UKRAINE

THE COUNTRY THAT CODES

IT Industry in Ukraine. 2019 Market Report
This report has been put together by N-iX - one of the largest IT service companies in Ukraine. However, it would be impossible without the research done by numerous organizations which work on developing the IT sector and business in Ukraine. We are grateful to our partners for their generous assistance. This research relies heavily on the insights gathered by IT Ukraine Association, European Business Association, DOUsa, Ukraine Invest, Lviv IT Cluster, ACC, NUCC, and many other organizations.

ACKNOWLEDGEMENTS

The Norwegian-Ukrainian Chamber of Commerce (NUCC)
The Norwegian-Ukrainian Chamber of Commerce (NUCC) is a non-profit, non-governmental organization established by and for Norwegian and Ukrainian companies. It works to stimulate commercial cooperation, strengthen relations and exchange of information and experience between Norway and Ukraine.

Canada-Ukraine Chamber of Commerce (CUCC)
Founded in 1992, Canada-Ukraine Chamber of Commerce (CUCC) is dedicated to supporting trade and investment between Canada and Ukraine. CUCC has over 100 registered members representing 20 industry sectors. It participates in or organizes business forums, trade missions and conferences, facilitates business, partners with governments in Canada and Ukraine, and provides a range of business facilitation and networking opportunities.

The German-Ukrainian Chamber of Industry and Commerce (AHK Ukraine)
The German-Ukrainian Chamber of Industry and Commerce (AHK Ukraine) is part of the worldwide network of German Foreign Trade Chambers (AHK), which has 140 offices in 92 countries. Founded in Kyiv in 2016, the organization has since supported Ukrainian and German companies in international business development and is an important platform for bilateral economic exchange.

Lviv IT Cluster
Lviv IT Cluster is a community of information technology companies. Together with schools, universities, and local authorities, Lviv IT Cluster develops the business environment of the city. It is aimed at strengthening and developing IT industry on local and national levels, as well as proving the competitiveness of Ukrainian IT education and IT business in Europe and the whole world.

IT Ukraine Association

The IT Ukraine Association was founded in 2004 by the leading IT-companies in Ukraine. During the years of operation, the Association has become the largest community of service IT-companies in Ukraine. Today the Association includes 58 software development companies, which collectively account for 50% of the total revenue of the Ukrainian IT industry.

“For many years Ukraine has been recognized as “IT destination” of Eastern Europe and now it becomes an emerging spot for AI, Data Science and digital transformation. IT is the most dynamically growing industry in the country of the last decade. In times of booming global demand for digital products and services, experienced engineers and high human capital potential are the main Ukraine’s competitive advantages which bring new opportunities to our customers.”

European Business Association (EBA)

Established in 1999, the EBA provides a forum in which members can discuss and find solutions to common problems affecting business in Ukraine. This initiative was initially supported by the European Commission and has grown to become one of the largest and most influential business communities in the country.

“The country that codes. IT industry in Ukraine. 2019 Market Report” released by N-iX company is a great overview of the IT industry development in Ukraine. Importantly, the documents include a broader picture of Ukraine and cover not only IT issues but the political situation, infrastructure and business climate in the country as well. This paper will help readers to understand Ukraine better and will encourage more overseas partners.”

The American Chamber of Commerce in Ukraine (ACC)
The American Chamber of Commerce has been operating in Ukraine since 1992. A non-governmental member-funded non-profit organization, the Chamber represents key business leaders and experts from 600 member organizations. It cooperates closely with Ukrainian state authorities to improve the business environment and attract Foreign Direct Investment into the economy.

“Ukraine’s economy is showing continuous, albeit modest, growth over the past three years. This offers opportunities in a broad range of sectors, especially in IT. Ukraine has become a lucrative IT HUB with the best talents. The IT sector in Ukraine is showing double digit growth annually. 74% of AmCham UKrania members reported that their business increased in Ukraine in 2018. three quarters are forecasting continued growth in 2019. Thus, further boosting Ukraine’s IT sector’s development is among the top priorities for AmCham Ukraine. The IT Committee of the American Chamber of Commerce in Ukraine has a 20-year legacy and unites more than 60 leading IT companies starting from top-notch tech giants to ambitious startups. AmCham Ukraine advocates for a predictable and transparent tax policy for the IT industry, simplification of the employment rules for non-residents as well as promoting Ukraine’s IT brand internationally and fostering the development of IT education.”
Executive Summary

Ukraine has become a major player on the global tech arena. Its IT industry reaches new heights every year as its IT talent pool is approaching 200,000 software developers.

As a developing economy with many political and economic challenges in addition to a complicated history, it could not but develop an aptitude for solving problems. Many Ukrainian software engineers joke that problem-solving and thus coding is in their DNA, and that is why they are so good at it.

Promisingly, the country will not experience much turbulence in the years to come. Its IT market will prosper, more and more businesses will venture into Ukraine looking for skilled engineering talent, and everyone will reap benefits from new partnerships.

So what is happening on the Ukrainian IT market today? How likely is this promising scenario? And what are the key forces driving Ukraine to the foreground of the global tech scene? Discover this and more about the country that codes in this report.

About this report

Ukrainian IT market has become a lucrative spot on the world business map. A lot of research has been done into the industry trends, the growth of the engineering talent pool, major Ukrainian IT cities, the business climate, etc. Yet there has been few consolidated reports on the country’s IT market and making informed business decisions.

Therefore, this report gathers data provided both by Ukrainian and international advisory firms, media, business associations, and other reputable sources. It includes findings by PwC, Gartner, CBInsights, Stack Overflow, A.T. Kearney, DOU and others.

Sources: [1, 8, 25, 26, 34, 35, 58, 59, 60, 61, 90, 91]
PART 1. UKRAINE: COUNTRY OVERVIEW

Much of Ukraine’s success stems from its ample resources. It is the largest country lying entirely in Europe with the population of nearly 43 million and the workforce of 20 million people. Its size, rich natural resources, a wide pool of educated workforce make Ukraine a lucrative investment market for global businesses.

The country has a favourable geographical position as it borders Poland, Romania, Slovakia, Hungary and Moldova in the west; Belarus and Russia to the north and east; Bulgaria, Georgia and Turkey to the south over the Black Sea. For European businesses, geographical location and time zone proximity significantly simplify collaboration. Moreover, the European mindset and a similar business culture remove communication bottlenecks.

Ukraine is a member of the IMF, the World Bank, the European Bank for Reconstruction and Development, and other financial institutions. In 2008, it joined the World Trade Organization and has Free trade agreement (DCFTA) with the EU. The country is a member of many other international associations, including the United Nations, the Council of Europe, the OSCE, and others.

Ukraine has already harmonized much of its legislation with the EU law as it is paving its way to the EU membership. Despite its post-soviet economic hurdles, the country’s economy has revived and the Ukrainian hryvnia has become the strongest currency in the post-soviet countries, according to Bloomberg.

As an emerging economy, Ukraine has a quite low cost of living. It has the world’s second lowest Big Mac price of $1.64. Cost of living in Ukraine is 58.29% lower than in the United States. Rent in Ukraine is 74.78% lower than in the United States and a one-bedroom apartment monthly rent is around $200. [5]

At the same time, Ukraine ranks 50th out of 157 countries on the Human Capital Index, which assesses the knowledge, skills, abilities, and health of the population. [4]
LITERACY AND EDUCATION

99.8% Literacy rate

70% Have a secondary or higher education

$69.6B (~$2.5B) The state budget for education

38th Ranking of National Higher Education Systems

185K Students entering universities every year

1,586,700 Higher educational institutions

1,582,000 Students currently studying for higher education degrees

According to the Ukrainian constitution, access to free education is granted to all citizens. Secondary education is compulsory, and it is free in state schools, which constitute the overwhelming majority. Also, Ukrainian students can apply for state-funded scholarships at state universities. The number of private secondary schools and higher educational institutions is much smaller. Overall, in 2016/17 the number of students in primary and secondary schools reached 3,846,000, in vocational schools — 285,800, and in higher educational institutions — 1,586,700 students. At the beginning of 2017–2018 academic year, there were 661 higher educational institutions, and 1,539,000 students studied there in 2016–2017. In 2017, there were 421,000 graduates, which is 8.9% more than in 2016. [6]

According to The Law on the State Budget of Ukraine for 2019, the state budget subvention that goes to the local budgets to finance education will reach $2.6B, which is by 13% more than in 2018. So the state also contributes to the development of the country’s education.

Historically, the system of education has been well-developed in Ukraine. The first higher educational institutions emerged in the country during the late 16th and early 17th centuries: Ostroh Academy (the first higher education institution in Eastern Europe), Kyiv Mohyla Academy (1632), the Liviv University (1661), and others. Today, Ukrainian higher education is part of the Bologna process, which aims to ensure comparability in the standards and quality of higher-education qualifications in Europe. So Ukrainian students can get either a bachelor’s degree (4 years) or a master’s degree (5–6th year), in accordance with the Bologna process. Ukraine has been a full member of the Bologna Process and the European higher education area since 2005.

