# ARMENIAN ICT SECTOR

## STATE OF INDUSTRY REPORT

# ARMENIAN ICT SECTOR

# 2018

## STATE OF THE INDUSTRY REPORT: INFORMATION AND TELECOMMUNICATION TECHNOLOGIES SECTOR IN ARMENIA

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ENTERPRISE INCUBATOR
FOUNDATION

**Report prepared by Enterprise Incubator Foundation**
**December 2018**

# Content

CHAPTER 1.

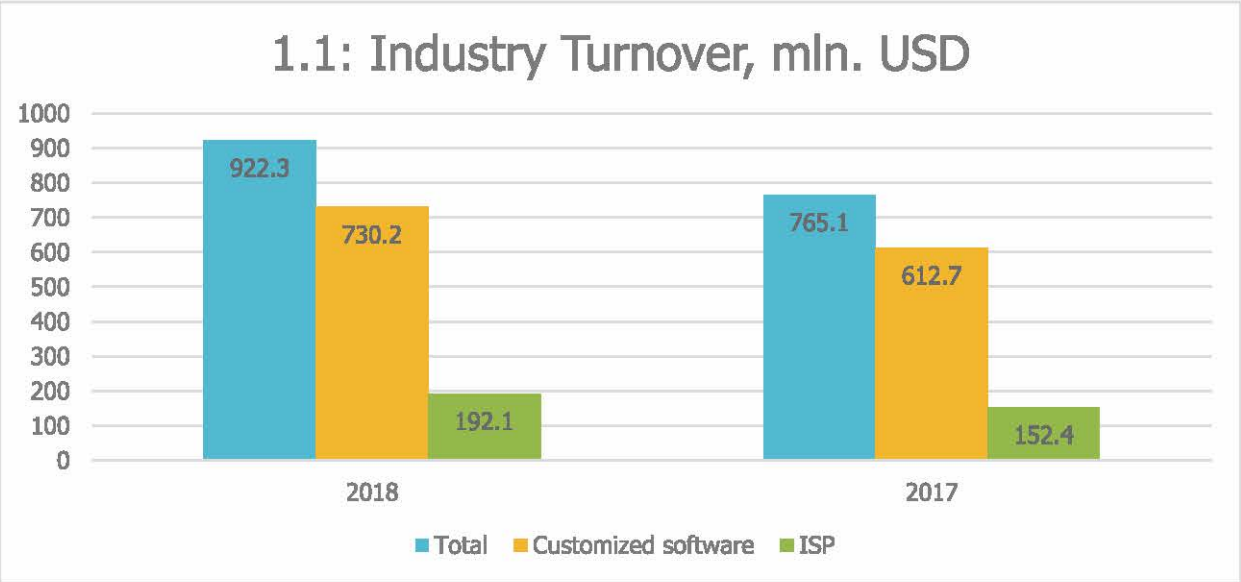
# ICT BUSINESS IN ARMENIA

# 1. ICT Business in Armenia

## 1.1 Overview of the IT Industry in Armenia

Armenia has retained its great potential for technology development, and was considered a hub for software development, industrial computing, electronics, and semiconductor production, even during the Soviet Union. It continues to be the regional leader in IT and high-tech industry due to its competitive labor, its share in GDP, and its constant growth in the number of companies and total turnover. It is already a widely accepted fact that information and high technologies – and their commercialization in different industries – are the main factors driving growth in the world economy throughout the most recent decades.

The industry's total revenue, which consists of the Software and Services sector and the Internet Service Provider sector, reached 922.3 million USD in 2018, a 20.5 percent increase over 2017 (Chart 1.1).




Armenia's competitive technical workforce creates a favorable investment climate for both large ICT companies and multinationals. These specialists ensure annual productivity estimated at about 50,700 USD for their companies.

Armenian ICT companies mainly specialize in embedded software development, semiconductor design, customized software, outsourcing, financial software, multimedia, web design, information systems, and system integration. Armenia has made significant gains in semiconductor design and the creation of related intellectual property.

During 2018 about 800 ICT companies have been in active operation in Armenia. However, we have to mention that the number of companies operating in other regions of Armenia has increased from year to year due to the development of educational and scientific infrastructure. This is particularly true of the Shirak and Lori regions. Just in 2017-2018 150 new companies were established (18.8 per cent of operating companies), and the number of ICT sector jobs increased by about 4200.

The Survey of Armenia's Information and Communications Technology Industry has been implemented since 2002, for the purpose of using tailored measures to follow up on ICT developments and address identified issues.

## 1.2 Why Start a Business in Armenia?

Armenia has a positive and open attitude towards foreign investments. The Government is carrying out deep and comprehensive reforms of the business environment providing favorable investment and business opportunities for foreign investors.

Availability of high-class specialists in Armenia is also an important pre-requisite and a stimulating factor for starting a business. Armenia has offered foreign investors a number of incentives over the past several decades, such as not levying duties on investment in founding capital and removing obstacles to investment entry. The RA Law on Foreign Investments created a solid foundation for attracting foreign investments to Armenia via regulation of legislative, economic, and organizational issues aimed at foreign investors' rights, legal interests, and property protection; the involvement of foreign material and financial resources; the creation of necessary conditions for the introduction and effective use of advanced technologies; management; and organization. The law also provides effective mechanisms for the protection of foreign investments. Specifically, in the event that the legislation on foreign investments is amended during the five years following initial investment, per foreign investor's request, the legislation in effect when the initial investment is made will be applied. The regulation provides foreign investors operating in RA with an opportunity to not only be protected from unfavorable legislative changes, but also to effectively take advantage of favorable legislative regulations.

In addition, according to the RA Law on Profit Tax, the taxpayer's losses for the current and previous years – including those of foreign investors – are transferred to the five years following the year the losses were incurred.

It should be noted that today Armenia is the 41th among 190 countries according to the ranking of WB "Doing Business 2019" and is ranked 44th among 186 countries in the 2018 Index of Economic Freedom released by the Heritage Foundation with an overall score of 68.7.

Also, according to the same source, Armenia made it easier to start a business by streamlining post-registration procedures and by eliminating company registration fees.

The following table shows key indicators for establishing and operating a business for 2018.

| Indicator | Armenia | Europe and Central Asia | OECD Countries |
|---|---|---|---|
| Starting and registering a business: Time (days) | 4.5 | 10.1 | 8.6 |
| Starting a business: Cost (% of income per capita) | 0.9 | 4.2 | 3.2 |
| Enforcing contracts: Time (days) | 570 | 478.0 | 558.2 |
| Enforcing contracts: Cost (% of claim) | 16 | 25.5 | 22.2 |
| Total tax rate (% profit) | 18.5 | 34.2 | 40.7 |

The table's contents indicate that the presented indicators for Armenia are more favorable than those for Europe, Central Asia, and OECD countries.

Foreign investors can benefit from the following investment incentives:

- 100% of property ownership
- Companies registered by a foreigner in Armenia have the right to buy land
- Free economic zones. Residents of FEZ in Armenia are completely exempted from profit tax, VAT, property tax and customs duties. Services on behalf of the state bodies are delivered on "one stop shop" basis
- VAT payments postponement for up to 3-year period for importing equipment and goods within the scope of investment projects
- Grandfather clause for 5 years (guarantees against changes of legislation on investments)
- Unrestricted access to any sector and geographic location within country
- Free and unlimited repatriation of property and profits
- Unlimited currency exchange on market rates
- Duty free import of personal goods of foreign employees
- Exploitation of natural resources through concession contracts
- No restrictions on staff recruitment.

Armenia has signed bilateral agreements on reciprocal promotion and protection of investments with 40 countries and is currently negotiating similar arrangements with 24 more countries. Armenia has Free trade agreements with most of CIS states, which implies duty free access to about 250 million consumers. Armenia is also a signatory of the International Convention of Investment Disputes (ICSID), CIS Multilateral Convention on the Protection of Investor Rights. In addition, it has double taxation treaties with 46 countries as of 2018. The benefits of these particular treaties are easy to access by providing supporting documentation of residency from foreign tax authorities. Armenia currently enjoys Generalized Scheme of Preferences (GSP) beneficiary status with the United States, Canada, Switzerland, Japan, and Norway. Since 2009 Armenia has also been included in the list of countries granted GSP+ by the European Union. Since January 1, 2018, the exporting procedures to the EU have been facilitated by applying the system of self-certification of origin - the Registered Exporter System instead of the system of certificates of origin. Since January 2, 2015, Armenia is a member of the Eurasian Economic Union (EEU), thus creating the following opportunities:

- Access of Armenian production to about 170 million consumers.
- Duty free import of raw materials from EEU member states.
- No customs formalities during mutual trade between EEU member states, which leads to reduction of financial costs and time-waste for business.

## 1.3 Legal Framework

***General Description***

In general, Armenia is considered a Civil Law country, although the decisions of the country's highest instance court – the Court of Cassation – are precedential and mandatory for First Court and Appellate Court.

Among the legal acts that govern the Republic's business environment, the following should be mentioned:

- European Convention of Human Rights
- RA Constitution
- The Civil Code
- RA Law on Limited Liability Companies
- RA Law on Joint Stock Companies
- RA Law on State Registration of Legal Entities and State Registration of Separated Subdivisions of Legal Entities, Institutions, and Individual Entrepreneurs
- The Labor Code
- The Tax Code, effective from January 1, 2018
- RA Law on Foreign Investment
- RA Law on State Registration of Rights to Property.

From 2017 through 2018, Armenia continued to implement and strengthen previously introduced improvements in various areas. In terms of their relevance to improving the business and investment environment for IT companies, the most notable of these are undertakings related to taxes, foreign trade, establishing companies, enforcing of contracts, protecting investors, registering property, and other ongoing initiatives. To illustrate, in adherence to its longstanding commitment to creating a fast and effective reform process, the Government of Armenia approved the 2016 Program of Activities in Support of Improved Business Environment (RA Prime Minister's Decree N477-A of 5 May, 2018). This Program aims to facilitate and streamline administrative procedures that are needed to establish and develop a business in Armenia. This action promotes rapid growth for small and medium enterprises and implements a balanced tax and customs policy. These efforts are certain to have a positive effect on Armenia's IT sector and increase entrepreneurship in the IT field.

***Taxation:*** Presented below, Armenia's main tax categories are rather low compared to those of other countries.

- Multi-level personal income tax: 23-36 percer
- Social security payment (cumulative pension): 5 percent, 2.5 percent of which is refundable by the State
- Value added tax (VAT): 20 percent (16.67 percent in some cases)
- Turnover tax: 1.5-5 percent (up to 25 percent in particular cases)
- Corporate (profit) tax rate: 20 percent.

In 2018, the legislative package related to State support for the IT sector was successfully implemented. Particularly, about 360 IT start-up companies having a corresponding certificate benefit from tax privileges including a zero percent profit tax rate and a ten percent income tax rate. A draft of extension of application deadline formerly used in the scope of the mentioned law was developed and now being circulated.

It is important to note that from 2017 through 2018, Armenia continued to employ the privileged system of taxing family business activities. In terms of the applications of the tax legislature, a family business is considered to be any business activity implemented by more than one member of a family (parent, spouse, child, sibling) to make profit (revenue), if the sales revenue from the products and services generated from all aspects of that business activity does not exceed 18 million AMD (not including VAT) during the previous calendar year. Under existing legislation, family business entities are exempt from all state taxes generated through family business activity (including the obligation as a tax agent to calculate, withhold, and transfer the tax to the state budget), except for the obligation to calculate and pay the income tax for taxed income paid by the tax agent to the members involved in family business (including hired workers), which is paid in the amount of five thousand AMD per person. This is to be paid on or before the 20$^{th}$ of the month following the month for which income is calculated, and is considered a final obligation with regard to income tax.

Concluding the description of the tax field, we should note that a new Tax Legislation will be in effect starting on January 1, 2018. This sets a number of considerable changes in comparison with the regulations that were in force before. For example, beginning on January 1, 2018, the dividends of individuals residing in the Republic of Armenia are taxed at five percent. Also, liability measures have been revised, income tax rates have changed, and so on.

***E-Governance:*** During 2017 and 2018, the previously introduced www.e-gov.am website was effectively in use among the general public and in the business community of the Republic of Armenia. This platform presents a system for unifying all tools and resources and offers information on electronic governance services provided by the state entities. In addition to various useful opportunities, this website allows for electronic submission of tax reports by all business entities, including those involved in the IT sector. Thirty-nine different tax reports can now be submitted through the electronic tax submission system, and new types of reports are continuously added. This resource includes a number of additional systems, such as State Payments; State Real Estate Cadaster; electronic registry of organizations; legal databases; and the official website for online notifications, electronic signature, and electronic visas. Some of these systems are described in greater detail later in this report.

The website's *Write a Letter to the Government* section allows any legal or physical entity to express opinions, positions, and views. Another option in this section allows for tracking the progress of a letter/application/request and determining which Government body or official has been tasked to handle it.

***Starting a Business:*** The www.e-register.am website continued to effectively function throughout 2017 and 2018. Since its launch in April 2011, this platform has consistently made the State Registry of Legal Entities' service available electronically, as well. The system allows the user to register a legal entity (sole entrepreneurs would register physical entities) in a matter of minutes, thus minimizing time spent. Available in English and Russian, the site makes Armenia's IT sector and its companies accessible and transparent to foreign investors.

The One-Window system for registering legal entities continued its operations in 2018. It provides those seeking to establish a legal entity or a sole entrepreneurship unit with the opportunity to deal with a single state entity, specifically the State Registry of Legal Entities under the Ministry of Justice. Once the agency accepts the documents, it works in conjunction with other involved state agencies to handle all additional tasks. In the past, registering a company involved visits to six different state agencies; currently, it is possible to obtain a company name and tax registration and insurance number, and complete other required state registration processes through a single agency.

