2008

ARMENIAN INFORMATION TECHNOLOGY SECTOR

INDUSTRY REPORT

Ministry of Economy of the Republic of Armenia
ENTERPRISE INCUBATOR FOUNDATION
USAID FROM THE AMERICAN PEOPLE | CAPS

ARMENIAN INFORMATION TECHNOLOGY SECTOR
SOFTWARE AND SERVICES

2008 STATE OF INDUSTRY REPORT

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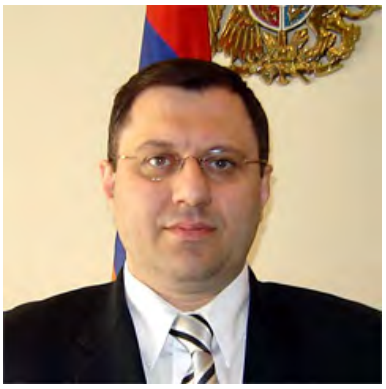
FOREWORDS



Information technology has become one of the major sectors of Armenian economy contributing to the technological innovation and productivity growth in the country. IT industry, together with the telecommunications sector, is one of the fastest expanding segments of the economy, and it has been identified by the Government of Armenia as a key area for the economic well being of our nation.

With its rich scientific research traditions and highly skilled labor force, Armenia turned into a destination of choice for many global technology firms. A number of high-tech companies from Europe, Russia, and the U.S. are operating large development and R&D centers in Armenia. These centers work on cutting edge technologies and tools employed by many corporations around the world to develop products and services or solve various business problems.

The new comprehensive IT sector strategy adopted by the Government of Armenia in 2008 focuses on developing telecommunications and business incubation infrastructure, improving the quality and increasing the number of technical graduates, expanding support and financing mechanisms for technology start-ups, as well as developing other areas important for the growth of Armenian IT industry. At the Government, we believe that the successful implementation of this strategy is the key to the transformation of Armenian IT sector into a highly competitive and recognized player among other technologically advanced nations around the globe.

Sincerely,

Nerses Yeritsyan
Minister of Economy of the Republic of Armenia

Enterprise Incubator Foundation is a business development and incubation agency supporting technology companies in Armenia. Our objectives are to improve competitiveness of Armenian IT companies in the global marketplace, build linkages with business communities in key technology markets, improve access of local companies to knowledge and information on best practices and experience, and assist Armenian firms with attracting local and foreign investors. An important part of our strategy is provision of research and analytical publications about Armenian IT industry. The goal of this Report is to help better understand Armenian IT sector, recognize its main needs, as well as gain insights on possible solutions to its key problems.

The Report is based on our surveys of the sector conducted in 2004 through 2008. It covers key aspects of the industry including history, revenues, productivity, workforce, educational sector, policy developments, and others. Appendices section contains information about Armenia, timeline of key historical dates, an FDI success story, detailed statistics, as well as definitions, key assumptions, and estimation methods.

The Report could not have been prepared without numerous interviews with managerial and professional staff of IT companies, faculty and students of educational institutions, representatives of development organizations, NGOs, training centers, and others. We are immensely grateful to all these individuals for their time and help.

We are thankful to the Ministry of Economy and USAID's Competitive Armenian Private Sector Project for supporting this publication.

Sincerely,

Bagrat Yengibaryan
Director of Enterprise Incubator Foundation

The ICT sector in Armenia is one of four industry clusters which are supported by the USAID funded CAPS project and among the first two selected for assistance back in 2005. The reason is simple: There is no other sector which has greater potential to improve the competitiveness of Armenian business as a whole than ICT. ICT provides a critical cross-cutting function that enables businesses to compete on the world stage and adopt world standard practices.

In this day and age it is difficult to imagine many industries that can attain global competitiveness without such tools as e-promotion, e-market research, e-commerce and extensive use of web pages and interactive media.

With its longstanding tradition of ICT innovation, including a growing base of ICT services firms and an extensive network of universities, the Armenian ICT cluster is poised for impressive further development and expansion. Custom software, microchip design, multimedia, custom ERP applications, e-commerce and other products/services are produced in Armenia by Armenian firms as well as numerous foreign branches. Hence, Armenia's base as a technology hub among CIS nations continues to develop and strengthen, and increasingly serves not only its domestic market but those of international clients as well.

Armenia's ICT industry is one to watch and one that deserves attention by stakeholders from around the world, as evidenced by the growing number of international events of late with strong Armenian presence.

Sincerely,

Hayley Alexander
Chief of Party, Competitive Armenian Private Sector Project (CAPS)

SECTOR AT A GLANCE

Historically, Armenia was on the forefront of high-tech research, development, and manufacturing. Since early 1950s, Soviet Armenia has been a main hub of USSR's critical scientific and R&D activities in a number of technology industry segments such as mainframe and industrial computing, electronics, semiconductors, software development, and others. Before the collapse of the Soviet Union, Armenian technology sector focused primarily on the large-scale R&D and production projects targeted at industrial and military applications. After the independence of 1991, the industry switched its focus to the software development, outsourcing, and IT services. The software and services segment really gained its momentum during the last 10 years, during which the sector grew at 27% per annum. In 2008, the share of the industry in Armenia's GDP was 1.2%[1], which is comparable to that of India (1.4%) and Germany (1.3%).

In recent years, the sector has witnessed major inflow of foreign investors who have located in Armenia to capitalize on the young and highly qualified workforce. Around 62% of the industry's output is exported to over 20 countries, mainly USA, Europe, and NIS. The major specializations include embedded software and semiconductor design, custom software development and outsourcing, financial applications, multimedia design, Internet applications, web development, MIS and system integration. In particular, Armenia has outstanding achievements in semiconductor design software and IP solutions. Foreign companies specialized in chip design place their R&D facilities in Armenia to benefit from the talented and creative workforce pool and highly competitive wage rates.

COMPETITIVE ADVANTAGES OF ARMENIA

- World-class R&D capabilities in computer science, physics, and mathematics,
- Well-educated and talented workforce with a high degree of technical skills and English language proficiency,
- Strong university programs with specializations in IT and sciences,
- Highly competitive cost of labor and low operating costs,
- Solid Government support of the sector and commitment to improve the investment climate,
- Strong and successful Diaspora in Europe and North America,
- Extensive experience with large multi-national companies,
- Sound laws and regulations for IP protection.

[1] Based on 2007 GDP figure, source Central Bank of Armenia.

2008-2006 MAIN INDICATORS

	2008	% from Industry	2006	% from Industry	% change 2008/2006	CAGR 2008/2006
Operating Companies						
Industry total	175	100%	160	100%	9%	4.6%
Local firms	119	68%	112	70%	6%	3.1%
Foreign branches	56	32%	48	30%	17%	8.0%
Industry Revenues, millions of U.S. dollars						
Industry total	$111.3	100%	$84.2	100%	32%	15.0%
Local firms	$50.1	45%	$36.7	44%	37%	16.9%
Foreign branches	$61.2	55%	$47.6	57%	28%	13.4%
Industry average revenue per company	$0.64	100%	$0.53	100%	21%	9.9%
Local firms	$0.42	66%	$0.33	62%	29%	13.4%
Foreign branches	$1.09	172%	$0.99	188%	10%	4.9%
Domestic market	$41.9	38%	$30.9	37%	36%	16.4%
Exports	$69.4	62%	$53.3	63%	30%	14.1%
Software and IT consulting	$96.0	86%	$75.2	89%	28%	13.0%
Internet Services	$15.3	14%	$9.0	11%	70%	30.5%
Productivity (weighted average output per technical employee), U.S. dollars						
Industry total	$29,300	100%	$26,500	100%	11%	5.2%
Local firms	$27,500	94%	$22,500	85%	22%	10.6%
Foreign branches	$30,400	104%	$28,900	109%	5%	2.6%
Human Resources (persons)						
Industry total	4,890	100%	4,020	100%	22%	10.3%
Technical professionals	4,250	87%	3,390	84%	25%	12.0%
Management and administrative	640	13%	630	16%	2%	0.8%
Local firms	2,460	50%	2,010	50%	22%	10.6%
Foreign branches	2,430	50%	2,010	50%	21%	10.0%
Students in IT related specialties at major Armenian universities	6,800	100%	5,280	100%	29%	13.5%

INDUSTRY OVERVIEW

Armenia is one of the leading information technology nations among the neighboring CIS and Middle East countries. This potential was formed when Soviet Armenia has become a key science, R&D, and high-tech manufacturing location of the former USSR. At the peak of its growth in 1987, science and technology sector in Armenia employed, according to various estimates, around 100,000 specialists. The collapse of the Soviet Union, regional conflicts, and devastating earthquake in the north of the country brought enormous economic hardships to Armenia. The consequences for the high-tech sector were significant: the majority of science and R&D institutions had to curtail or shut down operations leaving thousands of people jobless.

Independence of 1991 created completely new opportunities for the industry and particularly for entrepreneurs and IT professionals. Focus of the industry shifted from major manufacturing operations to the software and services segment, which has witnessed substantial growth during the last 10 years. Today, Armenian IT industry is one of the most dynamic and promising sectors of the economy. Past successes, qualified professionals, and Armenian entrepreneurial spirit position the industry to be successful in the years to come.

HISTORY

There are two principal stages in the development of Armenia's technology sector: period under the Soviet rule and post-Soviet independent Armenia. During the first stage, Armenia was a major center for R&D and production in the areas of computer science and electronics. This potential has been created back in the 1950s when several major R&D and semiconductor manufacturing plants were established. These institutions operated for the Soviet Government and concentrated primarily on medium and large scale industrial and defense applications. Many organizations had in-house software development departments focusing on automation of accounting and other organizational functions. During the second stage, tech sector concentrated on outsourcing and offshore software development. During this period, potential of IT industry has been recognized by a larger number of investors, policy makers, and professionals. Armenia has become a location of choice for several multinational companies to outsource R&D, operations, and software development. Armenian Government declared support of the ICT sector as a key priority for its economic development policy.

SOVIET ARMENIA (1920 - 1990)

The roots of the industry can be traced back to the period before and during World War II when a heavy industrial expansion was underway in the USSR. This required educated technical specialists in different fields of the economy leading to the establishment of two primary educational institutions in Armenia: Yerevan

State University (YSU) in 1919 and Yerevan Polytechnic Institute (currently State Engineering University of Armenia, SEUA) in 1933. Armenian Academy of Sciences (currently National Academy of Sciences, NAS) was formed in 1935. Foundation of YSU, SEUA, and NAS was a starting point in the long history of the development of science and technology in Armenia.

Era of computers and software development has begun in 1956 with the launch of Yerevan Scientific Research Institute of Mathematical Machines (YerSRIMM). The institute was specifically created by the decision of the Soviet Government to design and build electronic computers and related equipment. Already in 1959, YerSRIMM designed a first generation computer "Aragats" running on vacuum tubes; in 1961, a second generation computer "Razdan" on semiconductor elements was ready. During early 1960s, institute focused on the development of small and medium scale computers, and by the end of 1960s, it moved to the design of mainframes, automated control systems, as well as operating systems, networking and application software. YerSRIMM was the leading institution of the former USSR specialized in the development of microprogrammed computer systems "Nairi", which received more than 40 patents and was presented at 20 international exhibitions. YerSRIMM designed and produced at its own production plant dozens of computers, some of which were compatible with PDP of Digital Equipment and IBM mainframe series. The institute was well known for the development of IBM-360/370 compatible ES series of computer systems widely used in scientific and industrial applications throughout the Soviet Union. A significant achievement of YerSRIMM was a project to design a telecommunication system for the mission to the moon. In 1980s, YerSRIMM alone employed around 10,000 people, more than twice the size of the whole IT workforce today.