Innovations

Ukrainians have strong technical competencies and necessary skills for developing innovative solutions. According to Bloomberg Innovation Index 2018, Ukraine is one of the top 50 innovative economies as there have been substantial improvements in education, technologies, human capital, research, and other areas in recent years. [11] In Ukraine, innovations are also driven by the absence of rigid regulations in many areas. Thanks to this flexibility, Ukrainians have developed a lot of disruptive products. For instance, the country’s Privat24 has become one of the first and the best online banking systems in Europe, and stem cell treatment that is developing in Ukraine has saved many lives (Ilaya Clinic).

Science and research have always been strong in Ukraine. This is proved by the active patenting activity in the country both among residents and non-residents. Ukraine has a high number of patents and utility models registered during the 2007–2017 period, well above its GDP per capita ratings — more than 140,000(!). Ukrainian residents obtain a remarkably high number of utility models, one of the highest in the world. The main reason for this is a simpler, cheaper, and faster procedure required to obtain them. The most advanced patenting areas include IT, agriculture, renewable energy, pharmaceuticals, mechanical engineering, robotics, and others. [12]

Source: [2, 4, 5, 6, 7, 8, 10]
In 2017, the country entered the EU–Ukraine Association Agreement and published a plan of measures for its effective implementation. Ukraine is showing signs of stabilization and prosperity. Its GDP grew by 3.5% in 2018 hitting the target of $391.53 billion, inflation is slowly but surely going down, and it is estimated to normalize at around 6% in 2019. Moreover, over the last 3 years, Ukraine has gone up 23 positions in the World Bank’s Ease of Doing Business 2018 (76 places higher compared to 2012).

Investments
Since 2014, the state has focused greatly on improving the business climate in Ukraine, and it has taken many measures in that direction. As a result of the continued effort, Ukraine has become an investment hot spot. Foreign direct investment and in the fourth quarter it increased by $833 million. So in 2018, the country attracted $1 billion in direct foreign investment and in the fourth quarter it increased by $833 million. In 2018 this number exceeded $2.490 billion.

Ukraine is attracting investments not only from existing, but also from new foreign companies. Since 2015, with the participation of foreign investors, 80 factories have been built or are currently under construction. Moreover, there are some big companies on the market, which is of vital importance for big investors. For instance, 40+ companies are valued at $50 million and more.

In 2018, the largest direct investments were made in industrial enterprises (33.6%), wholesale and retail sales, as well as motor vehicle and motorcycle repair industry (15.6%). Major investor countries include: Cyprus (28.1%), the Netherlands (20.6%), the United Kingdom (6.1%), Germany (5.5%), Austria (3.4%), the British Virgin Islands (4.1%) and Switzerland (4.7%).

It is also worth noting that Moody’s Investors Service has improved Ukraine’s credit rating on international economic list from Caa3 to Caa2, changing the outlook from “stable” to “positive”. In addition, Ukraine was able to improve its ranking in the 2017-2018 Global Competitiveness Index (GCI) by 4 points, currently ranked 81st among 137 surveyed countries (vs 85th place among 138 countries in the 2016–2017 GCI) [23].

The largest deals in the IT domain in the recent years were a $110 million investment in Grammarly, $30 million in BitFury, $10 million in Petcube, and $7 million in People.ai.

Also, Ukraine is home to 100+ R&D offices of market-leading companies across a wide range of industries. They include Boeing, Aricent, Huawei, Siemens, Oracle, Magento, Apple, Microsoft, Deutsche Bank, Skype, eBay, IBM, and others. The USA has the largest share of R&D partnerships in Ukraine. It equals about 45% of companies. Kyiv is the key location for setting up R&D offices. Other cities that are a perfect fit for setting up an R&D office include Lviv, Dniprop, Odesa, Kharkiv, and Vinnytsia.

The taxation system in Ukraine has very favorable conditions for IT companies. A significant number of IT specialists in Ukraine work with companies under a private entrepreneurship model. It consists of three groups, but the most flexible and frequently used is the third one. Entrepreneurs pay a single income tax of 3% if they are VAT payers and at 5% if not. In addition, they are subject to a social security tax of 22% of a minimum wage (around $30). Such a model is very advantageous because it significantly reduces the tax burden on companies.

As the Ministry of Economic Development and Trade of Ukraine claims, most of the taxes raised from Ukraine’s IT sector come from people registered as private entrepreneurs. The number of its revenues grew by an average of 58.8% during 2013–2017 and reached 3.2 billion UAH ($118.5 M) in 2017.

By contrast, the amount of taxes paid by IT companies during 2014–2017 was steadily growing by 27% each year and in 2017 it reached 4.1 billion UAH ($151.9 M), according to the survey conducted by IT Ukraine and IRDDO. This tendency continued the following year. And in the first half of 2018, revenues from taxes grew by 30.1% in comparison to the corresponding period of 2017.

On September 22, 2018, a draft to the Law On Amendments to the Tax Code of Ukraine concerning the Abolition of the Electronic Administration System of Value Added Tax was registered. According to this draft, the Ukrainian IT sector should be subject to the increase in taxes.

According to the amendments to the Tax Code of Ukraine (TCU), on January 1, 2018, new VAT exemption regulations related to software supplies became effective. Based on these regulations, during the period from 1 January 2013 to 1 January 2023, VAT exemption is applied to software supply transactions included in the extended list that is effective starting 1 January 2018 and software related transactions with payment that is not considered royalty as specified in paragraphs 2–7, subparagraph 14.1.225 of the TCU.

Another bill On Amendments to the Tax Code of Ukraine regarding the Exit Capital Tax was registered On July 5, 2018. According to it, the exit capital tax will replace the corporate profit tax starting from 1 January 2019. It will facilitate running a business in Ukraine and reduce the cost of fulfilling the tax duty.

The exit capital tax rates will be as follows:
- 15% — to the capital withdrawal transactions (payment of dividends);
- 20% — to the transactions equivalent to the capital withdrawal transactions (interest paid to the related non-residents and non-residents registered within the countries being low-tax jurisdictions etc.);
- 5% — to the funds paid to fulfill financial obligations to the related non-residents.

Moving from the corporate profit tax to the exit capital tax will provide tangible benefits both for local IT companies and their clients. The former will be able to attract more investments and their tax reporting will become more transparent and the latter will enjoy administrative simplification and a significant decrease in the tax burden.

Anti-corruption initiatives
As part of its anti-corruption endeavour the country has implemented:
- ‘Prozorro’ e-procurement system throughout all levels of government and state owned enterprises;
- Public access to state property registers, implementing E-Data, and placing the Treasury system online;
- E-declarations for all public servants, including the judiciary;
- An automatic VAT refunds system;
- New anti-corruption institutions such as National Anti-Corruption Bureau (NABU), National Agency to Prevent Corruption (NAPC), Special Anti-Corruption Prosecutor (SAP), reformed National Police force, etc.;
- The High Anti-Corruption Court of Ukraine.

Source: [88]

Source: [26, 27, 29]
Cultural and geographical proximity

Ukraine is close to the Western culture, which facilitates communication and helps in building business relationships. There is a small time difference with major European cities and the short flight distance between Ukraine and other European countries. Although Ukraine is not part of the European Union as yet, the EU and the US citizens do not need a visa to enter the country. In general, citizens of 64 jurisdictions, including all European citizens, the citizens of the USA and Canada, can enter Ukraine without a visa for a stay up to 90 days within any 180 day period. And on 4 April 2018, Ukraine introduced electronic visas. So 52 more countries can obtain these visas and they are valid for tourism and business purposes for 30 days and cost $85.

An important step in making Ukraine closer to the EU was approving visa-free travel for Ukrainians. That facilitated business traveling for Ukrainians and eliminated another barrier between Ukrainian and European business worlds. The EU’s approval came in 2017 and followed the reforms in areas such as migration, public order and security, external relations and fundamental rights. On June 11, 2017, the Council of the European Union introduced visa-free travel for short trips by Ukrainian citizens to 30 EU countries and the Schengen zone. Currently, Ukrainian citizens with biometric Ukrainian passports have visa-free or visa-on arrival access to 128 countries and territories, thus ranking the Ukrainian passport 44th in terms of travel freedom, according to the Henley Passport Index.

Political situation

Ukraine is a semi-presidential representative democratic republic with a multi-party system. Executive power is exercised by the Cabinet of Ministers, Legislative power is vested in the parliament (Verkhovna Rada). The president is elected by popular vote for a five-year term. The President nominated the Prime Minister, who must be confirmed by the parliament. The Verkhovna Rada (Parliament of Ukraine) has 450 members, elected for a four-year term.