***State Registration of Rights/Title Over Real Estate:*** The discussion of the IT business environment within the context of developments that took place in 2017-2018 should also address legal regulation with respect to registering rights over real estate, which is an important

area for both start-ups and established companies with growth potential. In 2017-2018, system reform continued to work toward streamlining the process of state registration of rights, as well as saving time by introducing the One Window principle. To this end, the drafts of respective legal acts were elaborated upon, and creation of the unified pubic registry portal as a functioning service office is ongoing. Application of the so-called acceleration rates for fees levied for state registration of rights continued in 2017-2018, an important factor in improving the business environment.

In regard to registration of rights, the electronic system of the State Committee of Real Estate Cadastre under the RA Government continued to operate as a means of improving the overall business environment. An official electronic registry system is available on the Committee's official website at www.e-cadastre.am. It allows for electronic online submission of requests to register rights over real estate and movables, and supports documents in compliance with the procedure defined by the RA Law on State Registration of Rights over Property

***Contract Enforcement:*** When discussing the Armenian business environment in relation to IT companies, it is important to recognize that the previous years' legislative changes led to the removal of a discretionary requirement for "by seal" ratification of transactions or other documents signed by legal entities. In other words, the mere signing of civil/legal acts by legal entities functioning in Armenia does not constitute grounds for recognizing them as invalid.

The use of the Electronic notary system and the One Window approach is continuously extending in 2017-2018. Particularly, the Armenian E-Notary Information System (AENIS) applies a one-window approach to service provision. In addition, the electronic notary system, which is available throughout the country, has been an effective tool for improving notary service and increasing efficiency when signing contracts requiring notary validation.

***State E-Payment System:*** the state electronic payment system (www.e-payments.am) continued to successfully operate in 2017-2018. It facilitates processing electronic payments of state and local duties as defined by RA legislation, along with fees and administrative fines collected for services delivered by state or local government bodies.

The payment system accepts ArCA, Visa or MasterCard payment cards. Payments are grouped into four main categories: duties, service fees, fines, and taxes. Each category includes payment type sub-indexes for efficiency and convenience.

The system also accepts community payments (e.g., property tax, land tax, garbage collection fees, and others).

The state e-payment system also enables Armenian citizens in foreign countries and citizens of other countries to make consular service fee payments (e.g., passport issuance, entry visa, and others) or pay state duties.

***Dispute Resolution:*** In general, disputes that arise within Armenia's business environment are resolved in Armenia's three-stage judicial system (the Court of First Instance, the Appellate Court, and the Court of Cassation). Disputes arising from public legal relation (for example, when one side is an administrative body and the dispute arises during the implementation of the body's administrative activity) are subject to investigation in the RA Administrative Court. Courts of general jurisdiction investigate all other types of disputes according to territorial breakdown.

It is also important to note that in Armenia, a business dispute can be resolved through commercial arbitrage (in this respect, the Republic of Armenia is a country of UNCITRAL Model Law, and is a party to the 1958 New York Convention on the Recognition and Enforcement of Foreign Arbitral Decisions) or through reconciliation.

Launched in 2017, the BizProtect digital platform (http://www.bizportect.am) allows business representatives to report corruption risks and other problems encountered in the business sector, while also ensuring their security. It should also be noted that information received through this platform is also used to develop new policy for the business sector and to suggest respective reforms.

## 1.4 Competitive Advantage

With its favorable climate for direct foreign investments in ICT, Armenia offers the following competitive advantages relative to other countries of the region:

- World-class R&D capabilities in engineering, computer science, physics, and mathematics
- Well-educated and talented workforce with technical skills and English language proficiency
- Strong university programs with specializations in IT and related sciences
- Highly competitive labor costs and low operating costs
- Solid government support for the sector and commitment to improving the investment climate
- Sustainable and continuous growth in the IT sector
- Strong and successful Diaspora in Europe and North America
- Extensive experience with large multinational companies
- IP protection laws and regulations that meet international standards.

CHAPTER 2.

# 2018 SURVEY

# 2. 2018 Survey

## 2.1. Sampling and Methodology

In 2018, the survey sample was expanded to include approximately 750 of the ICT companies operating in Armenia. These were classified according to NACE rev.2. To observe the expanded population data time series, the data available for 2017 were refined accordingly.

The report is based on the survey conducted by EIF at the end of 2018. Three main groups including companies operating in the segment of software development and services, internet service providers, as well as ICT-related faculties at major educational institutions participated in the survey. It looks into a number of areas important in respect of the industry development and growth, such as business environment and legal framework, educational system, human resources, export, and others. The report also uses information and data from industry surveys that EIF conducted from 2003 through 2017.

The 2018 survey covered about 340 respondents involved in software development, IT consulting, Internet services, and the ICT departments at major educational institutions.

**Outline of the Industry Survey**

This report draws on the industry survey EIF conducted at the end of 2017. The survey respondents included three main groups: companies in the Software and Services segment, Internet Service Providers, and ICT-related departments at major educational institutions. The survey looked into a number of areas important to the development and growth of the industry, such as business and legal environment, revenues, educational framework, human resources, export, and others.

**Information and Data**

A quantitative longitudinal investigation was conducted. Raw data was collected through face-to-face standardized interviews. Companies were chosen through probabilistic sampling, whereas respondents were chosen based on the "unique respondent" principle. The survey relied on data provided during interviews with industry representatives. Incomplete or unreliable data was matched with the data generated from the estimates made in the ICT sector growth model. However, based on our experience in the industry, estimates available in other surveys and publications, and other sources, we believe that the Report offers a reliable description of the industry, its main trends and characteristics, and its overall prospects.

To ensure grounds for comparison in the longitudinal investigation, the questionnaire used in previous studies was employed. Additional questions related to current matters, taxation issues and further investigation of the industry were added to the questionnaire. Specifically, questions related to the more detailed description of the company and of staff mobility were included.

**Sampling**
The multistage stratified sampling technique used considered the following criteria:

1. Work Area: Companies working in three main segments were identified:
   - Software and services
   - Internet service providers
   - Main ICT-related university faculty
2. Company Size: large, medium-size and small companies were selected.

The resulting sample size consisted of 260 companies. The sample error did not exceed the critical value at a 0.05 (five percent) significance level.

**Definitions**
The Software and Services segment of the Information Technology industry is defined as the cluster of companies engaged in software development and maintenance; provision of software-related services, consulting, and integration; development of graphics, animation, and multimedia applications; chip design; and provision of engineering and R&D services.

Internet service providers offer access to the Internet (wholesale and/or retail) through various channels. This group includes VoIP businesses and companies that provide web hosting services and work with web portals.

Companies included in our research may be engaged in a number of other operations within the technology sector, but the two components described above constitute the main direction of their operations and are their major sources of revenue. Respectively, only the software and ISP segments of those companies were used to estimate industry figures. Local companies are defined as Armenia-based enterprises with at least 51 percent of their equity owned by Armenian citizens, permanent residents of Armenia, or locally owned firms. Foreign branches or companies are defined as Armenia-based enterprises with at least 51 percent of their equity owned by foreign citizens, residents, or firms.

**Assumptions and Estimation Methods**
The productivity estimate was based on annual revenues per employee. Two sets of figures were calculated: The first involved a simple division of all industry revenues by the total workforce; the second looked at the annual revenue of each company per employee, and calculated an average for the total industry using revenues as the weight factor. While the second estimation provided a better picture of productivity, it complicated the process of forecasting industry growth. Therefore, the first method was used for making industry projections. Productivity calculations were made only for software development and services companies.

Workforce estimates were based on the number of technical, business, or administrative specialists employed by companies in the Software and Services segment and of technical employees of ISPs.

**Acknowledgments**
The Ministry of Transport, Communication and Information Technologies of the Republic of Armenia supports the implementation of the annual survey for 2018.

EIF's research team would like to express our gratitude to the management of the Armenian ICT companies, as well as faculty members of YSU, NPUA, ERIICTA, RAU, and AUA for their time and kind assistance with data acquisition as they participated in the survey.

The names of our research group's key members appear below. We would also like to thank all those who participated in our research, including our fieldwork team and volunteers, for their contribution to the implementation of our survey and the preparation of our Report on the State of ICT Industry 2018.

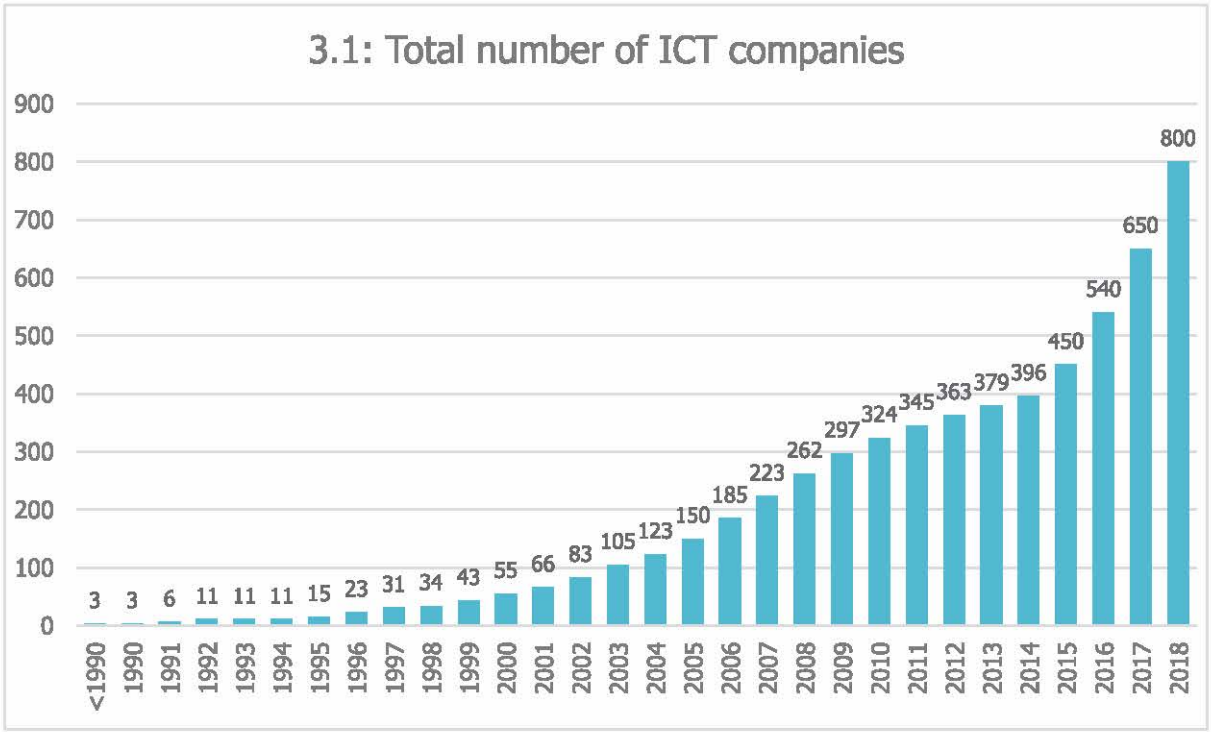
Zhenya Azizyan – Research Manager, ICT industry expert
Emma Ghrejyan – methodology design, overall market research, data input and analysis
Diana Avetisyan – fieldwork coordinator
Aram Khachatryan – ICT-related legal framework analysis.

CHAPTER 3.

# KEY FINDINGS

# 3. Key Findings

Armenia's software and services industry is rather young; nearly 95 percent of the companies were founded during the time period extending from 2000 to 2018 (Chart 3.1). The first local private software firm was established in 1987, and within the next five years, the first foreign branch was launched in Yerevan. The period from 1991 through 1997 proved to be a challenging transitional period for the technology sector, as regional conflicts, a declining economy, and brain drain prevented the economy's general recovery. According to various estimates, 35 to 40 software firms and ISPs, employing nearly 1,000 specialists, were in operation in Armenia in 1998. During the same year, the sector's workforce was actually notably smaller than that of 1987, when only Yerevan Computer Research and Development Institute employed up to 10,000 people. But during the last 11 years, the industry has seen a sharp increase in the number of local start-ups and foreign company branches.




In 2018, the number of actively operating ICT companies reached about 800, which indicates an unprecedented growth rate of 25 percent compared to 2017. 52.5 percent of the mentioned 800 entities were local companies. From 2008 through 2018, an estimated average of 53.8 ICT companies was established each year. For comparison, it should be noted that back in the 1990s, the same indicator reflected only five to six companies established per year.

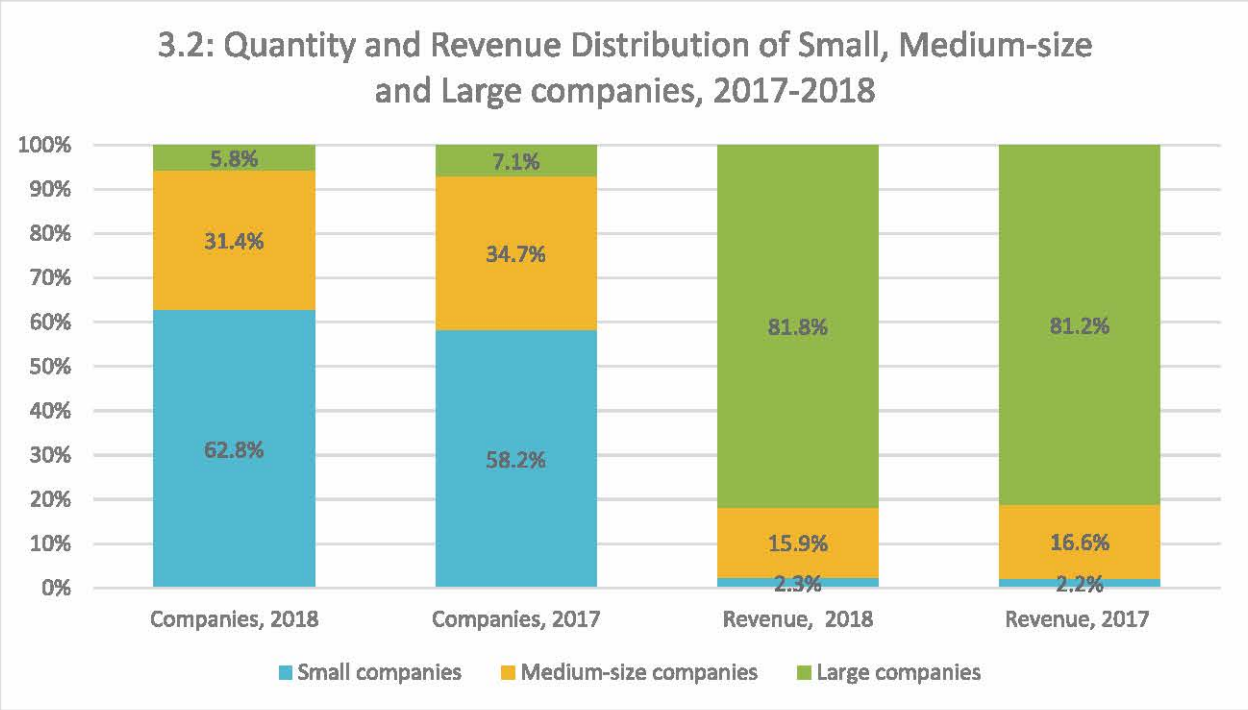
The number of actively operating ICT companies has increased by 150 in 2018. This is attributed to the enforcement of the legal package related to state support for the ICT sector, which defined tax incentives for start-up companies, as well as to the implementation of multifaceted infrastructure, financial and other assistance programs.