A number of production companies were established oriented towards R&D and manufacturing of electronics and semiconductor devices. "Transistor" semiconductor R&D and manufacturing plant (1958) was a USSR leader in the production of transistors and amplifier diodes. In 1964-65, "Sirius" radioelectronics plant making radio-electronic components and "Posistor" microelectronics factory producing diodes and hybrid integrated circuits were constructed in the city of Abovyan. Institute of Microelectronics, Scientific Research, and Technology (1966) was developing microelectronic circuits, automated measurement devices, and other advanced electronic devices. Yerevan Telecommunications Research Institute (YeTRI) established in 1978 was involved in the production of integrated circuits and other products based on silicon thin film technology. In 1986, Ashtarak semiconductor and electronics manufacturing plant was constructed with total investment of $120 million. The plant focused on the production of semiconductor wafers, circuit boards, solar cells, and other electronic devices. Another major manufacturing facility, "Mars" integrated circuits and electronics plant ($300 million investment) was built in 1988 to make printed circuit boards and integrated circuits.

After the liberalization of the Soviet economy in late 1980s, a number of new firms have been created to provide system integration and custom software development services. These companies focused mostly on services to the domestic market with very few of them doing business with foreign clients. Major areas of specialization at the time were accounting and financial applications targeted at the local customers, hardware assembly and sale, and some outsourcing services. The first private IT company in Armenia, "Armenian Software", was established in 1987. As of 1990, there were around 40 large technology oriented R&D institutes and production companies in Armenia. During this period, Armenia was considered a leading center of electronics and information technologies of the Soviet Union.

INDEPENDENT ARMENIA (1991 - 2008)

On September 21, 1991 Armenia declared independence from the Soviet Union. Break-up of USSR and start of the era of personal computers led to the collapse of the Armenian technology sector that for many years has been concentrated primarily on large-scale manufacturing and R&D. The fact that major client of the industry - the giant Soviet military-industry complex - was no longer available exerted great pressure on the industry to shift its focus from large-scale military applications to market and customer driven solutions and services. Thus, gradually new companies have evolved to fill emerging opportunities locally and in foreign markets. The potential created during previous years was the major force, which enabled entrepreneurs and investors to start new business ventures in the fields of high tech and IT.

In 1990s, a new age in the industry development started when several U.S.-based software businesses opened branches in Yerevan including Boomerang Software (internet applications), Credence Systems (semiconductor design-to-test solutions), Cylink (network security products and VPN solution), Epygi Technologies (IP PBXs), HPL Technologies (yield management software and test chip solutions), Virage Logic (advanced embedded memory IP), and others. Diaspora played a key role in the formation of Armenia's fledgling software industry and was the primary factor behind the early establishments of many foreign companies in Armenia. Starting late 1990s, the industry received a new impulse for growth stemming from successes of the previously formed companies, overall recovery of the economy, and unprecedented growth of the worldwide IT industry. The potential of Armenia's IT industry drew attention of a larger number of investors, policy makers, and professionals. The industry started offering higher paying jobs to the young generation encouraging them to pursue careers in the technology fields.

Existing strong scientific and educational base formulated the significant success of the semiconductor design industry, which has grown into a large revenue generating segment within the IT industry and attracted a number of large foreign direct investments. In 2000, U.S. based LEDA Systems Inc., founded by a graduate of State Engineering University and specialized in design of integrated circuits and

components, started a branch in Armenia. One of the key initiatives of the company was the formation of a specialized training center in cooperation with SEUA. At the center, students have an opportunity to receive high-quality engineering practice in the design of integrated circuits, related software and components. Armenia's considerable expertise in the field of chip design attracted Synopsys Inc., a global leader in EDA and VLSI design. The company acquired Armenian operations of LEDA Systems and Monterey Arset (systems on a chip) in 2004 and HPL Technologies in 2005. Currently, Synopsys is the largest software firm in Armenia employing more than 400 professionals. Following the success of Synopsys and Virage Logic in Armenia, Mentor Graphics Inc.[2] established a presence in Yerevan through the acquisition in May 2008 of Ponte Solutions Inc, a California-based developer of solutions for the manufacture and design of semiconductors with a major R&D center in Armenia. In 2007, National Instruments, an Austin, Texas based corporation with over 4,300 employees and operations in 40+ countries, started an engineering and R&D office in Yerevan, Armenia. National Instruments manufactures automated tested equipment and develops virtual instrumentation software employed by engineers worldwide to design solutions for a variety of industries such as aerospace, automotive, communications, electronics, energy, industrial measurement and control, life sciences, semiconductors, and others. Today, NI Armenia is offering conceptual solutions for engineering firms engaged in the development of products and turn-key solutions for different industries, including aerospace.

In early 2000s, more foreign businesses launched development locations attracted by highly qualified labor force and competitive costs: CQG (analytics software and trading solutions), EPAM Systems (offshore software development), Lycos Europe (pan-European online network), Luxoft (software development and outsourcing), and others. Such major brands as Alcatel, Siemens AG, Microsoft Corporation, and Sun Microsystems Inc. operate representative offices in Armenia and are involved in various industry specific and educational initiatives. In 2007, Sun Microsystems and Enterprise Incubator Foundation started a joint project aimed at establishing training laboratories at several major Armenian universities and a solution development and R&D center. The project is co-financed through the USAID/Armenia's Global Development Alliance initiative, which supports public-private programs focused on democracy, economic growth, workforce development, education, and environmental issues.

Growing importance of IT industry led the Government of Armenia to declare ICT as one of the priority sectors of Armenian economy in 2000. Other key initiatives in

[2] Mentor Graphics Corporation (NASDAQ: MENT) is a US-based firm established in 1981. The company is a world leader in electronic hardware and software design solutions, providing products, consulting services and support for the world's most successful electronics and semiconductor companies. Company has an annual turnover of over $825 million and employs 4,300 people worldwide. Source: http://www.mentor.com/.

the policy field include preparation of Armenia's ICT Master Strategy and formation of Information Technologies Development Support Council (ITDSC) in 2001 and start of Enterprise Incubator project in 2002. Union of Information Technology Enterprises (UITE), Armenian IT association, was established in July 2000 by the private sector to consolidate industry advocacy efforts, facilitate business, and encourage advancement of research in the ICT sector. In 2008, the Government adopted a new industry development strategy focused on infrastructure, workforce, education, venture financing, e-society, and other areas.

INDUSTRY BACKGROUND

Armenian IT sector has two distinct segments of companies: firms with local ownership and branches of foreign companies. Characteristics of the businesses from each segment such as number of employees, salaries, revenues, and others are noticeably different. Industry analysis in the Report stems from and relies on this important classification of Armenian IT enterprises.

COMPANY FOUNDATIONS

Armenia's software and services industry is young: the prevailing number of companies, nearly 80%, was founded during 2000-2008. First local private software firm was established in 1987, and within 5 years first foreign branch was launched in Yerevan. 1991-1997 turned to be a tough transitional period for the technology sector: regional conflicts, collapsed economy, brain drain - all had considerable effects on the revival of the industry. As of 1998, around 35-40 software firms and ISPs were operating in Armenia employing, according to various estimates, nearly 1,000 specialists. Size of the workforce was notably smaller in 1998 compared to that observed in 1987 when only YerSRIMM employed up to 10,000 people.

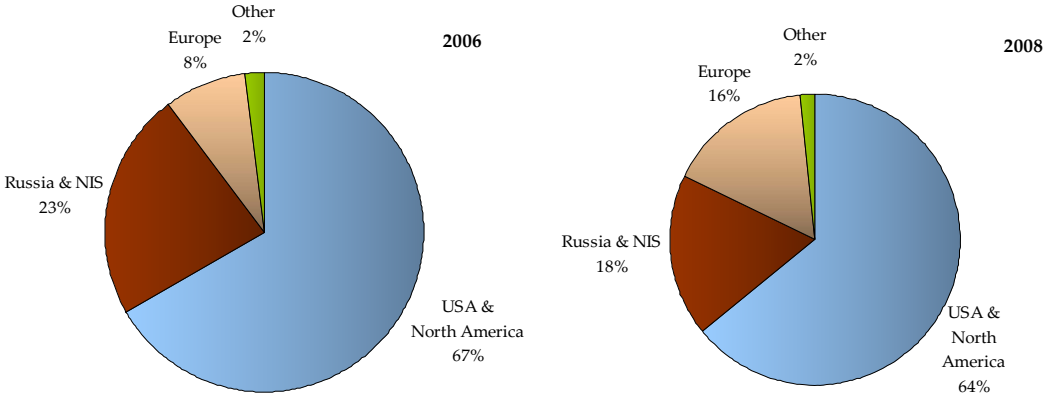
During the last 10 years, the industry saw a sharp increase in the number of newly formed companies, both local start-ups and branches of foreign companies. More than 90% of the foreign companies were established in 1998-2008. The number of operating IT companies in 2008 reached 175 representing nearly 17% growth from 1998 to 2008. On average 17 IT businesses were launched annually in 2000-2008. This is in sharp contrast to 1990s when only 5 companies were formed each year. At the peak in 2004, annual number of newly started firms reached around 25. These high rates, however, may be difficult to sustain due to a shortage of qualified developers, engineers, and project managers. So far, size of the workforce has been the primary factor limiting industry growth. Apparently, shortage of specialists will keep its priority at least until the end of the decade.

COMPANY OWNERSHIP GEOGRAPHY

In 2008, number of foreign companies in Armenia reached 56 entities or 32% from the industry total. Armenia's expertise in software development has been gaining more and more recognition outside the country thus fostering foreign investments in the IT sector. Compared to 2006, percentage of firms with Russian/CIS ownership decreased by 5% stressing the fact that very few software businesses have recently been formed with CIS investments. On the other hand, more companies with European ownership were established during the last 2 years leading to a larger share of EU firms, which increased from 8% to 16%. Still the majority of foreign branches are from the U.S.: 64% of overseas firms have North American ownership, essentially the United States.

During 2004 and 2005, Armenian IT sector witnessed a major M&A within the chip design segment. Synopsys Inc., a leader in delivering solutions for semiconductor design and manufacturing, acquired LEDA Design, Monterey Arset, and HPL Technologies. The new combined development center in Armenia owned by Synopsys is currently the largest domestic software powerhouse with more than 400 employees. Other examples of acquisitions of existing Armenian companies during the last several years include two state-owned Armenian enterprises (YCRDI and Yer.ACSSRI) sold to Russian investors by the Government of Armenia, an Armenian branch of a U.S. company, Brience, which was acquired by Germany-based Lycos Europe, and acquisition of Ponte Solutions, a U.S. company with an R&D center in Armenia, by a U.S.-based Mentor Graphics Corporation.

Company Ownership: Geographical Distribution



In the majority of cases, the foreign branches are pure development centers for the parent companies. Foreign companies usually set-up small development centers and, as there is an effectively operating team in place, start increasing the number of employees and moving higher value-added activities to Armenia. It is common when the whole cycle of a company's technical activities including R&D, design, coding, testing, and support is eventually moved to Armenia. In addition, some companies have also started relocating parts of their business-related functions such as marketing and customer support to Armenia. Practice of sending local professionals to the customer sites outside of Armenia to provide implementation and customer support has been widely used.

DIASPORA

Diaspora is considered one of the major competitive advantages of Armenia in terms of access to foreign markets and expertise. The majority of foreign branches operating in Armenia are established through direct involvement of Diaspora Armenians. Diaspora representatives are usually well disposed towards Armenia and are willing to contribute to its development. Companies with top management or owners of Armenian descent are better suited to evaluate the risks and understand the culture. Local companies also benefit from Diaspora when selling their services abroad. Poor marketing skills and knowledge of target markets is a serious obstacle for the local companies. Having better understanding and being close to the target markets, representatives of Diaspora are better suited to sell or create connections. In many cases, they serve either as the final customers of the product or as liaisons between Armenian and Western companies.