According to The Constitution of Ukraine, everyone has the right to freedom of thought and speech, and to free expression of their views and beliefs, so it guarantees the fundamental freedoms, such as the freedom of religion, the freedom of speech and press, etc. In its attempts to get rid of the Soviet legacy, fight the corruption, and ensure its European future, the country often goes the way of mass protests. In 2004, the Orange Revolution was triggered by the rigged presidential elections. While in 2014 the Revolution of Dignity was caused by the high level of corruption in the country, the change in the EU integration course by the government, and its violent attack on the protesters. After the revolution, Crimea was annexed by the Russian Federation and the military conflict between the two countries began. Today the conflict is contained in the east of the country.

To settle the conflict and keep it under control, Ukraine is cooperating with the US and Canadian army, the US Congress, the UN, etc. For instance, Canada has been a strong supporter of Ukraine in its fight against the oppressor. [15] It also provides direct support to the Ukrainian government and army in a number of different ways. More than 200 Canadian Armed Forces (CAF) personnel are deployed in Ukraine. Also, Canada has given more than $700 million in financial, humanitarian, and military assistance, including military equipment, to Ukraine since the start of the hostilities in 2014. And it is going to provide more in the coming years. The House of Representatives of the US Congress supported the allocation of $250 million to help Ukraine enforce security in 2019. Like many other countries with conflict zones, including Israel, Morocco, and Pakistan, Ukraine remains an alluring business destination.
PART 1. UKRAINE: COUNTRY OVERVIEW

INFRASTRUCTURE IN UKRAINE

- 170,000 km of roads
- 22,000 km of railways
- 23 major airports (19 government-owned)
- 20M passenger flow in 2018
- 4,115 different types of hotels
- 6,277 properties, according to Booking

Source: [10, 17, 18, 19]

Infrastructure

Airports and Travel routes

Ukraine is perfect for doing business as it is easy to reach from key global business hubs. For instance, it takes just 3 hours to get to London from Kyiv by air, and 2 hours from Kyiv to Berlin. There are 19 passenger airports, and every year airway companies open new flights from Ukraine.

The passenger flows have intensified since the introduction of the visa-free access to the Schengen area for Ukrainians. Many new airlines entered the Ukrainian market, and a lot of new flights across Europe have been opened. In addition, vibrant investment activity in the country and opening of many new international businesses triggered the need for more transatlantic flights. Therefore, in 2018 the passenger flow in the Ukrainian airports reached a record 20 million people. [17]

Boryspil Airport near Kyiv is the biggest in the country. It has 2 runways, 4 passenger terminals with the total capacity of over 5,000 passengers per hour, 1 cargo terminal with 9 warehouses and the total area of 14,580 m². Its facilities are used by 33 airlines, which provide 76 regular flights. The passenger flow in Boryspil Airport reached a record of 10.6 million passengers in 2017.

Lviv, another Ukrainian IT hub, also has a new modern airport, which welcomed 1.1 million passengers in 2017. Odesa, Dnipropetrovsk, Kharkiv, Odesa, and Zaporizhia in 2017, and this number has grown even since. Experts assess the volume of the Ukrainian restaurant market of $769 M, and by the number of establishments (over 15,000) it has reached the before crisis period of 2013.

Data Protection and Information Security

Ukraine’s legislation on data protection and info security focuses mostly on cybersecurity in the state sector. Regarding data protection in the private sector, the main legislative act regulating data protection in Ukraine is the Law of Ukraine On Personal Data Protection, which was passed on 1 June 2010. [24] Also, Ukraine is a party to the Convention for the Protection of Individuals with regard to Automatic Processing of Personal Data dated 1981 and 2001 Additional Protocol. In July 2013, Parliament passed amendments to the Data Protection Law and made it more up to date.

Other legal documents that ensure data protection in Ukraine are:

- the Constitution of Ukraine dated 28 June 1996;
- the Civil Code of Ukraine dated 16 January 2003;
- the Law of Ukraine On Information dated 2 October 1992;

Since Ukraine entered the EU-Ukraine Association Agreement, it published a plan of measures for its effective implementation. The plan pays special attention to the harmonization of Ukrainian legislation with the EU law. According to Paragraph 11 of this plan, the Ukrainian Parliament Commissioner for Human Rights was required to revise the legal and organizational foundation for the protection of personal data to bring it into compliance with GDPR.

Additionally, on November 7, 2017, the President signed the Law On Basic Principles of Ukraine’s Cyber Security. The law determines the legal and organizational foundation for ensuring the protection of the vital interests of citizens and the national interests of Ukraine in the cyberspace. The law takes into consideration a number of proposals from NATO and the EU experts.

With the adoption of GDPR, Ukraine has introduced a number of changes into its legislation on the protection of personal data to bring it into compliance with the EU standards. Now, the Data Protection Law fully corresponds to the EU Data Protection Directive. On February 25, 2017, the former Ukrainian president Petro Poroshenko approved the Information Security Doctrine, which is aimed at protecting against cyber attacks during the free and globalized circulation of information.
PART 1. UKRAINE: COUNTRY OVERVIEW

The Ukrainian IT market has enjoyed impressive growth in recent years and became one of the key sectors contributing to the country’s economy. The statistics presented by different organizations such as the World Bank, PwC, IT Ukraine, and State Statistics Service of Ukraine vary a bit but all of them demonstrate steep growth of the sector. Interestingly, the industry has accelerated since the beginning of 2014 political crisis when the prices for Ukrainian IT services became even more attractive for investors due to inflation.

Here are a few facts to confirm this trend:

- ICT became the 3rd largest export service industry, amounting to more than 20% of all Ukrainian service exports;
- The Ukrainian IT industry is growing at 26% rate;
- There are currently more than 4,000 tech companies operating on the market;
- There are over 1,600 IT service companies in Ukraine;
- The talent pool in Ukraine constitutes 185,000 IT specialists;
- Ukraine ranks 20th in A. T. Kearney Global Services Location Index of the most attractive outsourcing destinations;
- More than 100 companies on the Fortune 500 list are clients of Ukrainian IT firms.

This research further covers different aspects of the Ukrainian IT market development, such as IT talent pool, tech education, popular technologies, major IT companies, to name a few.

PART 2. UKRAINIAN IT INDUSTRY OVERVIEW

IT Market Dynamics

The Ukrainian IT market has enjoyed impressive growth in recent years and became one of the key sectors contributing to the country’s economy. The statistics presented by different organizations such as the World Bank, PwC, IT Ukraine, and State Statistics Service of Ukraine vary a bit but all of them demonstrate steep growth of the sector. Interestingly, the industry has accelerated since the beginning of 2014 political crisis when the prices for Ukrainian IT services became even more attractive for investors due to inflation.

Here are a few facts to confirm this trend:

- ICT became the 3rd largest export service industry, amounting to more than 20% of all Ukrainian service exports;
- The Ukrainian IT industry is growing at 26% rate;
- There are currently more than 4,000 tech companies operating on the market;
- There are over 1,600 IT service companies in Ukraine;
- The talent pool in Ukraine constitutes 185,000 IT specialists;
- Ukraine ranks 20th in A. T. Kearney Global Services Location Index of the most attractive outsourcing destinations;
- More than 100 companies on the Fortune 500 list are clients of Ukrainian IT firms.

This research further covers different aspects of the Ukrainian IT market development, such as IT talent pool, tech education, popular technologies, major IT companies, to name a few.
PART 1. UKRAINE: COUNTRY OVERVIEW

The role of the IT industry in the country's economy

The State Statistics Service of Ukraine reports that in the first three quarters of 2018 the Ukrainian service export surpassed $8.769B, which is 11.6% more than during the same period in 2017. The export significantly surpassed the import of services bringing a lot of money into the country's economy.

During this period, Ukrainian businesses made international operations with 228 countries. Russia, USA ($638.2M; 7.8%), and the countries of the EU are the biggest consumers of the Ukrainian services. The biggest share of the services was in the transportation, in particular the pipeline transportation (the natural gas transmission system of Ukraine). While ICT is the third most profitable Ukrainian service export industry. This sector brought into the economy $1.5B in January–September 2018, and constituted 16.7% of the Ukrainian service export volume.

Looking at the data on the Ukrainian service export by The World Bank, we can see that there were declines in 2009 just after the world crisis had hit and in 2014 after Russian meddling in the east of the country. However, if we look at the export of ICT services, the sector wasn’t affected by any of these downfalls and continued to grow steadily.

