# AN ANALYSIS OF THE IT SERVICES INDUSTRY IN UKRAINE

by

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**CAGR** Compound annual growth rate

**CCA** Comparative company analysis

**CEE** Central and Eastern Europe

**DOU** Developers.org.ua

**FY18** Fiscal year 2018

**HHI** Herfindahl-Hirschman Index

**HQ** Headquarters

**IDE** Integrated development environment

**IT** Information technology

**ITO** Information technology outsourcing

**NBU** National Bank of Ukraine

**OLS** Ordinary least squares

**PE** Private entrepreneur

**R&D** Research & development

**SEC** United States Securities and Exchange Commission

**SSSU** State Statistical Service of Ukraine

**UAH** Ukrainian Hryvnia

**USD** United States dollar

**VAT** Value-added tax

**YOY** Year over year

# CHAPTER 1. EXECUTIVE SUMMARY

Over the past several years, both the global IT services market and the Ukrainian IT services market have grown, but the Ukrainian market has grown at a faster rate. This presents a possible investment opportunity, as some market research claims that the market is growing much faster than the global market. However, are these claims accurate, or do they overestimate the potential of the market? In this report, the author answers four questions: does the competitive landscape of the market allow for new entrants, will the market continue to grow at its current rate, what are the largest factors limiting the growth of the IT services market, and what can the potential investor do to support the growth? To answer these questions, the author conducted a five forces analysis with two approaches: a company-level and employee-level approach.

Before conducting any analysis, the author defined the scope of the report as IT services companies with 50 or more employees in Ukraine at the time the research was conducted. Not included in this report are IT product companies—who do not create specialized software for individual customers—and research and development centers of non-IT companies—e.g. Boeing—because their outputs are not classified as IT services. Also, the author included only companies with 50 or more employees because the number of smaller companies is rapidly changing and it is unrealistic to analyze them.

In the company-level approach, the author sought to estimate competitive rivalry by quantifying market concentration. First, the author collected general information about the companies in the scope of this project through various open sources such as Crunchbase, LinkedIn, Owler, DOU.ua, and others. Then, the author estimated the annual revenue for each IT service companies based on characteristics of the company such as age, number of employees, specialty, etc. Based on these values, the author calculated the market concentration. The concentration of the labor market and the actual market were similar; therefore, the author uses labor market concentration as a proxy for actual market concentration and then estimated the change in market

concentration over time. The author found that the market concentration has been decreasing, but the regression model used had a residual standard error of ±53%, thus the author concluded that this approach is not meaningful with the data that is currently available.

In the employee-level approach, the author sought to quantify the relationship between the number of IT specialists and total market revenue to predict the growth of the market over the next several years. First, the author estimated the number of IT specialists in the IT services market from an open-source IT survey and obtained official annual volumes of computer service exports from the National Bank of Ukraine. Next, the author regressed the log of market volume on the log of the number of IT specialists each year. The regression model had a standard residual error of ±9% and showed that the IT market has constant returns to scale on human capital and that the mean annual revenue per employee was 16,000 USD. Based on this model, the author sought to predict the future growth of the market. To do so, the author first had to predict the number of new IT specialists. Using educational data on the historic number of secondary school graduates, students in IT programs, and graduates of IT programs, the author predicted the number of IT specialists for 2019–2023. Using these predicted values, the author obtained predictions for the total volume of IT service exports for 2019–2023, predicting that the market will grow at a CAGR of 9.8% over 2019–2023.

In the five forces analysis, the author found that the industry rivalry and the bargaining power of suppliers are high, the bargaining power of buyers and the threat of entry are medium, and the threat of substitution is low. The author found that the largest limiting factor in the IT market is the shortage of human capital. This shortage of human capital will cause the market to grow at a slower rate in 2019–2023 compared to 2016–2029. To fight the shortage, the government should increase spending on IT programs in secondary schools to increase awareness and interest in IT; however, these effects will take four or more years to realize. To receive more-immediate results, the government and/or private companies need to create and fund more crash-course IT schools where non-IT majors can become junior software developers in a year or less.

# CHAPTER 2. INDUSTRY ANALYSIS AND RESULTS

## 2.1. Purpose

The global information technology (IT) services market has been growing at a steady rate of approximately 3% (CAGR) over the last eight years,[1] and Ukraine's IT service market has been growing even faster. The IT services market is an important part of Ukraine's economy, and exports from this market accounted for 20% of the GDP in 2018,[2] as well as 20% of all service exports from Ukraine.[3] Some reports referenced in this study forecast the growth of the IT services export volume from Ukraine at rates between 10 and 20% year-over-year (YOY).[4] That is much faster than the rate at which the global IT services market is growing. To an investor, a local market that is growing significantly faster than the global rate may sound unrealistic. That is not to say that this is impossible or even false, but potential investors in Ukraine's IT industry must bear in mind that many of the associations creating such reports are not entirely unbiased. UNIT.City, the author of one the most cited Ukrainian IT reports of 2019,[5] has its own "tech park"—a partially built office complex which depends on the continued expansion of the market and increased interest of multinational companies to fill their office spaces and remain profitable—therefore it has an incentive to overestimate the value and growth of the IT market in Ukraine. IT Ukraine Association, also a proliferate author of IT reports in Ukraine, is the "largest community of service IT-companies in Ukraine" that's main purposes are protecting the interests of the industry, providing help in development of education and human capital, and lastly, "[p]romote the [IT] industry in Ukraine and

[1] iEntry 2011; CMSWire 2012; TechCrunch 2013; Gartner 2014, 2015, 2016, 2017, 2018, 2019.

[2] NBU, 2019; The World Bank, 2019.

[3] Author's calculations based on NBU, 2019.

[4] AVentures Capital et al. 2019; UNIT.City and Western NIS Enterprise Fund 2019.

[5] UNIT.City and Western NIS Enterprise Fund 2019.

abroad, support business in establishing new contacts."[6] Lastly, the latest popular report on the Ukraine IT industry was authored by N-iX,[7] which is not an auditing or consulting company, but one of the largest IT companies in Ukraine. Because of their close ties with the IT service market in Ukraine, these organizations may have an incentive to overestimate the value—and more importantly, the overall growth—of the IT services market in Ukraine. Furthermore, many of the sources used in these reports, e.g. self-reported revenue figures from companies, could also be biased. The purpose of this report is to conduct an unbiased analysis of the IT services market in Ukraine with the potential foreign or domestic investor, including the Ukrainian government, in mind. This report aims to answer four important questions regarding the future of the market.

1. Does the competitive landscape of the market allow for new entrants?
2. Will the market continue to grow at 20% or more year over year (y-o-y)?
3. What are the largest factors limiting the growth of the IT services market?
4. What can the potential investor do to support the growth of this market?

These questions are important for a potential investor who must decide if the current level of competition is already too high for new entrants or startups and whether the growth forecast is realistic. Moreover, these questions are just as important for the Ukrainian government because the IT market is a large contributor to the national budget—paying approximately 600 mil. USD in taxes and fees in 2017[8]—and it has the potential to bring lasting economic growth to Ukraine.

### 2.2. Scope of the Report

In this report, the author conducts an industry analysis of the IT services market in Ukraine. The author uses two methodologies: the first is a company-level approach that aims to quantify overall market value, growth, and competition using data from

[6] IT Ukraine Association 2018a.

[7] N-iX 2019.

[8] Krasnikov, 2018.

individual companies; the second is an employee-level approach that aims to estimate market value, growth, and competition using data from individual employees of the IT services market. In the first methodology, the author focuses only on IT service companies operating within Ukraine with approximately fifty or more employees as of January 1st, 2019. According to the author's findings, there are approximately 82 international and national IT service companies operating within Ukraine with fifty or more employees, and this number continues to grow every year. In the second methodology, the author focuses on employees of IT service companies of all sizes. This report regards the services being exported from Ukraine, so it does not include IT product companies. However; this report does include both types of IT service companies, outsourcing and outstaffing, as well as the research and development (R&D) centers of multinational IT companies. The author also decided to exclude R&D centers of non-IT companies, e.g. Boeing, to focus strictly on companies that

This report covers the IT services industry to the end of the fiscal year 2018 (FY18), with predictions for 2019 through 2023. It provides historical data for global IT service expenditures as well as the volume of IT service exports from Ukraine. Using the company-level approach, the report provides historic data for the growth of individual IT companies in Ukraine, but this data is limited to the largest 50 IT companies by number of employees in Ukraine each year. Using the employee-level approach, this report provides detailed information about the change in the number of employees and wages in the IT industry.

Previous reports, such as the CEE Software Development report[9], rely mainly on private information shared directly by the companies that are included in their report, and the data is not shared with the public. As mentioned above, self-reported figures by companies could be inflated. Furthermore, in the aforementioned IT reports, the methodology used in forecasting the growth of the industry is not explaining; instead, reports often use the phrase "expert analysis" without explaining what that entails. In

[9] AVentures Capital et al. 2019.

contrast, this industry analysis will be conducted using open data that is available on the internet in Ukrainian, Russian, and/or English, with an emphasis on government data where available. The author understands there are some limitations when using open data, especially regarding the absence or incompleteness of information. Understanding the limitations of such an approach, the author would like to apologize in advance for any inaccuracies in the data collected. To avoid falsely misrepresenting the financial health or potential of any particular company, the author will refrain from publishing forecasted growth for individual companies; instead, the author will forecast growth only for the market as a whole. The author will, however, include non-forecasted data at the company level, including approximations made from said data, because this data is available openly online from various sources. Finally, unlike other associations who have conflicts of interest because of their direct ties to the IT service market in Ukraine, the author has no conflicts of interest because he is a foreign national with no direct investment in the Ukrainian economy, the Ukrainian IT service market in general, or competitors of Ukraine's IT service market, and this report is not sponsored in any way by any IT company or association.

### 2.3. Research Methodology

The author completed the following report using open-source information from a myriad of sources. Financial information about publicly traded companies was obtained directly from investor reports through their annual or quarterly Security Exchange Commission (SEC) filings for the respective companies. However, the majority of companies (96% of those included in the report) present in the Ukrainian IT service industry are private companies that are not required to disclose such information. Market revenue estimates and lists of competitors for some companies were obtained from open-source, crowd-based information exchange websites. However, these sites contain revenue estimates for only a small portion (38%) of the companies included in this report, which were mainly larger companies (41% had 250+ employees). Furthermore, because some of these sites are open source, the figures could be grossly misstated. To estimate

revenues for the remaining companies, the author conducted a modified comparative company analysis (CCA), estimating the annual revenue of these companies using a multiple linear regression based on company properties such as the age of the company, the number of global employees, and proportion of global employees that are in Ukraine

2.3.1. Companies Selection

To obtain a list of the IT service companies in Ukraine, the author first collected the names and webpage hyperlinks of all companies listed on the page "Top IT Outsourcing Companies in Ukraine" on Clutch.co.[10] Clutch is a "B2B research, ratings, and reviews firm" based in Washington, D.C., that considers "verified feedback from client references, services offered, work quality, and market presence."[11] The aforementioned list obtained from Clutch contained 239 firms that operate in Ukraine (including those with less than 50 employees). The author then used WebSraper.io,[12] a web-scraping tool used for collecting large amounts of online information, to collect the names of the companies and data on the minimum project size for each company, the average hourly rate, the number of employees, the service focus, and office locations. Knowing that web scraping methods can sometimes produce incomplete or inaccurate results, the author then manually verified the location of company headquarters (HQ), whether these companies have offices in Ukraine, and that they are indeed IT service companies (as opposed to IT product companies who produce goods, not services). The author added IT services companies that were not on this list but were included in UNIT.City's 2019 tech report[13] and then excluded companies with less than 50 employees because information on companies this small is extremely limited and highly volatile.

[10] Clutch.co 2019b.

[11] Clutch 2019a.

[12] Web Scraper 2019.

[13] UNIT.City and Western NIS Enterprise Fund 2019.

2.3.2. Company Data Collection

After obtaining a list of the companies in the scope of this report and basic company information, the author obtained the links (those which were available) for these companies on the following websites: Crunchbase,[14] Owler,[15] and LinkedIn.[16] Crunchbase provided data on the founding date of the company, funding status, number of acquisitions (if any), and web traffic metrics. Owler provided the estimated annual revenue, estimated number of employees, and a list of competitors.

LinkedIn provided an estimate for the number of global employees currently working in each company as well as the number of employees in Ukraine. To obtain this information, the author first found each company page on LinkedIn, then clicked on the "See all [number] employees on LinkedIn" tab, and finally filtered the results by country to find both the total number of employees as well as the number of employees in Ukraine. Multiple companies had recently undergone name changes or had multiple pages due to mergers and acquisitions (M&A), complicating the process of finding the right amount. The employee counts from LinkedIn may seem unreliable because not every employee has a LinkedIn account; however, LinkedIn is widespread, especially in the IT industry, and the author validates such method by calculating the mean error between the number of employees according to LinkedIn and the number of employees according to official and/or well-recognized sources (for those companies for which such data is available).

Reputable data on the number of employees in the 50 largest IT companies was retrieved from Developers.org.ua (DOU).[17] DOU has been publishing such information semi-annually (usually in December/January and June/July) since the end of 2010. The

[14] Crunchbase 2019.

[15] Owler 2019.

[16] LinkedIn 2019.

[17] DOU.ua 2019b.

author uses the information from the most recent report,[18] published in July 2019, to quantify the reliability of the LinkedIn data. The employee counts published on DOU are not easily downloaded (as opposed to other data on their site); therefore, the author collected data from past semi-annual DOU reports using web scraping methods and uses them to display the dynamics of employment growth for the 50 largest IT firms in Ukraine each year.

Official figures for the number of global employees working in a firm were also available for some firms on their official company web pages. After obtaining information from the various sources, the author cross-checked the data for irregularities and filled in missing information by scanning news articles and company press releases.

2.3.3. Company Revenue Estimation

Some of the firms in the list operate almost exclusively in Ukraine—this was determined from information on office locations from various sources and employee accounts from LinkedIn—while other firms have their headquarters in Ukraine but regional offices in other countries, while yet others have only R&D centers or delivery centers in Ukraine. Complicating the matter, official revenues for public companies and estimated revenues for private companies represent the revenue from all offices, not just the offices in Ukraine. Therefore, to estimate the revenue of each company that was due to exports specifically from Ukraine, the author used the following ratio, (1), to estimate $R_{ukraine}$, the revenue from Ukraine, as a function of $R_{total}$, the total actual or estimated revenue, $E_{total}$, the total actual or estimated number of employees, and $E_{ukraine}$, the actual or estimated number of employees in Ukraine, with $\rho_{ukraine}$ as an abbreviation for this ratio of workers (proportion of total workers that are employed in Ukraine):

$$R_{ukraine} = R_{total} * \left(\frac{E_{ukraine}}{E_{total}}\right) = R_{total} * \rho_{ukraine} \quad (1)$$

[18] DOU.ua 2019b.