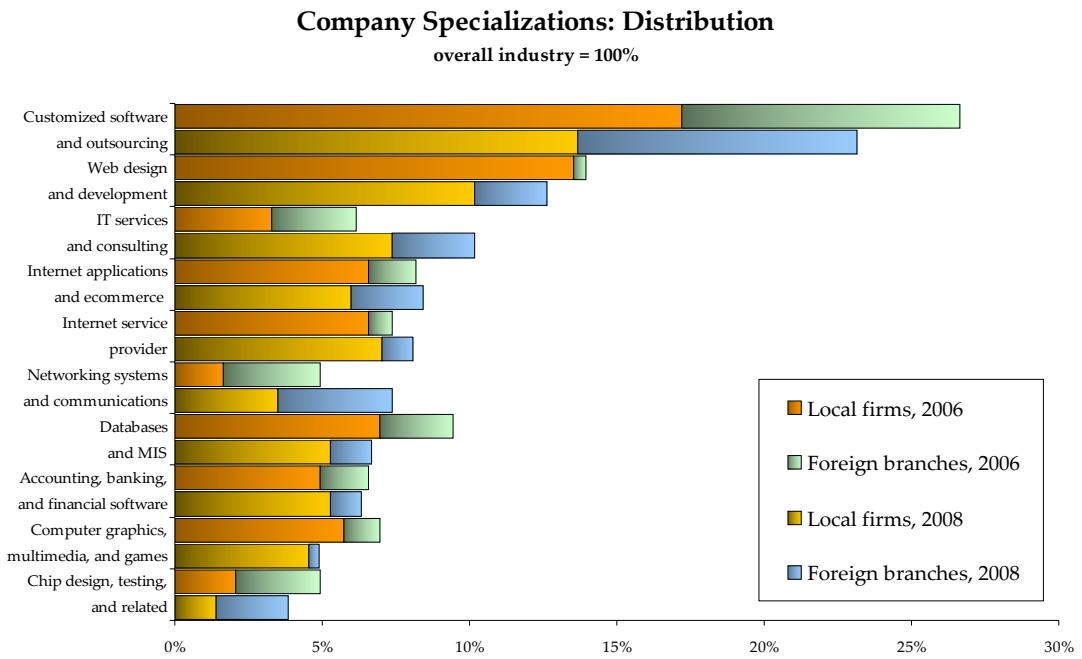
SPECIALIZATIONS

Since 2006, no major changes happened to the distribution of company specializations. The most widely practiced specializations are customized software, web development, and IT consulting. Otherwise, Armenian firms are now moving

from outsourcing and web design to other products and services. This is clearly a good sign that probably means that industry is shifting to higher value added services. More companies are now involved in engineering, systems development, and R&D services. Primary gainers were local firms, which are now also active in the chip design and systems engineering areas. Obviously, during the last years local firms have gained enough skills to offer advanced software solutions and services.

In addition, IT firms are pursuing opportunities in the Internet related areas such as web design and development, provision of Internet services, and Internet applications. Strong focus on internet related areas may be explained by the relatively high and increasing demand for internet services, low barriers to entry by groups of young entrepreneurs, and expectations of e-commerce growth in Armenia. Despite the low value-added nature of web development, it still plays an important role in the industry because of many small companies offering web design services.

Generally, local firms are more diversified than foreign branches, which can be explained by the small size of many domestic industry sectors where local firms are active. Foreign companies are specialized primarily in customized software and outsourcing (more than 30% of all branch specializations).



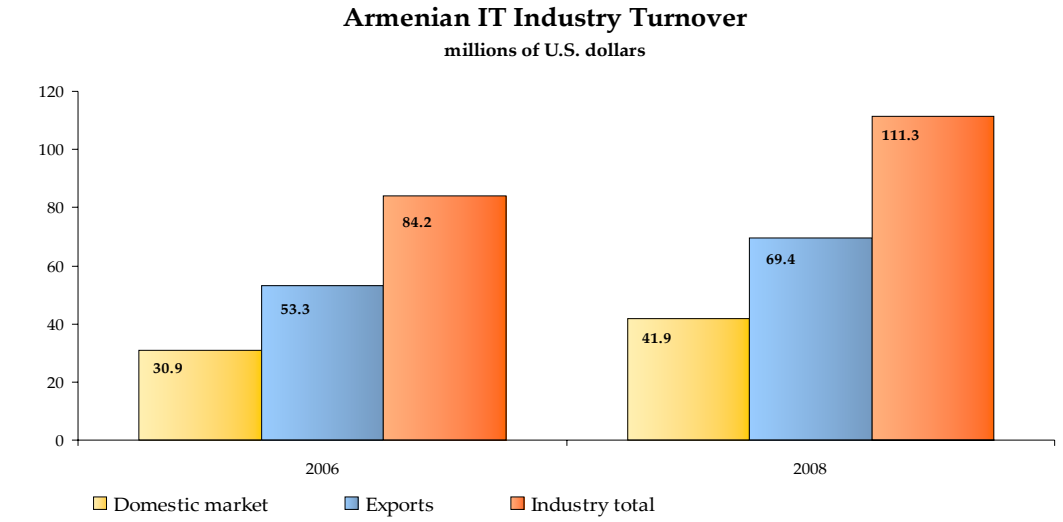
TECHNOLOGIES

Armenian companies and professionals use a variety of technologies and have experience with stand-alone, as well as client-server and net-centric applications.

Companies involved in embedded systems design and testing extensively employ C/C++ and assembly languages. JAVA and .NET technologies are more popular with companies focused on the creation of net-centric solutions. Internet technologies, such as AJAX, JSP, ASP, PHP, ColdFusion, HTML, DHTML, XML, and Flash are widely applied. Other languages and technologies include Visual Basic, Delphi, Perl, popular database systems such as Microsoft SQL Server, MySQL, Oracle, and Informix. Applications are developed for Windows, Solaris, Linux, and for handheld platforms. Open source development is becoming increasingly popular among young professionals and students, as well as IT businesses.

TURNOVER

In 2008, the turnover of Armenian software and services sector reached around $111 million resulting in 27% CAGR during 1998-2008[3]. This turnover figure constitutes 1.2% of Armenia's $9.2 billion nominal GDP in 2007[4]. It is close to the share of IT sector in GDP for such countries as India (1.4%) and Germany (1.3%)[5]. During 2006-2008, industry showed constant annual growth of 15% consistent with the growing Armenian economy[6]. Industry's contribution to the total exports rose from 3.6% in 2003 to 5.3% in 2006 and to 6% in 2008 proving the growing importance of the software sector for Armenia's landlocked economy focused on the expansion of export oriented businesses.

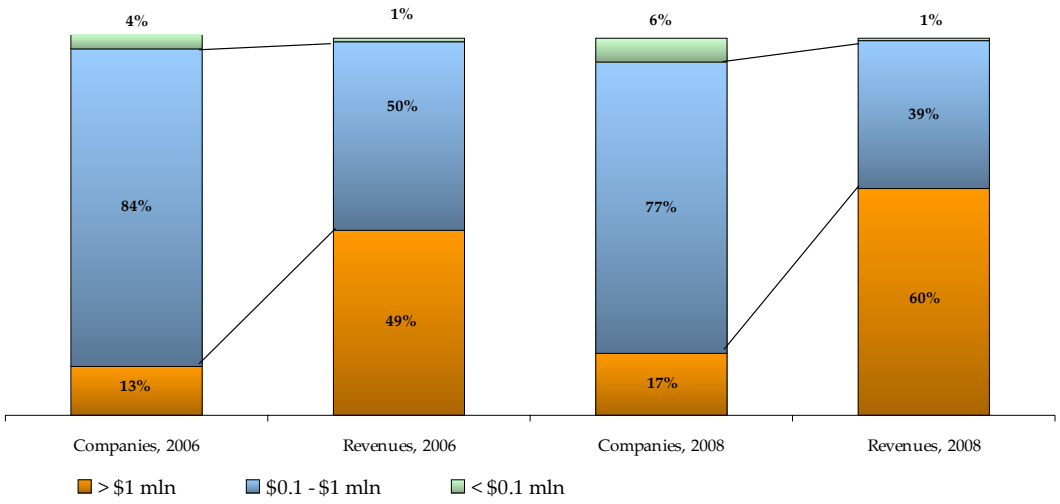


[3] In 1998, total turnover of tech industry's software and services segment was around $10 million. Source: USAID ICT Assessment Report, July 2000.
[4] Source: Central Bank of Armenia.
[5] Source: McKinsey & Company / Armenia 2020, Key Levers for Productivity Improvement in Armenia, 2003.
[6] During 2006-2008, there has been a significant appreciation of the Armenian currency, Dram: from 416.04 Drams per 1 U.S. dollar in 2006 (period average) to 307.64 in the first half of 2008.

Share of local companies' revenues in the industry's total has not changed considerably in 5 years and amounts to 45% or $50 million. At the same time, average revenue per company for locals increased by nearly 30% and only 3% for branches. Local firms are now in a better shape than two years ago: they have more employees, their technical expertise and knowledge of the market is on the rise, and they are willing to implement more complex and higher-value added projects. Consistent performance of the branches is explained by the way foreign companies operate in Armenia: they are primarily outsourcing centers with a specific budget and a small profit margin. This highlights the main issue of the branch outsourcing model: little value is left in the country, only operating related expenses. Nevertheless, branch model is still relevant for Armenia and has visible positive effects on the industry and overall economy. In the long run, however, models with a significant value added component are needed for the industry.

29 largest companies (with turnover $1 mln and over) comprising 17% of all IT firms generated 60% of all industry revenues. Today, there are 9 more companies with revenues in the range of $1 mln and over compared to 2006. Number of small firms with less than $100,000 in revenues also increased by 2%, although these firms do not have any visible impact on the industry. Rising operating costs and low effectiveness of small companies make it highly difficult for companies with less than 10 employees to operate in the long term.

Industry Revenue Concentrations

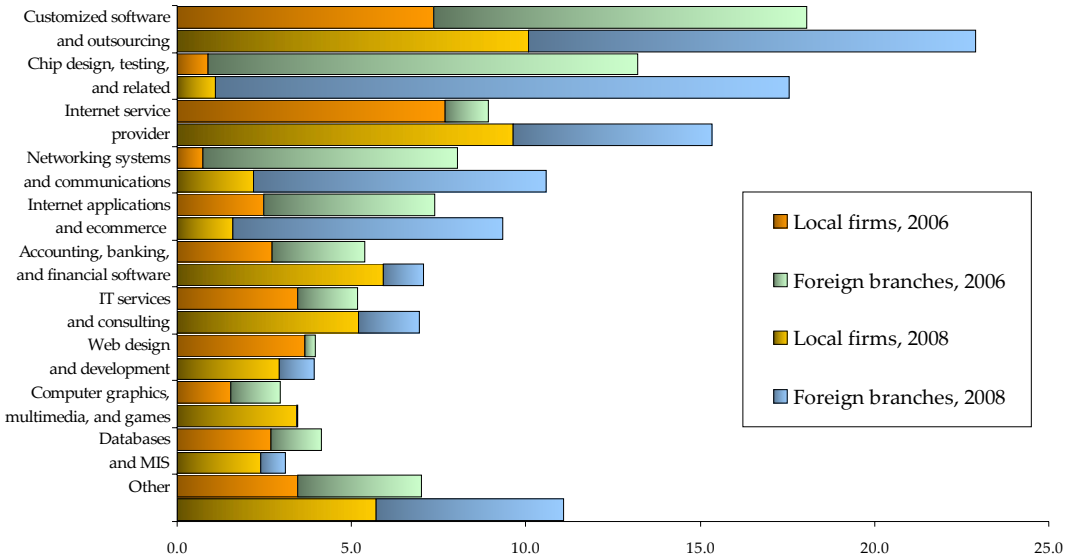


Largest revenue contributing segment of the industry is customized development and outsourcing; it generates $23 millions or 21% of the industry's total. Although only eleven companies (4%) are specialized in chip design areas, the revenue generated by this segment is around 16% of the industry's turnover. Other major revenue generating sectors are ISPs, networking systems and communications, and internet applications. Significant gainers are internet service providers; their turnover increased by around 70%. A key reason for this is the major change in

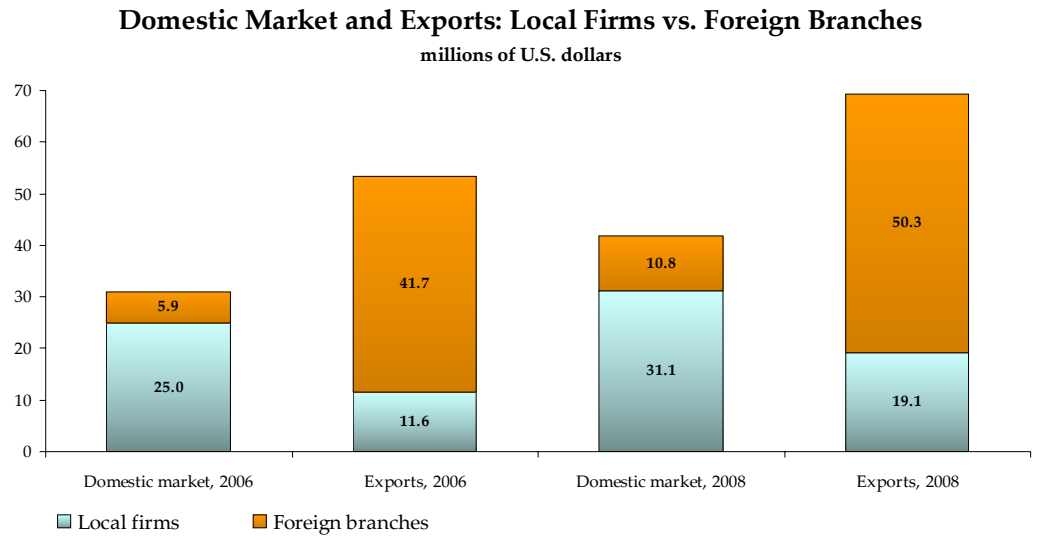
regulations pertaining to the telecommunications industry that ended the monopoly of Armenian Telephone Company. This led to the entrance of new major players in the ISP field and a major drop in internet connection costs. Moreover, additional networks were or are being laid to connect Armenia to major internet hubs in Russia, Europe, and US.

