international events on the latest technology advances organized in Ukraine annually	Ministry for Development of Economy, Trade and Agriculture of Ukraine	EPO, Ministry of Culture, Youth and Sports, MFA, UkraineInvest, UVCA, IT Ukraine, IT Committee EBA, Unit.City, TechUkraine Team, IT Clusters
	3.1.5. Initiate a large-scale exchange of experiences and ideas between Ukrainians and the rest of the world. Organize visits by leading experts and reputable professionals from universities, communities and successful companies abroad	2	01/06/2019	31/01/2022	– At least 10 top speakers annually visit Ukraine with talks	Ministry for Development of Economy, Trade and Agriculture of Ukraine	EPO, Ministry of Culture, Youth and Sports, MFA, UkraineInvest, UVCA, IT Ukraine,

Operational objective	Activity	Priority	Start date	End date	Targets	Leading implementing institution	Supporting implementing partners
	to come and share their vision and ideas, fostering understanding with representatives from our innovative ecosystems. Organize stage tours of ecosystem leaders, communities, non-profit organizations and civil servants in the leading innovative locations of the world. Organize knowledge transfer and best practices.				– At least 10 study tours organized		IT Committee EBA, Unit.City, TechUkraine Team, event companies, IT Clusters
	3.1.6. Use our diplomatic and political talents for promotion Build and reinforce the capacity of diplomats in Diplomatic Missions of Ukraine, as well as that of public figures traveling with trade missions to spread the right message abroad about the IT industry. For this: • Develop the program in close collaboration with industry leaders to present the key focus of the industry, real case studies, specific issues and emphasis on the opportunities to work with Ukrainian companies. Training should be organized and facilitated by the industry. It can be done online with interactive sessions; • In addition to the courses, organize field visits and meetings with industry for diplomats and public figures traveling abroad; • Actively involve IT industry representatives in outward missions and trade shows; • Perform all activities linked to the key message by segment and the global industry vision; • Introduce courses on IT to the Diplomatic Academy, invite industry leaders to teach; • As a further step, transfer Trade and Economic Missions back from MFA to the Ministry of Economic Development, Trade and Agriculture of Ukraine with a link to the activities of UkraineInvest and Export Promotion Offices or under their mandate. Linked to the initiatives #2, #7 and #16: TechUkraine Portal, Policy and Grants Platform and IT Reps Abroad	1	01/06/2019	31/12/2020	– Study program for diplomats and trade representatives from public figures developed – Training and field visits organized for at least 15 officials twice a year, including 1–2 EPO officers – Courses on IT in the Diplomatic Academy organized – Trade and Economic Missions transferred back under the responsibility of Ministry for Development of Economy, Trade and Agriculture of Ukraine	Ministry for Development of Economy, Trade and Agriculture of Ukraine, MFA	EPO, UkraineInvest, IT Committee EBA, Ukrainian Institute, IT Ukraine Association and IT Clusters

Operational objective	Activity	Priority	Start date	End date	Targets	Leading implementing institution	Supporting implementing partners
	3.1.7. Create a catalogue of companies and guides on "how to do business in Ukraine" Add a catalogue of companies and connect them to their success stories on the Tech Ukraine Portal and provide the relevant information for foreign investors on how to enter the Ukrainian market and do business. Such a catalogue can be created with the help of IT associations, clusters and companies. For this: • Work closely with IT associations and clusters to reach companies inside the country and create a repository of IT companies by available skills and services; • Add the catalogue of companies to the Tech Ukraine portal. It should provide success stories, information about their sales, services, capacities and contacts. This will help increase the visibility of medium-sized companies on the international market and highlight those that have created products; • The website should be in a simple and accessible format and ideally should provide information from the websites of associations and clusters whose function it will be to gather such information. For this a unified standard for collecting data on companies should be developed and a data collection form created and published; • Upload a guide on the web to explain how to enter the Ukrainian market and set up a company in the IT industry with practical steps and links; • Promote and redirect to the web platform through Chamber, cluster and association web sites; • Define specific labels allowing Ukrainian and foreign companies to have guarantees and to reduce feelings of risk. The labels should be verification that the company indeed has what it promotes, guarantees the protection of the IP, is in good standing with local authorities, etc.; • Give such labels to tech Companies and to companies/consultants accompanying foreign companies wishing to settle in Ukraine; • Connect Tech Ukraine Portal to EPO exporters platform. Linked to initiative # 2: TechUkraine Portal	1	01/06/2019	31/12/2020	– The platform with the catalogue developed and launched	NGOs, TechUkraine Team	Ministry for Development of Economy, Trade and Agriculture of Ukraine/EPO, IT Ukraine, IT Committee EBA, Unit.City, IT Clusters, UkraineInvest, UVCA