The author then used $R_{ukraine}$, the estimated total revenue for Ukraine, as a proxy for *export* revenue from Ukraine. The justification for doing so is that Ukrainian IT service companies provide services to mostly foreign clients, therefore the revenue of domestic IT services is small compared to the value of exports of IT services from Ukraine. Public companies are required to report overall revenue, and they usually show the breakdown of revenue by location of the customer, but the author could not find any filings that detailed the amount of revenue contributed from each country in which the company has delivery centers. Without more detailed financial statements from public companies or any financial statements from private companies—which sometimes self-report revenue but not detailed information to aggregators such as market intelligence firms, e.g. Gartner, AVentures Capital, etc.—the amount of export value from Ukraine for each company can be estimated only roughly. This may appear trivial, but before this report, no such estimates exist for nearly all of the companies included in the report.

As mentioned above, (1) provides a way to estimate export revenue for companies that had already published official or estimated total revenue. To predict the estimated total revenue for companies for which there were no reasonable estimates (e.g. available from Owler and/or Crunchbase), the author conducted comparative company analysis (CCA). First, the author built an ordinary least squares (OLS) model, or multiple linear regression, model to estimate the total revenue for companies which already had an actual or estimated total revenue (n = 34) using (2), in which $R_{total}$, the total estimated revenue, is a function of $E_{total}$, the total number of employees in the company, $age$, the age of the company calculated as 2019 minus the year founded, $\rho$, the proportion of workers that are Ukrainian (the number of employees in Ukraine divided by the total number of employees), $City$, the city in which the company headquarters is located, $Ctry$, the country in which the company headquarters is located, and $\epsilon$, the error term:

$$\ln(R_{total}) = \beta_0 + \beta_1 \ln(E_{total}) + \beta_2 age + \beta_3 \rho + \beta_4 City + \beta_5 Ctry + \epsilon \quad (2)$$

Then, the author used this model to predict the total annual revenues for the remaining companies (n = 48). Finally, (1) was applied to estimate each company's export revenue from Ukraine as a proportion of each company's total revenue.

Equation (1) assumes that, for IT service companies operating in Ukraine, there is a negligible difference between the revenue per employee in Ukraine and overall revenue per employee. The author sought to validate this assumption by calculating these figures for currently or historically publicly traded companies (e.g. EPAM Systems, Luxoft, GlobalLogic, etc.) using the following method: using investor reports and SEC filings, find or calculate the total number of employees, the number of employees in Ukraine or other similar region (e.g. Poland, Romania, Bulgaria, Slovakia), the total annual revenue, and the revenue from Ukraine or similar region, then compare the calculated overall revenue per employee with the calculated revenue per employee for Ukraine or other similar region. The author was able to find data regarding the total number of employees and the number of employees in Ukraine or neighboring countries (either directly or through estimates based on the total area of leased office space in each city or country) for these publicly trades companies; however, the author did not find any geographical breakdowns of the sources of revenue or cost of goods (which, in conjunction with a company's profit margin, can be used to estimate revenue). In the investor reports,[19] geographical revenue is usually reported based on client location, not based on the office that provided the services—only Itera ASA provided revenue by source country but employee accounts were not available.

Despite not finding the above figures, the author found that in the Central and Eastern Europe (CEE) Software Development Report, a survey using private company information (again, self-reported) found that companies with more than 90% of Ukrainian employees had an average annual revenue per employee of 49,360 USD, while companies with less than 90% of Ukrainian employees had an average annual revenue per employee of 55,090 USD.[20] This represents a difference of approximately 12% at most, which is a negligible difference for this report. However, as discussed above, the CEE Software Development Report uses self-reported information that could be

[19] EPAM Systems, Inc. 2019b. Luxoft 2018. Itera ASA 2019.

[20] AVentures Capital et al. 2019, 58.

significantly inflated. Because of this, the author will compare the average annual revenue per employee from that report with an estimated annual revenue per employee based on a semi-annual IT developer survey, and official revenue information from the NBU. The author uses (3) to calculate $RPE_{service}$, the average revenue per employee, as the ratio of $R_{ukraine}$, the total export value of computer services from Ukraine, and $E_{service}$, the estimated number of IT specialists working in IT service companies( again, this does not include employees working in IT product companies):

$$RPE_{service} = \left(\frac{R_{service,ukraine}}{E_{service}}\right) \quad (3)$$

The official export value of computer service from Ukraine, $R_{service,ukraine}$, is available from the National Bank of Ukraine,[21] but the number of IT specialists working in IT service companies, $E_{service}$, must be estimated. DOU estimates[22] the total number of IT employees each year, $E_{total}$, as the ratio of the number of IT specialists working in companies with "1,000 or more employees", $E_{size\geq 1000}$, according to their semi-annual publication titled "Top 50 Biggest IT Companies in Ukraine;"[23] and the proportion of IT specialists who work in companies with "1,000 or more employees," $\rho_{E,size\geq 1000}$, according to their semi-annual, anonymous salary survey,[24] as seen in (4).

$$E_{total} = \frac{E_{size\geq 1000}}{\rho_{E,size\geq 1000}} \quad (4)$$

In the semi-annual salary surveys, IT employees also answer in which type of company they work from the following options (translated from Russian): outsourcing, outstaffing, product, startup, and other. Services companies include only outsourcing, outstaffing companies. Outsourcing companies provide access to their development teams through their project managers, while outstaffing companies provide direct access

[21] National Bank of Ukraine 2019.

[22] DOU.ua 2018.

[23] DOU.ua 2019b.

[24] Voloshyn 2019.

to their development teams, i.e. sending them to the client location. The number of IT specialists working in IT service companies, $E_{service}$, can be estimated as the product of the total number of IT specialists, $E_{total}$, and the proportion of IT specialists who work in IT service companies, $\rho_{E,service}$, as seen in (5).

$$E_{service} = E_{total} * \rho_{E,service} \quad (5)$$

Substituting (4) and (5) into (3) produces (6).

$$RPE_{service} = \left(\frac{R_{service}}{E_{size\geq 1000}}\right)\left(\frac{\rho_{E,size\geq 1000}}{\rho_{E,service}}\right) \quad (6)$$

Using (6), the author can estimate revenue per employee in IT service companies, $RPE_{service}$, using the employee date from DOU and the official revenue from the NBU. The author will use these estimates to validate (1) and the results obtained from the CEE Software Development Report. If the reported revenue-per-employee is similar to the estimated revenue-per-employee obtained from (6), then the author will assume that both approaches are correct, and thus revenue per employee in Ukraine can indeed be estimated using (1). If the reported revenue-per-employee and estimated revenue-per-employee are not similar, then the author will conclude that the estimates made using (1) and (2) are inconclusive and that a company-level based approach is not possible at this time, nor are the estimates made for these companies worth publishing.

### 2.3.4. Market Concentration

After predicting the annual revenue for each of the 82 companies in the scope of this report, the author will estimate the concentration of the IT services market in Ukraine, quantified with the Herfindahl-Hirschman Index (HHI), which is defined by (7),[25] where $s_n$ is the market share percentage of firm $n$ expressed as a whole number, not as a decimal:

$$HHI = s_1^2 + s_2^2 + s_3^2 + \cdots s_n^2 \quad (7)$$

[25] Hayes 2019.

The author will calculate HHI using market share for all 82 companies in the sample and again using market share for only the largest 50 companies (this methodology[26] is used by regulators in the USA when calculating HHI). The market size used in these calculations is the sum of predicted annual revenues for the 82 firms included in this report. A value of 10,000 for HHI signifies a monopoly where one firm has 100% of the market share, while a value closer to 0 signifies a nearly perfectly competitive market where a nearly infinite number of firms each control a minuscule part of the market and no firms have a competitive advantage over others.

The author also sought to estimate how market concentration has changed over time; however, the estimated revenues are only available for FY18. To estimate the dynamics of the market concentration, the author will use employment numbers as a proxy for firm revenue. This method relies on the assumption that IT service firms in Ukraine have similar revenue per employee in Ukraine. If the assumption is valid, the values for market concentration using the labor market share and monetary market share should be similar. The author will estimate the changes in market concentration for the Ukrainian IT service market from January 2011 to January 2019 based on the number of employees in the largest IT service companies according to DOU's semi-annual report titled "Top 50 Biggest IT Companies in Ukraine"[27] and (8), where $HHI^*$ is the labor market concentration with $s_n^*$ representing the labor market share percentage (number of employees in firm $n$ divided by the number of employees in the IT service market) of firm $n$ expressed as a whole number, not as a decimal:

$$HHI^* = {s^*}_1^2 + {s^*}_2^2 + {s^*}_3^2 + \cdots {s^*}_n^2 \quad (8)$$

The result of this methodology is a multiple linear regression, as defined in (2), that describes the total annual revenue as a function of company parameters, a list of estimated annual export value for each of the 82 IT service companies in Ukraine with fifty or more employees, estimated market share of each company based on the predicted

[26] Hayes 2019.

[27] DOU.ua 2019b.

values for annual revenue, estimated market concentration for 82 firms and 50 firms (regulators use 50 firms to estimate), dynamics of the number of employees in the largest 50 IT companies in Ukraine semiannually from January 2011 to January 2019, and estimated market concentration dynamics based on the modified HHI calculated using these employee counts.

### 2.4. Market Sizing Analysis

The market sizing analysis section consists of the specific market definition and the size analysis for the defined market in 2018.

#### 2.4.1 Market Definition

The market considered in this report is the IT Services market of companies operating within Ukraine. These are informally known as "IT service companies" because they provide services for other companies or create specific products for individual customers. IT service companies differ from IT product companies in the target audience or customer base. IT product companies are those companies that create a product for the market, not for a specific customer. Examples of well-known IT product companies from Ukraine are Grammarly Inc.,[28] which is an online spell-checking and plagiarism-checking software which has features for free users as well as premium features that require a paid subscription, and MacPac Inc.,[29] which is a software company that offers a suite of programs that are designed to improve the usage of Mac computers. These companies, even though they sell a service (access to their products in the form of a monthly or annual subscription), do not market their products to specific customers; therefore, they are not included in the IT services market. Some of the largest IT employers in Ukraine that are not categorized under the IT services market include EvoPlay, a video game company with over 1300[30] employees in Ukraine that specializes

[28] Grammarly 2019.

[29] MacPaw Inc. 2019.

[30] DOU.ua 2019b.

in online game development and game platforms,[31] and Genesis, a firm with 1000[32] employees in Ukraine that develops software for iOS, Android, Windows, and macOS.[33] For firms that are both product and service companies, the author classified the company as an IT service company if the company's focus seemed to be service, based on a review of services and products available and customer base. The 2019 "Tech Ecosystem Guide to Ukraine" by UNIT.city[34] aided in this classification, however, the list of 30 IT service companies in this guide is non-exhaustive.

### 2.4.2 Market Sizing 2018

Worldwide spending on IT has both increased and decreased during the last five years. Since 2011, global spending on IT overall has grown at a CAGR of only 1.1%, while worldwide spending on IT services has grown at a CAGR of only 2.6% as seen below in

[31] EvoPlay Entertainment 2019.

[32] DOU.ua 2019b.

[33] Genesis 2019.

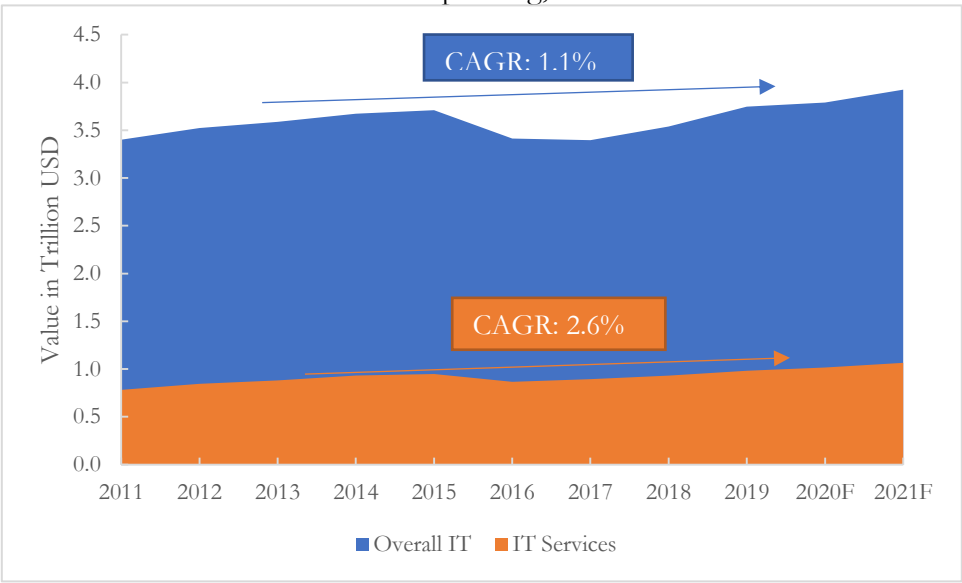
[34] UNIT.City and Western NIS Enterprise Fund 2019.

Figure 1.

Despite the slow growth of both global IT spending and global spending on IT services specifically, global IT service revenues have grown at a CAGR of 2.6% over the last five years as seen in

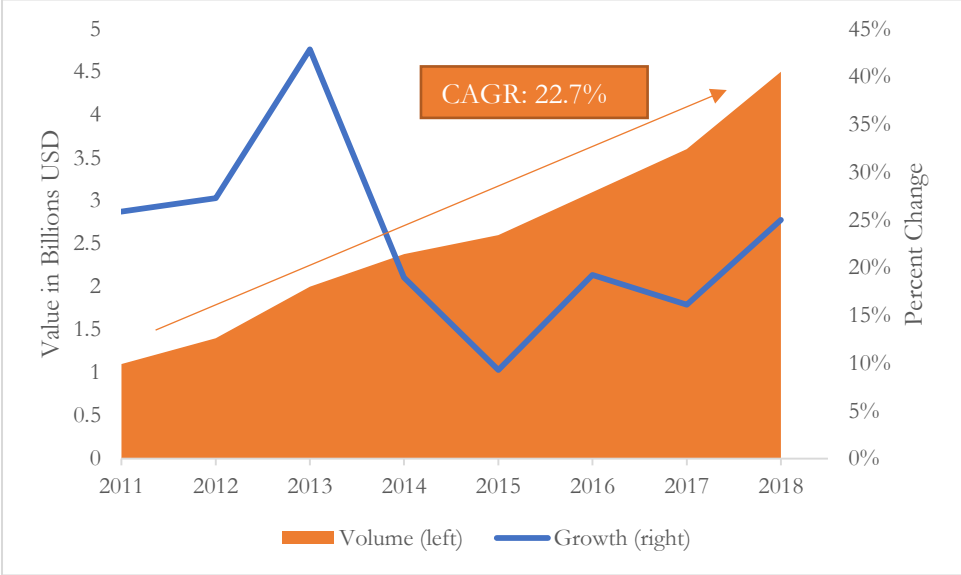
Figure 1. Ukraine's IT service market has grown tremendously in the same time period. As seen in Figure 2 below, Ukraine's IT service market export value has grown at more than 10 times the worldwide IT services market with a CAGR of 22.7%.