Company Specializations: Revenues

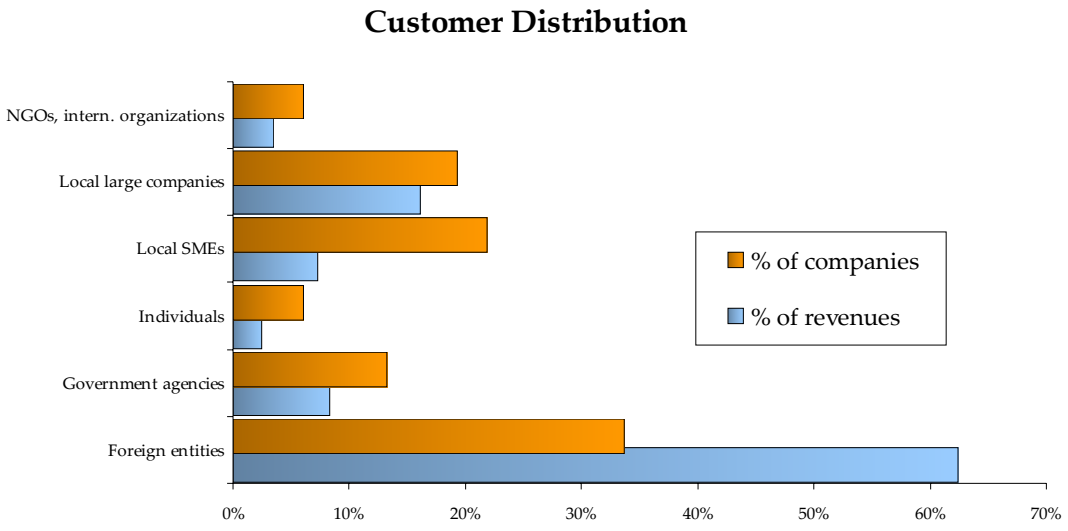
millions of U.S. dollars



In 2008, the domestic market reached $42 million comprising 38% of the industry's total. Share of the domestic market versus exports have not changed much since 2003. The main reason behind the difference in exports and domestic market (62% vs. 38%) is that the largest companies of the industry are branches of foreign firms, which almost completely export their products or services. In addition, many locally owned enterprises also export significant portion of their output. For example, two highly export-oriented segments, chip design and outsourcing, together generate more than 36% of the industry's overall revenue.



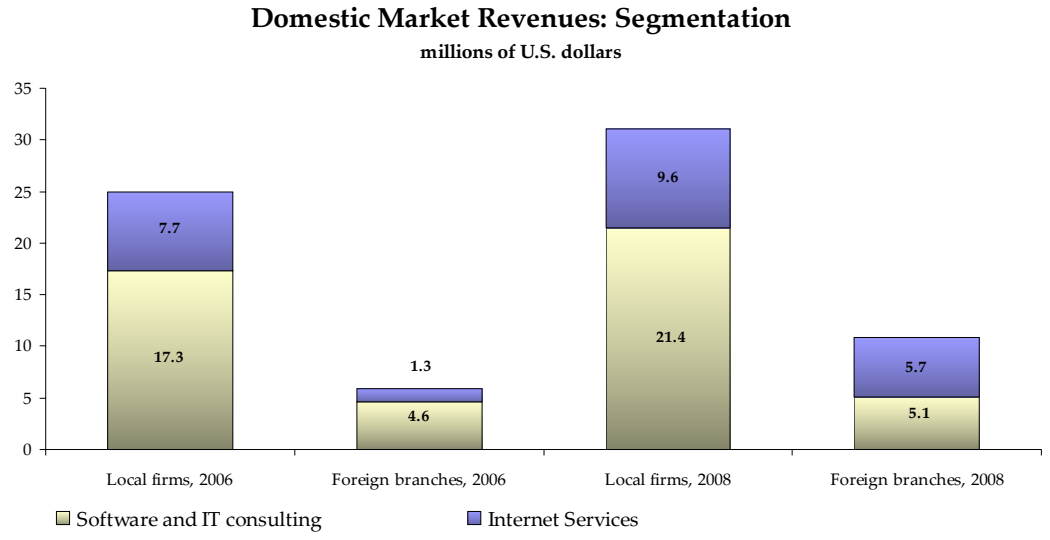
Domestic markets and exports are not distributed equally according to the company ownership geography. Domestic market is dominated by the locally owned companies with 74% share, while foreign branches account for 73% of the exports. This major difference is easily explained by the fact that almost all foreign branches are established by their parent companies as offshore software development locations. In addition, due to the small size of the Armenian market for IT products and services, foreign businesses do not show major interest in expanding their sales in Armenia. Nevertheless, comparison to 2006 demonstrates a slow shift towards a more balanced representation of local and foreign companies in both domestic market and exports. Local companies are increasingly export-oriented: their share increased by 5%; foreign branches are more active in the domestic market: their share rose by 7%.



As the above chart shows, the primary customers of the Armenian software companies, in terms of both number of clients and revenues, are foreign entities. These are essentially private companies (mainly large or sometimes SMEs) because exporting firms rarely conduct business with other categories of clients. Although, small firms do implement certain projects for individuals, these projects have no visible effect on the industry's overall picture. Within the domestic market, main customers are large companies, SMEs, and the Government and state agencies. The Government's relatively small market share is a serious obstacles for the industry's long-term development.

DOMESTIC MARKET

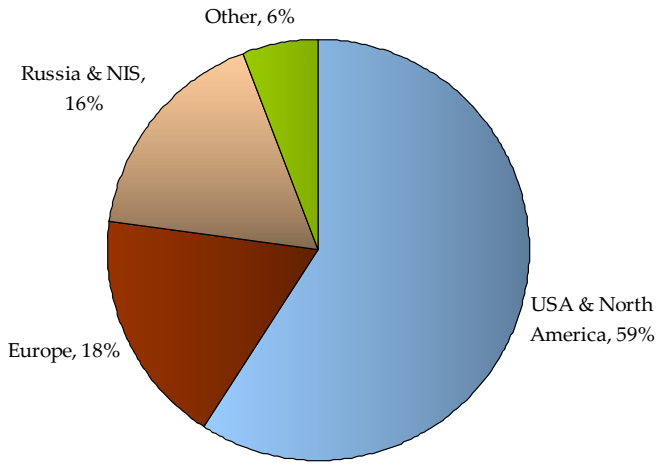
Revenues of IT companies from the domestic market reached $42 million in 2008. Software and IT consulting segment dominates with their $27 million in revenues. Share of foreign owned ISPs and overall ISP market have increased considerably due to the demonopolization of the telecommunications industry and formation of new large ISP firms. Still, revenues from the domestic market represent only about 60% of those generated from the export sales. The small size of the domestic market is the result of rather low demand for software and IT services from businesses and the Government. A number of factors are responsible for this low demand including low employee wages, high software piracy rates, low demand for productivity enhancement tools, financial constraints, and other factors. Because of the low domestic demand, there is no inducement for Armenian IT companies to develop packaged software or offer new and higher quality services. The majority of the software packages sold on the domestic market include accounting and financial software for large enterprises and banks. Other products and services with the largest demand are enterprise resource planning solutions, e-commerce, web development services, tools for healthcare industry, and distance learning programs.



EXPORTS

Armenian IT industry exports nearly $70 million of products and services to more than 20 countries. Around 67% of companies are engaged in exports to a various degree: some receive only small portion of their revenues from exports, others are 100% export-oriented. The largest share of exports, almost 60%, goes to the United States and Canada, the second largest is Europe with 18%, and third comes Russia/NIS with 16%. A similar distribution of export destinations was in 2006.

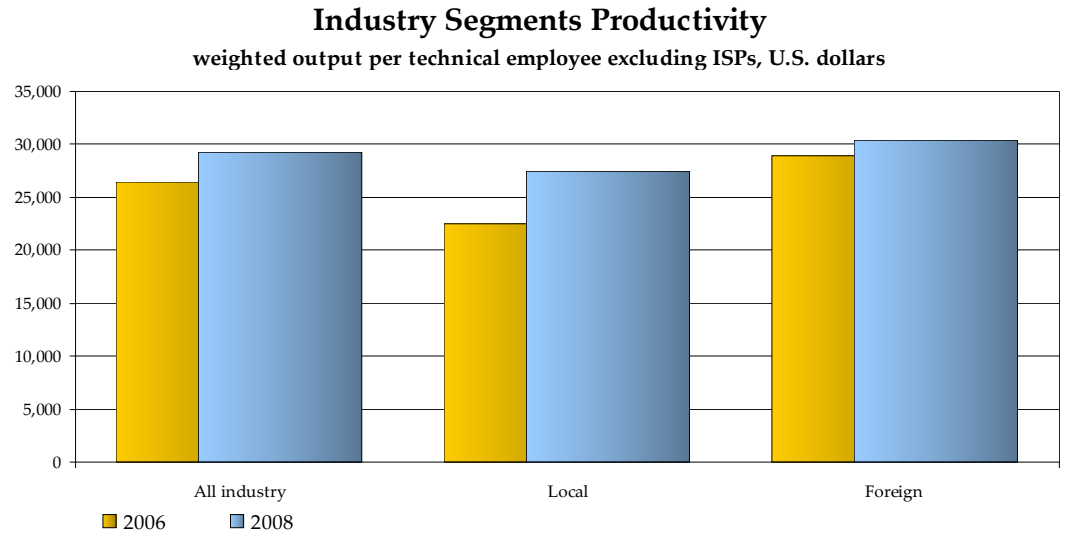
2008 Export Revenues: Geographical Distribution



Factors hindering growth of exports include still insufficient knowledge about Armenia and its IT industry by the international business community; language issues, which are, however, less important now as the young generation is becoming more proficient in English and other foreign languages; long distance from the key IT markets.

PRODUCTIVITY

Industry weighted average productivity or output per technical employee in 2008 reached around $29,300 representing 5% CAGR from 2006. Local companies showed 11% increase, while foreign braches only 3%. Although local firms are still behind the branches by 10%, they will reach and surpass foreign companies if the current trend continues further.



However, the real productivity has not risen much during the reporting period because of the large appreciation of the Armenian Dram against major international currencies. Obviously, the industry needs to change the current economic model based on low-end outsourcing services to higher value services such as engineering, research, and product development. We already see certain progress as some companies, both foreign and domestic, have started offering engineering, design, and R&D services. It is important to improve productivity considerably because Armenia does not have the enormous workforce of India or China, and, therefore, should focus on boosting output per employee versus size of the workforce in order to raise industry revenues[7].

In 1998-2008, the industry witnessed an increase in nominal productivity rates somewhere around 6-8% CAGR, which was mostly attributed to export-oriented firms[8]. Such companies find ways to the foreign markets, thus becoming able to generate higher revenues and to charge higher rates as they build their reputation among the existing and new customers. Additionally, software professionals, project managers, and companies in general become more experienced as they participate in larger and more advanced projects. In contrast to the export-oriented firms, those mainly focused on the local market do not show significant gains in productivity.