Operational objective	Activity	Priority	Start date	End date	Targets	Leading implementing institution	Supporting implementing partners
	3.1.8. Increase our physical visibility abroad Provide technical and financial support for participation in international events and organize trade missions and suitable events abroad, namely: • Provide financing to ensure greater participation in international events; • Choose and prioritize events important to the Tech industry, e.g. Disrupt SF (San Francisco, USA), CES (Las Vegas, USA), South by Southwest (Austin, USA), SVOD (Silicon Valley, USA), DLD (Tel Aviv, Israel), TNW (The Netherlands), WebSummit (Portugal), Collision (Toronto, Canada), Vivatch (France), CEBIT (Germany), Canton Fair (China), RISE (Hong Kong), AIM (Dubai, UAE), South Summit (Spain), Central European StartUP Award (EU), Economic Forum of Krynica (Poland), Expo 2020 (Dubai, UAE), Global Entrepreneurship Week, Global Innovation Summit, European Youth Award (Austria) and others; • Gather financial support via the Public/Private shared model; • Identify conditions and select companies to be a part of the national kiosk; • Provide additional training on marketing skills for company personnel participating in the events; • Develop marketing materials and concepts for the stand/booth to represent the full industry, including videos, brochures, leaflets, display stands and visuals; • Organize promotional campaigns (media, digital marketing) to cover the events and the companies' participation in foreign media; • Assist with logistical coordination for the expeditions; • With local Diplomatic Missions of Ukraine, organize appropriate events and B2B meetings; • Gather and publish information after B2B and international events from companies (they must agree to provide details and develop a case study/ success story). For this it is important to create requirements for the promotional activity participants and choose only the ones who agree to show the effectiveness of meetings in the amounts of contracts in order to assess the KPI of events. Linked to initiative # 3: TechUkraine Pavillon	2	01/01/2020	31/12/2022	– Marketing materials developed – Entire industry is represented at a minimum of 10 global events – Logistics and media support provided	EPO	IT Ukraine, IT Committee EBA, Unit.City, UkraineInvest, UVCA, TechUkraine Team, IT Clusters

Operational objective	Activity	Priority	Start date	End date	Targets	Leading implementing institution	Supporting implementing partners
	3.1.9. Finance and hire IT business representatives for target markets It is important to have IT Ukraine and/or matched business representatives in targeted markets who will be identified and co-funded by the government and professional associations or Chambers of Commerce, and will collaborate closely with Diplomatic Missions of Ukraine and Ukrainian diaspora in targeted countries (possibly target countries with a shortage of IT manpower, a high standard of living and business freedom, such as USA, Canada, UK, Germany, France). These persons should work as part of the International Offices of EPO, UkraineInvest, Ukrainian Institute, or other local Ukraine trade representative along with one more area professional. Their responsibilities include but are not limited to: • Introducing the Ukrainian IT industry at target events and presenting opportunities for working with Ukraine; • Marketing Ukraine in local and regional media; • Preparing promotion events (in collaboration with UkraineInvest, Ministry for Development of Economy, Trade and Agriculture of Ukraine, EPO); • Establishing a network with the local diaspora; • Introducing position of Country Tech Ambassadors. Linked to initiative # 2, 3 and 16: Tech Ukraine Portal, TechUkraine Pavilion and IT Reps Abroad	2	01/01/2020	31/12/2021	– 10 B2B meetings per industry segment in targeted market organized by industry representatives annually	Ministry for Development of Economy, Trade and Agriculture of Ukraine + TechUkraine Team	MFA, EPO, Ministry of Culture, Youth and Sports, IT Ukraine Association and IT Clusters, Chambers of Commerce