Figure 1. Worldwide IT and IT services spending, 2011-2021F




*Source*: author's calculations based on annual Gartner reports[35]

Figure 2. IT service exports from Ukraine, 2011-2018



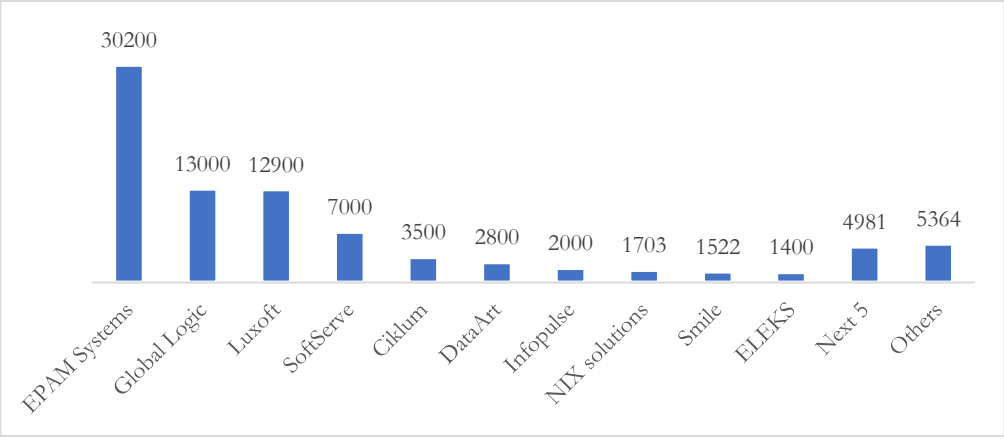

*Source*: author's calculations based on Ukraine Hi-Tech Initiative 2012 and UNIT.City and Western NIS Enterprise Fund 2019

[35] iEntry 2011; CMSWire 2012; TechCrunch 2013; Gartner 2014, 2015, 2016, 2017, 2018, 2019.

As mentioned above, the Ukrainian IT service market has 82 firms with fifty or more employees. It far from being a highly concentrated market (defined as having an HHI greater than 2,500[36]), but there are a few firms which employee a large share of the IT specialists in Ukriane. As seen in Figure 3, it is clear that EPAM, GlobalLogic, Luxoft, Softserve, and Ciklum are the largest firms that are part of the IT service market in Ukraine. However, this figure is based on global employee counts based on official data about each company. In contrast, Fig. 4 shows the largest companies in the Ukrainian IT service market based on number of employees employed in Ukraine.

From Figure 3 and official and DOU.ua company pages and UNIT.City and Western NIS Enterprise Fund. 2019
Figure 4, it is apparent that in terms of global employees, EPAM Systems and GlobalLogic employ almost as many IT specialists (49.9%) as all of the other firms covered in this report. However, in terms of employees in Ukraine, this amount is less than 30%. This is significant because it shows that the giant IT service firms are not as concentrated in the Ukrainian IT service market. Despite the fact that EPAM and GlobalLogic employ a large share of the IT workforce in Ukraine, there are also many small and medium sized IT service firms in Ukraine. As seen in Figure 5, the majority of IT service firms in Ukraine have less than 50 employees overall.

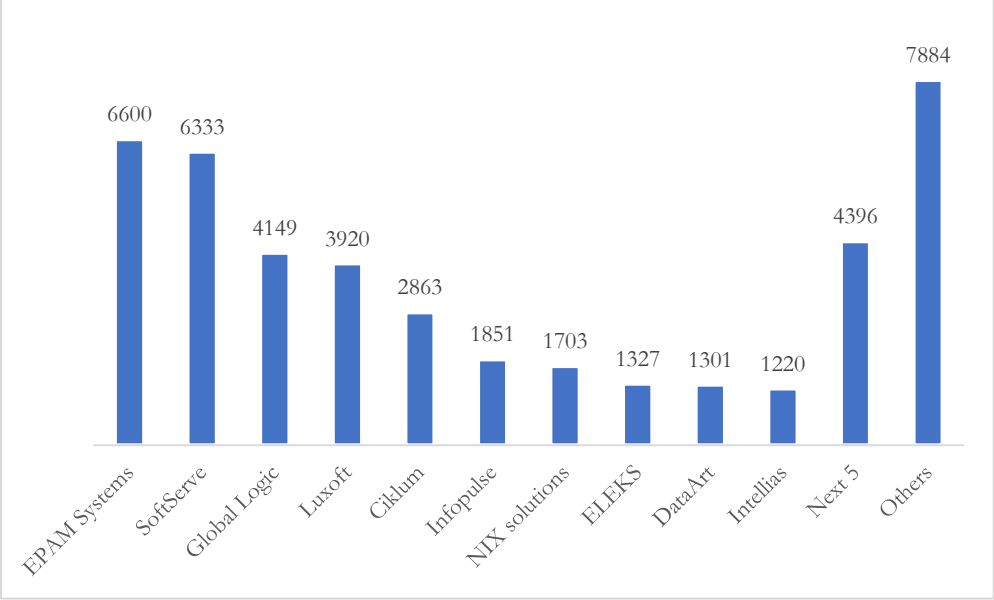
Figure 3. Global employee counts of largest IT service firms in Ukraine




[36] Hayes 2019.

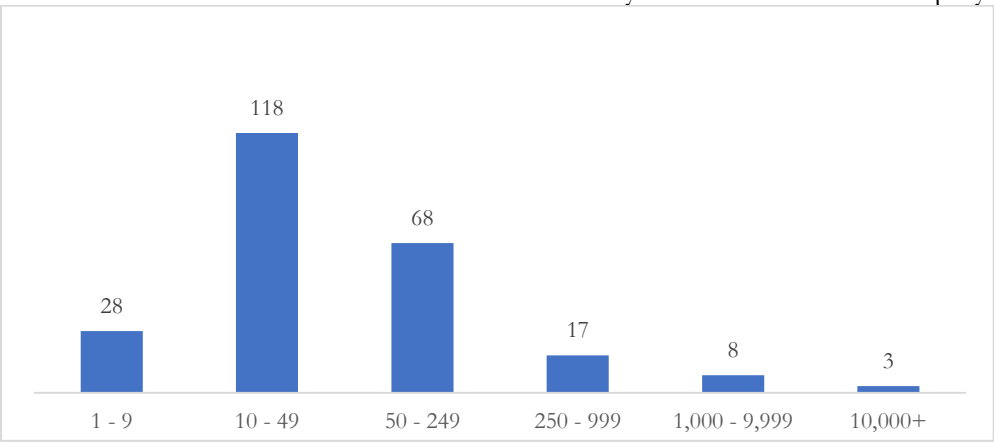
*Sources*: official and DOU.ua company pages and UNIT.City and Western NIS Enterprise Fund. 2019

Figure 4. Ukrainian employee counts of largest IT service firms in Ukraine




*Sources*: official and DOU.ua company pages and UNIT.City and Western NIS Enterprise Fund 2019

Figure 5. Distribution of IT service firms in Ukraine by the total number of employees




*Source*: employee counts from Clutch.co 2019b

The reason for the large number of small companies is because of the dynamics of the Ukrainian IT service industry. The IT service industry is rapidly growing but becoming more and more competitive as new firms enter the IT service market. Overall

the market has been growing at a rate that may seem to be unmaintainable. The dynamics of the market concentration will be discussed in the next section, Five Forces Analysis.

### 2.5. Five Forces Analysis

This report will use the standard five forces analysis framework—consisting of competitive rivalry, the bargaining power of suppliers, the bargaining power of buyers, the threat of substitution, and the threat of entry—to analyze the prospects for new entry and the possible growth of the market.

#### 2.5.1. Competitive Rivalry

One of the main goals of this report is to estimate the market concentration of the firms in the IT service industry in Ukraine and the level of competition in the industry. Following the methods described in the methodology section, the author built a multiple linear regression model describing annual revenue as a function of year founded, number of total employees, and the proportion of workers that are in Ukraine. This model produced a $R^2$ of 0.9024 with a residual standard error of 0.5305 (with the dependent variable, total annual revenue, expressed in logs). The author chose to express the dependent variable and the number of workers in logs because of the logarithmic nature of their distributions (many firms with low revenue, few firms with high revenue; and many firms with few employees, few firms with many employees), thus the standard error represents an error of ±53%; because this value is so large, the author will not use this model to form conclusions. The regression includes several categorical variables with many levels, therefore the author has displayed the output of only the main variables below in Table 1.

The interpretation for the variables is as follows: a 10% increase in the number of employees corresponds with a 9.25% increase in the total revenue, an increase of one year in the age of the company corresponds to a 2.6% increase in the total revenue, a 1-percentage-point increase in the proportion of workers that are in Ukraine corresponds to a 1.73% decrease in the total revenue, companies with their HQ in the US have total annual revenue that is 71.1% lower than those with their HQ in Ukraine, and companies

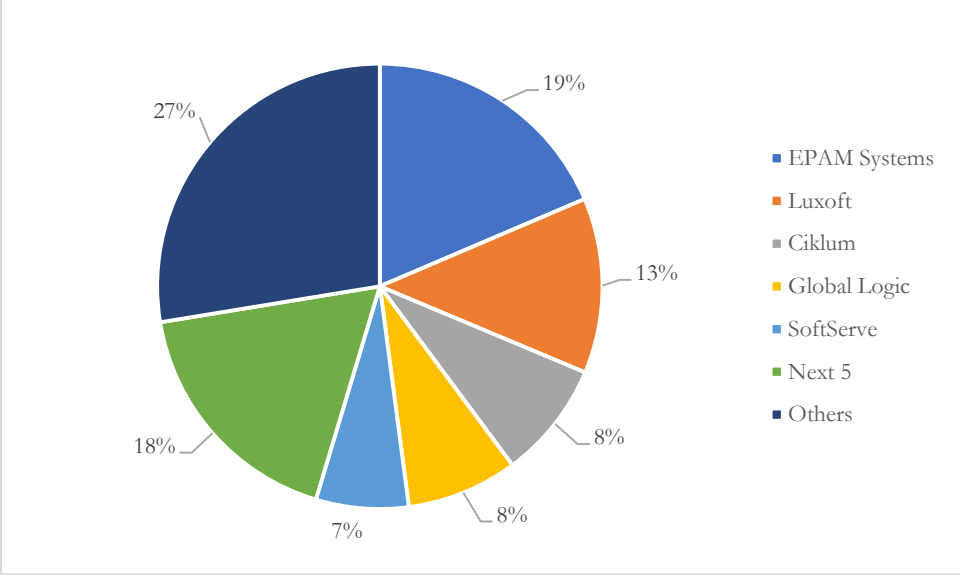
with their HQ not in the US or Europe have total annual revenue that is 65.3% lower than those with their HQ in Ukraine, all else held equal.

Table 1. Firm-level regression output for most significant variables

| Variable | Estimate | Standard error | p-value |
|---|---|---|---|
| log(Employees) | 0.925 | 0.083 | 0.000 |
| Age | 0.026 | 0.016 | 0.127 |
| Proportion | -1.731 | 0.494 | 0.002 |
| Country-USA | -1.243 | 0.355 | 0.006 |
| Country-other | -1.06 | 0.489 | 0.018 |

Using the regression model specified above, the author estimated total annual revenues for the remaining 48 companies. Then, using (2), the author estimated the IT service export revenue from Ukraine for all 82 companies. The estimates for these companies are listed in the Appendix in Table 5. Based on the estimated annual revenues, the author calculated the market shares of all 82 companies as seen below in Figure 6.

Figure 6. Estimated market share of Ukrainian IT service firms

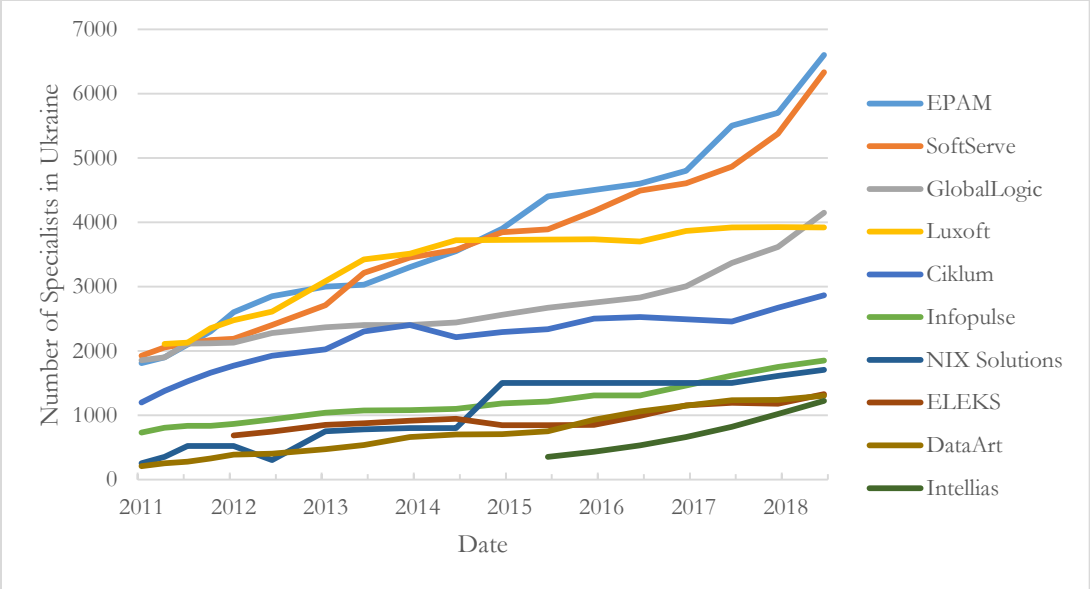



*Source*: author's calculations based on regression results

Using the estimated market shares, the author calculated that the Ukrainian IT service market has an HHI, or market concentration, of 790. An HHI of below 1,000 signifies a competitive market, however, this market is far from being perfectly competitive. Perfectly competitive markets have HHI's that are much closer to 0, indicating that there is still plenty of market share that can be taken by new entrants.