There are several major factors responsible for the low productivity of Armenian IT companies:

- small domestic market for software and services and low demand for productivity and sophisticated tools;

[7] This follows from the basic equation: Revenue = Output per employee x Workforce size

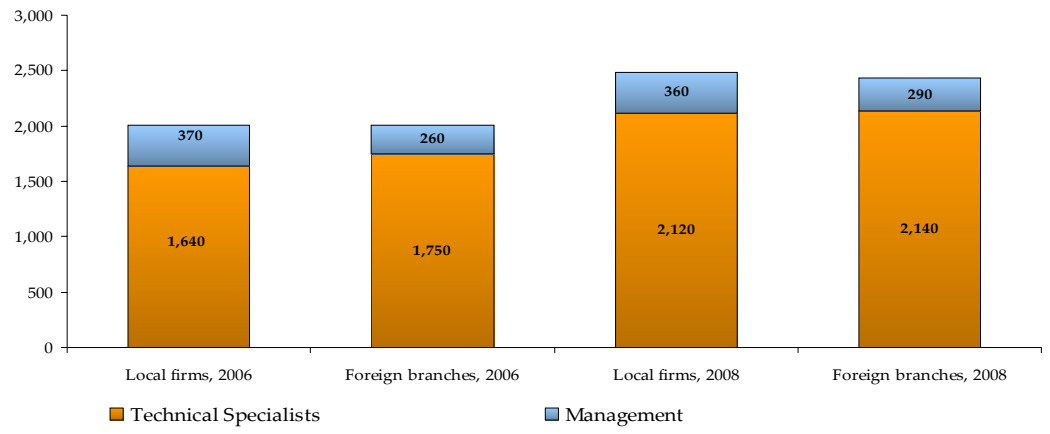
[8] Due to unreliability of historical data, as well as significant changes in the industry structure, growth in productivity is difficult to estimate. Therefore, rates provided here should be used with caution.

- focus on low-end outsourcing services and insufficient concentration on packaged software and other higher value segments;
- shortage of high-end software engineering, project management, and business professionals;
- lack of recognized process management certifications such as CMMI, ISO 9001, and others;
- relatively poor physical infrastructure including telecommunications and internet access;
- insufficient number or lack of specialized support institutions such as venture capital funds, incubators, technoparks, and others.

WORKFORCE

In 2008, total workforce[9] employed by the IT sector reached around 4,900 specialists. This represents 10% CAGR from 2006 and approximately 17% from 1998[10]. Around 85% of the workforce are technical specialists such as software engineers, analysts, developers, project managers, and others. Ratio of technical staff to management employees is just about the same as it was in 2006. Local and foreign companies each employ approximately 50% of the total workforce; almost no change from 2003/2006. Management and business professionals represent 15% of the total. Males and females account for around 65-70% and 30-35% of the workforce respectively. Percent of females employed by the IT sector in Armenia is higher compared to the U.S. (26.6%, 2005)[11] and is almost twice as that in the UK (15%, 2006)[12].

Workforce Distribution: Specialty and Company Ownership

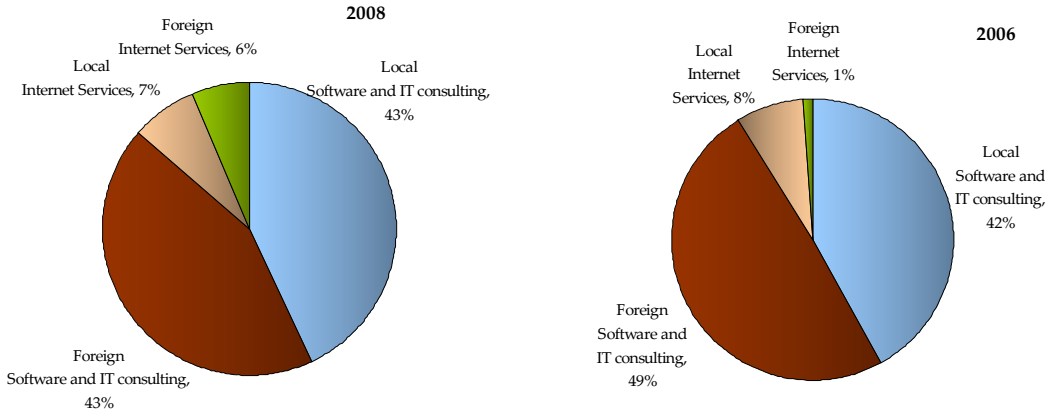


[9] This includes only technical and business employees.
[10] Reliable and consistent historic data on workforce were not available. Substantial differences exist among various sources, which cite figures in the range from 500 to 1,500 for the year 1998. We decided to use 1,000, which creates relatively consistent picture of the industry's historical growth.
[11] Source: U.S. Department of Labor: Bureau of Labor Statistics, http://www.bls.gov
[12] Source: http://www.computing.co.uk , "IT industry is losing the feminine touch"

On average, an IT company employs 28 people (4900/175), a small change from 2006, 25 (4000/160). An average Armenian IT firms has 24 technical specialists, 4-5 business people. Such a company, in comparison to 2006, has 15% more technical staff and almost same number of business people. Average local company in 2008 employs 21 people, which is 15% more than it was in 2006. On the other hand, an average foreign brach today has around 43, almost same as it was in 2006.

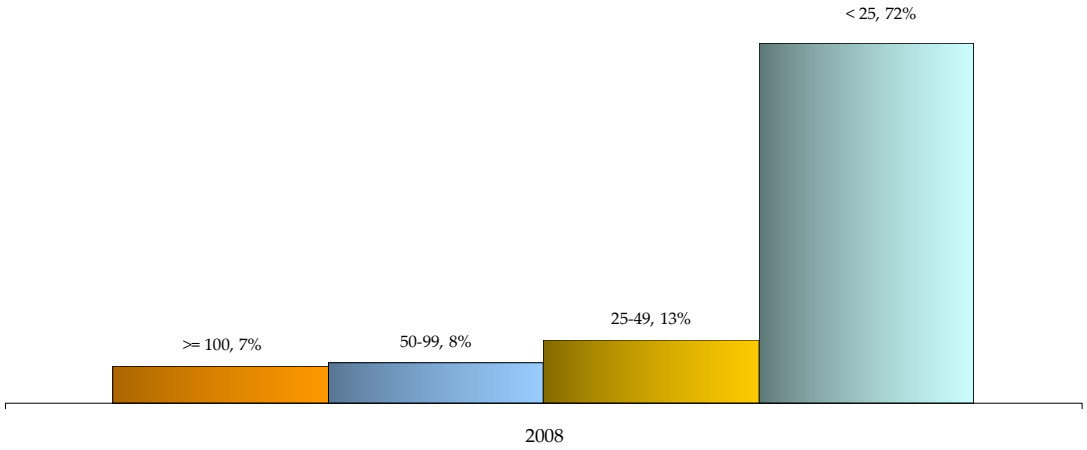
From nearly 4,900 business and technical professionals employed by sector, 14% (680) works for the ISPs. Workforce distribution, as below chart shows, has changed slightly from 2006: more people work for foreign ISPs, 6% of the workforce in 2008 versus 1% in 2006.

Workforce Distribution: Segments and Company Ownership



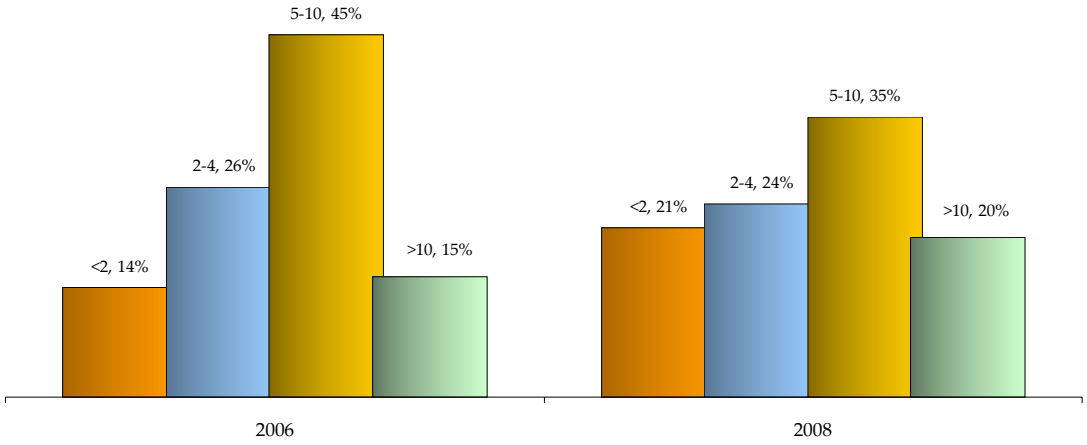
Distribution of companies according to their staff size in 2008 is almost identical to that of in 2006. As before, the number of specialists employed by the firms varies significantly within the industry. Only 7% of all businesses employ 100 or more specialists, while 72% has less than 25 employees. These largest 7% of companies employ nearly 1,800 people constituting around 35% of the total workforce. On the other hand, firms with less than 25 people employ in total close to 1,300 specialists, which is around 25% of the workforce. Thus, distribution of companies according to the workforce size, as below chart shows, is skewed considerably towards small businesses, which is one of the factors negatively affecting industry's productivity.

Company Size Distribution



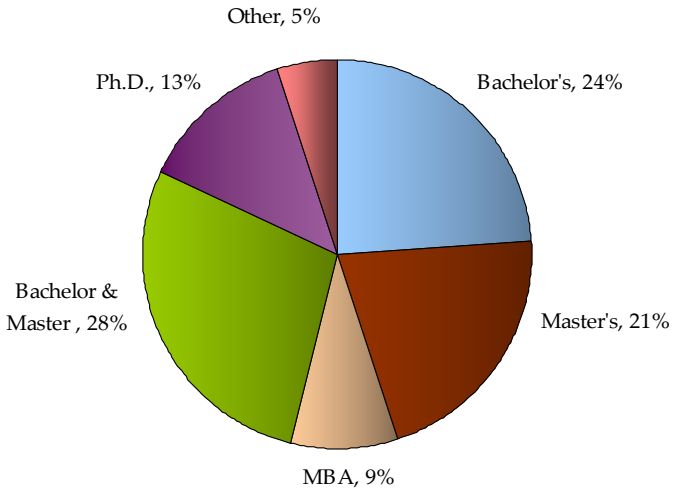
Around 50% of the IT workforce has over 5 years of experience, which is lower compared to 2006 figures (60%). Today, a larger number of new graduates and students are employed by both local and foreign companies leading to a decline in average years of experience. Around 15-20% of the technical staff has some type of a professional qualification from leading vendors such as Microsoft, Oracle, Sun, and others.

Employee Average Experience



In 2008, employee with 5-year Bachelor & Master of Science (BSMS) degree still constitute the largest share of the workforce. However, since major universities have moved to a western system of education with Bachelor's (4 years) and Master's (2 years) degrees, the share of BSMS gradually decreases. On the other hand, the majority of BS majors continue on to the Master's level, and many also do a PhD.