According to the PwC analysis, the market increased by 150% in the period from 2011 to 2015, and has the potential to reach $5.7 billion by 2020. [21]

In 2016, EBA and PwC presented a comprehensive analysis of the Ukrainian IT industry. The study suggests that the Ukrainian IT services market increased by 2.5 times between 2011 and 2015 and reached $2.5B and over 90,000 specialists. In 2018, it surpassed 180,000 specialists and is projected to grow to 200,000 professionals by 2020. As a result, the tech industry created 420,000 jobs in IT and related industries. [21]

According to Wikipedia, the Ukrainian information technology market topped all the other Central and Eastern European countries in 2007 and in 2013. Also, Ukraine ranked fourth in the world by the number of certified IT professionals after the United States, India, and Russia. The latest market research shows that the country has significantly surpassed 2007 indicators. With the growing role of the IT industry in the country’s GDP, the Ukrainian government is introducing a myriad of reforms to promote its further development. As stated by President Petro Poroshenko, “Our joint goal is to provide maximum support for IT sector”. Here are a few important things that are being implemented:

- Predictable and consistent taxation
- Domestic market stimulation
- Reforms of the educational system
- IT and telecom infrastructure improvement
- Intellectual property rights protection
- Protect from abuse by public authorities
- Promotion of the Ukrainian IT industry abroad
- Favourable conditions for IT professionals

IT outsourcing providers constitute the largest share of the Ukrainian IT service market. Although the number of startups (over 2,000 companies) and international R&D centres (over 100 companies) is growing, IT outsourcing companies employ more than 60% of all engineers who live in Ukraine.

The USA and Western European countries remain the largest target markets of the Ukrainian IT service companies. In 2012, the USA was the largest consumer of the Ukrainian IT service exports (81%). Recent research indicates that it is still the main market for the Ukrainian IT export but the share of European businesses has grown significantly over the years. Ukrainian IT companies cooperate with large and small businesses across the globe. More than 100 companies from the Fortune 500 list are clients of Ukrainian IT firms. As for the key industries, Ukrainian IT vendors primarily specialize in data management, telecommunications, cloud, gaming, e-commerce, media, fintech, healthcare, and others, according to the report by Ukraine Digital News.
PART 1. UKRAINE: COUNTRY OVERVIEW

Ukraine’s role as the global outsourcing destination has grown significantly since 2009. According to A. T. Kearney Global Services Location Index, the country’s financial attractiveness, people skills and availability, and business climate have improved, so it went up by 13 positions in the ranking in 2017. Moreover, in 2019, it has become the top 20 outsourcing destination in the Index.

The index tracks the offshoring landscape in 55 countries. In 2017, Ukraine came after the USA and Russia with a score of 5.31, and was followed by Estonia and Hungary. While in 2019, Ukraine ranked higher than Poland, Romania, Latvia, Hungary and other popular IT hubs of Eastern Europe.

A. T. Kearney research covers the hottest issues of the outsourcing phenomenon, in particular automation and its influence on offshore service markets. It suggests that as automation destroys many low-skilled jobs, the focus will shift to higher-skilled jobs. Although automation will eliminate a substantial number of jobs that are currently offshored, offshoring will continue to be important in the future, especially when it comes to high-level tasks. Since complex engineering tasks constitute the largest share of the Ukrainian IT outsourcing market, the country’s tech industry is to take a leading position in the global tech arena.

IT Infrastructure

Proliferation of IT businesses in Ukraine created a lot of new opportunities for the country’s real estate market. With software engineers moving to IT cities and their high purchasing power, the real estate market has soared in recent years. IT companies have grown in number and size and created strong demand for quality office space. Therefore, the biggest IT cities such as Kyiv, Lviv, Kharkiv, Odessa, and Dnipro, have started changing shape and growing both in size and the quality of living.

IT companies didn’t stand by and started initiating their own infrastructure projects in cooperation with local IT clusters, state authorities, and foreign investors. One such instance is the Innovation District IT Park, the largest infrastructure project of Western Ukraine, worth $160 million, that was launched in Lviv in 2018. IT Park is an ambitious development project stretching forth 10 hectares and designed to host up to 14,000 people. It will consist of 6 class A office buildings, with a total area of around 164,000 m², 3 business centers, a 200 keys hotel, and a designated multi-functional area for leisure and social needs.

Another interesting project launched in Lviv is IT Village, a residential district, which is to become a new village for IT professionals and a community of people with common interests. The complex of 17 hectares in total will consist of 133 separate houses located near Lviv.

Kyiv as the capital city has a well-developed infrastructure and many interesting projects that target IT businesses. For instance, UNIT.City is a large innovation park in Kyiv stretching on the territory of 25 hectares. On the space of 500,000 m², it unites 15,000 residents, 3,000 students, 1,500 places in coworkings, 10 R&D laboratories, and more. The same company started a similar project in Lviv called LvivTech.City. The park will occupy the territory of 1.77 hectares, and the total area of the office will be more than 40,000 m².

Sheptytsky Centre in Lviv
PART 1. UKRAINE: COUNTRY OVERVIEW

Innovation District IT Park

- **164,000 m²** total area
- **200 keys hotel**
- **6 class A office buildings**
- **3 business centers**

IT Village

- **170,000 m²** total area
- **133 houses**

UNIT.City

- **500,000 m²** total area
- **15,000 residents**
- **1,500 places in coworkings**
- **10 R&D laboratories**

LvivTech.City

- **4.8 ha** total area
- **40,000 m²** area of the offices
- **3,000 work places**

Source: [45, 46, 47, 48]
Ukraine vs other IT outsourcing destinations of the CEE region

Businesses that consider Ukraine as a destination for future outsourcing partnerships often include other CEE countries in the decision-making process. Apparently, every location has its benefits, so let’s take a closer look at the factors that influence the quality of software development outsourcing. They, first of all, include the IT talent pool, availability of trusted vendors, domain expertise, business climate, security, and legal aspects.

Comparing CEE countries against these factors, we can see that Poland and Ukraine have the largest talent pools in the region. Poland, Bulgaria, Hungary and a few other CEE countries are members of the EU and this is a big selling point for them. On the other hand, Ukraine and Belarus offer more competitive prices for their IT services.

<table>
<thead>
<tr>
<th>Population (millions)</th>
<th>Number of software developers in CEE, according to State of European Tech (2018)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poland</td>
<td>38.4</td>
</tr>
<tr>
<td>Ukraine</td>
<td>19.6</td>
</tr>
<tr>
<td>Romania</td>
<td>10.6</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>9.8</td>
</tr>
<tr>
<td>Hungary</td>
<td>7.1</td>
</tr>
<tr>
<td>Czech</td>
<td>7.1</td>
</tr>
<tr>
<td>Slovakia</td>
<td>9.5</td>
</tr>
<tr>
<td>Belarus</td>
<td>5.4</td>
</tr>
<tr>
<td>Lithuania</td>
<td>2.8</td>
</tr>
<tr>
<td>Latvia</td>
<td>1.3</td>
</tr>
<tr>
<td>Estonia</td>
<td>2</td>
</tr>
</tbody>
</table>

GDP (nominal in billion US$)

<table>
<thead>
<tr>
<th>Country</th>
<th>GDP (nominal in billion US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poland</td>
<td>581.3</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>264.5</td>
</tr>
<tr>
<td>Romania</td>
<td>248.8</td>
</tr>
<tr>
<td>Hungary</td>
<td>164.5</td>
</tr>
<tr>
<td>Ukraine</td>
<td>132.9</td>
</tr>
<tr>
<td>Slovakia</td>
<td>112.3</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>66.2</td>
</tr>
<tr>
<td>Belarus</td>
<td>60</td>
</tr>
<tr>
<td>Lithuania</td>
<td>54.5</td>
</tr>
<tr>
<td>Latvia</td>
<td>35.8</td>
</tr>
<tr>
<td>Estonia</td>
<td>31.2</td>
</tr>
</tbody>
</table>

ICT SERVICE EXPORT VOLUME 2017 (World Bank) — in billion US$
Industry recognition: IT Awards, Industry Ratings, and Memberships

Ukraine is cementing its position in the global tech scene, and it is reflected in a plethora of industry ratings and awards. Every year more and more Ukrainian companies are listed among the fastest-growing and most reputable businesses. Also, they are well-represented in business associations and international organizations. Ukraine takes the leading positions in the rankings of outsourcing destinations as its business climate is improving and the talent pool is growing.