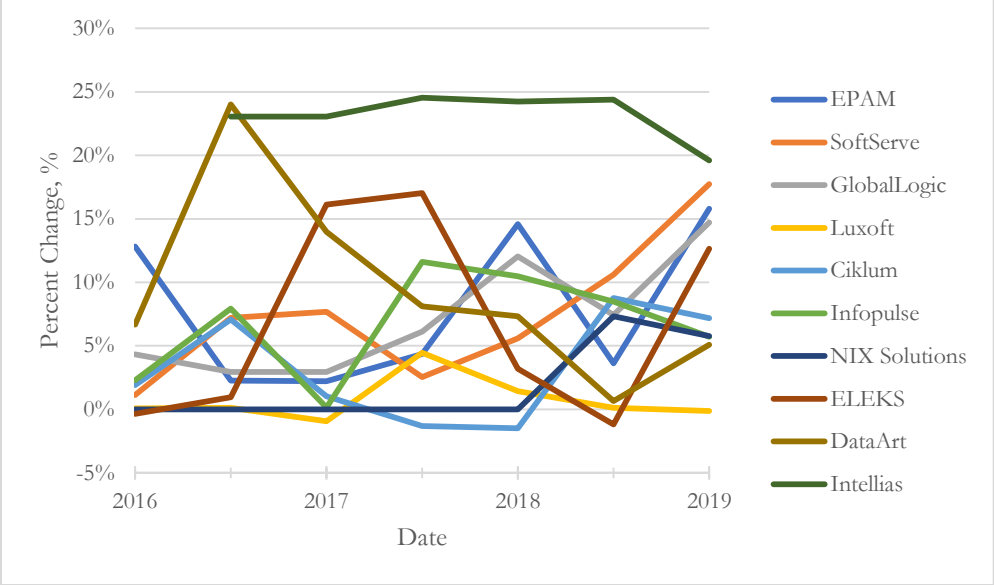
As a validation of the market concentration analysis, the author also calculated a modified HHI based on the number of employees in each of the largest 50 IT firms in Ukraine using (8). Figure 7 below illustrates the dynamics of employment in the 10 largest IT service firms from 2011 to 2019. It is clear in this figure that overall these companies are growing—many through mergers and acquisitions (M&A)—but employement growth for some companies has slowed or stopped the past couple of years. For example, Intellias, Ciklum, NIX Solutions, and Infopulse saw decreasing rates of employee growth, while Luxoft has had near 0% growth for the last two years, foreshadowing possible market saturation, wage inflation problems, or human capital shortages, as seen in Figure 8, which illustrates the percent change in the number of employees.

Figure 7. Employee growth in the ten largest Ukrainian IT service firms, 2011–2019




*Source*: adapted from DOU.ua 2019b

Figure 8. Employee growth in the ten largest Ukrainian IT service firms, %, 2016-2019



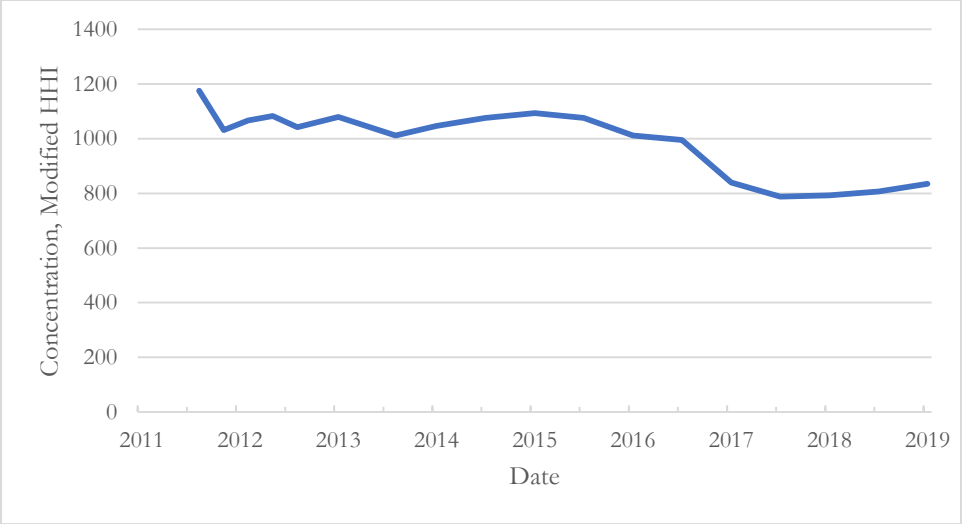

*Source*: author's calculations from DOU.ua 2019b

Using the number of employees in each company as a proxy for market revenue as described in (8), the author validated the regression predictions using a modified HHI index. The first validation used employee counts for the 50 largest IT companies. The list of the 50 largest IT companies also includes product companies and research and development centers for non-IT companies; however, the majority (76%) of the 50 largest IT firms are service firms, so the purpose was still fulfilled. Using this data,[37] the author estimated that the IT industry in Ukraine has an HHI of 458 as of January 1st, 2019. This value is lower than the value received from the regression results, but they are on the same order, and this value is from the entire Ukrainian IT market, not only the IT service market. The author then recalculated the modified HHI using employee counts only from the 50 largest IT companies that were IT service firms, excluding product companies and R&D centers for non-IT companies, and found that the IT service industry had a modified HHI of 835 as of January 1st, 2019, a value similar to the value based on regression results (HHI = 790, difference of less than 6%).

[37] DOU.ua 2019b.

The two methods produced similar estimates of the market concentration of the IT service industry in Ukraine. However, these are static estimates that do not show how market concentration is changing over time. The change in market concentration overtime is more telling the future attractiveness of the market to future entrants. Using the same semi-annual data collected from DOU and the above modified HHI formula as specified in (8), the author repeated the calculations for each half-year period since January 2011, as seen in Figure 9 below.

Figure 9. Market concentration of the IT services industry in Ukraine, 2011-2018

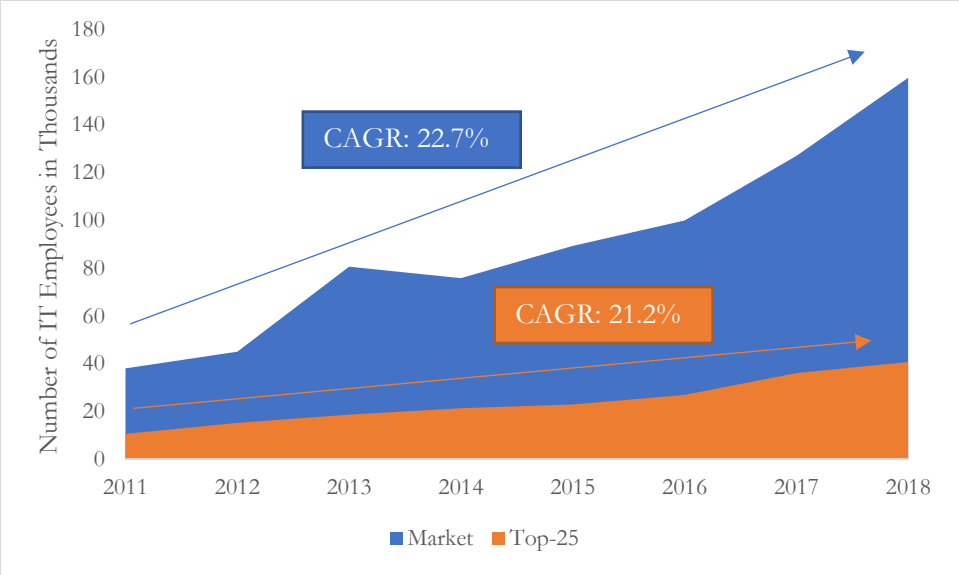



*Source*: author's calculations based on DOU.ua 2019b.

From the above figure, it is evident that the IT services market in Ukraine has been slowly becoming less concentrated. The market concentration has been decreasing at a CAGR of approximately 5% over the past seven years. Although HHI is an index based on sums of squares, the distribution is still linear. A market consisting of two firms each controlling 50% of the market has an HHI of 5000, while a market consisting of four firms each controlling 25% of the market has an HHI of 2500 or half the value of the market with two equal firms. If the market concentration is decreasing, that means that the largest firms are growing slower than the rest of the market combined. These results agree with the results from DOU which show that the overall IT market in

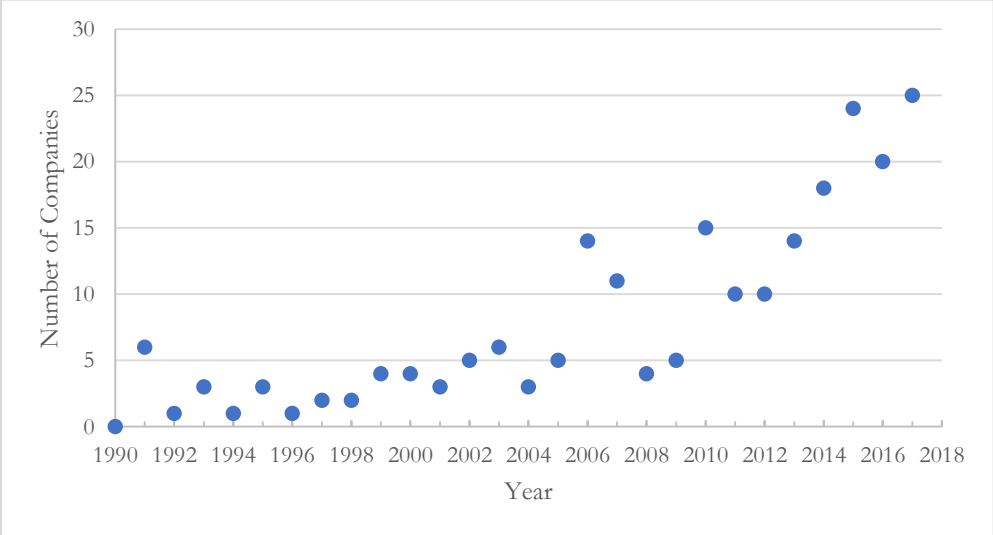
Ukraine is growing quicker (CAGR of 22.7%) than the top-25 companies (CAGR of 21.2%) as seen in Figure 10 below.

Figure 10. Growth of the market vs. 25 largest companies in Ukraine, 2011-2018




*Sources*: DOU.ua 2019b and author's calculations

Figure 11. Number of active companies in Ukraine by year founded, 1990–2017




*Source*: date founded according to Clutch.co 2019b

As seen in Figure 11, 25 firms entered the market in 2017 alone, and the number of new entrants is climbing with a CAGR of 20% over the last five years. This explains why the market concentration has been decreasing over the period analyzed. The market concentration will continue to decrease as more and more new firms enter the IT service market and together they grow more quickly than the largest firms. The amount of firms entering the market seems to be growing linearly, and competition between firms is already quite high, especially because of the shortage of developers (that will be discussed in the next section). Based on the above information, the author classifies the competitive rivalry as high.

### 2.5.2. Bargaining Power of Suppliers

The bargaining power of suppliers in the Ukrainian IT service industry is extremely low with one notable exception. Bargaining power of suppliers occurs when certain inputs for an industry are produced by very few supplying firms, therefore giving these supplying firms leverage to negotiate higher prices for their inputs into a specific industry. The inputs for the IT service industry in Ukraine differ very little from the inputs for the global IT service industry. The types of suppliers for this industry include computer hardware manufacturing companies such as Apple, HP, Dell, etc., integrated development environment (IDE) providers such as Microsoft and JetBrains, office space suppliers such as real estate companies and coworking space providers, local internet providers such as Kyivstar, Volia, etc., and lastly, the software developers and general staff hired by the firms.

Computer manufacturers have no bargaining power because the IT service industry does not require computers that are different from what is available on the consumer market, therefore the IT service industry benefits from the competitiveness of the consumer market. Furthermore, IDE providers, although they provide professional software that improve the efficiency of workflows in IT companies, do not have much bargaining power because of the number of free software alternatives to these more robust IDEs such as Atom, NetBeans, PyCharm, etc. Office space suppliers have little

bargaining power in Ukraine because of the abundance of office space. In Kyiv, office vacancy dropped from 6.8% to 4.9% during Q4 2018, however, another 100,000 sq. m of additional office space is scheduled for completion in 2019.[38] More centralized locations may be better for IT service firms from the perspective of worker commutes and business meeting locations, but most IT service firms do not require class-A, specially designed offices in high-end business centers—they can locate their companies in standard class B, standalone office buildings or even residential buildings zoned for office use if the size of the company allows. Internet providers— although their input is arguably the most important for IT service companies because almost all communication and services depend on high-speed, reliable internet—do not have bargaining power over IT service firms because the input is a widespread commodity in Ukraine and IT service firms do not require irregularly fast data speeds (e.g. 10 Gbps) to work efficiently. These suppliers collectively have very little bargaining power over ITO firms because of the high-standardization of inputs and a plethora of providers of the required inputs.

There is, however, one "supplier" that has considerable bargaining power over ITO firms: software developers that firms hire, either as full-time, salaried workers or as private entrepreneurs (PE's)—in Ukrainian: *fizychna osoba-pidpryyemets' (FOP)* [фізична особа-підприємець (ФОП)]. The reason that developers have bargaining power on IT service firms, in the form of demanding higher wages and better benefits (e.g. medical insurance, additional paid-time-off, etc.), is that the demand for new developers is increasing more quickly than the supply of new developers is increasing. Ukraine produces approximately new 23,000 IT specialists per year[39], but the overall IT industry in Ukraine—including product companies R&D centers for non-IT companies—grew by approximately 30,000 specialists in both 2017 and 2018 according to labor market

[38] Kostiuk 2019a.

[39] UNIT.City and Western NIS Enterprise Fund 2019.

reports from DOU and the author's calculations.[40] Even on a global scale, the technology (software) sector is the sector with the highest turnover rate—13.2% in 2018.[41] The lack of developers leads to cutthroat competition between IT firms looking to expand organically by hiring experienced developers from other IT firms. This is evident from DOU's 2019 developer survey which showed that 40% of respondents have worked in three or more companies while only 28% of respondents are 31 years of age or older.[42] From the same report, 78% of respondents said "Pay and bonuses" were important when choosing a job in IT, more than any other category; furthermore, in the fiscal year 2018, the median salary for software developers increased from 1500 USD to 1600 USD, or by 14.3%, while mean salary increased from 1744 USD to 1984 USD.[43] Considering the above factors, it is clear that the IT specialists—who drive business revenues in IT service firms—are the ones with bargaining power. Therefore, the author classifies the bargaining power of suppliers as high. Furthermore, the author will conduct analysis based on the growth rate of the IT market and the growth rate of the supply of IT specialists (roughly, the number of graduates of IT programs in Ukraine) to determine if this problem will worsen or improve.

### 2.5.3. Bargaining Power of Buyers

The bargaining power of buyers in the Ukrainian IT service industry is medium for most firms. The bargaining power of buyers depends most on the industry for which a firm provides most of its services. According to the 2018 CEE Software Development Report, some companies are very diversified in terms of the industries to which they provide services, while others provide services to only one industry. Ciklum, Exadel, DataArt, EPAM, Luxoft, SoftServe, Intellias, and N-iX were all described as

[40] DOU.ua 2018; author's calculations based on methods from DOU.ua 2018 and data from Voloshyn 2019.

[41] Booz 2018.

[42] DOU.ua 2019a.

[43] Author's calculations based on Voloshyn 2019.

"Diversified," while other companies such as CoreValue and OSF Global Services specialize in customer relationship management (CRM) consulting.[44] Therefore, the amount of buyer power for IT firms depends on the concentration of the industry in which they operate. Industries with fewer buyers, e.g. Telecommunications, will have much higher buyer bargaining power than industries with more buyers, e.g. Financial Services or CRM.