# 3.1 Customized Software and Services

## 3.1.1 Economic Indicators

In 2018, the total turnover of the Armenian Software and Services sector amounted to around 730.2 million USD, indicating an average annual growth of 19.2 percent. Average annual growth in the industry amounted to 32.6 percent from 2010 through 2018.

Local companies are now in a better shape than they were five years ago. They have more employees, attract venture investments and demonstrate an overall improvement in technical expertise and knowledge of the market. In addition, they are implementing more complex and value-added projects. Thus, Armenian companies have become attractive to foreign venture and angel investors.



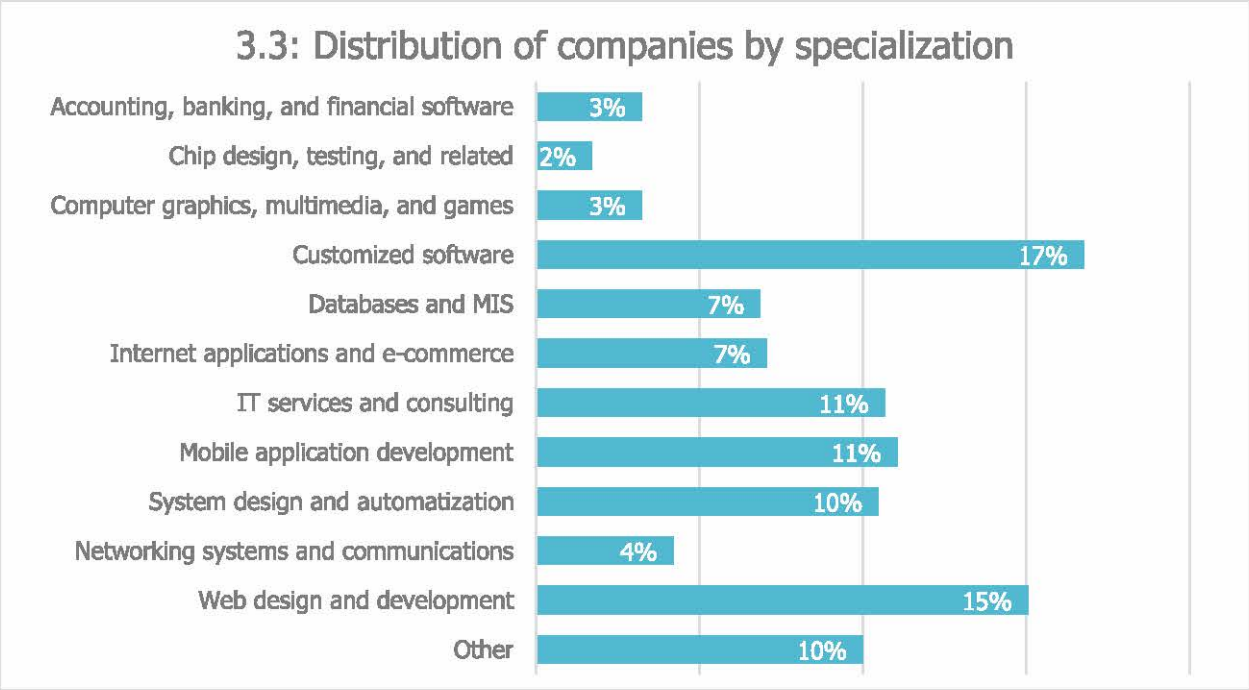

As the Chart 3.2 indicates, there is no essential change in the quantitative distribution of the companies. The share of small companies with less than 100K USD profit has increased by 4.6 percent reaching 62.8 percent as compared with 2017. Although small companies do not have a

great impact on the industry revenues, the growth of their number proves constant development of the local market. Large companies (with revenue of $1 million USD and up) make up only 5.8% of all operating companies, and medium-sized companies (with revenue of 100K USD up to 1 million USD) make 31.4 percent as compared to 34.7 percent in 2017.

The shares in terms of revenue distribution showed no significant change. Thus, the share of large companies' revenue is 81.8 percent, as compared with 81.2 percent in 2017, which is the major part of the industry revenue. Medium-sized companies' revenue share decreased to 15.9 percent compared with 16.6 percent in 2017, and the small companies' share increased to 2.3 % from 2.2% last year.

### 3.1.2 Main Specializations

The Chart 3.3 shows the results of a survey concerning the specializations of Software and Services companies, based on their share in the total number of companies. As we can see, *Customized software and Web design and development* are the most dominant of the specializations.

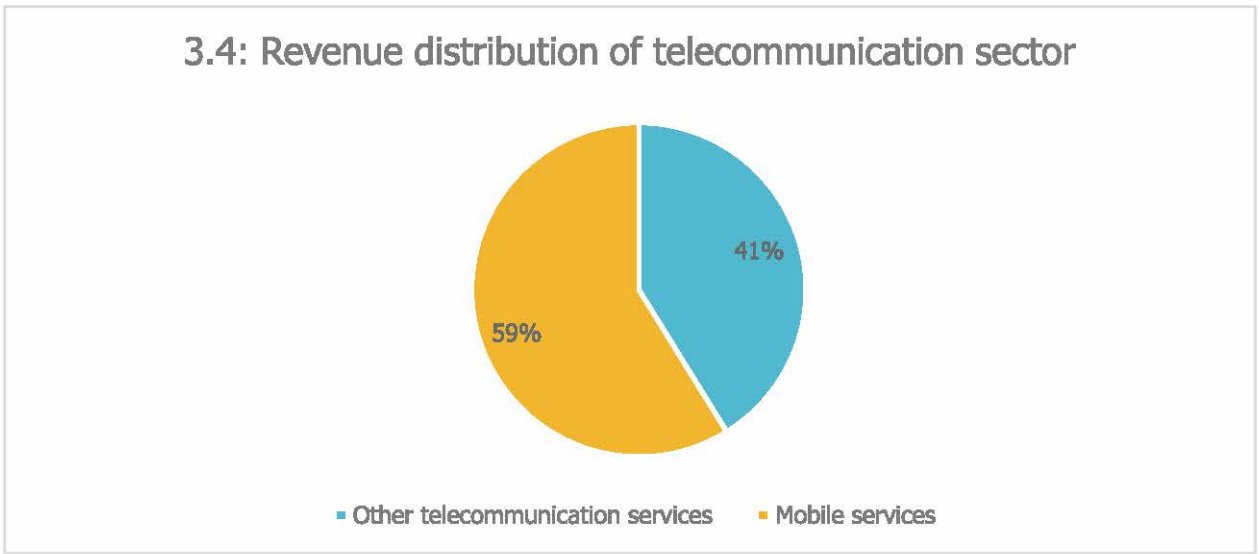



## 3.2 Telecommunications

### 3.2.1 The Industry and Key Economic Indicators

For this research, the Armenian Telecommunications sector is represented by 36 companies providing services under the following NACE rev2 classification: wired telecommunication services (61.10); wireless telecommunication services (61.20); other telecommunication services (61.90); and companies working on web portals (63.12). Services offered by these companies predominantly include mobile and fixed telephony; cable and wireless Internet; provision of IT infrastructure (e.g. web hosting), and VoIP services. It should be emphasized that telecommunication companies typically provide their services for the local market rather than for export.

According to the Chart 3.4, the share of revenues generated from mobile communications is the greatest among total revenues in Armenia's telecommunications sector. There are currently three operators in Armenia's mobile market: Veon Armenia (trademark Beeline, a member of VimpelCom Ltd.); VivaCell-MTS (daughter company of Russian MTS); and Ucom LLC.




Data from the 3rd quarter of 2018 indicate that there are more than 3.58 million mobile users/subscribers in Armenia. By contrast, growth in fixed phone services has been negative since 2009, with no evidence of any increase in progress; in 2018, there were about 588,000 [1234] fixed phone users.

The growth trend for the overall telecommunications sector had slowed since 2014 which an indicator of the market being overfull.

CHAPTER 4.

# KEY CHALLENGES FOR ICT OPERATIONS

# 4. Key Challenges for ICT Operations

Approximately 73.2 percent of survey respondents representing company leadership emphasized the challenges in connection with the shortage of highly qualified workforce and 64.2 percent mentioned the problem of attracting it. This can be due to growing demand for a technical workforce coupled with the continuous decline in the number of students in technical specializations. It should be noted that 35.3 percent of survey respondents pointed to the brain drain factor, although this indicator has decreased compared to 2017. (57.1%)

As surveyed companies indicated, limited access to financial and the lack of support from state authorities and non-governmental organizations (57 percent) hampered growth in the Armenian software development and services sector.

Based on answers provided by the surveyed companies, tax and customs procedures constitute another barrier (34.5 percent and 20 percent, respectively) to development for companies in the sector. This indicator has also decreased compared to 2017.

Nearly 23.2 percent of surveyed organizations indicated that they faced challenges related to gaining entry into world markets. The respondents noted that the underlying cause is lack of awareness in regard to Armenia among several international partners, or lack of trust in representatives of a country with low or average income levels.

22.1 percent of survey respondent organizations mentioned factors hampering healthy competition, 18.5 percent pointed to customers' lack of trust for buying products and 9.6 percent noted issues related to confidentiality and data protection.

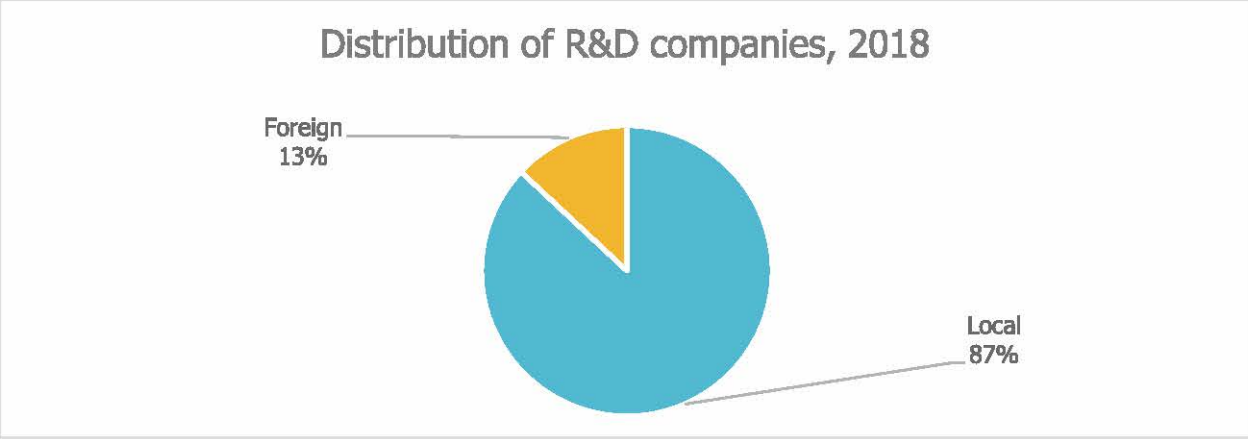
CHAPTER 5.

# RESEARCH AND DEVELOMENT IN ARMENIAN ICT COMPANIES

# 5. Research and Development in Armenian ICT Companies

The number of Armenian ICT companies that develop their own products and invest in Research and Development (R&D) increased from year to year. This indicated that Armenia's ICT sector was transforming from an outsourcing destination for foreign companies to a hub for technology development. Also, 41 percent of the companies in the sample generated revenue from their own products and services. For large companies, innovation-related revenue generation in large companies mainly correlated with the number of company employees. In other words, the larger the company, the higher the R&D investment.

Distribution of R&D companies by local and foreign ownership is shown in the chart below.




As reflected in the chart, the number of local R&D companies increased from 85 percent in 2017 to 87 percent in 2018. That was due to the increase in the number of newly established local technology companies.

Governments generally offer R&D tax incentives to support related activities. For companies, such tax incentives are an effective way of reducing innovation-related costs. Several of the government-provided tax incentives are unique in type and nature. Tax planning schemes used in various countries with regard to R&D tax incentives fall into three categories:

1. Spending-based tax incentives calculated based on an organization's R & D spending
2. Asset-based tax incentives calculated as a percentage of the asset value used for R & D purposes
3. Revenue-based tax incentives calculated as a percentage of related revenue.

Tax legislation effective starting 2018, the implementation of R&D activities corresponding to criteria defined by the RA Government will be considered a VAT-exempt transaction.

CHAPTER 6.

# EDUCATION

# 6. Education

## 6.1 General Overview

Sustained ICT growth in Armenia can be attributed to availability of high-quality technical and management professionals who work in the industry.