Global Sourcing Association (GSA)

In 2017, N-iX nominated Ukraine for Offshoring Destination of the Year by GSA UK and it won in this category outrunning many other popular outsourcing countries. In 2018, Ukraine was shortlisted in the global outsourcing destination category along with Mauritius, Northern Ireland, and South Africa. As stated by GSA, those selected have demonstrated excellence in strategic sourcing. Also, several IT companies with development centres in Ukraine were nominated in other categories. [60, 61]

Inc. 5000

Another esteemed rating Inc. 5000 lists the fastest growing Ukrainian companies year by year. In 2018, 33 Ukrainian businesses made it to the list. As for IT companies, the number increased from 3 vendors in 2017 to 5 IT service providers in 2018. They include N-iX, Clickky, Intellias, McPaw, and NetPeak. Clickky got 1153rd place in the rating with the growth rate of 600%; an IT product company MacPaw took 1289th position demonstrating the growth of 552%, and a software development company N-iX got the 2141st place with the growth of 331%. [62]

Software 500

Several Ukrainian companies got into Software 500 in 2018. Software 500 is an annual ranking of the top 500 global IT companies compiled by Software Magazine. In 2017, N-iX became the first Ukraine-based software development company listed in the ranking. In 2018, the rating included a number of other IT companies with development centers in Ukraine, such as EPAM Systems Inc., Luxoft, Intetics, Core Value Services, TEAM International Services Inc, and others. [57]

Global Outsourcing 100 by IAOP

Year by year, Ukrainian IT companies make it to the Global Outsourcing 100 by IAOP, an annual listing of the world’s top outsourcing providers. In 2019, 11 Ukrainian IT companies and 6 providers with development centres in Ukraine were included in Best of The GO100 listing. They are N-iX, SoftServe, Ciklum, Eleks, Infopulse, Intellias, Sigma Software, Miratech, AMC Bridge, Softengi, Program-Ace as well as Epam, Luxoft, Svitla Systems, Team International Services, Intertech, and Softjourn. In 2018, the rating included 18 IT outsourcing companies with development centers in Ukraine. This is 5 companies more than in 2017, and 8 more than in 2016.

Capture the Flag (CTF) — Information Security Competition

Capture the Flag (CTF) is a special kind of information security competitions. CTF games often touch on many other aspects of information security: cryptography, stego, binary analysis, reverse engineering, mobile security, and others. Ukrainian developers are recognized for their skills in all these areas, so the Ukrainian teams take the leading places in these competitions. In 2018, the Ukrainian team got the 7th place in the teams rating, and in 2019 they came in first. [54]
PART 2. UKRAINIAN IT INDUSTRY OVERVIEW

THE NUMBER OF IT PROFESSIONALS IN UKRAINE

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>91K</td>
</tr>
<tr>
<td>2016</td>
<td>100K</td>
</tr>
<tr>
<td>2017</td>
<td>166K</td>
</tr>
<tr>
<td>2018</td>
<td>185K</td>
</tr>
<tr>
<td>2019</td>
<td>200K</td>
</tr>
<tr>
<td>2020E</td>
<td>220K</td>
</tr>
</tbody>
</table>

Source: [31, 34, 35, 36]

REASONS FOR WORKING IN TECH

<table>
<thead>
<tr>
<th>Reason</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest in technologies</td>
<td>78%</td>
</tr>
<tr>
<td>High salaries</td>
<td>63%</td>
</tr>
<tr>
<td>Professional growth prospects</td>
<td>54%</td>
</tr>
<tr>
<td>Flexible work schedule</td>
<td>42%</td>
</tr>
</tbody>
</table>

Source: [56]

The biggest asset of the Ukrainian IT market is a vast pool of IT professionals unmatched by the quality of skills. As of Q1 2019, it comprises over 184,700 specialists and experts forecast it will surpass 200,000 by 2020. Most sources suggest that approximately 60% of Ukrainian software developers are currently employed in IT service companies. However, there is a decent share of captive centres in the country, and the number of tech startups is growing year by year.

There are several aspects that contribute to this growth.

Number one is the financial factor. The minimum official monthly salary in Ukraine is around $150. In 2018, the average monthly salary amounted to roughly $330, and in 2019 it is projected to reach $370. The average salary in the IT industry is almost 7 times higher. This huge gap is the main reason why so many people are trying to enter the sector, both young graduates and specialists from other spheres. In addition, IT jobs are not as sensitive to economic fluctuations as in the other sectors, so security and stability attract many specialists.

In addition, tech jobs come with a certain social status and prestige in Ukraine. Many people want to become a part of the Ukrainian IT community and enjoy the benefits of a career in tech, including decent salaries, business travel, international working experience, career prospects, and more.

Another factor that drives the Ukrainian IT market is the historically strong educational factor. Ukrainian software engineers often get their first job while still studying at the university, so they start gaining practical experience sooner. Since most professionals work at IT outsourcing companies that specialize in a wide range of domains and technologies, they get a lot of diversified experience. Also, their main reason for choosing a career in tech is interest in technologies, says the survey. In this part, we explore DOU findings in more detail.

Profile of the Ukrainian IT Professional

Every year, the largest Ukrainian developer community DOU.ua surveys the Ukrainian IT professionals to provide a detailed overview of the country’s tech talent market. Generally, Ukrainian tech talent is younger than in North America and Western Europe, however, age and experience.

DOU’s analysis has revealed that the average age of a software developer in Ukraine is 21-30. According to Stack Overflow, an average developer in the USA and the UK is 28-29 years old. [89] Compared with the USA and the UK, IT specialists in Ukraine are a bit younger, which can be explained by several factors.

Firstly, the Ukrainian tech market is younger overall. Also, in the recent years, there has been a massive influx of tech graduates on the Ukrainian IT market due to the increasing popularity of IT professions.

Most Ukrainian IT specialists have over 3 years of professional experience (58% of the respondents in total); 29% have 3-5 years of experience, 17% 6-10 years of experience, and 12% over 10 years of experience. In 2015, senior experts with 7+ years of experience constituted 19% of the workforce, and their contribution to the value created by the sector constituted 41%, according to the PwC report. Moreover, in 2013, Ukraine ranked fourth in the world in number of certified IT professionals after the United States, India and Russia. [57] Today, the number of certified specialists is growing, as Ukrainian IT companies encourage their employees to get certified and often reimburse the cost of the courses either partially or in full.

Although the number of captive centres and tech startups in Ukraine is increasing, the majority of Ukrainian IT professionals work in IT outsourcing companies. Most sources suggest that approximately 60% of Ukrainian software developers are currently employed in outsourcing.

Reasons for working in tech

In Ukraine, the three most popular reasons for working in tech are the interest in technology (78%), high salaries (63%), and professional growth prospects (54%). While in Kyiv the share of junior and senior software engineers is almost the same (22% and 21%), other key IT cities have got 2-3 junior programmers per 1 senior software engineer.

Women in tech

The women share in the Ukrainian IT sector continues to grow. While in 2016 there was 16% of women working in the industry, in 2017 this number reached 20%, in 2018 it grew up to 23%, and in 2019, women constitute 24% of the Ukrainian IT workforce. The most popular IT professions among women are quality assurance (24%), software development (23%), and non-technical jobs such as HR, PR, and Sales (20%).

Age (Years)

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20</td>
<td>8%</td>
</tr>
<tr>
<td>21-30</td>
<td>25%</td>
</tr>
<tr>
<td>31-40</td>
<td>25%</td>
</tr>
<tr>
<td>&gt;40</td>
<td>3%</td>
</tr>
</tbody>
</table>

Source: [56]

Experience (Years)

<table>
<thead>
<tr>
<th>Experience</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>13%</td>
</tr>
<tr>
<td>1-2</td>
<td>25%</td>
</tr>
<tr>
<td>3-5</td>
<td>17%</td>
</tr>
<tr>
<td>6-10</td>
<td>12%</td>
</tr>
<tr>
<td>&gt;10</td>
<td>27%</td>
</tr>
</tbody>
</table>

Source: [56]

Qualification Levels

<table>
<thead>
<tr>
<th>Level</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Junior</td>
<td>27%</td>
</tr>
<tr>
<td>Middle</td>
<td>19%</td>
</tr>
<tr>
<td>Senior</td>
<td>11%</td>
</tr>
<tr>
<td>Lead</td>
<td>19%</td>
</tr>
</tbody>
</table>

Source: [56]

No less important are the positive changes in the Ukrainian legislation and the taxation system. The state is trying to cut on the red tape and introduce economic reforms without putting too much pressure on the developing tech sector.

Last but not least, Ukraine’s geographical location is a major selling point for foreign businesses and investors. As more projects from diverse domains are outsourced to Ukrainian developers, their skill set and expertise are improving.

Interest in technologies Hight salaries Professional growth prospects Flexible work schedule

<table>
<thead>
<tr>
<th>Reason</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>78%</td>
<td>63%</td>
</tr>
<tr>
<td>54%</td>
<td>42%</td>
</tr>
</tbody>
</table>

Source: [56]
**Job satisfaction**

For Ukrainian software developers, the most important factors in choosing a job include salary and bonuses (78%), interesting tasks (63%), professional growth prospects (61%), comfortable work conditions (28%), flexible working hours (23%), the possibility to work remotely (14%), office location (9%), and an employer image (5%).

Most Ukrainian IT specialists enjoy their work. 31% of respondents find their current job truly interesting, while 52% consider it rather interesting.