Another important factor in determining buyer bargaining power in the IT service industry in Ukraine is the costs associated with switching between different IT service firms. This is highly industry dependent; in industries with very specialized software, e.g. Telecommunications and Auto & Transport, switching costs are very high because the services provided in these firms cannot be provided by any IT service firm; they must be provided by a firm with expert knowledge in this specific industry. On the other hand, the financial services industry is more standardized and there are a plethora of various ITO firms serving this industry; therefore, buyers in this market have slightly more bargaining power as they can "shop around" for the lowest price on the services they are seeking.

Another factor affecting the amount of buyer bargaining power in the IT service industry in Ukraine is the size of the IT service firm. For example, EPAM, the largest IT service firm in Ukraine, has a customer base that includes 120 Fortune Global 2000 Customers[45] and does not have to accept deals that are too cheap considering its reputation and size. On the other hand, smaller, new companies with a small customer base trying desperately to make some revenue cannot necessarily reject potential clients that are offering less money than is expected.

The final factor affecting the amount of buyer bargaining power is the concentration of buyers by country. In 2018, over 30% of all ICT service exports from

[44] AVentures Capital et al. 2019.

[45] EPAM Systems, Inc. 2019a.

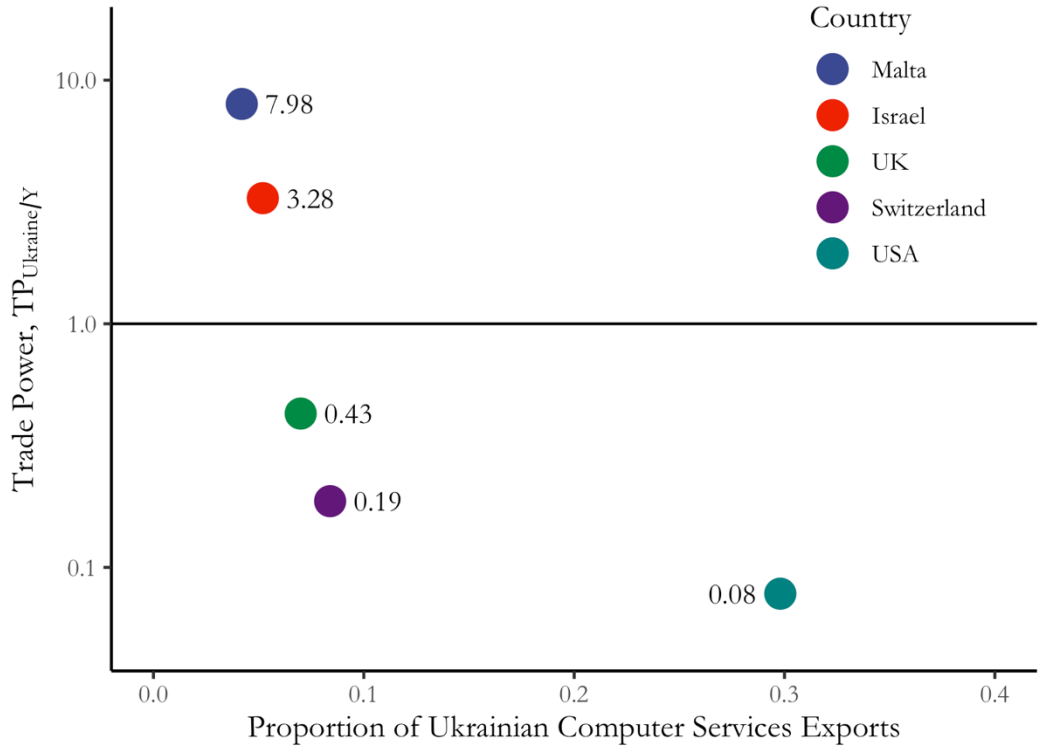
Ukraine went to the US, and over 50% went to only five destination countries.[46] Even though the Ukrainian IT services market is highly dependent on a few select countries, these countries are not necessarily dependent on IT service imports from Ukraine. A simple way to illustrate the bargaining power between countries trading services or goods is to then compare the amounts traded between the two countries to the amounts traded between all source and destination countries. In other words, if 50% of Ukraine's IT service exports go to the USA, but only 5% of all IT service imports to the USA come from Ukraine, then Ukraine does not have supplier power; indeed, the USA would have buyer bargaining power. To quantify this relationship, relative trade power (or bargaining power) can be described using (9),where $TP_{\frac{X}{Y}}$, the trade power of country $X$ over country $Y$, is the ratio of $\%IMP_{X\to Y}$, the percent of all imports to country $Y$ that come from country $X$, and $\%EXP_{X\to Y}$, the percentage of all exports from country $X$ that go to country $Y$.

$$TP_{\frac{X}{Y}} = \frac{\%IMP_{X\to Y}}{\%EXP_{X\to Y}} = \frac{IMP_{X\to Y}/IMP_X}{EXP_{X\to Y}/EXP_Y} \tag{9}$$

This coefficient has a logarithmic scale with a minimum and maximum value of 0 and positive infinity, respectively. In this ratio, a coefficient of one signifies that both countries have equal trade power, i.e. that each country is equally dependent on the other for the trade of a specified service or good. A coefficient of 10 represents that the exporting country—in this case, Ukraine—has 10 times more trade power than the country that is importing; likewise, a coefficient of 0.1 represents the opposite case, where the exporting country has 10 times less trade power than the country that is receiving the imports. The author calculated the trade power of Ukraine with respect to the largest five destination countries for Ukrainian IT service exports—the USA, the United Kingdom (UK), Switzerland, Malta, and Israel—as seen in Figure 12.

[46] Author's calculations based on State Statistics Service of Ukraine 2019a.

Figure 12. Trade power of Ukraine with the five largest importers of IT services, 2017




*Source*: author's calculations based on SSSU and data on individual countries[47]

According to Figure 12, the general trend is as follows: the higher the importance of a destination country (in terms of the proportion of Ukrainian IT service exports that go to said country), the less trade power that Ukraine has. For small countries like Malta and Israel, Ukraine has significant trade power ($TP$=7.98 and 3.28, respectively), while for the US, to which almost 30% of Ukrainian IT service exports went, the trade power is much smaller than one ($TP$=0.08), meaning that the US has significant trade power on the Ukrainian IT market. This is because IT service exports from Ukraine to the USA accounts for only approximately 2-3% of all IT services that the USA imports.[48] Furthermore, the percentage of Ukrainian IT exports that go to the USA has been

[47] State Statistics Service of Ukraine 2019a; International Monetary Fund 2019a, 2019b; Office for National Statistics 2018; Institut für Wirtschaftsstudien Basel 2018; Trade Map 2018.

[48] State Statistics Service of Ukraine 2019a; Trade Map 2018.

increasing at a CAGR of 9.5% from 2014 to 2018, showing that the Ukraine IT service market is becoming increasingly dependent on the USA as a customer while the dependence of the USA on IT imports from Ukraine remains low. Therefore, on a global scale, there is high buyer bargaining power in this industry.

Overall the buyer bargaining power in the IT services industry is medium. Smaller firms in niche markets face significantly higher buyer bargaining power than large firms in more generalized markets. Potential entrants should consider these factors when deciding which niche to enter. Also, the countries to which Ukraine exports IT services are highly concentrated, and increased tariffs on trade—e.g. to the USA, which has recently increased trade tariffs with the EU[49]—could increase the final cost of services from Ukraine and negatively impact the demand for IT services from Ukraine.

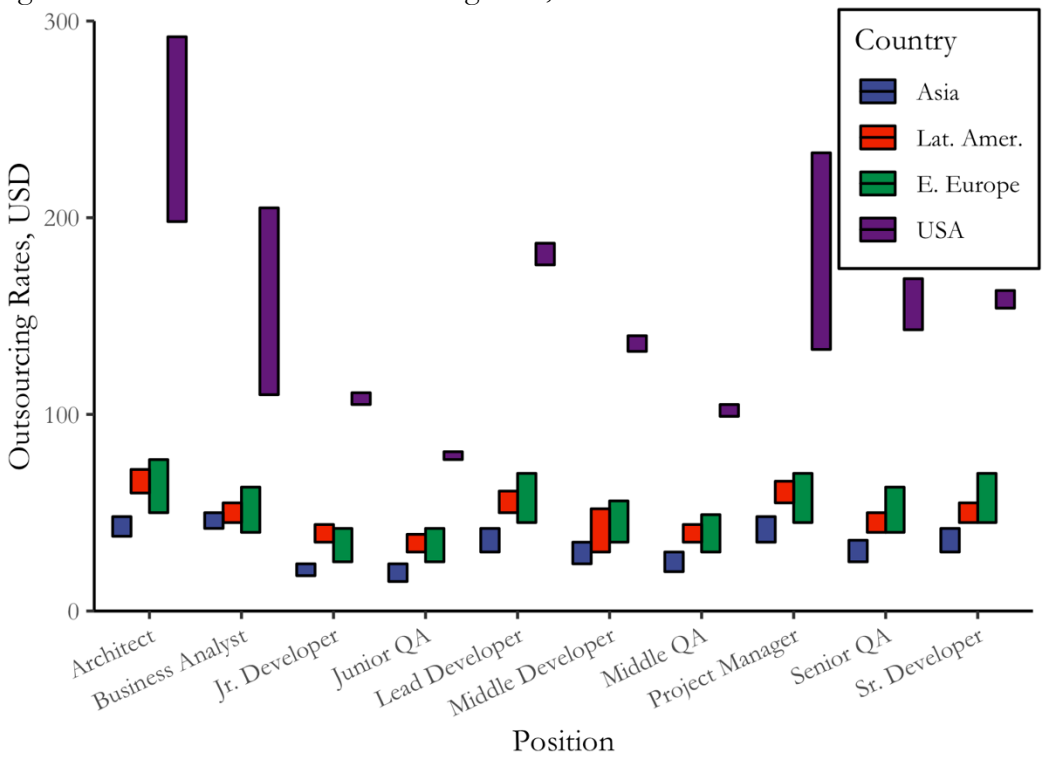
### 2.5.4. Threat of Substitution

To the fortune of firms in the ITO industry, both in Ukraine and around the globe, there are no perfect substitutes for the services provided by ITO firms. The only possible substitute is an onshore or in-house IT department. However, this may be extremely cost prohibitive because of the shortage of developers in North America, the largest customer of IT services,[50] and the high wages for developers in the USA. Figure 13 shows the large differences in wages, and thus, the cost of hiring, for developers from different countries.

[49] Nebehay 2019.

[50] AVentures Capital et al. 2019.

Figure 13. Global software outsourcing rates, 2018



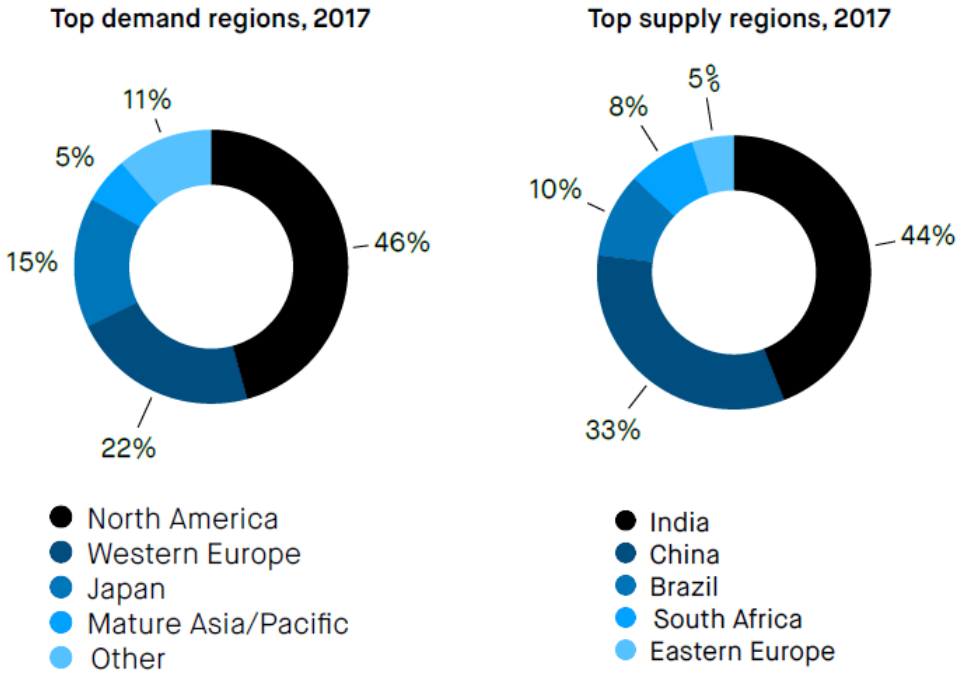

*Source*: adapted from Diceus[51]

Because the USA is the largest importer of Ukrainian IT services, it is meaningful to compare the costs of in-house and nearshore/offshore alternatives from the perspective of an employer in the USA. As seen in Figure 13, it is evident that in-house IT departments in the United States are quite costly, and it definitely cheaper (and may even be more effective because of freed up human capital in-house) to outsource IT work to firms that specialize in outsourcing such services. Therefore, in this sense, in-house IT departments are not a substitution threat to IT service companies. However, if we are speaking about threats to the IT service industry in Ukraine, it is apparent that outsourcing rates in Asia are lower than in Eastern Europe, and Latin America has outsourcing rates that are similar to Eastern Europe's. Eastern Europe supplies a small

[51] Kravchenko 2018.

portion of the IT services demanded globally. As seen below in Figure 14, India and China supplied more than 75% of the market in 2017, while Eastern Europe supplied only 5%. Considering outsourcing rates from Asia are cheaper, firms looking to outsource IT work do not choose Eastern European (including Ukrainian) IT service for the price alone. Ukrainian firms, to stay competitive, must supply services of higher quality than their Asian or Latin American counterparts.