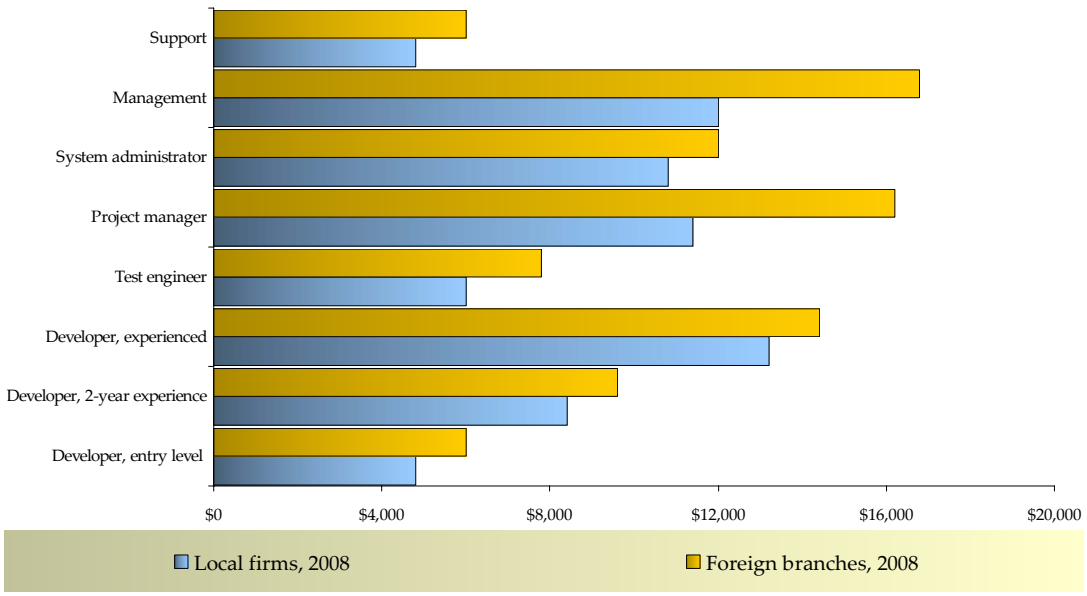
Employee Educational Background



Armenia has been chosen as an offshore development destination by the foreign companies partly because of its inexpensive and highly productive labor. However, due to low supply of qualified specialists and appreciation of the local currency, salary costs have increased considerably over the last 2 years. On average, salary costs per one employee have increased at 14% CAGR, which is almost completely driven by the change in the exchange rate of Armenian Dram.

Employee Average Gross Annual Salaries

U.S. dollars



Dollar salaries are of primary concern to export-oriented companies; their profit margins shrink as costs (incurred in Drams) rise at higher rates than do revenues (received in U.S. Dollars or Euros). Armenia is still considered a low-cost offshore

development location, where salaries are competitive with those of many IT outsourcing countries such as India, Russia, Israel, Ireland, and China. Nevertheless, economic forces behind the appreciation of Armenian Dram may have serious negative impact on the cost effectiveness of Armenian software firms.

EMPLOYEE DEVELOPMENT

On average, around 40% of technical and business specialists received training in 2008. Still, training budgets are very low accounting for less than 5% of the companies' total turnover. Training of the personnel, in many cases, is conducted with the help of various agencies such as EIF, USAID, and others.

There are differences for employee development among locally owned companies and foreign subsidiaries. Branches, as part of their strategic management, constantly train their employees both in Armenia and at the head offices. In addition, they have built resource centers and libraries to assist employees in training and knowledge management. Employees of certain foreign branches are offered employee stock options and other non-salary incentives. Branches normally enjoy low turnover rates and high employee commitment.

In contrast, although local companies accept training as an important part of the development, few are able to provide training on a permanent basis. Staff training is greatly affected by the availability of funds and training personnel. One of the options is free or low-cost trainings offered by the development or government programs, which, however, are mostly targeted at general industry needs rather than a specific company's requirements. Salary levels lower than those adopted at the foreign branches and lack of proper employee incentive plans were for many years major factors behind the high turnover rates at the local firms. Recently, however, various forms of incentives are becoming more widespread at the local companies. During the last several years turnover rates have decreased substantially, which was the result of higher job and salary stability, better working environment, emergence of strong teams within the companies, and other factors.

Many of the companies practice non-paid internships when selecting fresh graduates. It is common to host interns and to train them and use for low value-added jobs and then select the best for permanent positions. New employees usually do not start working at full capacity for periods longer than two months. For many companies this is a limiting factor hindering growth and making employers complain about the quality of education. This issue is common also for companies in India where fast growing companies cannot bill for new employees for the first 3-6 months[13].

[13] India: The Growth Imperative, McKinsey Global Institute, September 2001; www.mckinsey.com/knowledge/mgi/India

OTHER AREAS

MANAGEMENT PRACTICES

Significant difference exists between locally owned companies and branches of foreign firms on how companies' management is carried out. The majority of branches do not engage in common management practices such as business development, marketing, and strategic management: these activities are accomplished by the head offices. In addition, foreign companies, when compared to locally owned firms, employ more advanced project management practices and use better documented and designed methodologies. The reason is that, in most cases, processes employed by the parent companies are simply copied to the Armenian branches.

After the collapse of the planned Soviet economy, commonly accepted management practices have only recently entered Armenian business community and IT sector in particular. As a result, many local software companies do no have sufficient experience and knowledge of the best management practices widely employed by western companies. The major reasons are the lack of high-quality managers with appropriate education and background, newly developing market economy, insufficient experience with international clients.

However, as companies grow and develop, their management grows to be more and more sophisticated. Western practices are becoming part of the day-to-day management of local software firms. While several years many marketing and project management functions were conducted by a company's director, now the majority of firms has separate departments dedicated to marketing, HR, operations, and other areas. Companies accept larger number of business graduates and pay more attention to management training and professional development. Process improvement methodologies such as CMMI, ISO, and IT Mark are becoming widely recognized in Armenia as more companies engage in streamlining their management and development processes.

RESEARCH AND DEVELOPMENT

Historically major research has been carried out in specially created institutions mostly for defense and industrial projects financed by the Government. Departments at the universities focused on smaller-scale research programs. After disintegration of the Soviet Union, government funding has sharply decreased, which in turn forced these institutions to look for new sources of funding to finance their research activities. Several private companies have been created on the basis of state-owned research institutions to develop and market commercial products and to perform smaller-scale research activities. Now, around one fifth of the private companies are involved in some sort of research activities. This research,

however, is mostly of applied engineering and company specific nature and is directed at quick creation of intellectual property. In case of foreign branches, the results of their research are transferred to the parent companies in their respective countries and, therefore, do not normally create competitive advantages for Armenia.

Public research is conducted mostly by the major universities (SEUA and YSU) and by institutes within the National Academy of Sciences. Research is carried out in the fields of computer aided design, theory of algorithms, discrete mathematics and combinatorics, cognitive algorithms and expert systems, software engineering, networking, distributed processing, pattern recognition, math logic, computational methods and signal processing systems, and others. Generally, in recent years there was a shift towards applied as opposed to the fundamental research, which raises concerns over the long-term viability of research by universities and research institutions. Institutions involved in R&D activities are faced with several issues. Other issues are weak commercialization mechanisms and modest cooperation between the industry and research organizations.

In 2008, around 30-35% of companies were involved in some kind of an R&D related activity. Total R&D expenditures amounted to around 5-10% of the industry's turnover.

TELECOMMUNICATIONS

According to various estimates, including EIF 2008 industry survey and ITU 2007 World Telecommunication/ICT Indicators, the number of Internet users in Armenia is somewhere around 150,000-200,000 or 5-7% of the entire population; the number of individual internet subscribers reaches 90,000-100,000 or 3% of the population. While dial–up access is still prevalent among individual users (about 80–85%), they are gradually shifting to DSL and WiFi.

Fiber-optic infrastructure is available in Yerevan and two other cities of Armenia. Several ISPs have their own fiber-optic networks including Arminco, Armenian Data Company, Fibernet, Web, and others. Most of ISPs have access to the global Internet either via satellite connections or leased international lines from Armentel/Beeline, a major Armenian telecom company, and Fibernet. Armenia is connected to the global internet through 3 fiber-optic channels (155 Mbps) via Georgia and Iran and satellite channels such as Teleglobe, PlanetSky, SatGate, and others.

In 2008, Cornet-AM (owned by Russia's Comstar-United TeleSystems) launched a commercial mobile WiMax (IEEE 802.16e, 3.6-3.8 GHz) network covering Yerevan and 18 major cities. At this point, the WiMAX service is targeted at corporate subscribers and includes digital telephony, broadband internet access, data transmission, conferencing, and virtual private networks (VPN). Another newcomer, iCON Communications, is on track to launch a WiMax service in Yerevan by January 2009 and expand the coverage to other major cities during 2009. Services will be offered to private, corporate, and public customers.

After the liberalization of the telecom market, the cost of international connections has significantly decreased. Still, it is rather high in comparison to that of connections in European and certain CIS countries: 1 Mbps costs an Armenian ISP around 1,500-3,000 Euro (it was 12,000 Euro in 2006 and 16,000 Euro in 2005). Unlimited dial–up access service costs a user about USD 30 in Yerevan and about USD 35 in rural areas. Cost of an unlimited 256/64 Kbps ADSL connection in Yerevan and 3 other major cities is around USD 40. In addition, Armentel/Beeline deployed a CDMA450 infrastructure to provide "CDMA Internet" services predominantly for rural inhabitants. The speed of CDMA Internet is up to 115.2 Kbps with USD 20 monthly subscription fee.

There are two mobile phone operators in Armenia: ArmenTel/Beeline, owned by one of the Russia's largest mobile operators VimpelCom (NYSE: VIP) and VivaCell/MTS, owned by Mobile TeleSystems (NYSE: MBT), the largest mobile operator in Russia and CIS. Cost of mobile domestic calls is within USD 0.1-0.2 for both prepaid and postpaid services. In 2007, the mobile operators were granted licenses to supply 3G (Armentel/Beeline) and EDGE (VivaCell/MTS) services in Armenia. Both companies have nationwide GSM infrastructures; Armentel/Beeline also runs Armenia's fixed telephone and primary internet networks. A third mobile operator, Orange SA (owned by France Telecom), which received license at the end of 2008, will offer GSM and 3G services, as well as voice and data transmission.

EDUCATIONAL SECTOR

Armenia has a strong tradition of higher education, where universities put great stress on training students in the fundamentals and in educating them to understand the entire engineering process. Today this tradition is enhanced with new ideas and approaches, which are the results of Armenia's adoption of free market principles.

UNIVERSITIES

State Engineering University of Armenia (SEUA) and Yerevan State University (YSU) are the oldest and largest institutions developing engineering professionals

for the computer industry. Other institutions active in the IT education include American University of Armenia (AUA), European Regional Institute of Information and Communication Technologies in Armenia (ERIICTA), and Russian-Armenian (Slavonic) University

State Engineering University of Armenia is the successor of Yerevan Polytechnic Institute established back in 1933. The university offers a number of degrees in many fields of engineering, science, and technology, and it is the primary educational institution preparing engineering specialists in Armenia. It has several branches in other cities of Armenia. Number of students today is around 11,000; estimated number of all graduates is more than 100,000. SEUA began teaching computer related courses starting from 1960 when the Department of Cybernetics, Computer Systems, and Radio Engineering was launched. Later each of these areas has become separate departments and together they now educate more than 2,500 engineering students. Today, Department of Computer Systems offers several specializations in computer and hardware design, software engineering, electronics and chip design, automated control systems, and others. SEUA conducts R&D in a variety of areas such as CAD systems, neural networks, solid-state physics, superconductivity, electromagnetic fields, circuit analysis, and other areas[14].

Yerevan State University offered its first classes in 1920. Today, it is the largest educational institution in Armenia with more than 13,000 students and estimated number of all graduates reaching 90,000. YSU offers degrees in a wide range of disciplines including biology, economics, history, languages, law, mathematics, physics, and other areas. Department of Physics and Mathematics was established back in 1924; later, in 1971, Department of Informatics and Applied Mathematics was founded. These mathematics departments offer majors in such IT related areas as algorithmic languages, cybernetics, discrete math, system programming and modeling, and others.[15]

American University of Armenia (AUA), an affiliate of the University of California, was established in 1991 as a graduate university based on the U.S. system of education. AUA offers Master's degrees in Business Administration, Computer and Information Science, Industry Engineering, Law, and other areas. AUA conducts research in such fields as business, engineering, environmental management, healthcare, law, and policy through its several research centers[16]. European Regional Institute of Information and Communication Technologies in Armenia (ERIICTA), established by the European Union, offers degrees in Software Engineering and IT Business Management. Russian-Armenian (Slavonic) University, established by the initiative of Armenian and Russian Governments,

[14] Source: SEUA, http://www.seua.am
[15] Source: YSU, http://www.ysu.am
[16] Source: AUA, http://www.aua.am

provides majors in mathematics and math modeling, system programming, electronics and microelectronics. A number of other colleges and universities established recently are developing rapidly to meet existing and future demand of IT specialists.