**FACTORS THAT INFLUENCE WORK CHOICE**

- **Salary and bonuses**: 78%
- **Interesting tasks**: 63%
- **Professional growth prospects**: 61%
- **Comfortable work conditions**: 28%
- **Flexible work schedule**: 23%
- **Possibility to work remotely**: 14%

**WHERE UKRAINIAN IT PROFESSIONALS WORK**

- **80%** at the office
- **8%** at home
- **6%** in different places
- **1%** in the coworking space
- **0%** in other places

**English proficiency**

Ukraine is the country with the moderate English proficiency but it improves its position on the English Proficiency Index every year. In its 7th edition, the country’s score was 50.91, and in the newest 8th edition it went up to 52.86 and now holds 43rd place among 88 countries. Other countries with the moderate English proficiency include France, Italy, Spain, Belarus, to name a few.

According to EPI, many countries demonstrate significant improvement in English fluency and the global trends suggest this tendency will continue. Public and private investment in English language instruction has not slowed. Also, English is as present as ever in the workplace.

Ukrainian IT companies are definitely part of this trend as they invest heavily in English training initiatives. Most companies offer their employees either full or partial reimbursement for English courses, others set up their own training centres. Moreover, the requirements to the job candidates English-wise are quite high, so Ukrainians who want to work in tech dedicate much effort to mastering their English skills.

According to the DOU survey, 81% of the Ukrainian IT specialists have intermediate and higher level of English, and the situation is constantly improving. IT professionals located in Lviv are more fluent in English than, for example, Kharkiv IT professionals (52 and 44%). Female workers have a better command of English – 54% of women and 43% of men have upper-intermediate and higher level of English. Top management, Project Managers and Business Analysts are the most fluent, while UI developers, system administrators and designers know English a bit worse.

**ENGLISH PROFICIENCY INDEX**

- **Very High Proficiency**
  - Sweden: 70.72
  - Germany: 63.74
- **High Proficiency**
  - Poland: 62.45
  - Bulgaria: 57.81
- **Moderate Proficiency**
  - Spain: 55.85
  - France: 55.49
  - Belarus: 53.53
  - Ukraine: 52.86
- **Low Proficiency**
  - Japan: 51.80
  - Egypt: 48.76
- **Very Low Proficiency**
  - Turkey: 47.17
  - Saudi Arabia: 43.65
UKRAINE — THE COUNTRY THAT CODES

Key technologies

Ukrainian software developers specialize in a wide range of programming languages, technologies, and tools. Since over 60% of Ukrainian IT professionals work in IT service companies, they have a chance to work on many different projects and thus possess a versatile tech expertise. Not only do Ukrainian engineers have hands-on knowledge of many technologies but also know how to use them in various domains.

According to HackerRank, Ukraine ranks 11th with an overall score of 88.7 points out of 100 among the top 50 countries with the best software developers in the world. [59] Also, it is 6th on the TopCoder rating of the best programmers. [53]

The annual survey of Ukrainian software engineers by DOU shows that Java is the most popular programming language in Ukraine, followed by JavaScript, C#, PHP, and Python. Go and TypeScript made it to the top 10 for the first time in 2018. [56] Looking at the dynamics of the recent years, Java’s share decreased significantly in the last 2 years, which may be connected with the development of alternative JVM languages. JavaScript is still growing but not as fast as before, but if we take into account TypeScript, the growth rate is the same. The popularity of C# has been falling down in the recent years. Python is growing and it has definitely become the dominant platform for Data Science, which is a global trend.

When asked which programming language Ukrainian software developers are planning to learn next year, 52% of them want to learn one. They are primarily interested in mastering Python, JavaScript, Go, Java, Kotlin, and TypeScript. [71]

As for the languages Ukrainian programmers use as supplementary ones, the leaders are JavaScript, Unix Shell, Python, Java, SQL, (PL-SQL, T-SQL), and TypeScript. [71]

Since the demand for software development services is growing globally and in Ukraine alike, the number of tech related job openings is soaring as well. In 2018, the number of jobs posted on DOU has increased from 3,111 to 4,606 a month. While the number of applications went up by 23% — from 270,000 to 330,000. At the same time the number of companies that offer employment opportunities on DOU grew by 38% — from 2,419 to 3,339. [78] The most in-demand IT professionals are Front-end, QA, and PHP experts; these categories constitute 31% of all vacancies.

Moreover, Ukraine ranks first worldwide in the number of C++ developers since it has a long-standing engineering tradition and many enterprises in rocket engineering, space exploration, aircraft production, electronics manufacturing, electricity production, and other high-tech engineering. Also, the country boasts the biggest number of Unity3D developers worldwide and has the second highest number of JavaScript, Scala and Magento developers. [60]

Game Development in Ukraine

Ukraine has a strong game development industry with a large pool of Unity and Unreal Engine programmers. There are both captive centres of renown game production companies and many game development studios in the country. Ukrainian developers created such well-known games as S.T.A.L.K.E.R., Cossacks, Metro, Sherlock Holmes series, Warface, World of Warplanes, and many others. Ubisoft, Crytek, Playtech, Gameloft, Playtika, Wargaming and other global game producers have big R&D centres in Ukraine.
STEM education in Ukraine

In Part 1 of this report, we provide a general overview of the educational system in Ukraine. Here we would like to focus on the tech education in the country.

We explore the following:
• public and private educational establishments which have strong STEM programs;
• innovative educational programs which improve the skills of the Ukrainian workforce;
• educational initiatives driven by major IT companies and local IT clusters;
• private educational programs and extracurricular education.

Degrees. According to the DOU survey of the Ukrainian IT professionals, 82% of men and 87% of women have an academic degree, either tech related or not. 41% of women and 64% of men that hold engineering positions in the Ukrainian IT industry have got STEM degrees.

STEM education is becoming increasingly popular in Ukraine due to the development of the IT sector and the job prospects it offers. There are around 130,000 engineering graduates annually in Ukraine, which is more than in France, Germany, Poland, and many other European countries. [10, 19] Also, Ukraine has the largest share of IT graduates among CEE countries — over 16,000 IT graduates every year. [10]

Self-education. A previously mentioned DOU survey also explored the topic of self-education among Ukrainian IT professionals. The results showed that only 12% of the respondents do not devote any time to self-development. Others read professional literature, attend IT events, as well as take various courses and trainings. Online education is popular as well. QA's and BAs choose this option more often than other Ukrainian IT professionals. Around 34% of developers attend specialized IT events, 67% read professional literature, and 57% take online courses.

Universities

Secondary education in Ukraine is obligatory and mostly funded by the state. Unlike many other countries, Ukraine has quality state education and few private schools. Moreover, the state gives away a lot of higher education scholarships every year. For instance, in 2018 the state offered scholarships to 117,965 students who wanted to obtain a Bachelor’s degree and to 62,403 students who aspired to do Master’s.

Therefore, students who want to obtain a degree and quality, can earn their Bachelor’s, Master’s or Ph.D without incurring lifelong debts. Thanks to this, the country has a well-educated workforce and most software engineers hold advanced degrees.

According to surveys, Ukrainian IT professionals are often critical about their higher education. The ratings based on the IT specialists’ feedback show that most universities get the scores that range between 4 and 7 out of 10 points. However, those who have already graduated evaluate their education much higher. This might be explained by the fact that graduates have more working experience and understanding of how a university affects their career, as well as by the changes happening in education right now and more possibilities for self-education. [61]

DOU RATING OF UKRAINIAN UNIVERSITIES

DUE RATING OF UKRAINIAN UNIVERSITIES

<table>
<thead>
<tr>
<th>Rank</th>
<th>University Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>National Technical University “Igor Sikorsky Kyiv Polytechnic Institute”</td>
</tr>
<tr>
<td>2</td>
<td>Kyiv Taras Shevchenko National University</td>
</tr>
<tr>
<td>3</td>
<td>Karazin Kharkiv National University</td>
</tr>
<tr>
<td>4</td>
<td>National Technical University “Kharkiv Polytechnic Institute”</td>
</tr>
<tr>
<td>5</td>
<td>National Technical University “Lviv Polytechnic Institute”</td>
</tr>
<tr>
<td>6</td>
<td>National University of Life and Environmental Sciences of Ukraine</td>
</tr>
<tr>
<td>7</td>
<td>Bogomolets National Medical University</td>
</tr>
<tr>
<td>8</td>
<td>National TU Dnipro Polytechnic</td>
</tr>
<tr>
<td>9</td>
<td>Sumy State University</td>
</tr>
<tr>
<td>10</td>
<td>Ivan Franko National University of Lviv</td>
</tr>
</tbody>
</table>

*TOP 200 UKRAINE* 2018 UNIVERSITY RANKING

Source: [65]
### Innovative educational programs

In general, Ukraine has always had a strong system of STEM education. Albeit some programs got outdated, local IT companies in cooperation with IT clusters have put in much effort in recent years to innovate them and open modern research labs for engineering students — their future employees.