Operational objective	Activity	Priority	Start date	End date	Targets	Leading implementing institution	Supporting implementing partners
3.2. Implement internal promotion of IT sector as a sector that brings global standards of doing business to Ukraine, grows new generations of people with global mindset, increases purchasing power of Ukrainians, stimulates the development of various supporting industries, Including construction, retail, transportation, transfer technologies to local e-Government and IT ecosystem as a whole.	**3.2.1. Promote the Ukrainian Tech and Entrepreneurship Culture locally** Develop separate messages and promote entrepreneurship, success stories and case studies for technology and the opportunities it provides locally. Linked to initiative # 2 and 14: TechUkraine Portal and Digital Skills Program	1	01/06/2019	31/12/2023	– Ukrainian Tech promoted locally and the market educat-ed and inspired	TechUkraine Team	Ministry for Development of Economy, Trade and Agriculture of Ukraine, EPO, MFA, Ministry of Culture, Youth and Sports, UkraineInvest, UVCA, IT Ukraine, IT Committee EBA, Associations, Unit. City, 1991, IT Clusters
	3.2.2. Launch Digital Education for the entire population of Ukraine Promote digital skills development and professions among schoolchildren, students and working population. For this: • Analyze the degree of awareness about IT and its importance at the national level; • Design a program on the development of digital skills of citizens and modernization of pre-school, secondary, extra-curricular, vocational higher education and adult education systems; • Ensure introduction of a separate profession of Chief Digital Transformation/ Change Managers; • Consider models of public and private partnerships and create appropriate incentives for the development of non-formal education (e.g. School of New Professions, National Animation Center, helping various social strata acquire new digital skills, new professions and allow them to earn money); • Introduce specialized conferences on digital solutions in various key spheres via the model of public/private partnership, where the state identifies the focus areas and gives or pays for the space and the respective industry associations organize the event, inviting local and international vendors and increasing awareness about digital solutions in specific areas; • Develop a marketing campaign to promote a successful IT person representing various opportunities in the industry through an IT careers awareness campaign on state media and public events, targeting parents and schoolchildren; • Highlight and empower Ukrainian STEM background. Linked to initiative # 14 and 7: Digital Skills Program and Policy and Grants Association	1	01/06/2019	31/12/2021	– Digital Education program for the entire population of Ukraine launched – The software segment of the local market doubles in the next two years	Ministry of Education and Science	Ministry of Social Policy, Ministry of Economic Development, Trade and Agriculture, State Agency for E-Governance, IT Associations, Regional Clusters and Educational Institutions