Figure 14. Top supply and demand regions for software development services, 2017

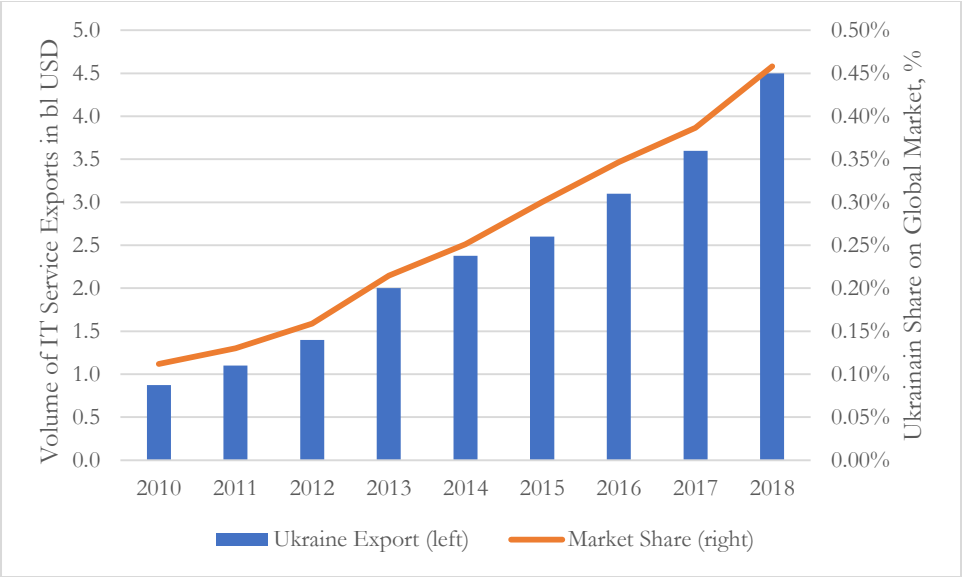



*Source*: reproduced from AVentures Capital et al. 2019 with permission

Despite the massive market share taken by China and India, Ukraine has been increasing its share in the global IT services market. According to the author's

calculations based on yearly reports from Gartner[52] and two Ukrainian sources,[53] Ukraine has been increasing its global market share at a CAGR of 19% as seen in Figure 15.

Figure 15. Volume of Ukrainian IT service exports and global market share, 2010–2018




*Source*: author's calculations based on multiple reports[54]

Considering the growth of Ukraine's share of IT service exports illustrated in Figure 15, it may be assumed that even though developer costs are significantly lower in Asia Pacific than in Ukraine, IT service firms in this region do not pose a large threat to the IT service industry in Ukraine. The remaining threats to Ukraine's IT service industry are IT service firms from neighboring countries, e.g. Poland, Romania, Belarus, and Russia, that can offer similar services at similar costs. However, the amount of services provided by Eastern Europe as a whole is minute compared to the global demand for IT services, thus these companies are not a significant threat. Considering the

[52] iEntry 2011; CMSWire 2012; TechCrunch 2013; Gartner 2014, 2015, 2016, 2017, 2018, 2019.

[53] AVentures Capital et al. 2019; UNIT.City and Western NIS Enterprise Fund 2019.

[54] iEntry 2011; CMSWire 2012; TechCrunch 2013; Gartner 2014, 2015, 2016, 2017, 2018, 2019; Ukraine Hi-Tech Initiative 2012; UNIT.City and Western NIS Enterprise Fund 2019.

aforementioned factors, the author asseses that the IT service industry in Ukraine has a low threat of substitution, be it onshore, in-house IT departments in North America and Western Europe or IT services firms from neighboring countries.

### 2.5.5. Threat of New Entry

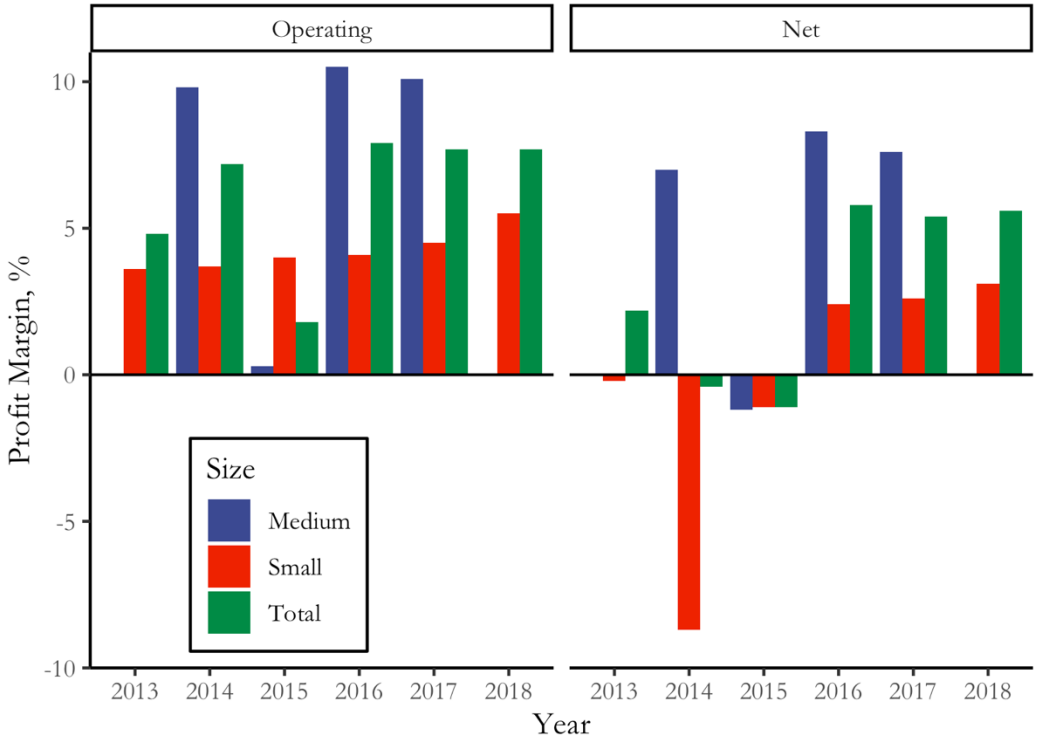
The Threat of New Entry in any market depends on three main characteristics of the market: monetary barriers to entry, legal barriers to entry, and profitability of the market (which is related to the concentration of the market). In Ukraine, there seem to be few monetary barriers to entry, encouraging many new firms to enter the market. The IT service market is interesting because the business model is dependent mainly on human capital, not physical capital, and thus the largest costs are variable costs, not fixed costs. As discussed in Sec. 2.5.2, Bargaining Power of Suppliers, the main inputs of the IT service business model are computer technology, programming software, office space, internet connection, and software engineers (and other staff). Because the largest costs in this industry are variable costs, the monetary cost of entering the market is low. Some IT companies even hire developers who work from home on their personal computers, and many software programming suites are freeware, lowering the variable costs for new entrants as well.

Currently, the legal costs of starting a business in Ukraine are also low. For example, Ukrainian nationals and foreigners can become a PE, the most common business structure for small IT companies, for free or for a small fee through administrative companies that help with the process. This form of company has a simplified tax system that reduces the tax burden on small and medium enterprises (SME's). For PE's of the third group—the maximum annual revenue for which is 5 Mil. UAH (approximately 200,000 USD)—operating under the simplified tax regime, there is no separate income tax (usually 18%), military tax (1.5%), value-added tax (VAT) in some cases (20% of cost of goods purchased), or regular social-security tax (918 UAH, or approx. 37 USD, instead of the usual 22% of profit up to 13,770 UAH, or approx. 555 USD)—instead, PE's of the third group pay a unified tax of only 5% of income, a large

tax relief compared to the 18% tax on income alone.[55] Both Ukrainians nationals and foreigners both can create this form of company, thus the legal barriers to entry are low.

Finally, the profitably of the market affects the number of new entrants. Markets with large profit margins are attractive to new entrants. On the other hand, markets that are not profitable or have small profit margins are not as attractive to new entrants because it is harder to enter the market and steal market share will still turning a profit. Figure 16 illustrates the operating profit margins (the ratio of operating profit and revenue) and net profit margins (the ratio of net income and revenue) for all computer service firms in Ukraine from 2013 to 2018.

Figure 16. Profit margins for computer service companies in Ukraine, 2013-2018




*Source*: State Statistics Service of Ukraine 2019d

[55] Contact Ukraine 2019.

From Figure 16, it is clear that 2014 and 2015 were difficult years financially for the IT service market. Despite this, the market as a whole has had an operating profit margin of approximately 7.8% from 2016 to 2018, and a net operating profit margin of approximately 5.5%. Historically, in almost every year with data for both small- and medium-sized companies (the SSSU sometimes publishes incomplete information, denoted by a Cyrillic "к" (*к*) to protect the financial confidentiality of private companies), medium-sized companies had higher profit margins. Moreover, for small companies, the operating profit margin has been increasing slightly over the past six years; for the market as a whole, the operating profit margin has both increased and decreased over the same period, so the trend is not clear. What is clear is non-zero profit margins in the IT services market, and this will continue to attract new firms.

In summary, the monetary barriers for new IT firms entering the market are low, as are the legal barriers. However, the current shortage of software engineers makes it hard for new firms to find new employees; therefore, the author is classifying the overall threat of new entry as medium.

## 2.6 Predicting Market Growth

### 2.6.1 Limiting Factors

Throughout much of this paper, there has been the reoccurring theme that the IT services market in Ukraine may be growing at an unsustainable rate. Through researching the factors that could soon bottleneck market growth—available office space, excess wage growth, access to foreign investment, demand for Ukrainian IT services, and supply of software engineers—the author has hypothesized that the factor most likely to limit the growth of the market is the supply of software engineers. This hypothesis can be checked by utilizing the open data that is available from the SSSU regarding academic enrollment by academic specialty paired with the employment estimates obtained using DOU's methodology discussed in Sec. 2.3.3.

To estimate the number of new IT specialists added to the supply of developers each year, the author summed the number of graduates of IT programs at the bachelor's,

specialist (this level was canceled in 2016 by a law signed in 2014[56]), and master's levels. Ukraine reorganized the structure of its degrees in 2015, therefore the author counted the graduates of programs that belonged to the "Information Technology" branch (department code: 12) according to the 2015 list,[57] and graduates of programs that belonged to the "Computer Science and Computer Engineering" branch (department code: 0501) according to the pre-2015 lists.[58] The author decided not to include graduates of the "junior specialist" level (or *molodshyi spetsialist* [молодший спеціаліст] in Ukrainian), because according to the author's calculations based on the DOU salary surveys,[59] junior specialist was the highest level of education completed by only 3% of new IT specialists (those with less than one year of total experience). Figure 17 compares the number of new grads to the annual change in the number of IT specialists.

Figure 17 illustrates that the number of IT specialists in the IT services market drastically increased in 2013, decreased in 2014, and has increased—although not always at an increasing amount—every year since 2015. Since 2014, the number of new IT specialists every year has been greater than the number of graduates. This difference can be explained by specialists with IT backgrounds who did not work in the IT services market but then switched into the IT services market. However, the number of IT specialists in other markets is finite, thus at some point in time, the growth of the market will be nearly limited to the number of new IT graduates each year. The decrease in the number of new specialists in the IT services market in 2019 could be evidence that this point will be reached soon.

Figure 17 further shows that since 2014, the number of graduates of IT programs has increased from 10,515 to 13,594, which is a CAGR of 6.6%. Because of the high salaries and general popularity of the IT industry in Ukraine, the author expected the

[56] Verkhovna Rada of Ukraine 2014.

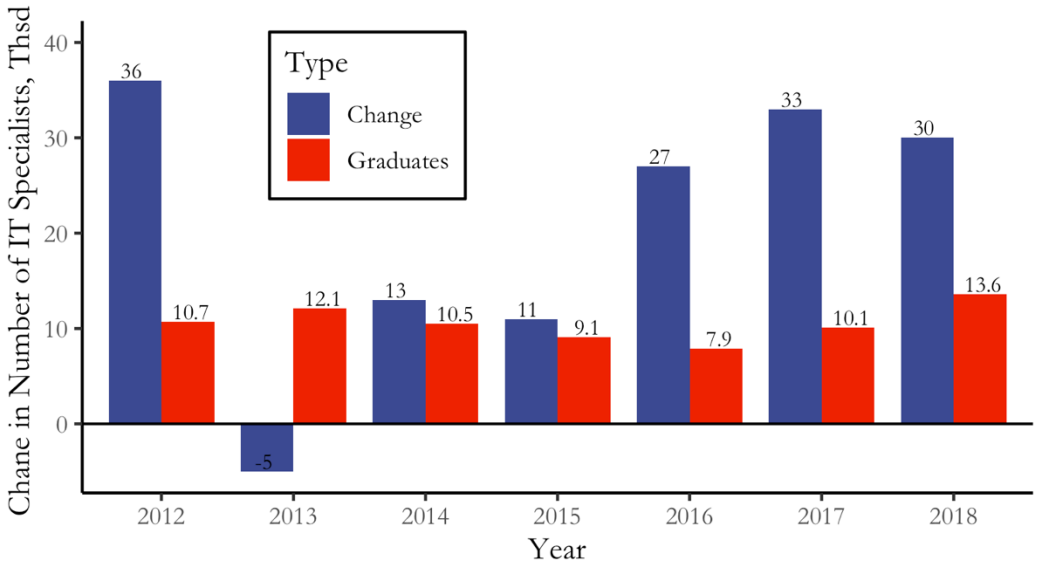
[57] Verkhovna Rada of Ukraine 2015a.

[58] Verkhovna Rada of Ukraine 2015b, 2015c.

[59] Voloshyn 2019.

growth of the number of graduates of IT programs to be faster. According to the author's calculations based on the aforementioned educational data, in 2014, 3.7% of all students who began studying at the bachelor's level chose academic majors in the IT branch, while in 2018, this number was 8.4%, meaning that IT was more than twice as prevalent among new bachelor's students. Thus, slow growth is not due to the unpopularity of the IT industry; instead, it is due to the historically declining number of students in Ukraine.

Figure 17. Growth of employment in the IT services market vs. IT Graduates, 2012–2018



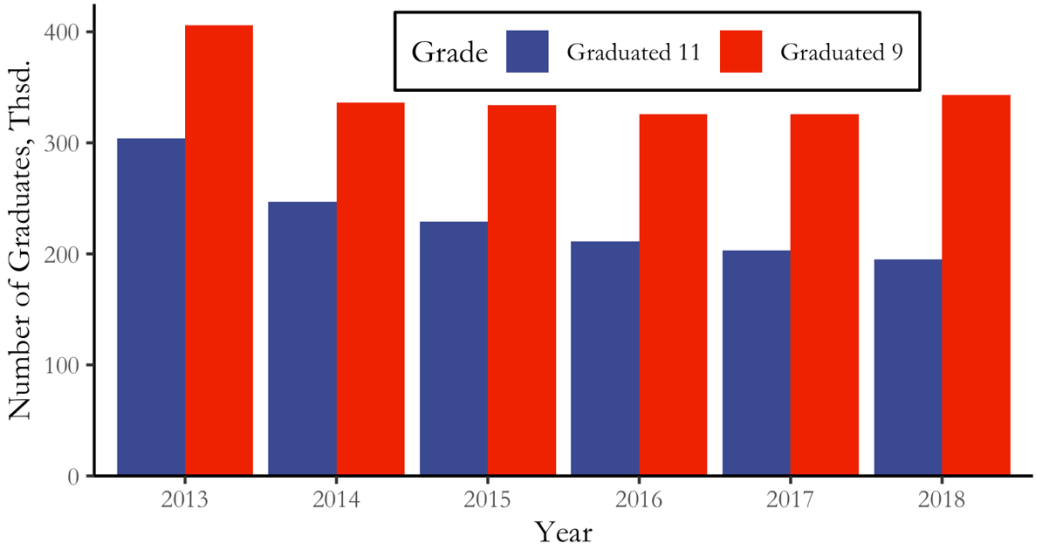

*Sources*: author's calculations based on surveys and educational data from the SSSU[60]

Ultimately, the number of IT graduates is limited by the number of students who enroll in universities (four years prior, if referring to bachelor's programs). Likewise, the number of students who enroll in universities is limited by the number of students who graduate from secondary school, and this number is limited by the number of students who are enrolled in secondary school overall. Figure 18 shows the change in the number of students who finished 11th and 9th grades (or *klas* [клас] in Ukrainian) from 2013 to

[60] Voloshyn 2019; State Statistics Service of Ukraine 2019c, 2018b, 2017b, 2016b, 2015b, 2014b, 2013.