The education system of the Republic of Armenia includes pre-school, pre-higher education (including primary school, intermediate school, and high school) vocational (professional-technical), higher, and post-graduate education. There are 24 (public) state universities and 37 private universities in Armenia, the majority of which are based in Yerevan. Several universities also have branches in the regions.

Due to the high-quality educational programs offered for decades at Armenian Universities, the labor market in Armenia is supplied with a workforce that is in high demand. The Universities emphasize teaching fundamental knowledge, along with hands-on practical experience. Educational methodologies used by the Universities are continuously supplemented with new ideas and enhanced by the traditions and approaches utilized by the internationally acclaimed institutions of higher education. Upholding free market principles in Armenia has made such developments possible.

In 2017-2018 academic year, approximately 78,747 students were enrolled in varying specialization studies at Armenian universities[1]. The State Engineering University of Armenia (NPUA) and Yerevan State University (YSU) are the largest institutions offering programs for ICT-related technical specializations. Other institutions involved in ICT education include the American University of Armenia (AUA), the European Regional Educational Academy (EREA), the Armenian-Russian (Slavonic) University (RAU), National University of Architecture and Construction of Armenia (YSUAC), and the French Higher Institute of Engineering in Armenia (ISIFA).

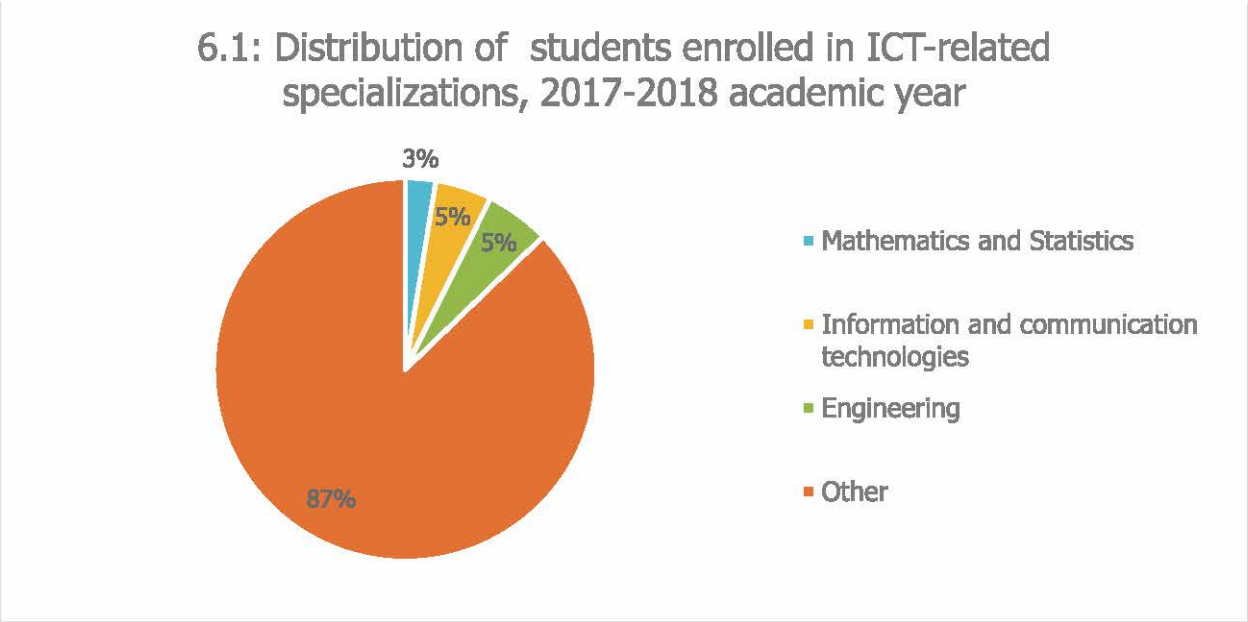
Representatives of departments teaching ICT specializations at the abovementioned universities were involved in the survey. The surveyed institutions are considered the main universities in Armenia offering ICT-related faculties.

Data received from these six key universities indicate that ICT-related departments employ about 1,000 faculty members, including lecturers and researchers. In the 2017-2018 academic year, more than 3000 students were enrolled in these universities.

1Source: RA Statistical Service, www.armstat.am

## 6.2 Higher Education Institutions/Universities

During the 2017-2018 academic year, a total of 10 070 students – or 12.8 percent of the total student population at all Armenian universities – were enrolled in departments related to informational and high-tech specializations. For comparison, students studying economics and management represent nearly 20.2 percent of the total number of students enrolled in Armenian universities (78 474) (Chart 6.1):




National Polytechnic University of Armenia (NPUA) and Yerevan State University (YSU) are the largest and oldest institutions in Armenia that offer majors for ICT specialists. The National University of Architecture and Construction of Armenia, the American University of Armenia (AUA), the European Regional Educational Academy (EREA), and the Armenian-Russian (Slavic) University (RAU) also offer IT education.

**National Polytechnic University of Armenia (NPUA)**

NPUA succeeded the Yerevan Polytechnic Institute, which was established in 1933. The University offers several degree programs in engineering, science, and technologies, and is considered to be Armenia's major educational institution for technical specialties. The University has affiliates in a number of regions

throughout Armenia. Today, 8,000[2] students are enrolled at NPUA, which has graduated over 125,000 students since its inception. In 1960, when the Cybernetics, Computing Systems, and Radio-Technical Department (later divided into three discrete departments) was established at NPUA, the University added computer classes. Today, these departments offer a number of specializations, such as computer hardware and software development, electronics and microchip design, automated management systems, and others. NPUA conducts scientific research in computational systems, design and installation of networks, artificial intelligence, the study and development of dynamic systems, analysis and synthesis of management systems, microelectronics, microchips techniques, and more.

The NPUA Yerevan Campus is a host to Armenian National Engineering Laboratories (ANEL) located at the Building # 10.

It is a center of excellence that hosts 30 state-of-the-art education and research laboratories affiliated to syllabi of six NPUA departments (Cybernetics, Radio technology and Telecommunications, Energy technology, Transport systems, Mechanics, Mechatronics). The synergy of educational and R&D labs allows students to get involved in scientific projects based on ANEL with most up-to-date hardware and software.

The main goal of the ANEL is to meet the demand of the engineering industry in quality specialists and graduates educated on up-to-date technological base to confront the employee shortage and to increase value-added and innovativeness of Armenian high-tech businesses, thus increasing their international competitiveness.

The NPUA Campus also hosts Microsoft Innovation Center Armenia. The Center provides students, enterprises and startups with world-class resources and support focusing on skill development and innovative thinking, as well as advice on products/services that local and international markets demand. Since 2001, more than 4 500 students/IT specialists have participated in training courses, seminars and other educational programs organized by the Center; 80 percent of them are employed by leading IT companies.

2 Source: NPUA http://www.polytech.am

**Yerevan State University (YSU)**

Established in 1919, YSU is currently Armenia's largest educational institution, with over 18,000[1] students. YSU offers educational programs in specializations such as biology, economics, history, linguistics, legal studies, mathematics, physics, and other sciences. The Mathematics and Physics Department was established in 1924, and the Informatics and Applied Mathematics Departments opened in 1971. These departments prepare IT-related specialists in the following areas: algorithm languages, cybernetics, discrete mathematics, software development modeling, and others.

The YSU Information Technologies Educational and Research Center was established in 2007, with the objective of providing programs in professional tutoring/mentoring, continuing education, discrete programs, scientific research, university education management and quality assurance, and the development and installation of informational systems. In addition to offering traditional formats, the Center offers online and distance learning courses and combined programs. The Center's IT-related graduate programs include development of informational technologies, management of information technologies, and visual computation.

The YSU hosts Innovative Solutions and Technology Center (ISTC) which aim is to develop and strengthen the educational capabilities of Armenian higher educational institutions, create favorable conditions for sustainable business environment.

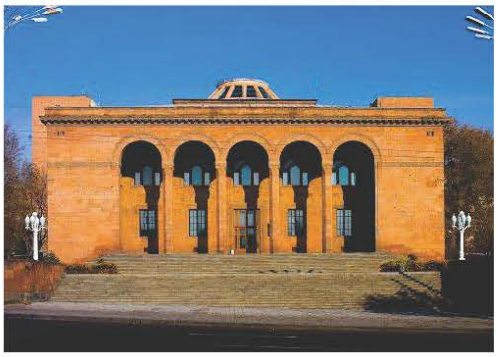
The goal of the Center is to address the following challenges:

- Upgrade IT syllabus at leading higher educational institutions of Armenia
- Upgrade the lab infrastructure at YSU
- Rise the qualification of academic staff
- Support certified workforce specialized in IT/High-Tech
- Make Armenia a regional IT/High-Tech center of excellence

YSU also hosts Armenian-Indian Center for Excellence in ICT that delivers both short-term and long-term ICT training courses designed to fit learning interests of students with different specializations who are willing to start a career in ICT field. The trainings are aimed at delivering necessary knowledge and skills in modern technology in order for students to fit the changing demands of the fast-growing ICT market. Training program are designed based on developments of advanced computing systems, as well as on the current and foreseen workforce demands of the Armenian ICT industry.

Along with training activities, the Center can also carry out high-end R&D activities in the state-of-the-art R&D lab, which provides necessary software tools, including High Performance Computing (HPC) applications.

**National Academy of Science of Armenia (NASA)**



The Armenian Academy of Sciences – which became the National Academy of Sciences of the Republic of Armenia in 1993 – was founded on November 10, 1943 with the USSR Academy of Science's Armenian Branch (organized in 1935) as its foundation. NAS RA is a highest state scientific self-governing organization that unites NAS Members and scientific staff members of affiliated scientific and research institutions.

Source: YSU http://www.ysu.am

The Academy promotes and carries out fundamental and applied research in various scientific fields and coordinates research carried out throughout Armenia.

NAS RA is an official scientific consultant to the highest Governing Bodies of Armenia. The Presidium of NAS RA has five scientific divisions that concentrate on particular areas of science: Division of Mathematical and Technical Sciences, Division of Physics and Astrophysics, Division of Natural Sciences, Division of Chemistry and Earth Sciences, Division of Armenian Studies and Social Sciences.

**American University of Armenia (AUA)**

Founded in 1991, AUA provides a high-quality graduate and undergraduate education that encourages civic engagement; promotes democratic values; and fosters scholarship in a setting that values and develops academic excellence, free inquiry, integrity, scholarship, leadership, and service to society. AUA's graduate program offers advanced degrees in eight fields of study: Business Administration, Industrial Engineering and Systems Management, Computer and Information Science, Political Science and International Affairs, Economics, Public Health, Law, and Teaching English as a Foreign Language. AUA also offers a

dual Master of Business Administration (MBA)/Master of Public Health (MPH) program. The goal of these programs is to develop critical analysis skills and depth of knowledge through advanced coursework, independent study, and research. AUA's undergraduate program offers bachelor's degrees in English and Communications, Computational Sciences, and Business. Through its undergraduate courses, the University provides depth and breadth of knowledge for career preparation and further studies and a strong foundation of general knowledge and life-long learning skills.

**European Regional Educational Academy (EREA)**

Established in 2001 by the European Union, EREA specializes in programming and IT business management. Parallel to its mainstream academic programs, EREA offers programs in the English, German, and French languages. Approximately 220 students are currently enrolled in EREA programs. The Academy offers graduate and post-graduate education, European educational standards for professional training and qualification courses, and college (vocational) education programs in Yerevan and the regions.

**Armenian-Russian (Slavonic) University (RAU)**

The Armenian-Russian (Slavonic) University was founded on August 29, 1997, based on an agreement between the Governments of the Republic of Armenia and the Russian Federation. In 1999, the University expanded its list of specializations to include Applied Mathematics and Informatics. It opened its Physics-Technical Department in 2003. These departments have educational programs in Mathematics and Math Modeling, Software Development, and Electronics and Chip Design. In 2012, the standalone departments that offered programs in similar subject areas became separate institutes/colleges. Currently, the Institute for Mathematics and High Technologies provides specialized education in information and telecommunication areas through specializations in Applied Mathematics and Informatics, Electronics and Nano-Electronics, Telecommunication Technologies and Communication

Systems, Electronic Media Technologies and Design, Medical Biochemistry, Pharmaceutical, Bioengineering, and Bioinformatics. Over 490 students are enrolled in the university's various programs.

With the exception of a few universities, the current educational system is overwhelmingly the legacy of the former Soviet Union. Following Armenia's independence, the country's workforce demand underwent a drastic change, which in turn led to the disappearance of several specializations and the emergence of others. A number of Armenian universities have already transitioned to a two-tiered educational system that offers both undergraduate and graduate degree programs. However, the five-year system inherited from the Soviet Union is still functional at some of the universities. Several universities issue Candidate of Sciences and doctorate degrees.

The educational sector's main issue is a lack of sufficient financing, since tuition fees and state subsidies are not adequate for the majority of the universities, and the private sector's involvement in financing educational programs is not sufficient. In addition, because tuition is already too high for the average Armenian student, increasing fees is not an option for most universities. Additional obstacles to university development include the lack of textbooks and specialized literature, difficulties associated with cooperation with the private sector, and challenges related to recruiting new specialists to replace aging faculty members. In addition, some of the universities still face problems related to Internet access and insufficient access to computers.

### 6.3 Faculty and Teaching Methods

YSU and NPUA employ the largest portion of the country's ICT specialization faculty members, with the rest distributed among the remaining universities. The six leading universities employ about 1,000 faculty members. It should be noted that the majority of the universities consider their contemporary curricula and methods to be in line with industry requirements.

A number of faculty members use the experiences of leading European, Russian, and American universities as supported by their peers at those institutions. In many instances, local IT experts are invited to the universities to help them bring curricula in line with industry trends and requirements.

Many of the universities acknowledge that in addition to learning technical skills, students need to gain business knowledge. To that end, a number of universities offer courses in marketing, management, business ethics, legal studies, and others. The universities also emphasize the importance of learning foreign languages, specifically English and Russian, as part of the overall process of shaping high-quality technical and management professionals.