Operational objective	Activity	Priority	Start date	End date	Targets	Leading implementing institution	Supporting implementing partners
3.3: Reinforce further development and cooperation of trade support institutions, investment promotion institutions and other local stakeholders to educate and facilitate Global Companies to invest in Ukraine	**3.3.1. Attract more investors** Work closely with regional, state and city administrations to attract more investors and facilitate their implementation in the country in order to decrease risk by: • Providing support for potential investors with adaptation to Ukrainian peculiarities through describing clear steps and contact persons for investors wishing to enter the market; • Appointing a high profile person in investment offices who will be responsible for the proactive attraction of new valuable investors; • Building closer cooperation between regional authorities through UkraineInvest and local IT Clusters and Chambers of Commerce to work on this task together; • Introducing other incentives (e.g. incentives based on created jobs in R&D, accelerated depreciation of R&D equipment for fiscal purposes, 0% income tax for some period for R&D companies, etc.). Linked to initiative # 2: TechUkraine Portal	3	01/01/2020	31/12/2022	– Gateway for investors to Ukraine created – One person responsible for attracting IT investments appointed – Connections between regional authorities, local IT clusters and Chambers of Commerce built and formalized	UkraineInvest	Ministry for Development of Economy, Trade and Agriculture of Ukraine, National Investment Council of Ukraine, UVCA, Ministry of Communities and Territories Development of Ukraine, Export Promotion Office, Regional Development Agency
	3.3.2. Develop capacities and a sales mindset in local authorities Train local authorities together with local IT companies on best practices in marketing and sales and develop a better understanding of market requirements and investor needs. Hire market specialists/industry representatives to conduct workshops and training. Regional authorities should be working with local clusters, ministries should make excursions to IT industry companies, and IT companies should visit ministries to foster better connections and understanding. Linked to initiative # 10: Business Skills Program	3	01/01/2020	31/12/2022	– Sales skills of both IT companies and local authorities significantly improved resulting in business growth in the region	NGOs	Ministry for Development of Economy, Trade and Agriculture of Ukraine, Regional State Administration, UkraineInvest, IT Ukraine, IT Committee EBA, clusters, associations
	3.3.3. Organize Welcome to Ukraine Programs Support organizations for soft landing and mobility programs, create knowledge and experience exchanges for international investors and develop potential trade missions in Ukraine and Innovation buyers. For this: • Create a position to support and facilitate the installation of foreign IT companies in Ukraine, a “local support coach" who would be responsible for convincing prospects during their visit to Ukraine and would take charge of local monitoring of the project; • Both positions, the country’s trade representative and the local coach, should be incentivized if they succeed. Linked to initiative # 2: TechUkraine Portal	3	01/01/2020	31/12/2022	– People to fulfil the role of local support coach identified and trained – Assistance to at least 10 investors provided annually	UkraineInvest, EPO	Ministry for Development of Economy, Trade and Agriculture of Ukraine, Unit.City, UVCA, IT Ukraine, Associations, clusters

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APPENDIX 1: LIST OF PARTICIPANTS IN THE PUBLIC–PRIVATE CONSULTATIONS (IN ALPHABETICAL ORDER)

No.	Name	Name of the Institution
1	Alena Skyrta	Inscience
2	Alevtina Maksymchuk	Chamber of Commerce and Industry Israel–Ukraine
3	Alexander Yurchak	APAAU
4	Alexandra Sirovatko	Data Science Group
5	Alexey Ostapenko	Mts Zdravitsa, Private Enterprise NPO Agronakinform
6	Alex Brodsky	AB Consulting
7	Alina Zagaytova	First Solar
8	Alina Shyshkina	Ministry of Economic Development and Trade
9	Anastasiia Nehoda	Cherkasy IT Cluster
10	Anastasyia Sleptsova	SPREAD
11	Andrey Akselrod	People.ai
12	Andrii Kolotii	Export Strategy Team
13	Andrii Starzhynskyi	EBA IT Committee
14	Andriy Biryukov	Hi–Tech Office Ukraine
15	Anna Haidai	GIZ Ukraine
16	Anna Karmazina	Kyiv IT Cluster
17	Anna Sklyarenko	Hi–Tech Office Ukraine
18	Anna Vlasyuk	Office of the National Investment Council under the President of Ukraine
19	Anton Zotov	GlobalLogic
20	Artem Afian	Juscutum
21	Artyom Ahromkin	Investment Promotion Department, Ministry for Development of Economy, Trade and Agriculture of Ukraine
22	Constantine Vasuk	IT Ukraine Association
23	Daniil Stolyarov	Almaz Capital
24	Darya Chayka	Directorate of Innovations and Technology Transfer, MESU
25	David Braun	Template Monster
26	Deborah Fairlamb	Ministry of Finance of Ukraine, Start-up Fund
27	Denis Hurskyi	Social Boost
28	Denis Dovgopoliy	GrowthUP Group
29	Dima Gadomsky	European Legal Tech Association
30	Dmitry Kushnir	IT Ukraine Association
31	Dmitry Ovcharenko	IT Ukraine Association
32	Dmytro Gordiienko	Facebook inc.
33	Dmytro Prymak	NUCC (Norwegian Ukrainian Chamber of Commerce)
34	Dmytro Pryadko	IT Committee of Association of Ukrainian Enterpreneurs (SUP)
35	Eduard Rubin	Kharkiv IT Cluster