2018 based on primary and secondary school data from the SSSU. There is an obvious drop in the number of graduates from both 11th and 9th grades in 2014, perhaps due to the occupied territories of Crimea and parts of Donetsk and Luhansk regions not being counted from 2014 onward. Moreover, even after 2014, the number of students graduating from 11th grade has been decreasing with a CAGR of -8% from 2013 to 2018. This decrease in the number of graduates from 11th grade has, in turn, caused a decrease in the number of new students enrolling in universities during the same period.

Figure 18. Graduates of 11th and 9th Grades in Ukraine, 2013–2018




*Sources*: State Statistics Service of Ukraine 2019b, 2018a, 2017a, 2016a, 2015a, 2014a

2.6.2. Labor Market Prediction

Holding the hypothesis that the number of graduates from secondary school is affecting university enrollment and ultimately the number of graduates from universities, the author sought to predict the number of students who will graduates from 11th grade over the next five years. To do this, the author gathered data from the SSSU on the number of students per grade, i.e. the number in 11th, 10th, 9th, 8th grades, etc., for 2012 through 2018, and then calculated the average completion rate of each. The completion rate of 10th grade and the proportion of students who study past 9th grade have been

increasing, so the author used the most recent (max) value. Then, the author forecasted the number of students in each proceeding class for 2019 through 2023 based on the actual values from 2018 and the calculated or predicted completion rates for each class as seen in Table 2.

Table 2. Number of students (in thous.) in Ukraine, by grade and year, 2016-2023F

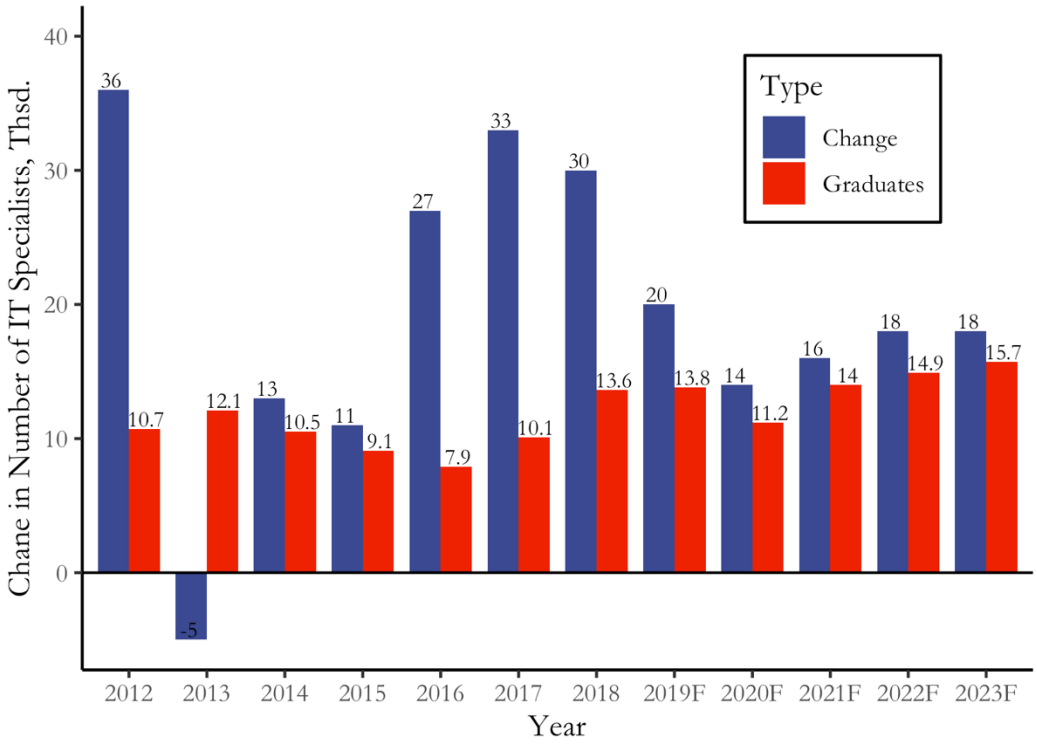
| Grade | 2016 | 2017 | 2018 | 2019F | 2020F | 2021F | 2022F | 2023F |
|---|---|---|---|---|---|---|---|---|
| **1** | 425 | 425 | 455 | - | - | - | - | - |
| **2** | 341 | 422 | 423 | 452 | - | - | - | - |
| **3** | 402 | 429 | 420 | 420 | 450 | - | - | - |
| **4** | 386 | 401 | 427 | 418 | 419 | 448 | - | - |
| **5** | 370 | 385 | 400 | 426 | 416 | 417 | 446 | - |
| **6** | 347 | 368 | 383 | 398 | 423 | 414 | 415 | 444 |
| **7** | 353 | 346 | 367 | 382 | 396 | 422 | 413 | 413 |
| **8** | 345 | 351 | 344 | 365 | 380 | 394 | 420 | 411 |
| **9** | 326 | 343 | 350 | 342 | 363 | 378 | 392 | 418 |
| **Grad. 9** | 326 | 326 | 343 | 350 | 342 | 363 | 378 | 392 |
| **10** | 192 | 193 | 217 | 221 | 216 | 229 | 239 | 247 |
| **11** | 192 | 185 | 188 | 211 | 214 | 210 | 223 | 232 |
| **Grad. 11** | 201 | 194 | 187 | 189 | 212 | 216 | 212 | 224 |

*Sources*: SSSU 2019b, 2018a, 2017a, and author's calculations for 2019F–2023F

Following this, the author then used data on the above predicted number of graduates from 11th grade for 2019–2023, the historic enrollment rate from 11th grade to the university level (nearly 100%), the rate at which new students choose IT programs, the number of new bachelor's and master's students, and the historic graduate rate from bachelor's (92%) and master's (100%) to predict the total number of graduates from IT programs for 2019–2023. Furthermore, based on analysis of the data from the DOU salary surveys, the author discovered that approximately 10% of new IT specialists were graduates not of bachelor's or master's programs, but other categories such as only

secondary school, two-year college/vocational school, or doctorate programs. Therefore, the author then increased the number of predicted new IT specialists by this amount. Lastly, the IT services market is acquiring workers from other markets (at a decreasing rate over the last three years), so the author further increased the predicted amounts by 20%, 10%, 5%, 5%, and 5% for the years beginning with 2019–2023, respectively.

Figure 19. Growth of employment in the IT services market vs. IT graduates, 2012–2023F




*Sources*: author's calculations based on surveys and educational data from the SSSU[61]

Figure 19 shows the growth of employment in the IT services market versus the number of new IT graduates including the predictions made for 2019–2023. As seen in the figure, the author has predicted, using the methodology described above, that the number of graduates in 2019 will increase slightly, will decrease in 2020 (for the first time

[61] Voloshyn 2019; State Statistics Service of Ukraine 2019c, 2018b, 2017b, 2016b, 2015b, 2014b, 2013.

in four years)—mainly because of the low number of new bachelor's students in 2014 and 2015 (35,574 and 37,125, respectively), compared the past several years (53,002 in 2018)—and then grow at a CAGR of 12% from 2020 to 2023. Furthermore, the author predicts that the number of new IT specialists will decrease in 2019 and 2020—i.e. the total number will grow, but by a decreasing amount—grow in 2021 and 2022, and grow slightly or not at all in 2023. Through this analysis, the author has therefore determined that the largest limiting factor for the IT services market is the lack of human capital in the form of qualified IT specialists.

### 2.6.3. Market Revenue Prediction

As seen in the previous section, the author predicted that the amount by which the size of the IT services market will increase—in terms of the number of employees—will be significantly lower for 2019–2023. The question that remains is: how will this limit in human capital affect the operations of the market, and, more specifically, the annual revenue? To predict the future market revenue in light of this finding, the author decided to use an OLS regression to estimate the annual revenue of the Ukrainian IT services market as a function of the number of specialists employed in the market. The author argues that the IT services market is characterized by a Leontief production function in which $q_n$, the output of firm $n$, is the minimum of $a_n K_n$ and $b_n L_n$, where $K_n$ and $L_n$ are the units of physical capital and labor (human capital), and $a_n$ and $b_n$ are the coefficient of production of capital and labor, respectively, as seen in (10).

$$q_n = \min(a_n K_n, b_n L_n) \tag{10}$$

There is no shortage of physical capital (e.g. computers and office/working space) in the given industry, and the costs of physical capital are small compared to those of human capital, therefore the author assumes that firms will be limited by human capital, not physical capital, reducing (10) to (11).

$$q_n = \min(a_n K_n) = a_n K_n \tag{11}$$

Moreover, the output of the market as a whole is merely the sum of the firms, as seen in (12), where $\bar{a}$ is the weighted mean of the coefficient of production of labor and $K_{market}$ is the number of IT specialists in the market.

$$Q = \sum_{i=0}^{n} q_i = \sum_{i=0}^{n} a_i K_i = \bar{a} \sum_{i=0}^{n} K_i = \bar{a} K_{market} \quad (12)$$

Equation (13) is the log transform of (12), and (14) is the estimated form of (13) where $\beta_0$ is the intercept, $\beta_1$ is the return to scale on the number of workers (and we expect this coefficient to be one).

$$\log(Q) = \log(\bar{a} K_{market}) = \log(\bar{a}) + \log(K_{market}) \quad (13)$$

$$\log(Q_i) = \beta_0 + \beta_1 \log\left(K_{market_i}\right) + \epsilon_i \quad (14)$$

The results from this regression are listed below in Table 3. The regression has an $R^2$ value of 0.9721, an adjusted $R^2$ of 0.9674, a residual standard error of 0.09243 and an overall p-value of 6.881e-06. The interpretation of the output is as follows: a 1% increase in the number of IT specialists corresponds with a 1.04% increase in the annual revenue, and the overall coefficient of production of labor, $\bar{a}$, or annual revenue per employee, is equal to exp(2.75308) or 15.69089 (thous. USD). It thus follows that the monthly revenue per employee is 1,307 USD. Also, performing a coefficient test with the null hypothesis, $H_0: \beta_1 = 1$, and the alternate hypothesis, $H_1: \beta \neq 1$, results in a p-value of 0.2942294, meaning that we cannot reject the null hypothesis that $\beta_1 = 1$ (which aligns with our assumptions and expectations).

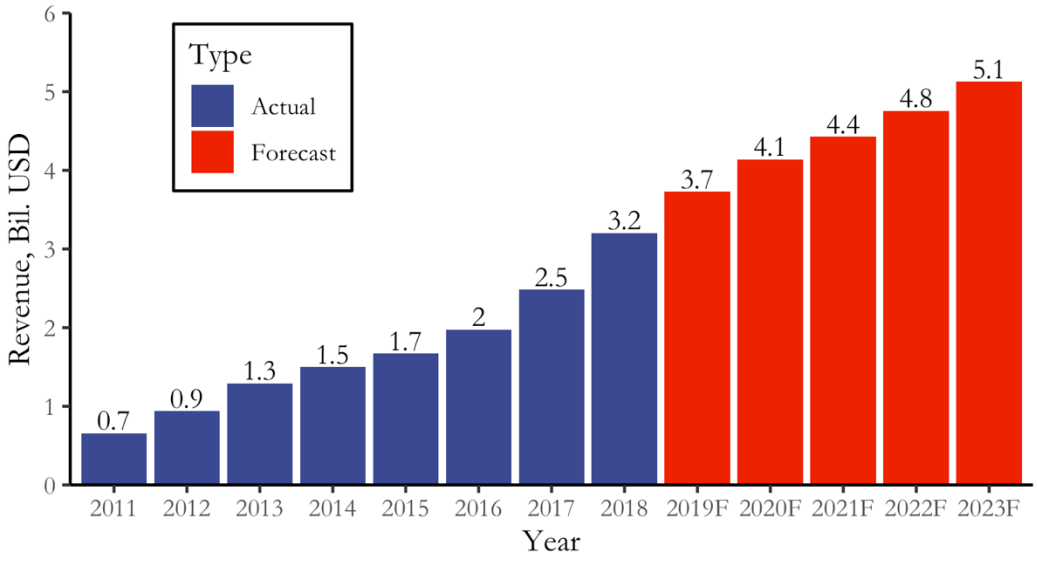
Table 3. Market revenue regression output

| Variable | Estimate | Std. error | p. value |
|---|---|---|---|
| Intercept | 2.75308 | 0.31899 | 0.000133 |
| $\log(K_{market})$ | 1.04263 | 0.07215 | 0.000007 |

With the market regression complete, the author then predicts the annual market revenue for 2019–2023 using the above regression specification and the predicted

employment amounts (based on the analysis completed in Sec. 2.6.2., Labor Market Prediction) for 2019–2023, as seen in Figure 20.