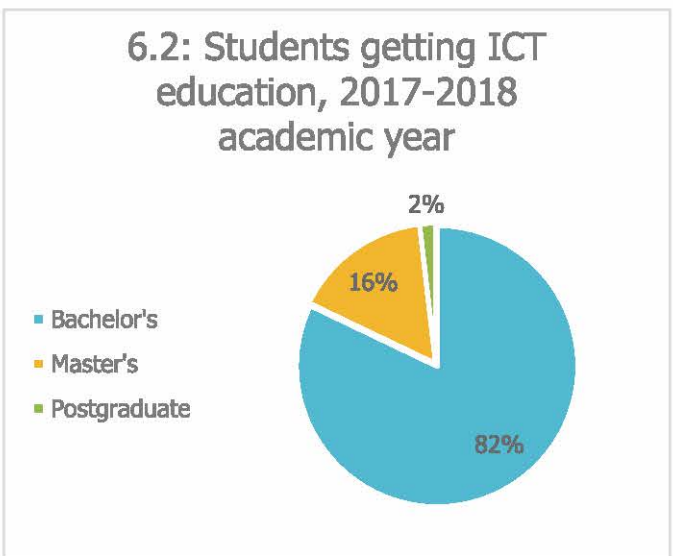
Even with the recent education system reforms, the instructional methods in current use do not meet the demand for highly qualified IT specialists. Other interrelated issues include low faculty salaries and aging faculty members.

Source: RA Statistical Service, www.armstat.am

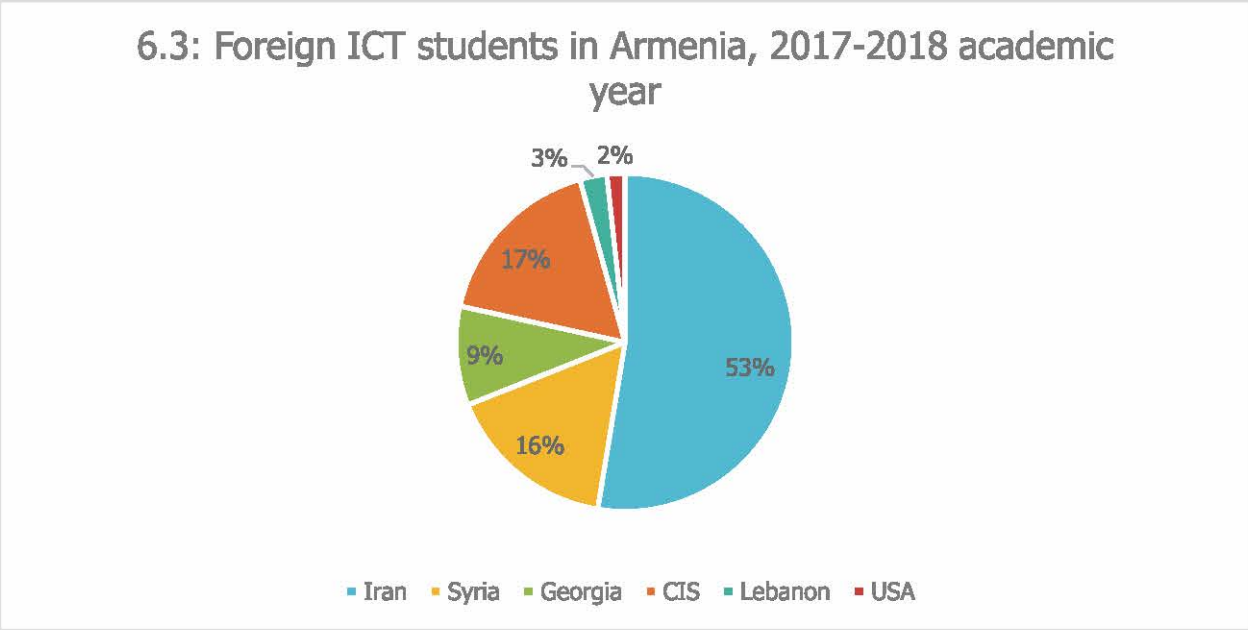
### 6.4 Students

During the 2017-2018 academic year, 10 070 students[1] were enrolled in various institutions that offer IT specializations, with the majority studying at the seven main universities. Throughout the past three to six years, the students' academic progress has substantially increased. A high level of competition for each spot has made it difficult to enroll in IT-related programs, especially at YSU and NPUA. The most popular majors include Computer Science, Applied Mathematics, Information Technologies, Information System Security, Automated Control Systems, and Microelectronics.

The general opinion among IT company representatives is that the current student count is not sufficient to meet industry demand for an average of 2,000 specialists. They also point out that in some cases, students' proficiency levels fail to meet industry demands, necessitating further training before they can seek full-time employment.




Many foreign students move to Armenia in order to get higher education and skills necessary for employment. They generally prefer medicine, economic and computer science specializations. The distribution of those particularly interested in ICT education are presented in the Chart 6.3 below.




Today, a large number of students prefer the IT industry, which is rapidly becoming a highly desired sphere. However, on their own, universities cannot provide students with enough experience to obtain jobs in the industry. To address this, many companies are involved in organizing special trainings, courses, and internship programs for students.

A number of centers are also operating in the field with a special role in professional skill development, particularly:

**Armenian-Indian Center for Excellence in ICT**
Implemented by the Enterprise Incubator Foundation (Armenia) and the C-DAC Center (India), the Armenian-Indian Center for Excellence in Information and Communication Technologies is a joint project of the Governments of Armenia and India. The center is located at YSU, where it offers IT-related trainings, management courses, exchange programs, and more.

**Microsoft Innovation Center Armenia (MIC)**
Established through the combined efforts of the RA Government, the Microsoft Corporation, USAID, NPUA, and EIF, Microsoft Innovation Center (MIC) Armenia provides world-class resources and support focusing on skill development and innovative thinking that local and international markets demand. The Center delivers training courses on programming fundamentals for beginners, web programming, and object-oriented programming.

**Innovative Solutions and Technologies Center in Armenia (ISTC)**
ISTC Armenia is the result of a joint effort between the RA Government, IBM, USAID, YSU, and EIF. ISTC offers trainings and workshops in Cloud Computing, Cyber Security, Cognitive

Computing, Big-Data Analytics, and Artificial Intelligence, with an emphasis on the use of IBM products.

**Armenian National Engineering Laboratories (ANEL)**
ANEL is a product of the joint efforts of the RA Government, National Instruments, USAID, NPUA, and EIF. In particular, the ANEL Research Laboratories offer services that quickly and inexpensively resolve technical and scientific challenges facing the industry and research institutes. Its Educational Laboratories complement these efforts through the provision of facilities for training future personnel for research institutions, Armenian industry, and engineering groups.

**Gyumri Technology Center**
Gyumri Technology Center (GTC) was established through the joint efforts of the RA Government, World Bank, and EIF. GTC offers courses in Basic Programming in Web, Mobile, and Software: Algorithms and Data Structures; Database Programming; Interface Design; etc.

**Vanadzor Technology Center**
Vanadzor Technology Center (VTC) was established through the joint efforts of the RA Government, World Bank, and EIF. In particular, the Center's goals include the development of technical and business skills, the promotion of technological entrepreneurship, the commercialization of innovative research undertakings, the creation of new technology companies, the attraction of foreign investments, and more. VTC offers courses in IT and Programming, Basics of Mathematics, English, Multimedia and Entrepreneurship.

**Synopsys Inc. Educational Centers and Initiatives**
With the goal of preparing qualified microelectronics specialists, Synopsys Inc. operates bachelor, master, and research programs at its educational center and at NPUA, YSU, RAU, EREA, and other RA universities.

## 6.5 Cooperation with the Private Sector

During the period following the collapse of the Soviet Union, cooperation between the IT industry and educational institutions was rather lacking, but some positive developments have recently taken place. The most obvious examples include the following:

- With the goal of preparing qualified specialists in the field of microelectronics, starting back in 2004 Synopsys Inc. implements bachelor, master, and research programs at the various RA universities. In particular, Chair of Microelectronic Circuits and Systems at National Polytechnic University of Armenia – bachelor; master, and research programs in Integrated Circuits Design and Electronic Automation Design; Yerevan State University Faculty of Radiophysics – bachelor's, master's and research programs in Integrated

Circuits Design; Russian-Armenian (Slavonic) University Chair of Microelectronic Circuits and Systems – bachelor and master programs in Integrated Circuits Design; and European Regional Educational Academy Chair of Microelectronic Circuits and Systems – bachelor, master, and research programs in Design of Integrated Communication Circuits.

- The Fund for Armenian Relief (FAR) and EIF established the Gyumri IT Center (GITC), the city of Gyumri's first IT training center, in 2006.
- In 2011 Microsoft Innovation Center Armenia was established through the combined efforts of the RA Government, the Microsoft Corporation, USAID, NPUA, and EIF.
- The Regional Mobile Application Laboratory for Eastern Europe, South Caucasus, and Central Asia was established in 2011 as part of a collaboration among InfoDev, the Government of Finland, Nokia, and EIF.
- Since it began operations in 2011, the TUMO Center for Creative Technologies has provided thousands of students aged 12 to 18 with extracurricular education in the sphere of digital media.
- National Instruments and EIF partnered in 2013 to establish the Armenian National Engineering Laboratories in NPUA.
- In 2014, Samsung and YSU jointly established the Samsung Learning Center at YSU.
- In cooperation with IBM, the Innovative Solutions and Technologies Center was established in 2015. The Center's physical facilities opened at Yerevan State University in November 2016. ISTC and YSU jointly launched a master's degree program in Big Data in 2017.
- In 2017, the RA Government and Philip Morris International signed a Memorandum of Understanding that provided for the implementation of initiatives aimed at developing a research and scientific-educational ecosystem in Armenia and establishing a research center.
- In the scope of the Global Innovation Forum held in Yerevan on 29 October, 2018, a Memorandum of Understanding was signed by Enterprise Incubator Foundation, San Jose State University and FAST Foundation on cooperation in implementing academic programs and extension courses for young specialists and students in the field of data science and data analysis.
- A Memorandum of Understanding was signed in November, 2018, by Enterprise incubator Foundation and renowned US Rutgers University with the aim of providing students and young specialists in Armenia with expertise and consulting support for implementation of scientific research and engineering programs.

Numerous companies hire the graduates of these tailored training programs. Currently, industry and university cooperation goes no further than the provision of educational programs and training courses that mainly focus on the development of high-quality professionals for specific companies and for the industry in general.

CHAPTER 7.

# ICT WORKFORCE STRUCTURE

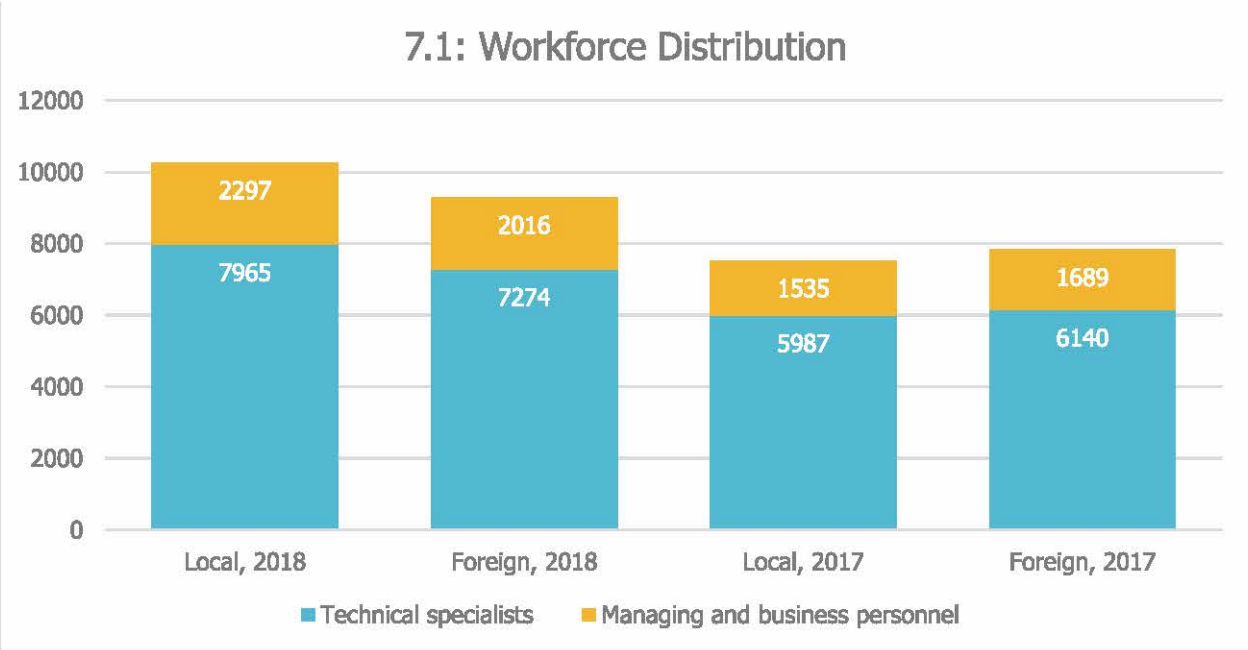
# 7. ICT Workforce Structure

The workforce is unquestionably one of the Armenian ICT sector's most important competitive advantages. In addition to providing relatively low-cost labor, Armenian specialists are highly productive, which makes them attractive to foreign investors. The number of workers employed in the IT sector reached 19 552 in 2018, which reflects an increase of approximately 27 percent over 2017. Over 15 000 technical specialists are employed as software engineers, analysts, developers, IT project managers, and so on.

For the technical workforce, the combined annual growth rate was calculated at 25 percent in the last year and reached 50 070 USD per employee.

62.9 percent of the 15 239 IT sector technical specialists are engaged in the software and services segment, while the remaining technical workforce is engaged in the telecommunication segment.