No.	Name	Name of the Institution
36	Elisabeth Fullerton	Fullerton Ventures, GP
37	Emal Bakhtari	Department of Open Markets, National Bank of Ukraine
38	Eugene Shulgin	Chamber of Commerce and Industry Israel-Ukraine
39	Eugene Sysoyev	Ukrainian Venture Capital and Private Equity Association (UVCA)
40	Evhenyi Rokytskyi	Dnipro Space Cluster
41	Evhenyia Luhanovskaia	EBA IT Committee
42	Galina Bitichuk	Institute of Pedagogics of National Academy of Sciences of Ukraine
43	Igor Samokhodsky	Office of Effective Regulation (BRDO)
44	Inna Shatova	Ministry of Economic Development , Trade and Agriculture of Ukraine
45	Iryna Andruschenko	Digital Ukraine Initiative for New Leaders, D2 Digital
46	Iryna Ozymok	Western NIS Enterprise Fund
47	Iryna Hordiichuk	Ukrainian Venture Capital and Private Equity Association (UVCA)
48	Iryna Shcherbyna	State University of Telecommunications
49	Iurii Petruk	AgTech Ukraine Association
50	Ivan Polukhovich	HS "IT cluster of Vinnytsia"
51	Ivanna Pogrebniak	Kharkiv IT Cluster
52	Ivan Pogrebniak	Outsourcing 2 IT
53	Jane Klepa	1991 Open Data Incubator
54	Kateryna Oliinyk	American Chamber of Commerce
55	Karen Mkrtumyan	State Enterprise "Goszovnishinform"
56	Kateryna Kryvoshei	GIZ Ukraine
57	Khrystyna Popovych	Export Strategy Team
58	Kiril Mazur	Unit.City
59	Konstantin Chizhik	Office of the National Investment Council under the President of Ukraine
60	Konstantin Meshkov	NodeArt
61	Kseniia Savchenko	Office of Reforms of financial sector
62	Larysa Antoniuk	Kyiv National Economic University named after Vadym Hetman, Ukraine
63	Maiia Sperkach	National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”
64	Maksym Dybenko	Kyiv IT Cluster
65	Maksym Yakover	Unit.City
66	Matthew Lewis	Silicon Valley Planet / UNIT.City
67	Maria Shevchuk	Export Promotion Office
68	Marina Khmara	Institute of International Relations, Kyiv National Taras Shevchenko University
69	Marina Vyshegorodskikh	BrainBasket Foundation
70	Maryana Kahanyak	Export Promotion Office
71	Maxim Pochebut	IT Ukraine Association
72	Maxim Romanov	APAAU
73	Mikhail Titarchuk	Ministry of Economic Development, Trade and Agriculture of Ukraine