Figure 20. Annual revenue of Ukrainian IT services market, 2011–2023F



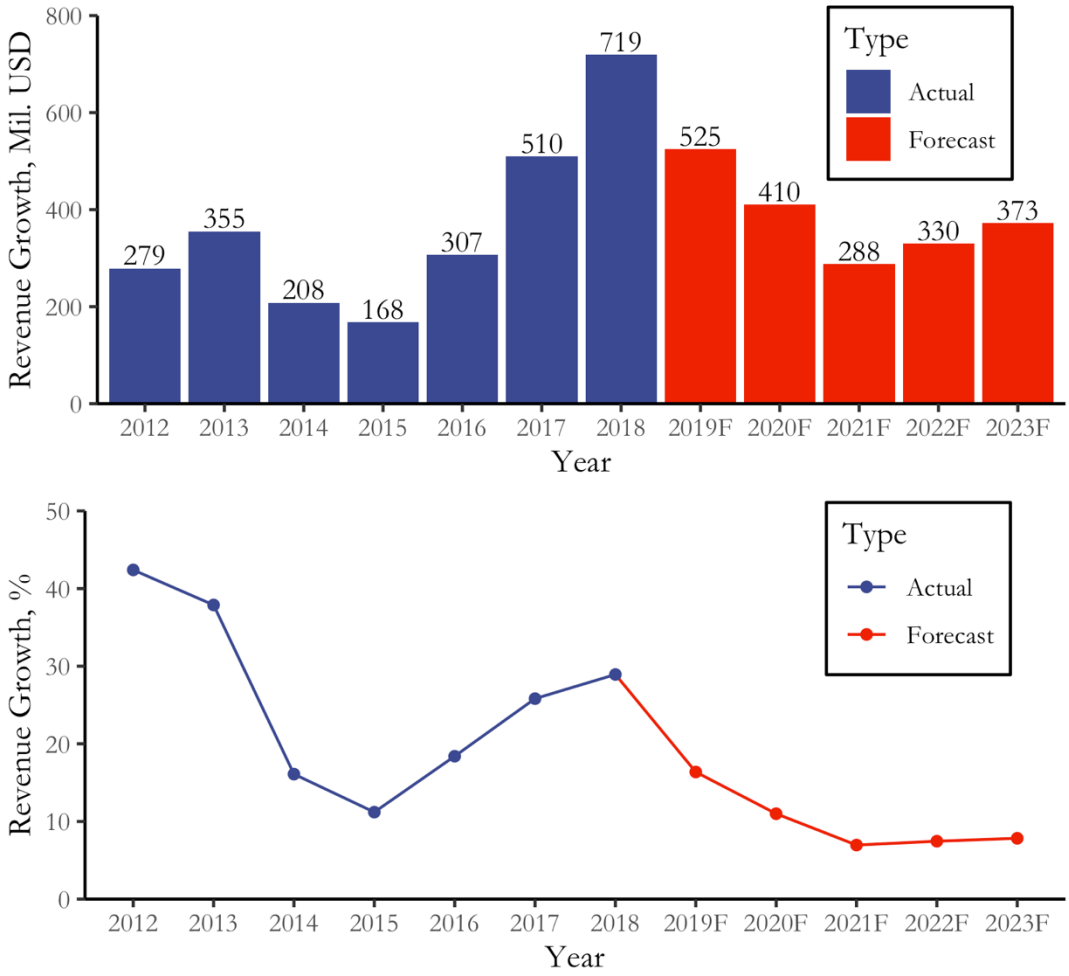

*Sources*: National Bank of Ukraine 2019 (actual) and author's calculations based on regression (forecast)

Based on the regression results, and as illustrated in Figure 20, the author predicts that the Ukrainian IT services market will continue to grow. Despite the shortage of human capital, the author predicts that the market will grow at a CAGR of 9.8% over the next five years, much slower than the rate often quoted in tech reports. From this figure, it may not be immediately apparent that the growth is going to be slow down over the next several years. Figure 21, which illustrates the changes, not the levels, makes this trend clearer.

According to the author's predictions, the change in annual revenue will decrease in 2019, 2020, and 2021, to the lowest level that will be recorded in the period from 2012 to 2021F. Then, the change in annual revenue will increase to 7-8% in 2022 and 2023. Therefore, through the employee-level analysis, the author found that the market is not likely to grow at 20% YOY because of human capital shortages; instead, it is more likely

to grow at a CAGR of approximately 10% over the period 2019–2023. Large companies can grow quickly by acquiring smaller firms, but this sort of growth is not organic, and it does not represent growth of the actual market, but instead a transfer of market share.

Figure 21. Change in annual revenue of Ukrainian IT services market, 2011–2023F




*Sources*: author's calculations based on National Bank of Ukraine 2019 (actual) and author's calculations based on regression (forecast)

# CHAPTER 3. CONCLUSIONS AND RECOMMENDATIONS

## 3.1. Five-Forces Conclusion

As stated at the beginning of this paper, the main purposes were to answer the following questions: Does the competitive landscape of the market allow for new entrants? Will the market continue to grow at 20% or more year over year (y-o-y)? What are the largest factors limiting the growth of the IT services market? What can the potential investor do to support the growth of this market? The Five-Forces analysis addresses the first and third questions. The findings from the Five-Forces analysis for the IT services industry in Ukraine are summarized below in Table 4.

Table 4. Summary of five forces analysis for the Ukrainian IT services industry

| Force | Level | Explanation |
|---|---|---|
| Industry Rivalry | High | In 2018 the Ukrainian IT services industry had an HHI (market concentration) of 790—HHI less than 1,500 is considered competitive. Using the labor market approach, the market had an HHI of 835 in 2018. Also, market concentration has been decreasing at a CAGR of 5% over the last seven years. |
| Bargaining Power of Suppliers | High | Suppliers of non-human inputs such as computers, programming environments (software), office space, and internet/mobile connections do not have bargaining power because the goods/services they supply to the IT service industry are not highly differentiated. However, software engineers—the most important input—have high bargaining power because there is a growing shortage of software engineers in Ukraine. |
| Bargaining Power of Buyers | Medium | Some IT service firms operate in highly concentrated markets with few buyers, e.g. Telecommunications, thus these buyers have significant bargaining power. Firms operating in less concentrated markets, e.g. e-commerce and financial services, face less buyer bargaining power. Finally, on a global level, around 30% of Ukraine's IT exports go to the USA alone, and this proportion has been increasing with a CAGR of 9.5% from 2014 to 2018. This concentration can be damaging if the US adds more tariffs to its imports. |

Table 4—Continued

| | | |
|---|---|---|
| Threat of Substitution | Low | In-house IT departments are cost-prohibitive, so many US and Western European firms outsource IT work to IT service companies. Outsourcing rates in Asia are lower than in E. Europe, and the rates in Latin America are similar to those in E. Europe; however, the demand for Ukrainian and Eastern European IT services, in general, are still increasing because the amount of services provided from E. Europe is minuscule compared to the global demand. |
| Threat of Entry | Medium | The IT services industry has few to no monetary barriers to entry. Legal barriers to entry are also small or non-existent, even for foreigners. Moreover, SME's in the IT service market benefit from the simplified tax regime, allowing them to pay fewer taxes. The overall market had operating and net profit margins of approximately 7.8% and 5.5%, respectively, in 2016, 2017, and 2018. |

Based on the five-forces analysis completed, the author found that the industry rivalry is high, the bargaining power of suppliers is high, the bargaining power of buyers is medium, the threat of entry is medium, and the threat of substitution is low. Based on these findings, the author predicts that new firms will continue to enter the market at a high rate, decreasing market concentration even further. Further, the author discovered that the largest limiting factor is most likely the shortage of human capital.

### 3.2. Predictions

As stated in Sec. 2.6.3., Market Revenue Prediction, the author predicts that the market will not continue to grow at 20% or more YOY as stated in some tech reports. Over the past two years, the annual revenue grew by more than 20% each year; however, the lack of new IT graduates will bottleneck the growth of annual revenues, leading the market to grow at a lower rate of around 10% (CAGR) over the next five years.

Several inputs could be flawed and may affect the validity of the predictions. The model the author used to predict future market growth relies on three indicators: the official export value of the computer services industry as reported by the NBU, the estimated employee accounts based on DOU's semi-annual salary surveys, and the

amount of IT graduates each year at the bachelor's, specialist, and master's levels. The possible issues with each input are discussed below.

First, the amount of IT graduates each year is official data from the SSSU, however, the author relies on the assumption that all graduates of IT programs go to work in the IT industry, and very few or no graduates from other academic programs go to work as IT specialists in the same industry. While this assumption seems reasonable, significant amounts of IT specialists may come from other academic branches such as mathematics or engineering. Based on the current survey data available from DOU, there is no way to test this assumption further. Moreover, Ukraine reorganized the structure of its academic programs (perhaps to match changes in technology and trends), therefore the author had to match the types of academic programs as closely as possible and manually aggregate the data for both the old and new format. There is also the possibility that the author miscopied some information, but any differences are likely minor.

Second, the estimates for the number of IT specialists that are used in this study are calculated using DOU's methodology based on the number of respondents that answer that they work in companies with more than 1,000 employees and the number of IT specialists that work in companies with more than 1,000 employees. For this data to be reasonable, the survey needs to representative of the entire IT population. The most recent survey—conducted in June and July of 2019—recorded around 10,000 responses, or more than 5% of specialists working in the IT industry. However, this survey is not conducted randomly (it is hosted on DOU's website and anyone with an account can respond), therefore the responses may be skewed. Dou publishes these estimates every year in December in an article called "Labor Market," based on responses from the salary survey conducted in the summer of that year.[62] DOU has not completed the labor market report for the year 2019, but the salary data is already available, therefore the author estimates the total using the above methods.

[62] DOU.ua 2018.

Third, the revenues used in estimating the regression model come from the NBU. Specifically, this information is published in the balance of payments reports, in which "credit" signifies exports (sending services and receiving money) and "debit" signifies imports (receiving services and sending money).[63] from these reports, the author used the values for credits from the "computer services" which is in the "telecommunications, computer, and information services." It is the author's position that the IT services market most closely aligns with this specific category. IT Ukraine Association has argued that the NBU figure underestimates the true value of exports from the IT services market because revenue received from "consulting, business process analysis and other types of non-transferring services" get included in a column titled "other services."[64] However, the author was not able to find information supporting or refuting this claim. If the figures from the NBU are understated but consistently understated, then the findings of this report are unchanged. If, however, it can be shown that the NBU's figures are becoming significantly more and more inaccurate, then it could discredit these results.

In light of the possible inconsistencies or inaccuracies in the data used as inputs in the regression, the author crosschecked as many sources as possible to improve the quality of the model. However, the author was not able to find any other sources that would improve the reliability of the model. The single source that is not a government source is DOU. If DOU adds additional questions to their surveys such as "is this your first year working in an IT service company?" And "what was your academic major (specialty)?" Then fewer assumptions will be required and the model will be more reliably. However, even without these additions, the author is still confident in the model and the predictions for the market based on the model.

[63] National Bank of Ukraine 2019.

[64] IT Ukraine Association 2018b.

### 3.3. Recommendations

In conclusion, the author has determined that new firms will continue to enter the market, but that the market will not grow at 20% YOY because of the shortage of human capital. The last question remains, then, what can the potential investor do to support the growth of the market? Currently, investors can support the market by attempting to increase the number of qualified IT specialists. This number will continue to increase with time, albeit slowly, as the popularity of IT increases among young students that have yet to choose their future profession.

Being that this is a human capital problem, foreign investment can only be so effective. One of the reasons for this human capital problem is that after the fall of the Soviet Union, the population of Ukraine began decreasing. The population of young people has increased since then, but the university level population is still recovering. A way to solve the human capital problem then is to increase the opportunities for young students to become interested in IT and to incentivize them to become involved in IT. Currently, approximately 10% of students choose IT as their specialty, but this can increase. To increase the opportunities for young students, the Ukrainian government should increase spending on IT programs and equipment (basic computers) in schools throughout the country. The high wages (relative to the nation-wide median wage) in IT should be a large enough incentive to attract more students to IT.

The above approach will be effective over time, but it is not immediate. A quicker, but costlier, way to increase the number of IT specialists is for the government or private companies to fund more crash-course IT schools in which people with or without higher education can acquire the skills necessary to work as a junior software engineer quickly, perhaps in a year or less. Some tuition-free schools exist, but they are not well known or able to support the number of IT specialists Ukraine needs to meet the demands of the market.

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# APPENDIX

Table 5. Predicted annual revenues and market share, FY2018

| Company | Revenue (Thsd. USD) | Market Share |
|---|---|---|
| EPAM Systems | 402119 | 18.59 |
| Luxoft | 275555 | 12.74 |
| Ciklum | 184393 | 8.52 |
| Global Logic | 174529 | 8.07 |
| SoftServe | 145589 | 6.73 |
| Infopulse | 136918 | 6.33 |
| Netcracker | 87138 | 4.03 |
| DataArt | 61884 | 2.86 |
| ISD | 50141 | 2.32 |
| ELEKS | 48535 | 2.24 |
| Zone3000 | 48019 | 2.22 |
| Intellias | 38385 | 1.77 |
| NIX solutions | 35949 | 1.66 |
| Sigma Software | 33254 | 1.54 |
| Miratech | 28150 | 1.30 |
| Daxx | 24727 | 1.14 |
| N-iX | 23571 | 1.09 |
| Smile Open Source Solutions | 19563 | 0.90 |
| Itera | 18600 | 0.86 |
| Intetics | 18023 | 0.83 |
| Lohika | 16870 | 0.78 |
| TEAM International | 15954 | 0.74 |
| SiteCore | 15370 | 0.71 |
| Star | 13810 | 0.64 |
| Svitla Systems | 12302 | 0.57 |
| Exadel | 11806 | 0.55 |
| AMC Bridge | 11703 | 0.54 |
| Softengi | 10608 | 0.49 |
| Akvelon | 9356 | 0.43 |
| Provectus | 9342 | 0.43 |
| Innovecs | 9208 | 0.43 |
| Core Value Inc. | 9100 | 0.42 |
| AltexSoft | 7673 | 0.35 |
| OSF Global | 6875 | 0.32 |

| | | |
|---|---|---|
| VERNA | 6511 | 0.30 |
| BMS Consulting | 6449 | 0.30 |
| Program-Ace | 6338 | 0.29 |
| OnApp | 6292 | 0.29 |
| Light IT | 6189 | 0.29 |
| Abto Software | 6094 | 0.28 |
| Perfectial | 5855 | 0.27 |
| Intersog | 5472 | 0.25 |
| AppliKey Solutions | 5308 | 0.25 |
| Anuitex | 4824 | 0.22 |
| Softjourn | 4632 | 0.21 |
| PLVision | 4379 | 0.20 |
| Eastern Peak | 4300 | 0.20 |
| Telesens | 4185 | 0.19 |
| FreshCode | 4166 | 0.19 |
| MassMedia Group | 3719 | 0.17 |
| The APP Solutions | 3687 | 0.17 |
| Jevera | 3678 | 0.17 |
| "IT Specialist", LLC | 3235 | 0.15 |
| TechMagic | 3165 | 0.15 |
| WebbyLab | 3102 | 0.14 |
| InDevLab | 2995 | 0.14 |
| Vakoms | 2932 | 0.14 |
| Sloboda Studio | 2669 | 0.12 |
| Opinov8 Technology Services | 2668 | 0.12 |
| Ascendix Technologies | 2661 | 0.12 |
| JetSoftPro | 2565 | 0.12 |
| EDENLAB | 2404 | 0.11 |
| IT Svit | 2373 | 0.11 |
| Leobit | 2306 | 0.11 |
| Binary Studio | 2291 | 0.11 |
| Leadium | 2287 | 0.11 |
| Jelvix | 2222 | 0.10 |
| LineUp | 2093 | 0.10 |
| V.I.TECH | 1814 | 0.08 |
| Newfire Partners | 1654 | 0.08 |
| Volo | 1330 | 0.06 |
| X1 Group | 1239 | 0.06 |
| V-JET GROUP | 1082 | 0.05 |

| | | |
|---|---|---|
| Qwerty.Software | 1057 | 0.05 |
| Intent Solutions Group | 958 | 0.04 |
| Dressler Consulting | 899 | 0.04 |
| Belkins | 888 | 0.04 |
| 2021.AI | 833 | 0.04 |
| Scalors GmbH | 760 | 0.04 |
| Hacken Hub | 755 | 0.03 |
| GNC Consulting | 658 | 0.03 |
| INAP | 578 | 0.03 |