As the chart 7.1 indicates, compared with 2017, in 2018 the number of both management and business professionals in the total IT workforce – both in domestic and foreign-owned companies – increased. In contrast to 2017, 2018's distribution picture changed showing the number of local companies' employees to be higher than those in foreign companies.




According to data from 2018, 43 percent of the Armenian ICT workforce hold bachelor's and 41 percent earned master's degrees or higher, and students represented 11 percent of the entire ICT workforce. Although local companies prioritize personnel training as an essential factor in employee development, few are in a position to provide ongoing training. The availability of

resources and personnel play a significant role in this process. Many companies offer unpaid internships for new graduates that provide them with the opportunity to train for small, value-added jobs. Those who excel are then selected to fill permanent positions. New employees typically start working at full capacity only after minimum two months' probation period.

The majority of specialists (68 percent) employed in the Armenian ICT sector are male. On the other hand, the number of female employees in the software and services sector has decreased by 2 percent as compared to 2017.

On average, company directors in our survey sample had accumulated 13.4 years of experience working for domestic companies and 18.6 years working for foreign companies.

Local and foreign companies employed 52.5 and 47.5 percent of the total workforce, respectively (2008's ratio was 50/50).

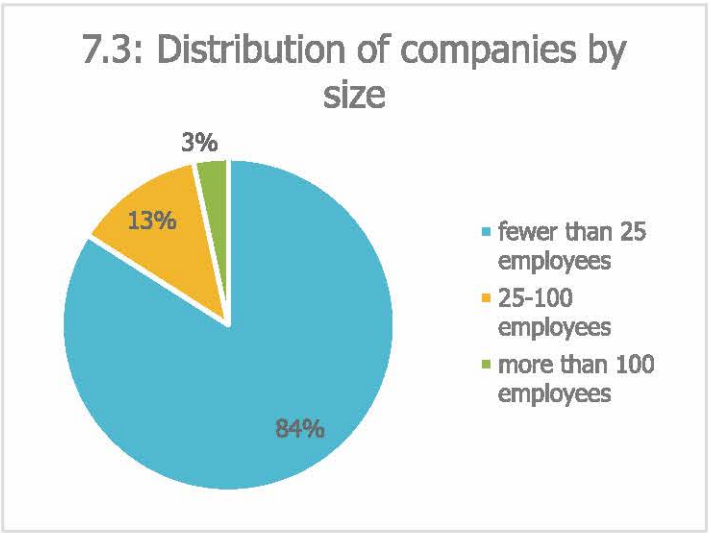
On average (arithmetic average value), foreign-owned and local companies employ 39 and 20 people, respectively.

Armenia is still regarded as a low-cost location for outsourcing software development, with salaries that are competitive with those of many IT-outsourcing countries, such as India, Russia, Israel, Ireland, China, and Central Europe.

Data on average salaries are shown in the Chart 7.2.


The results of this study indicate that technical employees' salaries are correlated with work experience, as opposed to educational attainment.

For 2018, company distribution according to employee numbers marks a difference due to emergence of startups and their active operation. Only 9.4 percent of all businesses employ 100 or more specialists; 12.6 percent employ 25 to 100 specialists; and 84 percent have fewer than 25 employees (see Chart 7.3).




In 2017-2018 more than 4 200 new jobs were created in the industry although during recent years the number of students opting for and studying IT specializations are decreasing which causes workforce shortage. Thus, 67.5 percent of surveyed companies indicated a need for new employees, and 73.2 percent emphasized the lack of highly-skilled workforce to be a hindering factor for development.

About 2.3 mln. USD is spent annually for qualification and skill development initiatives.

The chart above shows, the distribution of ICT companies in Armenia related to the workforce tended toward small businesses.

As part of their management strategies, foreign branches provided their employees with constant training opportunities, both in Armenia and at their home offices. Furthermore, these branches created special resource centers and libraries that provided the staff with opportunities to improve their qualifications and skills. Employees of a number of foreign companies were given the option to become shareholders in the companies and to benefit from additional non-salary incentives. Over the last three years, local companies have begun to offer similar initiatives.

CHAPTER 8.

# THE ROLE OF ICT SECTOR IN THE ECONOMY OF ARMENIA

# 8. The Role of the ICT Sector in the Armenian Economy

## 8.1 Development Trends and Prospects

In summarizing the results of the Survey, it may be stated that the IT sector shows an immense export potential and may significantly contribute to the growth and development of the economy of Armenia.

Today's Armenian IT companies are able to offer products and services that meet high international standards. However, certain problems remain from the perspectives of entry into foreign markets and the training of specialists to work in the IT industry. With respect to this, the role of government policies and ongoing programs in support of the sector will be an important one.

In 2018, revenues generated by the software and services sector and Internet service providers increased to represent 7.4 percent of Armenia's GDP (12.4 billion USD[3]).

During the period from 2010 through 2018, the ICT industry's average annual growth rate amounted to 25.6 percent.

From 2017 through 2018, more than 4 200 well-paid ICT sector jobs were created for technical specialists, and the number of new jobs increases each year. On the other hand, in 2017-2018, about 2 500 students enrolled in Armenian higher education institutions offering specializations in information and high technologies.

Local companies accounted for 55 percent of total revenues for the software and services segment. This reflects an increase of 11 percent when compared with 2017's 44 percent.

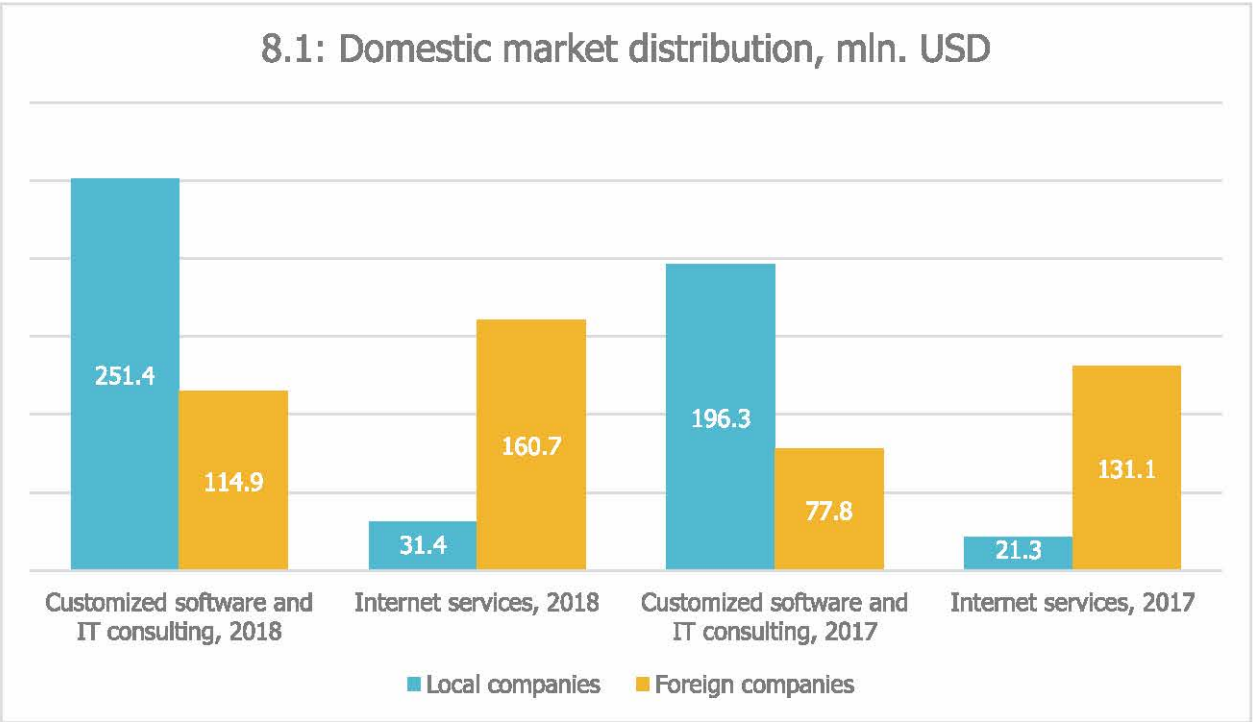
In addition to the local ICT companies, a number of foreign branches and representation offices are in operation in Armenia. These are primarily outsourcing centers with clearly defined budgets; a small proportion of the revenue generated by these foreign branches stays in the country as salaries and other expenses. Nevertheless, this branch model is still relevant in Armenia, and has a noticeable positive effect on the country's industry and overall economy.

## 8.2 Domestic market

In 2018, domestic market volume reached about 558.4 million USD, and comprised 60.5 percent of the industry's total. This marks a 31 percent increase as compared to the 2017 domestic market share. The distribution of domestic market is shown in Chart 8.1. The software sector's

[3]Source: National Statistical Service of the Republic of Armenia, http://www.armstat.am.

share constituted 65.6 percent of the domestic market, and the ISP segment was at 33.4 percent, with an estimated 192.1 million USD in total market revenues. The shares of locally owned ISPs – and the overall ISP market – increased considerably due to entry into the market of new, large ISP firms and the acquisition of telecom players.




In general, the domestic market's sales volume increased by 31 percent after 2017 because of the growing demand for IT sector services in other industries. There is a growing demand for IT services in the domestic market, but the process has been slowed by a number of factors, including domestic market margin, low wages, limited demand for productivity enhancement tools, financial constraints, prevalent software piracy, and so on.

The relatively low domestic demand was insufficient to induce the Armenian ICT companies to develop new software packages or offer new and improved services. A large percentage of the software packages sold on the domestic market were accounting and financial software for large enterprises and banks. Other in-demand products and services included enterprise resource planning solutions, e-commerce, web development services, tools for use in the healthcare industry, and distance learning programs. Developments in artificial intelligence, machine learning, big data analysis, and IOT continued to gain momentum.

## 8.3 Exports

Armenia's export volume has marked a 7 percent growth rate in 2018, reaching 363.9 million USD. This represents 39.5 percent of the Software and Services segment (without ISPs) total.

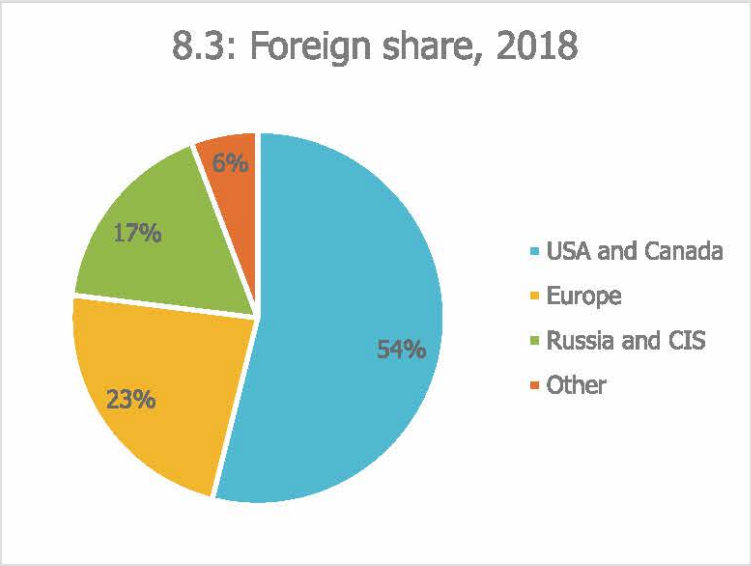
Foreign companies accounted for 65 percent of export share. A part of the largest software and services companies were branches of foreign firms, which export a major portion of their output. In addition, many domestic enterprises also export a significant portion of their products and services.


At 45 percent, the United States and Canada represented the largest share of exports. Europe came next at 25 percent, then Asia at 11 percent, and Russia and CIS countries were at 10 percent. Other countries including Cyprus, South American countries and India are at 9 percent. From 2017 the distribution of export destinations changed significantly, particularly it has become more homogeneous since Armenia entered into the Eurasian Economic Union (EEU). It is worth mentioning that Armenia increased the scope of its partnership with Asian countries, and that was also reflected in the export geography.

In general, the main factors hindering the growth of exports included the international business community's lack of awareness about Armenia and its IT industry; the country's distance from major IT markets; and language barrier. The latter, however, has become less important.

## 8.4 Companies with Foreign Share

The data for 2018 show that 243 foreign-owned companies, or 30.4 percent of the industry total, were in operation in Armenia. In 2005, these companies represented only 25 percent of Armenian ICT companies. Armenia's expertise in software development continued to gain recognition overseas, thus attracting foreign investments in the ICT sector.




As they did in the previous years, US companies represented the majority of foreign companies operating in Armenia (54 percent). This number is greater by 10 percent than those for the past three years. Companies with Europe-owned and Russia/CIS-owned shares represent 23 percent and 17 percent, respectively.

The majority of foreign branches were purely development centers for the parent companies. These were usually established as small development centers that first formed effective teams, began to increase their employee numbers, and then moved on to activities of greater value to Armenia. It has been a common practice to eventually move the entire cycle of a company's technical activities to Armenia, including R & D, design, coding, testing, and other functions. In addition, some companies have begun to relocate portions of their business-related functions, such as marketing and customer support, to Armenia. The practice of sending local professionals to customer sites outside of Armenia to provide implementation and customer support was also prevalent.

## 8.5 Success Stories

Synopsys, Inc. (Nasdaq: SNPS) is the Silicon to Software™ partner for innovative companies developing the electronic products and software applications we rely on every day. Synopsys established a presence in Armenia in 2004 as Synopsys Armenia closed joint stock company (CJSC) after acquiring Monterey Arset and Leda Design, with a combined total of nearly 130 local employees. Later, Synopsys enlarged its presence in Armenia by acquiring HPLA in 2005 and Virage Logic in 2010. Today, Synopsys is one of the largest IT employers in Armenia, with more than 750 employees (including more than 650 engineers), and is among the largest Synopsys sites outside the U.S.