No.	Name	Name of the Institution
74	Milena Naymark	Nova Ukraine
75	Mykhailo Bechkalo	UkraineInvest
76	Mykhailo Krikunov	Clust-UA
77	Mykola Filtsev	IT Committee of Association of Ukrainian Enterpreneurs (SUP)
78	Mykola Slobodian	Kyiv IT Cluster
79	Mykola Vinogradov	Silicon Valley Planet
80	Mykola Volvach	Ministry of Education and Science of Ukraine
81	Mykyta Safronenko	Ukrainian American Coordinating Council
82	Nadiia Vasylieva	Institute of Digital Transformation
83	Natalia Drik	Blockchain Associaton
84	Nataliia Cherkas	Kyiv National Economic University named after Vadym Hetman, Ukraine
85	Natalia Mykolska	Stanford Center on Democracy, Development, and the Rule of Law (CDDRL)
86	Natalia Radchenko	Juskutum
87	Nataly Veremeeva	Kyiv IT Cluster, Export Strategy Team
88	Nestor Shvets	Lviv IT Cluster
89	Nick Bilogorskiy	Nova Ukraine
90	Oksana Borisenko	Digital Ukraine Association
91	Oksana Markarova	Ministry of Finance of Ukraine
92	Oleg Bilozor	Reply
93	Oleg Naumenko	Hideez
94	Oleg Sobolev	Wireless Ukraine Association
95	Oleksandr Klikich	Ukrainian Chamber of Commerce
96	Oleksandr Krotenko	Consulate General of Ukraine
97	Oleksandr Kubrakov	IT Ukraine Association
98	Oleksandr Soroka	Startup Network
99	Oleksandra G Hovorukha	Sigma Software, UTEW
100	Olena Chmir	DNU UkrINTEI
101	Olena Kornienko	Hi-Tech Office Ukraine
102	Olesia Zaluska	Export Strategy Team
103	Olesya Ulyanova	Kharkiv IT Cluster
104	Olexandr Romanko	Kyiv School of Economics
105	Olexandr Pavlenko	Zeus Group
106	Olexii Skrypnik	Eleks
107	Olexii Vitchenko	Digital Future
108	Olexiy Podoliyev	Kyivvodokanal
109	Olga Afanasyeva	Executive Director of Ukrainian Venture Capital and Private Equity Association (UVCA)
110	Olga Andrienko-Bentz	PwC
111	Olga Kalender	Ministry of Economic Development, Trade and Agriculture of Ukraine

No.	Name	Name of the Institution
112	Olga Lugova	Ukrainian Association of ODOO
113	Olga Shapoval	Kharkiv IT Cluster
114	Olga Stepanenko	Kyiv National Economic University named after Vadym Hetman, Ukraine
115	Olga Zhornova	Academy of Monitoring and Examination
116	Ostap Korkuna	Nova Ukraine
117	Pavlo Kartashov	Ministry of Finance of Ukraine
118	Rostyslav Dyuk	FinTech Association
119	Ruben Nieuwenhuis	Amsterdam Economic Board
120	Ruslan Kupriyuk	Ternopil City Council
121	Sergey Verlanov	Ministry of Finance of Ukraine
122	Serhii Telenyk	National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”
123	Sofia Belenkova	Kharkiv IT Cluster
124	Solomiya Lototska	Export Strategy Team
125	Stepan Veselovskyi	Lviv IT Cluster
126	Svitlana Khutka	SocialINdicators, U.World Foundation, Inc.
127	Taras Kitsmey	IT Ukraine Association, Lviv IT Cluster
128	Tatyana Laduba	IT Ukraine Association, Luxoft Ukraine
129	Tatyana Tananaiko	Ministry of Economic Development, Trade and Agriculture of Ukraine
130	Ulyana Khromyak	UkraineInvest
131	Vadim Konoval	State Agency for E-Governance of Ukraine
132	Viacheslav Rozgon	State Agency of Water Resources of Ukraine
133	Vitali Povh	NGO "Ukrainian-Chinese Commonwealth Association"
134	Vitaliy Chernuik	Directorate of Innovations and Technology Transfer, MESU
135	Vitaly M. Golomb	GS Capital
136	Vlad Tislenko	Concepter
137	Volodymyr Bek	IT Committee of the European Business Association
138	Volodymyr Dembitskyy	UkraineInvest
139	Volodymyr Dykov	KitWorks.systems Company
140	Volodymyr Nochvai	Kyiv Academic University
141	Volodymyr Novoderezhkin	State Research Institute of Informatization and Economic Modeling
142	Volodymyr Tsoi	IT Committee of Association of Ukrainian Enterpreneurs (SUP)
143	Volodymyr Varhola	APPAU
144	Vyktor Hurskyi	Social Boost 1991 Open Data Incubator
145	Yaroslav Azhnyuk	Petcube
146	Yaroslav Kutovyi	IT Ukraine Association
147	Yaroslav Rozhilo	Ukrainian Center for Social Data
148	Yaroslava Antipina	IAB.Ukraine