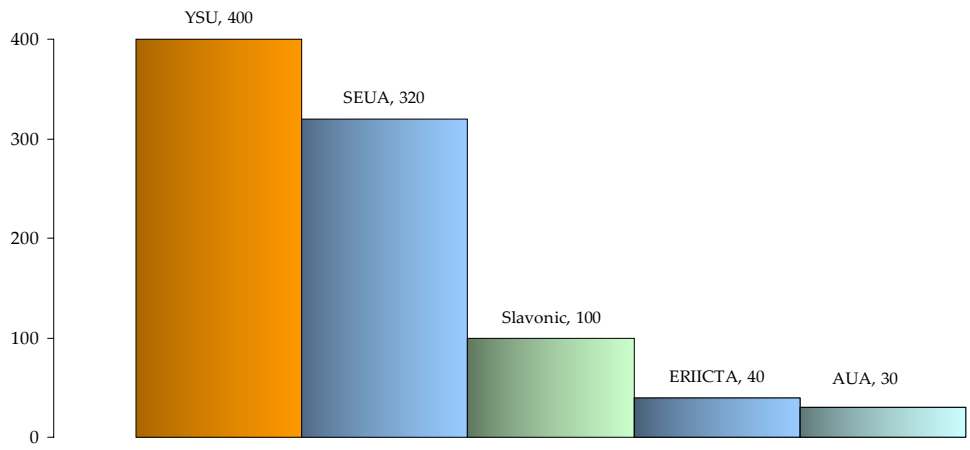
Current educational system, except for a few universities, is inherited from the former Soviet Union. After the independence, however, demand for professionals has changed significantly, which resulted in discontinuation of many fields and specializations and emergence of new ones. While the 5-year degree system practiced by Soviet educational institutions is still widespread in Armenia, a number of universities recently have adopted the western style two-level educational system with Bachelor's and Master's degrees. Many universities offer post-graduate education and PhD.

The main issue faced by the educational sector is inadequate funding: tuition fees and government support are not sufficient for the majority of educational institutions. At the same time, many universities have no intention to raise tuition fees because they are already high for an average Armenian student. Other issues faced by many schools are lack of textbooks and professional literature, outdated library, limited availability of computer equipment and Internet connection.

FACULTY AND TEACHING METHODS

26 educational institutions are involved to a various degree in IT related education[17]. Most of the faculty staff is concentrated in YSU and SEUA with the remainder spread throughout other universities.

Faculty Distribution across 5 Major IT Universities



[17] USAID/ CAPS, "IT Workforce Supply Assessment", 2006; http://www.caps.am

The majority of educational institutions consider their curricula and teaching methods being up-to-date and meeting industry requirements. Many professors develop their classes using experience of leading European, Russian, and US universities and with their assistance. In some cases, local IT professionals are invited to help faculty in aligning the curricula to the latest industry trends and requirements. Today, more and more institutions recognize that besides technical skills students need to be proficient in business areas as well. Different business courses are offered at a number of universities including marketing, management, business ethics, law, and other subjects. Teaching of foreign languages such as Russian and English are also considered extremely important for developing high-quality engineering and managerial cadre.

Despite the recent improvements in the educational system, current teaching methods are considered by many as inadequate in the attempt to meet the IT industry's demand for high-quality human resources. In addition, two major interrelated issues: low wages and aging faculty – result in the faculty size being constant or decreasing over time while the student body growing each year.

COOPERATION WITH INDUSTRY

Cooperation between the industry and the educational institutions was rather weak for a number of years. However, this trend has changed recently. Examples of such cooperation are:

- Interdepartmental Chair of "Microelectronic Circuits and Systems" established by LEDA Systems (acquired in 2004 by Synopsys Inc.) and SEUA. The Chair, now part of Synopsys University Program, supplies more than 60 high-quality VLSI and EDA specialists each year[18]. Later Synopsys expanded this initiative through opening interdepartmental chairs at YSU and Slavonic.
- Internet and web technologies laboratories established by Lycos Europe, EIF, and Sourcio CJSC at SEUA and YSU in 2005.
- Sun educational laboratories formed by Sun Microsystems, EIF, and USAID at SEUA, YSU, and Slavonic in 2008.
- Gyumri IT Center, first IT training center in the city of Gyumri, established by the Fund For Armenian Relief (FAR) and EIF in 2006.

Students graduating from these educational facilities are accepted by the companies for employment. At this point, industry and university cooperation does not go further than teaching and training, mainly concentrating on the preparation of quality professionals for several companies and industry in general.

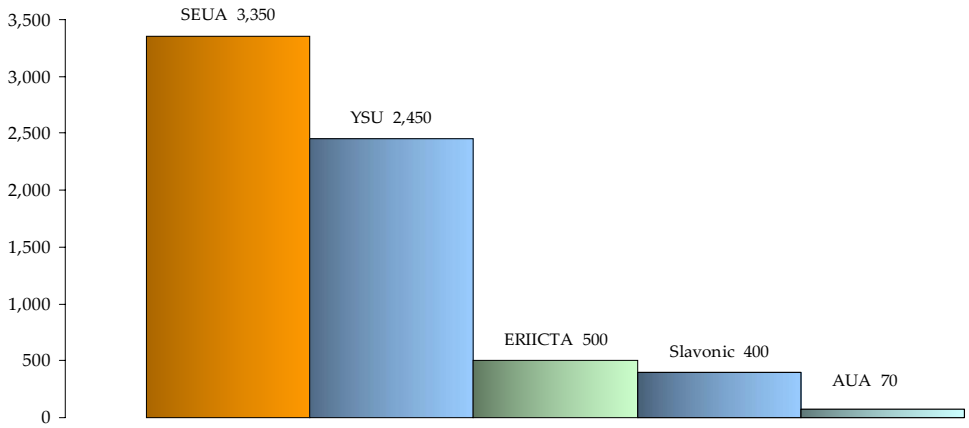
[18] Source: SEUA, http://www.seua.am

STUDENTS

In 2008, nearly 7,000 students were enrolled in various IT related fields at 5 main Armenian IT universities. Around 85% of all these students study at SEUA and YSU. Foreign students from Europe, Russia & CIS, Middle East, and other countries study in Armenia, and their number is growing over time. Overall quality of the enrollees has been improving for the last 3-5 years. Admissions to IT departments are very rigorous, especially in case of SEUA and YSU. Programming, information and applied mathematics, automated control systems and microelectronics are the most popular majors for applicants.

Student Distribution across 5 Universities

IT related majors



In general, the representatives of IT firms regard the current number of students as inadequate to meet industry's demand in technical specialists. In addition, they point that the quality of certain graduates does not meet the needs of the industry, and these graduates require on job training in order to become qualified for full time positions.

POLICY DEVELOPMENTS

In 2000, the Government of Armenia declared development of information and communication technologies as one of the priorities for the Armenian economy, which followed by a number of specific actions to bring this decree into effect. In 2001, the Government jointly with the World Bank, USAID, foundations, academic institutions, and private enterprises developed the ICT Master Strategy and ICT development implementation plan to promote IT and establish 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 in accordance with the recommendations outlined in the ICT Master Strategy.

In July 2001, Information Technologies Development Support Council of Armenia (ITDSC), chaired by the Prime Minister was established by the decree of the President of Armenia. The mission of the Council is to act as a bridge between the Government and the private sector and to serve as a connecting link between the Diaspora and Armenia. The goals of the Council are to assist the Government and the private sector in building strong and viable IT industry and developing Armenia into an advanced information society. In 2002, Enterprise Incubator Foundation was established by the Government of Armenia and the World Bank to support the development of information technology industry in Armenia. EIF is the largest development initiative within the IT industry in Armenia. Information technology is considered by the Government as an important area for international cooperation. Various projects are initiated in this area: the European Regional Institute of Information and Communication Technologies in Armenia (ERIICTA), which was established with the financial assistance from the European Union; Competitive Armenian Private Sector Program (CAPS), a program funded by the United States Agency for International Development and implemented by Nathan Associates in cooperation with J. E. Austin Associates.

While today the Government is more active in the IT sector than several years ago, many companies, nevertheless, expect substantially higher involvement of the Government in the sector development. Expectations include such activities as fostering the use of locally made software by other sectors and, by that, increasing the demand for domestic IT products and services, improving the legislative framework including reforms in tax regulation, providing larger support to universities, improving telecommunications infrastructure, and supporting IT firms with financing and international marketing.

In 2008, the Government adopted a new 10 year industry development strategy focused on building infrastructure, improving quality of IT graduates, creating venture and other financing mechanisms for start-up companies. The main goals of this new strategy are:

- build a developed information society in Armenia;
- make Armenia part of the knowledge creation global network;
- form a strong and advanced information technology sector.

The strategy aims at increasing considerably the rates of computer and internet penetration in all segments of the economy (households, public sector, businesses, education sector), building new technoparks and incubators, establishing a major venture fund, improving considerably the quality of university graduates, increasing the number of companies with recognized certifications such as ISO and CMMI, developing domestic market for locally created IT products and services, increasing FDI, and others. The Government body responsible for the implementation of this strategy and overall IT industry development is the Ministry of Economy. Below table provides IT industry's 10-year growth targets.

Industry Growth Target Indicators	2006	2018
Home computer penetration	20%	70%
Educational computer penetration	10%	100%
Public sector computer penetration	10%	100%
Population Internet penetration (in terms of physical, financial, content and language access)	15%	90%
State entity spending on locally developed IT products, % of state budget	<0.1%	>1%
Domestic spending on locally developed IT products, % of GDP	<0.5%	1%
Share of e-services in all services provided by the state entities	<1%	80%
Number of IT companies with foreign capital	160 50	1,000 200
IT workforce	5,000	20,000
Productivity, output per employee	17,000 USD	50,000 USD
Industry revenues	85 mln USD	1 bln USD
Exports	53 mln USD	0.7 bln USD
Companies with ≥ 1,000 employees	0	>1
IT companies offering R&D services	<10	100-200
Techno-city Techno-Parks & incubators	0 2	>1 >10
Venture capital funds committed	< 1 mln USD	>700 mln USD
Local open joint stock companies (registered at the Armenian Stock Exchange)	1	50-100
Local open joint stock companies (registered at international Stock Exchanges)	0	>5

APPENDICES

1. ARMENIA, KEY FACTS

Republic of Armenia or "Hayastani Hanrapetutyun" in Armenian (Հայաստանի Հանրապետություն), formerly one of the fifteen Soviet republics, declared its independence on September 21, 1991. Capital and the largest city is Yerevan.

GEOGRAPHY

Armenia is located in the South Caucasus region of Eurasia continent. Border countries are Azerbaijan (east and southwest), Georgia (north), Iran (south), and Turkey (west). Land area is approximately 29,800 square kilometers or 11,500 square miles. Armenia is a mountainous region with the average elevation above sea level of 1,800 meters or 5,900 feet. The climate is sunny, dry, continental with hot summers and moderate to cold winters.

POPULATION

Population is around 3.2 million as of 2002 with approximately 67% residing in cities and towns. Armenian is the official language. Armenians are fluent in Russian, and many, especially in Yerevan, are also proficient in English. The population of Armenia is highly educated with 98% literacy rate for residents over 15 years old. Educational system of Armenia has two levels, which includes secondary and higher educational institutions. The largest universities are Yerevan State University and State Engineering University. Armenia was the first country to officially adopt Christianity as its state religion in 301 A.D.

GOVERNMENT SYSTEM

Armenia is an independent democratic state with the president as the head of the state. The president is elected by the citizens of Armenia for a five year term and maximum of two consecutive terms. The President of Armenia is Serge Sarkisian, who was elected on February 19, 2008. The president appoints the prime minister and the members of the Government. The National Assembly, the parliament of Armenia, is the legislative body. It has 131 members who are elected for four-year terms.

ECONOMY

Major industries: beverages, building materials, chemical and petrochemical, construction, electric motors, electric power production, electronics, food and food processing, forging pressing machines, furniture, diamond cutting, watch industry, health care, hosiery, instruments, jewelry, knitted wear, metal-cutting machine tools, mining, non ferrous metallurgy, shoes, silk fabric, software development, tires, tobacco, tourism, watches, wood working. According to the 2008 Index of Economic Freedom[19] compiled by the Heritage Foundation and the Wall Street Journal, Armenia is the 28th freest economy in the world (Sweden 27, Latvia 38).