National Instruments (NI) is a leading multi-national technology company with direct operations in 41 countries. NI is a producer of automated test equipment and virtual instrumentation software. National Instruments transforms the way engineers and scientists around the world design, prototype, and deploy systems for test, control, and embedded design applications. The NI academic program is carried out in more than 110 countries. There has been an NI branch in Armenia since 2005 that currently employs around 100 people. During the past ten years, the NI Armenian branch generated more than 15 spin-offs.

Mentor Graphics Corporation is a world leader in electronic hardware and software design solutions. In July 2008, Mentor Graphics established its representative office in Armenia by acquiring the assets of Ponte Solutions Inc., Mountain View, CA. In March 2017, Siemens closed its acquisition of electronic design automation (EDA) software creators Mentor Graphics, expanding its software business and entering the integrated circuit and embedded software segment. Mentor joined the Siemens product lifecycle management (PLM) software business unit within the Siemens Digital Factory division.

VMware established its Armenian R & D site in 2010 through the acquisition of Integrien Corporation, the leader in real-time performance analytics. After the acquisition, VMware changed the name of Integrien's core product from Integrien Alive Enterprise to VMware vCenter Operations, and it later became the key component of vCenter Operations Management Suite. This product provides a new and greatly simplified approach to operations management of physical, virtual, and cloud infrastructures, which helps enhance VMware vSphere, thus realizing a new technology transformation. The vCenter Operations team has expanded in the past year, adding roughly 40 highly qualified and experienced engineers and researchers. The team is composed of PhDs and engineers who are in charge of overall product development.

In November 2014, Cisco Systems Development president, Mario Mazzola, visited Armenia, where he announced that Cisco Systems (an American multinational corporation headquartered in San Jose, California that designs, manufactures, and sells networking equipment) had acquired the Armenian company Memoir Systems and has opened an office in Armenia. This acquisition has enabled the company to increase the manufacture of affordable and high-speed memory for existing ASIC-Cisco switches and circuits.

On June 20, 2014, US-based multinational computer technology company Oracle announced that it had signed an agreement to acquire LiveLOOK for the purpose of strengthening the Oracle Service Cloud with leading co-browse functionality to improve customer experiences through connected real-time engagements. Following this acquisition, Oracle decided to keep the LiveLOOK office in Yerevan as part of its R & D staff, and that became the first Oracle R & D office in Yerevan. Oracle is now exploring the possibility of expanding in Armenia; during a speech he gave in Armenia, LiveLOOK Inc. founder and CEO Igor Khalatian announced that Oracle planned to open a 200 to 300-member R & D center in Armenia.

The Armenia-based Joomag Company is the pioneer in offering rich interactivity in digital publishing and a leader in the digital publishing services field. The company provides integrated solutions for publishing, distributing, tracking, and monetizing publications online for more than 300,000 worldwide publishers that create digital interactive magazines, newsletters, blogs, catalogues, brochures, and e-books.

Shadowmatic, an iOS app developed by the Yerevan-based Triada Studio, won the prestigious Apple Design Award during Apple's World Wide Developers Conference in San Francisco on June 8, 2015. Triada Studio is a computer graphics and animation studio with over 20 years of industry experience. Shadowmatic is the company's first project that combines its vast experience in computer graphics with an experimental in-house 3D engine. The team began working on Shadowmatic in March 2012, and continued to add new features to their original idea during the development phase, which lasted about three years. Released to Android users in 2017, the app appeared in Google Play's 2017 list of best games. It was recognized in a number of countries as one of the most innovative games.

Developed by Armenian experts, the PicsArt mobile photo editing application ranked fifth on Forbes Magazine's 2015. Hottest Startup list. At the same time, Google Play recognized the application as one of 2015's best apps. PicsArt's programming and marketing are carried out in Yerevan. The app has more than 100 million monthly active users.

SoloLearn is a startup featuring mobile apps with millions of users in more than 200 countries. SoloLearn is now the world's largest community of code learners, where learning is free and the content is developed by the community itself. Launched four years ago, SoloLearn currently has 8M millennial coders worldwide. The growth has been earned thanks to global user satisfaction, largely from the United States, India and Europe. In 2016 SoloLearn closed an investment round with Learn Capital one of the most respected education investors in the Bay Area. In 2017 SoloLearn won Facebook's FBstart App of the Year global award. In 2018 SoloLearn received a $5.6 million fundraising from Naspers Ventures, with participation from Learn Capital investor.

The Armenian start-up Triple-E is a platform of augmented reality that enables the user to add virtual objects to any surface. Dutch Crosspring incubator founder Maurice Beckand Verwee believed in the start-up and made an investment. The team will direct the investment to the technical development and independence of the platform.

The Teamable online platform, which helps companies quickly find employees by creating teams from groups of existing employees through suggestions, received a five million USD venture investment from True Ventures in 2017. Teamable cooperates with a number of well-known American companies, including Uber, Facebook, Lyft, Hipanalitics, Stripe, Oracle, Intuit, and others.

The Armenian Volterman smart wallet successfully implemented its crowdfunding campaign on IndieGoGo in 2017. It took just a couple of hours to reach it original goal of 45 thousand USD.

The Armenian start-up Inapptics was included in the acceleration program of the European start-up Wise Guys. An investment from the HIVE Foundation will enable the start-up to continue is operation and development in Armenia.

CHAPTER 9.

# POLICY DEVELOPMENTS AND MAJOR ACCOMPLISHMENTS

# 9. Policy Developments and Major Accomplishments

In 2000, the Government of Armenia declared the IT sector a priority in the development of the Armenian economy and followed up with a number of specific actions to bring the decree into effect. In 2001, the Government partnered with the World Bank, USAID, universities, various foundations, and private enterprises to develop the ICT Master Strategy and ICT Development Implementation Plan for the purpose of promoting ICT and establishing Armenia as a regional ICT hub. In May 2001, the Government approved the ICT Development Concept Paper and Action Plan prepared by the Ministry of Trade and Economic Development of Armenia based on the recommendations outlined in the ICT Master Strategy.

In 2000, the Union for Information Technology Enterprises was established as a business association for information and communication technology enterprises operating in Armenia. The goal was to protect the rights of the sector's companies and to promote business.

In July 2001, the Information Technologies Development Support Council of Armenia (ITDSC), chaired by the Prime Minister, was established by decree of the President of Armenia. The Council's mission is to act as a bridge between the Government and the private sector and to serve as a link between the Diaspora and Armenia. Its goals are to assist the Government and the private sector in building a strong and viable IT industry and developing Armenia into an advanced information society.

In 2001, ViaSphere Technopark CJSC was established. It provided business incubation services and created an excellent business environment for the development of already thriving technology companies and for start-ups.

In 2002, the Government of Armenia and the World Bank established the Enterprise Incubator Foundation to support the development of the information technology industry in Armenia. EIF is the largest development initiative within the IT industry in Armenia.

In 2008, the Government adopted a new ten-year industry development strategy focused on building infrastructure, improving the quality of IT graduates, and creating venture and other financing mechanisms for start-up companies. The main goals of this new strategy were to build a developed information society in Armenia, make Armenia part of the global network of knowledge creation, and form a strong and advanced information technology sector. The strategy aims at increasing the rates of computer and internet penetration in all segments of the economy, building new technology parks and incubators, establishing a major venture fund, developing a domestic market for local IT products and services, increasing foreign direct investments, developing other measures targeting the expansion of the ICT sector, and developing an information society in Armenia. The Ministry of Economy was the Government body responsible for the implementation of this strategy and overall IT industry development.

The Ministry of Transportation, Communication and Information Technologies took off the responsibilities starting from 2017.

Since 2008, National Budget allocations have been made to respective states bodies that regulate the IT sector for the purpose of providing government support for IT sector development. Funds are used for IT industry research; surveying industry status; preparing guidelines for the industry and enterprise rates; organizing industry-related events of local, regional, and international importance in Armenia, including exhibitions, forums, conferences, and competitions; Armenia's participation in major international events abroad; and co-financing joint projects and events with foreign governments, international institutions, and transnational organizations of the IT industry.

Arranged and implemented in close cooperation with the Government of Armenia, ArmTech is the Armenian global high-tech congress and DigiTec is the specialized information, telecommunications, and high-tech expo. Together, these events have established a tradition.

ArmTech congresses are intended to highlight growth in the high-tech industry that has strategic importance for the Armenian economy; promote international collaboration and attraction of investments; foster cooperation between IT specialists; and make the Armenian high-tech industry globally recognizable. The annual forum is organized sequentially in Armenia and the US.

The main goal of the DigiTec Expo is to create a favorable environment for communication between high-tech companies, business consumers, and the general public. The expo serves as the ground floor for studying and understanding the real picture; identifying the achievements, challenges, and opportunities of the Armenian ICT sector; facilitating market entry for IT companies and the exhibition of their products and services; and strengthening international relations.

In recent years, the Government of Armenia signed a number of cooperation agreements and memoranda of understanding with the governments of the Republic of India, the Arab Republic of Egypt, and others; and globally known companies Microsoft, Alcatel, Hewlett-Packard, Sun Microsystems, National Instruments, Mentor Graphics, Cisco, Intel, Synopsys, D-link, Siemens, Synergy, IBM, SAP and others.

The Government of Armenia also implements targeted projects for the development of IT sector infrastructure. Specifically, in 2008, the Government of Armenia approved the Concept Paper and Action Plan for reconstructing Gyumri as a technocity. Since that time, allocations have been made from the State Budget of the Republic of Armenia to the Ministry of Economy to provide state support to the activities of the Technology Centers in Gyumri and Vanadzor. The program's goal is to make Gyumri and Vanadzor Centers of Excellence, or Technocities known as business environments with large educational institutions; research centers; strong facilities for the

development, testing, and realization of innovative information and high-tech projects; and concerns with the capacity to begin large-scale production and small and medium high-tech companies.

It's one of the goals of the Government of Armenia's new ICT Development Strategy to form an E-society for the purpose of significantly expanding computer usage and Internet access in Armenia. The Computer for All Program has been launched to support that goal, according to the following aims:

- Make computers affordable and accessible to the population
- Train skillful computer hardware and software users
- Enhance Internet accessibility and use of E-services for the population
- Reduce the propagation of non-licensed software

The program was implemented by the Ministry of Economy of the Republic of Armenia and EIF, along with international and local ICT companies, banks, and other partners.

In 2010, the Ministry of Economy, the Ministry of Education and Science, Intel, Hewlett-Packard, EIF, and Unicomp CJSC signed memoranda of partnership to implement the Teachers PC and Classmate PC pilot projects in Armenia.

By its Decree N7 of February 25, 2010, the Government of Armenia approved the Armenian E-society Development Concept Paper, which is to be implemented over the next few years.

In 2010, the Government of Armenia introduced the www.e-gov.am electronic management portal to foster the use of electronic management systems to the fullest extent. The intention was to unify all electronic management tools and databases used by the Armenian governmental authorities and to provide an environment conducive to their use. The site offers electronic applications for licensing, electronic registration of organizations, electronic tax reports, electronic visa applications, electronic applications to the Intellectual Property Agency, issue of electronic signatures, electronic procurements, and more. New services are continuously added to the electronic management portal. Efforts are currently underway to introduce additional electronic services in the areas of e-health, e-education, e-pension, and e-identification.

To achieve the aforementioned objectives and implement other industry development programs and projects, the Government of Armenia signed a credit agreement with the International Bank for Reconstruction and Development that allowed for the establishment of the Armenia E-Society and Innovation for Competitiveness Program in 2011. The Program consists of several projects aimed at strengthening the ICT infrastructure in Armenia, fostering industry development, forming an e-society, and so on. Specifically, the program includes, but is not limited to, the following projects: Pan-Armenian Broadband Access and Management Network, Introduction of Certification Center in Armenia, Computer for All, Gyumri and Vanadzor Technology Centers,

Financial Support to Companies Needing Innovative Knowledge and Technologies, and Assistance to IT/Research Industry Development. The majority of activities in scope of this Program was implemented by EIF.

Armenia's first venture capital firm, Granatus Ventures, was established in 2011. This fund is important for Armenian IT companies, because in addition to developing IT infrastructures in Armenia, it aims to promote the innovative initiatives of Armenian IT companies, develop their capabilities, and contribute to the establishment of trade links with Western markets.

Since July 2011, the Republic of Armenia has undertaken eighteen months of the coordination of the Black Sea Economic Cooperation Working Group on Information and Communication Technologies.

In June 2011, Armenia passed the Law on the Free Economic Zone, and a number of important regulations were in place by late 2011.

In 2011, the Microsoft Innovation Center (MIC) was established through the joint efforts of the RA Government, USAID, Microsoft Inc., the National Engineering University of Armenia and the Enterprise Incubator Foundation. MIC uses an innovative and effective approach to supporting the development of fundamental knowledge and experience in small and medium-sized enterprises that design innovative ICT solutions, and provides improved business knowledge in order to establish sustainable enterprises.

In 2012, the Government of Armenia, USAID, National Instruments (NI), the State Engineering University of Armenia (NPUA), and the Enterprise Incubator Foundation (EIF) partnered to establish the Armenian National Engineering Lab (ANEL). The project's main goal is to meet the engineering industry's demand for quality specialists and graduates.

In December 2012, the Government of Armenia and Intel Corporation signed a Memorandum of Understanding in regard to cooperation in the sphere of education and R & D. Under this Memorandum, Intel plans to expand its joint efforts with Armenia to increase the rate of computer penetration in schools, improve teacher training, create educational content, and establish new partnerships in software development and joint research initiatives.

The first Armenian Free Economic Zone (FEZ) was established in 2012 to contribute to increasing export volumes and creating new jobs, and to ensure sustainable economic development by attracting foreign direct investments and introducing advanced technologies. The Free Economic Zones established at RAO MARS CJSC and the Yerevan Computer R & D Institute CJSC are oriented toward the production and export of innovative and high technologies in the fields of electronics, precision engineering, pharmaceuticals and biotechnologies, information technologies, alternative energy, industrial design, and telecommunications (elaboration and production of

technological equipment, systems, and materials for data/information transfer). Free Economic Zone operators are exempted from profit tax, income tax, VAT, property tax, and customs duties.