No.	Name	Name of the Institution
149	Yefrem Lashchuk	IT Ukraine Association
150	Yegor Chernev	NGO Innovative Nation
151	Yuliia Bosa	GIZ Ukraine
152	Yryna Shcherbyna	State University of Telecommunications
153	Yuri Peroganich	Association of Enterprises of Information Technologies of Ukraine
154	Yuri Petrovsky	State Enterprise "Goszovnishinform"
155	Yurii Tustanovskyi	The Secretariat of the Cabinet of Ministers of Ukraine
156	Yuriy Antoniuk	EBA IT Committee
157	Yuriy Lutsenko	COIN
158	Yuriy Zaremba	AXDRAFT

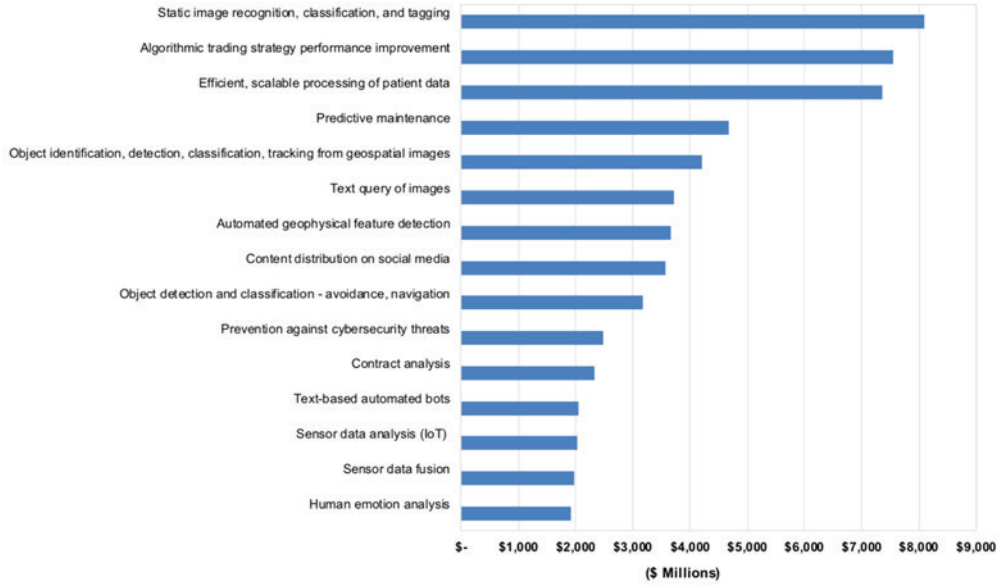
APPENDIX 2: ADDITIONAL INFORMATION ON IT COMPANIES IN UKRAINE

IT activity (main business model)	Ukraine
Manufacturer (or representative)	110
Software publisher	70
Publisher of software for a specific activity	120
Publisher of software for a specific process of companies	130
Software solutions integrator (developed by third parties)	60
IT services, Software development (hosting, maintenance, training, bespoke software development....)	450
Telecom services (Telecom operator, ISP...)	60
Telecom & network infrastructure integrator	50
IT infrastructure integrator	40
Consulting	110
Retailing to individuals	160
Retailing to enterprises (hardware, software & services & assemblers)	170
Wholesaler (resale of IT products to retailers)	100
Web agency	10
Other ICT connected activities	40
Total Locations	1,680
Total HQ	**1,500**

Estimates / compuBase (2017)