They teamed up to design Master’s programs to train students in various areas, such as data science, machine learning, artificial intelligence, IoT, etc. For instance, Ukrainian Catholic University offers programs in Computer Science with specialization in Data Science. The Master’s Program in Computer Science/Data Science gives the knowledge and skills in programming, big data system architecture, machine learning, product development, and more.

The new degree program in Artificial Intelligence was launched at Lviv Polytechnic National University in 2017. Also, the new modern IoT Lab was opened at the same university. The lab was launched by Lviv IT Cluster in cooperation with local IT companies in 2016. With the support of Lviv IT Cluster, four new educational programs united under the name “Data Science & Intelligent Systems” were launched at Ivan Franko National University of Lviv. They are Machine Learning & Artificial Intelligence, Data Analysis, Internet of Things, and Smart Solutions & Intelligent Systems.

A lot of similar educational initiatives have been launched at the universities of Kyiv, Dnipropetrovsk, Kharkiv, and other Ukrainian IT hubs.

### LVIV IT CLUSTER’S INNOVATION DEGREE PROGRAMS IN 2018-2019

<table>
<thead>
<tr>
<th>Program</th>
<th>Students</th>
<th>Scholarships</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internet of Things bachelor’s program at Lviv Polytechnic</td>
<td>102</td>
<td>130</td>
</tr>
<tr>
<td>Artificial Intelligence program at Lviv Polytechnic</td>
<td>122</td>
<td>45</td>
</tr>
<tr>
<td>Data Science &amp; Intelligent System at Ivan Franko National University of Lviv</td>
<td>7</td>
<td>62</td>
</tr>
<tr>
<td>Data Science program at Ivan Franko National University of Lviv</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Computer Science at Ivan Franko National University of Lviv</td>
<td>86</td>
<td></td>
</tr>
<tr>
<td>Robotics program at Lviv Polytechnic</td>
<td>37</td>
<td>32</td>
</tr>
<tr>
<td>Business Analysis &amp; Data Science at Lviv Polytechnic</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>Cybersecurity program at the Lviv State University of Life Safety</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Cybersecurity program at Lviv Polytechnic</td>
<td>83</td>
<td>158</td>
</tr>
</tbody>
</table>

Source: [66]

### The work of IT clusters

In 2017, Lviv IT Cluster visited 80 schools in Lviv and Lviv region. More than 2,000 students learned about the prospects of studying and working in tech. Over 1,100 students took a survey on technology-related interests. According to the results, 82% of students are interested in the innovational technologies, and 45% are going to enroll in the universities to IT educational programs. These results were confirmed the next semester, as 403 students started their studies at the IT Cluster educational programs, learning IoT, robotics, artificial intelligence, cybersecurity, data science, and others. [67]

### School programs promoting IT

#### The Hour of Code

The Ukrainian tech community takes an active part in the Hour of Code events. The Hour of Code started as a one-hour introduction to computer science, designed to show that anybody can learn the basics and to broaden participation in the field. Today, it is a global movement in 180+ countries and over 220,000 events in over 45 languages. In 2018, 2,262 Ukrainian students took part in this global event. The Ukrainian IT community and local IT companies actively support this movement. Ukrainian IT professionals visit thousands of schools to tell the students about the exciting opportunities in tech. [68]

#### IT Future

Another example of initiatives that promote IT and impact the growth of the Ukrainian tech talent pool is IT Future. It is a series of events by Lviv IT Cluster that aims to introduce educational opportunities in the IT sphere to high school students. Every year, the Cluster team visits schools in Lviv region with promotional lectures and meetings. This year, they visited more than 50 schools. Over 1,500 students had a chance to listen to the useful information about possible careers in tech. [69]

### Beyond state establishments — extracurricular education

Self-education has got increasing popularity among Ukrainian IT professionals, who both use online platforms like Coursera and Udemy and take additional hard and soft skills training. Besides official educational establishments, there are a lot of private IT schools where experienced professionals share their knowledge with the new generations of IT workers. DOU surveyed 73 private educational centres and discovered that in 2016 they had over 35,000 students. The 7 leading schools graduated 46% of all students. They are:

<table>
<thead>
<tr>
<th>City</th>
<th>Number of Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kyiv</td>
<td>24</td>
</tr>
<tr>
<td>Main Academy</td>
<td>5</td>
</tr>
<tr>
<td>IT Academy</td>
<td>5</td>
</tr>
<tr>
<td>Progkiev.ua</td>
<td>4</td>
</tr>
</tbody>
</table>

Source: [70]
Situations of the Ukrainian IT professionals demonstrate that 67% of Ukrainian IT specialists live in Kyiv, Kharkiv, and Lviv. IT companies are expanding to new talent markets and are opening offices in new locations. In the last two quarters of 2018, twice as many companies opened new offices as in January – July 2018. New development centres appeared in Kyiv, Lviv, and Rivne. As for the global reach, Ukrainian companies have been opening offices in Malaga, Berlin, Krakow, Toronto, Bucharest, Eindhoven, Sharlot, Chicago, and even in Tokio and Seoul.

43 out of 50 biggest Ukrainian IT companies have offices in Kyiv. 21 companies have development centres in Lviv, and 20 in Kharkiv. The biggest company in Kyiv is Epam (over 2,800 people) and in Lviv, it is SoftServe (over 3,000 specialists).

As the capital city of Ukraine, Kyiv is a major administrative, cultural, and scientific centre of the country. It is the largest city in Ukraine in terms of both population (almost 3 million people) and area. Also, it enjoys the highest levels of business activity. The city has a developed infrastructure and commercial real estate. On the other hand, Kyiv has a low cost of living and holds 173rd place out of 209 world cities in the Cost of Living Ranking by Mercer. Several leading Ukrainian universities, such as Kyiv National Taras Shevchenko University, the National Technical University “Kyiv Polytechnic Institute”, and Kyiv-Mohyla Academy are situated in the Ukrainian capital.

Software engineering is among the most developed spheres in Kyiv. All major Ukrainian IT companies, including GlobalLogic, Ciklum, SoftServe, Epam, N-iX, and many others, have large development centres in Kyiv. Also, there are more than 50 international R&D offices of large enterprises, such as Samsung, Huawei, Ericsson, NetCracker, etc. Many IT startups have offices in the capital, including Grammarly, Petcube, Terrasoft, Augmented Pixels, La Metric, etc.

According to Stack Overflow, there are around 68,500 software developers in Kyiv, which constitutes 40% of all Ukrainian IT talent pool. Therefore, many global companies outsource software development to Kyiv and partner with Ukrainian IT vendors.
LVIV

Lviv is the largest city in the western Ukraine with the population of over 800,000 people. The city has beautiful architecture with a lot of historical buildings included in the UNESCO World Heritage List. Therefore, thousands of tourists visit Lviv every year, contributing to the development of the hospitality infrastructure and travel routes. Euromonitor International’s city arrivals research included Lviv in its 2017 top 100 cities list based on 2017 international arrivals. Lviv went up by 52 positions between 2012 and 2017, and got 80th place in 2018. It is one of the main cultural and educational centres of the country, so there is a large student community in the city. The IT industry is the most developed sphere in Lviv along with tourism and mechanical engineering. There are over 20,000 IT professionals working in the city and around 317 IT companies, most of which provide software outsourcing services to clients in the USA, Western Europe, the UK, the Nordic countries, and other locations. In 2018, about 14,000 students studied at universities with tech programs, so the industry has constant inflow of fresh talent.

IT MARKET IN LVIV AND ITS ECONOMIC IMPACT, according to Lviv IT Cluster research

21K IT professionals in 2018

24K Estimated IT specialists in 2019

$600M Lviv IT industry turnover in 2017

$1M is spent by companies annually on further training of employees

13K+ of students are studying at universities with tech program

247-317 IT companies in 2017-2018 (28% growth)

KHARKIV

Lying in the north-east of the country, Kharkiv is the second largest city in Ukraine with almost 1.5 million citizens. The city has a long-established engineering tradition and well-developed machinery and electronics industries. There are hundreds of industrial companies in the city, including leaders in world tank production, aerospace and nuclear power plants automation electronics manufacturers, factories producing turbines for hydro-, thermal- and nuclear-power plants, and famous Antonov – the multipurpose aircraft manufacturing plant that makes the world’s biggest planes “The Antonov An-225 Mriya”.

Naturally, software engineering is another well-developed industry in Kharkiv. There are over 25,000 IT specialists in the city and around 450 active tech companies. The USA is the largest export market for Kharkiv IT companies, as it constitutes almost 65% of all IT export.

KHARKIV IT INDUSTRY, according to a study by PwC and IRS Group

450+ active tech companies

25K+ IT specialists

76% programmers

95% of Kharkiv’s total sales in IT services were exported in 2017

65% of IT services export is USA

The IT industry of the Kharkiv region will double in size by 2025

Source: [75]

Source: [76]
PART 1. UKRAINE: COUNTRY OVERVIEW

DNIPRO

Dnipro is a 1 million people city in the south-central part of Ukraine. It is another big IT hub with skilled engineering talent. It was one of the key centres of the nuclear, arms, and space industries of the Soviet Union. Today, Dnipro is a major industrial centre of Ukraine. Its factories produce a wide range of products, including machinery, ballistic missiles, mining, and agricultural equipment, tractors, trolleybuses, refrigerators, etc.