With the support of the RA Government and a number of private investors, Armenia's first venture fund was established in 2013. This initiative is important for Armenian IT companies because its goals are to support the innovativeness of Armenian companies; promote networking with the Western market for high technologies and FDI options; and develop Information Technology infrastructure in the Republic of Armenia.

In 2013, the Government of Armenia and IBM signed a Memorandum of Understanding that called for cooperation in the spheres of education and R & D, specifically the establishment of the Innovative Solutions and Technologies Center.

The Gyumri Technology Center was opened in Septober 2014 as an infrastructural unit to further the development and progress of information and high technologies in Gyumri and the Shirak region.

In December 2014, the Government of Armenia and IBM signed a Memorandum of Understanding in regard to cooperation in the social services sector, including the implementation of IBM Curam Technology in Armenia, as well as the establishment of the Center of Excellence in Social Services.

The RA Law on State Support for the IT Sector, which provides tax privileges for start-ups, was passed in 2014.

Under the UITE initiative, and with the support of the RA Government and a number of local and international companies, the ArMath engineering laboratories of Armenia's educational system were launched in 2014.

In 2015, the Government of Armenia and Microsoft signed a memorandum and cooperation agreement that called for the development and implementation of prospective new programs. The goal was to create the Microsoft Center for Mobile and Cloud Development at the Microsoft Innovation Center and mLab ECA.

In November 2015, the Union of Employers of Information and Communication Technologies was established to present and protect the interests of ICT employers in Armenia.

Based on the success of the Gyumri Technology Center, the Vanadzor Technology Center was launched in October 2016 as an infrastructural unit to further the development and progress of information and high technologies in Vanadzor and the Lori region. EIF is authorized as General Operator of both centers.

In partnership with IBM, USAID and EIF, the Innovation Solutions and Technologies Center was officially opened in 2016. The Center's main goal is to develop and empower the educational capacities of the Armenian institutions of higher education in the IT and high-tech sectors, and to create favorable conditions for the development of a stable business environment.

During the Armenia Investment Forum 2016 in New York, the RA Government and National Instruments signed a Memorandum of Understanding related to the establishment of Engineering City.

In March 2017, the RA Government and Philip Morris International signed a Memorandum of Understanding regarding the implementation of initiatives aimed at developing a research and scientific educational ecosystem in Armenia, as well as the establishment of a research center.

In 2017, the Digital Armenia Foundation was established to create a unified digital environment for all management areas based on contemporary information technologies.

In 2018, SoloLearn Armenian-US startup acquired a 5.6 mln. USD investment by Naspers Ventures, jointly with Learn Capital.

In 2018, the newly established SmartGateVC venture fund made its first investment in 2Hz, XCloud Networks and Embry startups.

In October 2018, the first international center of Tumo was launched in Paris. It is located at the Forum des Images Center, in the main part of Les Halles district of Paris. It provides free-of-charge education to about 1500 youngsters of 12-18 years-old.

By the RA Government's Decree of 30 August, 2018, it was decided to establish a free economic zone in Hrazdan town of Armenia, with EKOS cjsc appointed as the operator. It is envisaged to have a mining center in Hrazdan including operation based on block chain, with extensive use of big data computing and cloud technologies.

| IT Industry Growth Targets for 2018 | |
|---|---|
| | |
| Home/household computer penetration | 70% |
| Computer penetration at educational institutions | 100% |
| Computer penetration at central and local governments | 100% |
| Internet accessibility for general population | 90% |
| RA Government spending on locally developed IT products, % of national budget | >1% |
| Domestic consumption of locally developed IT products, % of GDP | >2% |
| Share of e-services in all services provided by RA state entities | 80% |
| Number of IT companies established<br>with foreign capital | 1,000<br>200 |
| IT workforce | 20,000 |
| Productivity and output per employee | 50,000 USD |
| Industry revenues | 1 billion USD |
| Exports | 700 million USD |
| IT companies with ≥ 1,000 employees | >1 |
| IT companies offering R&D services | 100-200 |
| Large technocities,<br>technoparks, and incubators | >1<br>>10 |
| Venture capital funds committed | >700 million USD |
| Local open joint stock companies registered at Armenian Stock Exchange | 50-100 |
| Local open joint stock companies registered at International Stock Exchanges | >5 |

# APPENDIX

# APPENDIX

## Industry Statistics

| | 2018 | % in industry total | 2017 | % in Industry total | % difference 2018/2017 | Combined annual growth rate 2018/2010 |
|---|---|---|---|---|---|---|
| **Number of companies** | | | | | | |
| *Total* | 800 | 100,0% | 650 | 100,0% | 23,1% | 19,1% |
| 1. Local companies | 557 | 69,6% | 448 | 68,9% | 24,3% | 20,5% |
| 1.1 Software development and IT consulting | 532 | 66,5% | 429 | 66,0% | 24,0% | 21,9% |
| 1.2 Internet services | 19 | 3% | 21 | 5% | -10% | -5% |
| 2. Foreign branches | 243 | 30,4% | 202 | 31,1% | 20,3% | 16,4% |
| 2.1 Software development and IT consulting | 232 | 29,0% | 191 | 29,4% | 21,5% | 16,4% |
| 2.2 Internet services | 11 | 1,4% | 11 | 1,7% | 0,0% | 17,6% |
| **Geographic distribution of companies with foreign share** | | | | | | |
| *Total* | 800 | 100% | 650 | 100% | 23% | 19% |
| Armenia | 557 | 69,6% | 448 | 68,9% | 24% | 21% |
| USA and North America | 131 | 16,4% | 104 | 16,1% | 25% | 18% |
| Europe | 56 | 7,0% | 42 | 6,4% | 34% | 15% |
| Russia and CIS | 42 | 5,3% | 42 | 6,4% | 0% | 14% |
| Other | 14 | 1,8% | 14 | 2,1% | 0% | 21% |
| **Export geography, millions of USD** | | | | | | |
| *Total* | 333,9 | 100,0% | 338,6 | 100% | -1% | 24% |
| USA and North America | 153,6 | 46,0% | 123,3 | 36,4% | 25% | 18% |
| Europe | 83,5 | 25,0% | 96,2 | 28,4% | -13% | 29% |
| Russia and CIS | 33,4 | 10,0% | 52,1 | 15,4% | -36% | 27% |
| Asia | 36.7 | 11,0% | * | * | * | * |
| Other | 30,0 | 9,0% | 67,0 | 19,8% | -55% | 44% |
| *the Asia destination has been classified in 2018 | | | | | | |

| **Productivity (average productivity per technical employee, excluding ISPs), thousands of USD** | | | | | | |
|---|---|---|---|---|---|---|
| *Total* | 50,07 | 100,00% | 40,109 | 100% | 25% | 6% |
| **Turnover of software development and Internet services sectors, millions of USD** | | | | | | |
| 1. Total sector | 922,3 | 100,0% | 765,1 | 100% | 21% | 25,6% |
| 1.1 Programming and IT consulting | 730,2 | 79,2% | 612,7 | 80,1% | 19% | 28% |
| 1.2 Internet services | 192,1 | 20,8% | 152,4 | 19,9% | 26% | 18% |
| 2. Local companies | 410,2 | 44,5% | 332,7 | 43,5% | 23% | 28% |
| 3. Foreign branches | 512,1 | 55,5% | 432,4 | 56,5% | 18% | 24% |
| 4. Domestic market | 558,4 | 60,5% | 426,5 | 55% | 31% | 26% |
| 4.1 Local companies | 282,8 | 30,7% | 217,6 | 28,4% | 30% | 25 % |
| 4.1.1 Programming and IT consulting | 251,4 | 27,3% | 196,3 | 25,7% | 28% | 29% |
| 4.1.2 Internet services | 31,4 | 3,4% | 21,3 | 2,8% | 47% | 10% |
| 4.2 Foreign branches | 275,6 | 29,9% | 208,9 | 27,4% | 32% | 26% |
| 4.2.1 Programming and IT consulting | 114,9 | 12,5% | 77,8 | 10,2% | 48% | 39% |
| 4.2.2 Internet services | 160,7 | 17,4% | 131,1 | 17,1% | 23% | 21% |
| 5. Export | 363,9 | 39,5% | 338,6 | 44,3% | 7% | 26% |
| 5.1 Local companies | 127,4 | 13,8% | 115,1 | 15.0% | 11% | 36% |
| 5.2 Foreign branches | 236,5 | 25,6% | 223,5 | 29,2% | 6% | 22% |
| **Distribution of specialists*** | | | | | | |
| *1. Total number* | 19552 | 100,00% | 15350 | 100% | 27% | 19,0% |
| 1.1 Technical specialists | 15239 | 77,9% | 12280 | 80% | 24% | 18% |
| 1.2 Managers | 4313 | 22,1% | 3070 | 20% | 40% | 23% |
| *2.* Programming and IT consulting | 12298 | 62,9% | 9057 | 59% | 36% | 16% |
| 2.1 Local companies | 7770 | 39,7% | 5219 | 34% | 49% | 19% |
| 2.2 Foreign branches | 4528 | 23,2% | 3838 | 26% | 18% | 12% |
| *3.* Internet services | 7254 | 37,1% | 6294 | 41% | 15% | 25% |
| 3.1 Local companies | 2492 | 12,7% | 2303 | 15% | 8% | 34% |
| 3.2 Foreign branches | 4762 | 24,4% | 3991 | 26% | 19% | 22% |
| *4.* Local companies | 10262 | 52,5% | 7522 | 49% | 36% | 22% |

| | | | | | | |
|---|---|---|---|---|---|---|
| 4.1 Technical specialists | 7965 | 40,7% | 5987 | 39% | 33% | 22% |
| 4.2 Managers | 2297 | 11,7% | 1535 | 10% | 50% | 22% |
| *5.* Foreign branches | 9290 | 47,5% | 7829 | 51% | 19% | 16% |
| 5.1 Technical specialists | 7274 | 37,2% | 6140 | 40% | 18% | 15% |
| 5.2 Managers | 2016 | 10,3% | 1689 | 11% | 19% | 23% |
| *6.* Programming and IT consulting | 12298 | 62,9% | 9057 | 59% | 36% | 16% |
| 6.1 Technical specialists | 10082 | 51,6% | 7675 | 50% | 31% | 16% |
| 6.2 Managers | 2216 | 11,3% | 1382 | 9% | 60% | 17% |
| *7.* Internet services | 7254 | 37,1% | 6294 | 41% | 15% | 25% |
| 7.1 Technical specialists | 4668 | 23,9% | 4452 | 29% | 5% | 22% |
| 7.2 Managers | 2586 | 13,2% | 1842 | 12% | 40% | 37% |

*Total numbers have been rounded

| | 2018 | % in total industry | 2017 | % in total industry | % difference 2018/2017 |
|---|---|---|---|---|---|
| **Number of companies by specialization** | | | | | |
| 1. Accounting, banking, and financial software | 24 | 3,2% | 34 | 5.2% | -28% |
| 2. Chip design, testing, and related | 13 | 1,7% | 16 | 2,4% | -16% |
| 3. Computer graphics, multimedia, and games | 23 | 3% | 20 | 3,1% | 12% |
| 4. Customized software and outsourcing | 128 | 16,8% | 133 | 20,5% | -3% |
| 5. Databases and MIS | 53 | 6,9% | 48 | 7,3% | 10% |
| 6. Internet applications and e-commerce | 53 | 7% | 46 | 7,1% | 17% |

| | | | | | |
|---|---|---|---|---|---|
| 7. IT services and consulting | 82 | 10,7% | 65 | 10% | 26% |
| 8. Mobile application development | 84 | 11% | 61 | 9,3% | 38% |
| 9. System design and automation | 80 | 10,5% | 56 | 8,6% | 44% |
| 10. Networking systems and communications | 32 | 4,2% | 20 | 3,1% | 57% |
| 11. Web design and development | 115 | 15% | 84 | 12,9% | 36% |
| 12. Other | 76 | 10% | 37 | 5,7% | 105% |
| 13. Internet service provider | 36 | 4,5% | 30 | 4,6% | 20% |
| *Mobile Application Development and System Design and Automation specializations were separated since 2012 | | | | | |

| | 2018 | % in total Industry | 2017 | % in total Industry | % difference 2018/2017 |
|---|---|---|---|---|---|
| **Revenue distribution by specialization, in thousands USD** | | | | | |
| 1. Accounting, banking, and financial software | 64,6 | 7% | 48,9 | 6,4% | 32% |
| 2. Chip design, testing, and related | 81,2 | 8,8% | 122,5 | 16% | -34% |
| 3. Computer graphics, multimedia, and games | 14,8 | 1,6% | 12,2 | 1,6% | 21% |
| 4. Customized software and outsourcing | 291,4 | 31,6% | 147 | 19,2% | 98% |
| 5. Databases and MIS | 58,1 | 6,3% | 12,2 | 1,6% | 375% |
| 6. Internet applications and e-commerce | 57,2 | 6,2% | 24 | 3,2% | 134% |
| 7. IT services and consulting | 44,3 | 4,8% | 36,7 | 4,8% | 21% |
| 8. Mobile application development | 35 | 3,8% | 30,7 | 4% | 14% |
| 9. System design and automation | 46,1 | 5% | 55,1 | 7,2% | -16% |
| 10. Networking systems and communications | 84,9 | 9,2% | 61,3 | 8% | 38% |
| 11. Web design and development | 63,6 | 6,9% | 55,1 | 7,2% | 15% |
| 12. Other | 82.1 | 8,9% | 6,5 | 0,8% | 1167% |
| 13. Internet service provider | 192,1 | 20,8% | 152,4 | 19,9% | 26% |
| *Mobile Application Development and System Design and Automation specializations were separated since 2012 | | | | | |