APPENDIX 3: ADDITIONAL INFORMATION ON ARTIFICIAL INTELLIGENCE OPPORTUNITIES

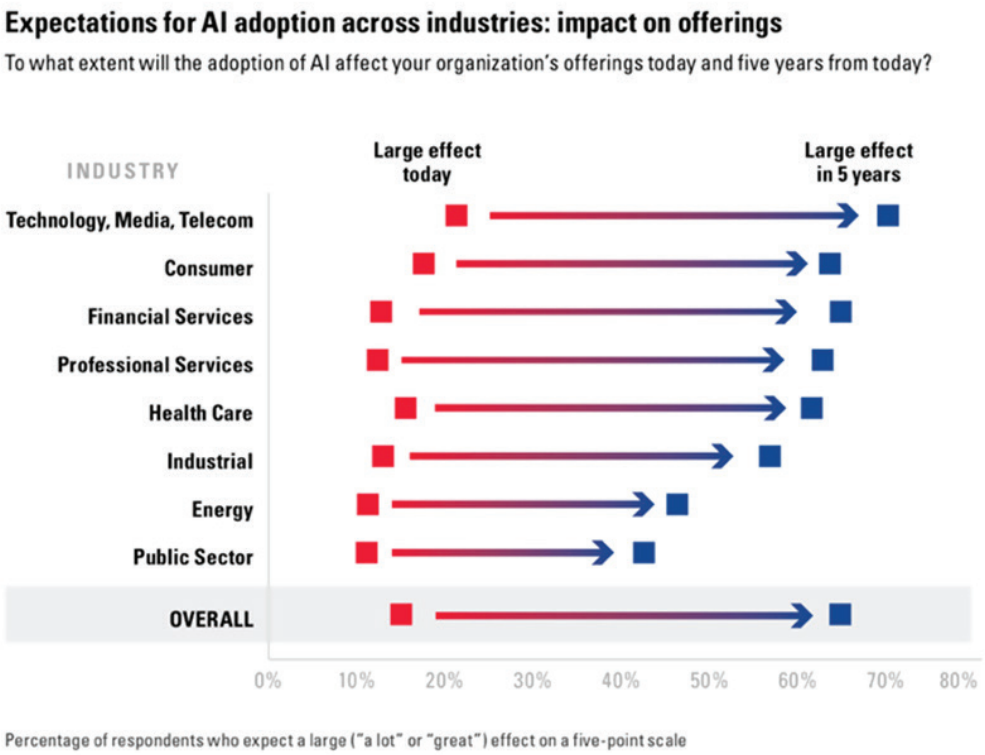
Chart 2.1 Cumulative Artificial Intelligence Revenue, Top 15 Use Cases, World Markets: 2016-2025



This chart shows the use cases ranked by cumulative revenues with the top three accounting for more than US$7 billion. The second largest group of six use cases is between US$3 and US$5 billion, and the third largest group is between US$1 and US$2 billion. The top three are related to Big Data and Vision with the rest spread across Big Data, Vision and Language. From an industry perspective, the advertising, consumer, investment, finance and healthcare industries are the leaders with regard to the top three use cases. While AI is expected to touch almost every industry, the transformative ability of AI will be felt the most across these five industries, presenting the largest market opportunity for AI vendors, both in terms of software and hardware[46].

Expectations for AI run high across industries, company sizes and geography. While most executives have not yet seen substantial effects from AI, they clearly expect to in the next five years. Expectations for AI's effects on companies' offerings are consistently high across industry sectors:

[46] Top 15 Use Cases for Artificial Intelligence. Practical AI Use Cases for Big Data, Vision, and Language Applications: Strategic Analysis and Market Outlook (2016).



Source: Reshaping Business with Artificial Intelligence[47]

Most organizations foresee a sizable effect on IT, operations and customer–facing activities:

Source: Reshaping Business with Artificial Intelligence[48]

[47] Reshaping Business With Artificial Intelligence • Mit Sloan Management Review (2017)
[48] Reshaping Business With Artificial Intelligence • Mit Sloan Management Review (2017)

#ЕКСПОРТУЙ
EXPORT STRATEGY TEAM

співпраця з німеччиною
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