The city has a strong educational system. It is home to two of Ukraine’s top-ten universities — the Oles Honchar Dnipro National University and Dnipro Polytechnic National Technical University. The system of higher education unites 38 establishments with over 2,000 graduates every year. As of 2017, 60% of the city’s population has a university education. So Dnipro has a well-educated workforce.

As for the IT service industry, there are more than 12,000 IT specialists in the city and around 170 IT companies. 41% constitute middle engineers and 36% — senior developers, so the city has a lot of experienced IT talent.

ODESA

Odesa is the third most populous city of Ukraine and a major tourism center, seaport and transportation hub located on the northwestern shore of the Black Sea. The economy of Odesa largely stems from its traditional role as a port city. The tourism sector is of great importance to Odesa, which is one of the most-visited Ukrainian cities.

The IT sector also plays an important role in Odesa’s economy. There are more than 150 IT companies in the city. In 2015, the number of IT specialists surpassed 6,000 people, according to DOU, and in 2018 it reached 10,000 professionals. The city’s strong educational system ensures constant inflow of new talent into the sector.
Ukrainian tech companies employ a lion’s share of the country’s IT talent. The market primarily constitutes IT outsourcing companies, IT product companies, and captive centres of global businesses. However, over 60% of Ukrainian IT professionals work in IT outsourcing companies.

In 2017–2018, the number of employees in Ukrainian 50 biggest IT companies grew by around 35% – from 43,000 to 58,000 specialists. Also, two companies surpassed 6,000 professionals. 25 biggest Ukrainian IT firms have demonstrated record growth rate in the last 5 years.

Twice as many companies from the Ukrainian Top 50 opened new offices in the second half of 2018 compared to 2018 Q1 and Q2. The most popular locations are Kyiv, Lviv and Rivne. As for the global locations, Ukrainian companies started operations in Malaga, Berlin, Warsaw, Krakow, Toronto, Turin, London, Bucharest, Eindhoven, Chicago, etc.

43 out of 50 biggest Ukrainian IT companies have offices in Kyiv, 21 in Lviv, and 20 in Kharkiv. Open space offices are common in the Ukrainian tech sector. 57% of Ukrainian IT professionals work in an open space office and 33% work in a separate office. Both groups are satisfied with their workplace. According to surveys, the employees of all these types of organizations are equally satisfied with their income. Only those specialists that work for startups are not satisfied with their salaries (around 10%).

Where Ukrainian IT professionals work:

- 44% — IT outsourcing company
- 28% — IT product company
- 10% — IT outstaffing company
- 5% — non-IT company
- 5% — startup
- 3% — freelance

Source: [56, 73, 79]
Ukraine houses a wide range of top-notch IT product companies including Grammarly, Readable, Jooble, Depositphotos, GitLab, TemplateMonster, and others. The Ukrainian startup ecosystem is growing by 500 new entrepreneurs each month. Startup investments are growing too. In 2017, there were 44 deals with the total investment volume of $265M.

Although it is not easy for startups to fight for software engineers with large outsourcing vendors, which dominate the Ukrainian IT market, they have several significant competitive advantages. Ukrainian upstarts attract prime tech talent by offering challenging projects, diverse tasks, and the chance to contribute to product development. In addition, it is a chance to get a lot of experience faster and grow professionally in a dynamic environment.

We have shortlisted several notable Ukrainian startups but there are a lot more successful tech companies that started in Ukraine. Some of them expanded to global markets and moved their headquarters to world business centres and the Silicon Valley, others were acquired by tech giants. For instance, Google bought Vicviève, while Lookery was acquired by Snapchat for around $150M.

**Grammarly** is a globally used online grammar checking, spell checking, and plagiarism detection platform. It was developed in 2009 by Alex Shevchenko and Max Lytvyn in Kyiv. Grammarly’s proofreading resources check against more than 250 grammar rules. Its algorithms flag potential issues in the text and suggest context-specific corrections. It is available via a browser extension for Chrome, Safari, Firefox, and Edge. Grammarly is available as an app for both iOS and Android.

**Clickky** is a full-stack platform for advertisers and publishers, which offers programmatic performance and video solutions. It is the largest independent mobile marketing platform in Eastern Europe which helps businesses engage new users and monetize mobile apps. The company was founded by Vadim Rogovskiy in 2010. Clickky has offices in New York, Moscow, Mumbai, and Beijing, with the R&D centres in Odesa, Ukraine. Alibaba is one of its many customers in Europe, Israel, India, China, and the USA.

**Kwambio** is a 3D Printing company focused on ceramics. Its proprietary binder jetting technology for powders reduces manufacturing time by 90% compared to traditional ceramics technology. It allows the designers to upload their 3D projects to the platform, while the users can change them as they wish and print on their 3D printers. The company was founded by the Ukrainian Vlad Usov in 2014.

**Petcube** is a Ukrainian startup that designs and develops hardware and software products for pets. It raised $14 million in seed, venture and Series A financing and more than $500,000 from two Kickstarter campaigns. The company was founded in 2012, in Kyiv by Alex Neskin, Yaroslav Azhnyuk, and Andrey Klein. As of May 2017, Petcube had sold over 100,000 cameras. The company’s products are available in over 18 countries and are sold in over 5,000 retail locations.

**SolarGaps** are smart blinds that automatically track the sun and generate electricity from its energy. The company was founded by Yevgen Eriko in 2016. With SolarGaps, you can produce your own electricity to save on the electricity bills. The users of SolarGaps smartphone app can monitor and control the system from anywhere in the world.

**Bitfury** is the leading full service Blockchain technology company and one of the largest private infrastructure providers in the blockchain ecosystem. Bitfury develops and delivers both software and hardware solutions necessary for businesses, governments, organizations and individuals to securely move an asset across the blockchain. The company was founded in 2011 by Valery Nesbysov and Valeriy Vavilov. By 2019 it attracted over $130M of investments.

**TripMyDream** is a travel platform that allows its users to find value flight and hotel deals for multiple destinations by analyzing price dynamics and availability using billions of data points. In 2016, it became the best travel startup in the world, according to Seedstars Summit 2016. It was founded by Ukrainians Andrey Burenok and Taras Polishchuk.

**Cardiomo** is a miniaturized wearable patch for continuous, real-time, remote health monitoring to detect and predict medically actionable CVD events and push alerts to save lives. It was founded by Ukrainians Ksenia Belykina and Roman Belkin in 2016.

**CruiseBe** is a popular cruise trip planner. The company was founded by Ukrainians Marina Shumaieva and Olesiy Shumayev in 2016. Its major products include Interactive deck centres and the Silicon Valley, others were moved their headquarters to world business centres and the Silicon Valley, others were acquired by tech giants. For instance, Google bought Vicviève, while Lookery was acquired by Snapchat for around $150M.

**Notable Ukrainian startups** but there are a lot more successful tech companies that started in Ukraine. Some of them expanded to global markets and moved their headquarters to world business centres and the Silicon Valley, others were acquired by tech giants. For instance, Google bought Vicviève, while Lookery was acquired by Snapchat for around $150M.
IT Service Companies

There are currently over 1,600 IT companies in Ukraine, and most of them provide software development services to customers around the globe. Therefore, businesses that look for an IT partner in Ukraine come up against the challenge of choosing among a variety of vendors. The selection criteria often include the company’s size, years on the market, track record of similar projects, references, experience in certain technologies and industry verticals, security practices, etc.

Ukrainian IT service companies stand out among the competition thanks to the convenient geographical location, cultural closeness, good communication, highly skilled talent and, of course, competitive prices. Therefore, these factors play a decisive role.

Most local software development companies are mid-size agencies: 41% of the vendors listed in the report by Ukraine Digital News have 20–99 employees, while businesses with 100–299 staff members make up an additional 18%. However, according to DOU, the number of large IT vendors in Ukraine has increased in 2017–2018 and 50 biggest firms grew in size too.

Industry focus of Ukrainian IT Service Companies

There are 485 companies listed on Clutch in the category ‘Ukrainian Custom Software Development Companies’. They deliver solutions in financial services, retail, healthcare, IT, etc.

N-iX

Founded: 2002
Employees: 900+
Global Offices: Malmo, Sweden; Florida, USA; Sofia, Bulgaria; Minsk, Belarus.
Key expertise: Software Development, AI/ML, Data Science, High Load Systems, Embedded Software, VR and Game Development

Delivery centres in Ukraine: Kyiv, Lviv

KEY CLIENTS:
PART 1. UKRAINE: COUNTRY OVERVIEW