MAIN ECONOMIC INDICATORS[20]

	2003	2004	2005	2006	2007
Gross Domestic Product, billions of U.S. dollars	$2.80	$3.56	$4.87	$6.41	$9.20
Real GDP growth, % change over previous year	13.9%	10.1%	13.9%	13.4%	13.8%
Inflation, annual average	4.7%	7.0%	0.6%	2.9%	6.0%
Unemployment rate, end of year	9.8%	9.4%	8.1%	7.4%	7.1%
Average wage, annual mean, U.S. dollars	$674	$980	$1,365	$1,846	$2,718
Exports of goods, FOB, billions of U.S. dollars	$0.68	$0.72	$0.95	$1.00	$1.16
Imports of goods, CIF, billions of U.S. dollars	$1.27	$1.35	$1.77	$2.20	$3.28
Exchange range USD/AMD, period average	578.80	533.45	457.69	416.04	342.08

BUSINESS ENVIRONMENT

The following are major taxes in Armenia, which are considered rather low compared to those adopted in many other countries:

- multilevel *personal income tax* has the maximum rate of 20%;
- *value added tax (VAT)* is 20%;
- *corporate tax* rate is 20%; and
- *employee social security taxes* with the rate of 3% are imposed on employees; a specific scale is applied for employers.

Around 20% of IT companies are involved in activities subject to licensing, i.e. data transfer and internet access services. The Law "On Licensing" and Law "On Electronic Communication" provide the list of business activities subject to licensing. Armenia offers several incentive programs for foreign investors. In particular, it provides 2-year long tax holidays for foreign investments over $1 million, no duties on statutory capital and raw materials, no barriers on investment entry, and a 5-year protection clause in the Law on Foreign Investments. Additionally, companies operating in Armenia have an option to carry forward indefinitely their losses.

[19] Source: the Heritage Foundation, http://www.heritage.org/research/features/index/countries.cfm.
[20] Source: the Central Bank of Armenia, www.cba.am.

There are incentives available to exporters such as no export duty and VAT refunds on goods and services exported. The implementation of the latter, however, has been difficult for a number of reasons. Imports of a few IT products are free from customs duties and taxes. VAT is levied on some products, such as computers, when they enter the country. According to the Armenian customs code, the value of contents of computer software is not included in the customs value, which is limited only to the value of the carrier media. This provision is in accordance with WTO/GATT customs valuation agreements.

Key Indicators for Opening and Operating a Business in Armenia[21]

Indicator	Armenia	Europe & Central Asia	OECD Countries
Starting a Business: Time (days)	24	32.0	16.6
Starting a Business: Cost (% of national income/person)	5.1	14.1	5.3
Registering Property: Time (days)	4	102.0	31.8
Registering Property: Cost (% of property value)	0.4	2.7	4.3
Hiring Cost (% of salary)	17.5	26.7	21.4
Firing Costs (weeks of wages)	13.0	26.2	31.3
Enforcing Contracts: Time (days)	185.0	408.8	351.2
Enforcing Contracts: Cost (% of debt)	14.0	15.0	11.2

Intellectual Property Rights

Armenia has started reforming its intellectual property regime in the last ten years. It has created a modern system that protects intellectual property rights. Currently, intellectual property related matters in Armenia are regulated by the Civil Code, law on copyright and neighboring rights, law on patents, law on trademarks, service marks and appellations of origin, law on protection of topographies of integrated circuits, and law on protection of the economic competition as well as by a number of international treaties. Armenian legislation on intellectual property has been harmonized with the requirements of the Agreements on Trade Related Aspects of Intellectual Property Rights (TRIPS Agreements). Since February 2003, Armenia has been a member of the World Trade Organization (WTO).

BANKING, CURRENCY, PAYMENTS[22]

There are 22 commercial banks operating in Armenia providing services through 360 branches as of August, 2008. The official currency is Armenian Dram; currency code is AMD. The average exchange rate for the first half of 2008 was 307.64 Armenian Drams to 1 United States Dollar. Banks and hotels accept all major

[21] Source: The World Bank's Doing Business database, http://www.doingbusiness.org
[22] Source: Central Bank of Armenia, http://www.cba.am

convertible currencies. All banks and the majority of hotels accept credit cards such as Visa and MasterCard.

INTERNATIONAL ORGANIZATIONS

Armenia has a membership in a number of international organizations, agreements, and treaties including Commonwealth of Independent States (CIS), Council of Europe (CE), Economic Commission for Europe (ECE), International Monetary Fund (IMF), Interpol, International Atomic Energy Agency (IAEA), International Civil Aviation Organization (ICAO), International Fund for Agricultural Development (IFAD), International Organization for Standardization (ISO), International Telecommunications Union (ITU), Organization for Security and Cooperation in Europe (OSCE), United Nations (UN), Universal Postal Union (UPU), World Bank (WB), World Health Organization (WHO), World Intellectual Property Organization (WIPO), World Trade Organization (WTO), and others.

MISCELLANEOUS

Power Supply: 220 V / 50 Hz.
Telephone Calls: country international dialing code is +374; for Yerevan +374 10.
Time Zone: Greenwich Mean Time (GMT) plus 4 hours.
Weights & Measures: metric system.
Working Hours: common hours are 9:00 to 18:00 with lunch from 13:00 to 14:00. Saturdays and Sundays are not working days.

2. Science and Technology in Armenia, Timeline

Year	Soviet Armenia organization established or event occurred
1919	Yerevan State University (YSU)
1924	Department of Physics and Mathematics at YSU
1933	Yerevan Polytechnic Institute (State Engineering University of Armenia, SEUA)
1935	Armenian branch of USSR Academy of Sciences
1942	Yerevan Physics Institute
1943	Armenian Academy of Sciences (National Academy of Sciences, NAS)
1946	Byurakan Astrophysical Observatory
1955	NAS Institute of Mechanics
1956	Yerevan Scientific Research Institute of Mathematical Machines (YerSRIMM)
1957	Institute of Informatics and Automation Problems
1958	"Transistor" semiconductor R&D and manufacturing plant
1959	First generation computer "Aragats" on vacuum tubes at YerSRIMM
1960	NAS Institute of Radiophysics and Electronics Department of Cybernetics at SEUA
1961	Second generation computer "Razdan" on semiconductors at YerSRIMM
1963	Development of microprogrammed computers "Nairi" at YerSRIMM
1964	"Sirius" radioelectronics plant in city of Abovyan
1965	"Posistor" microelectronics factory in city of Abovyan
1966	Institute of Microelectronics, Scientific Research, and Technology
1967	NAS Institute of Physical Research
1971	NAS Institute of Mathematics Department of Informatics and Applied Mathematics at YSU
1972	Department of Radio Engineering at SEUA
1973	ES-1030 computer (IBM 360/370) at YerSRIMM
1976	"Nairi-3" computer with shared usage capabilities at YerSRIMM
1978	Yerevan Telecommunications Research Institute ES-1045 computer (IBM 360/370) at YerSRIMM
1979	Department of Calculating Techniques (Computer Systems) at SEUA
1980	NAS Institute of Applied Problems of Physics
1981	"Nairi-4" computer (PDP compatible) at YerSRIMM
1984	ES-1046 computer (IBM 360/370) at YerSRIMM SEUA branches in cities of Kapan and Goris
1986	Ashtarak semiconductor and electronics manufacturing plant ($120 million investment)
1987	First Armenian private IT firm "Armenian Software"
1988	"Mars" integrated circuits and electronics manufacturing plant ($300 million investment)
1990	NAS engineering center "Mashtots" (atomic optics, thin film physics)

Year	Independent Armenia organization established or event occurred
1991	Armenia declares independence on September 21 American University of Armenia (AUA)
1992	Yerevan Automated Control Systems Scientific Research Institute (YerACSSRI) Arminco (leading ISP in Armenia)
1994	MSHAK (Armenia's leader in CNC systems and tools)
1995	HPL (U.S., yield management software; acquired by Synopsys in 2005) ArmenTel (Armenia's leading telephone company)
1997	Russian-Armenian (Slavonic) State University
1998	Acquisition of ArmenTel by Greek telecom OTE Credence Systems (U.S., semiconductor design-to-test solutions) Representative offices: Alcatel, Siemens AG
1999	Virage Logic (U.S., advanced embedded memory IP)
2000	Union of Information Technology Enterprises (UITE, Armenian IT association) Viasphere Technopark (U.S., commercial technology park) LEDA Systems (U.S., digital standard cells and I/O libraries; acquired by Synopsys in 2004) Epygi Technologies (U.S., IP PBXs)
2001	"Microelectronic Circuits and Systems" chair at SEUA in cooperation with LEDA Systems ICT Master strategy and Information Technologies Development Support Council (ITDSC) European Regional Institute of Information and Communication Technologies in Armenia (ERIICTA)
2002	Enterprise Incubator Foundation Lycos Europe (Germany, pan-European online network)
2003	EPAM Systems (U.S., global offshore software development firm)
2004	Synopsys Inc. (U.S., world leader in semiconductor design software) CQG (U.S., analytics software and trading solutions)
2005	VivaCell (second mobile operator in Armenia) Luxoft (Russia's leading software development firm)
2006	Microsoft Corporation, representative office Acquisition of ArmenTel by Russian mobile operator VimpelCom (Beeline)
2007	National Instruments Corporation (U.S., global leader in virtual instrumentation solutions) Macadamian (Canada, full-range software development and related services firm) Acquisition of VivaCell by Russian mobile operator Mobile TeleSystems (MTS)
2008	Mentor Graphics (U.S., a world leader in electronic hardware / software design solutions) New IT industry strategy adopted by the Government of Armenia Orange SA (France Telecom) won the state tender for the third mobile operator in Armenia

3. FDI CASE: SYNOPSYS INC., UNITED STATES

Synopsys, Inc. (NASDAQ: SNPS) is a world leader in delivering semiconductor design software, intellectual property (IP), design for manufacturing (DFM) solutions and professional services that companies use to design systems-on-chips (SoCs) and electronic systems. Founded in 1986, Synopsys is headquartered in Mountain View, California. In 2006, company generated revenues of $1.1 billion and employed 5,100 people worldwide.

The company established its presence in Armenia in 2004, shortly after Armenia's declaration of IT as a priority sector of the national economy. Since then, Synopsys Armenia has become one of the largest company sites outside the U.S. providing R&D and product support in areas of EDA, DFM, and development of semiconductor IP. Currently, the company employs more than 400 qualified Armenian engineers serving as the industry's flagship and one of the largest IT employers in Armenia. Synopsys Armenia's main activities include development of EDA tools, design of standard cell libraries, IPs and ICs, support to IC fabrication, university programs, and charitable activities.

Reasons for selecting Armenia as the company's major offshore development office include:

- Cost-effective market environment,
- Stable, democratic, and market oriented Government,
- Development of Information Technology industry is a key economic objective,
- Reliable electricity, water, and transportation system (short driving distances within Yerevan, capital of Armenia),
- Strong tradition of the engineering excellence,
- Availability of skilled and talented engineers and software developers.

Key facts about company's operations in Armenia:

- Synopsys is the largest IT employer in Armenia with more than 400 employees.
- In the past two years, the company has nearly tripled the number of engineering jobs in the Armenian branch.
- Armenia is among Synopsys' largest sites outside the United States and is the fastest growing one.
- Armenian engineers had delivered several releases of software and chip designs that generated revenue for Synopsys.
- Synopsys is now investing in a new state-of-the-art consolidated site.
- Company's Educational Center provides world-class engineering education and training to around 240 students.

Synopsys heavily invests in IT education and implements a number of pioneering and successful programs with the major Armenian universities including State Engineering University of Armenia, Yerevan State University, American University of Armenia, and Moscow Institute of Electronic Technologies. As a good corporate citizen, the company undertakes unparalleled efforts in consistently promoting public interest towards the IT industry through sponsorship of Presidential Awards for the best students, professional contests among young professionals and students, media campaigns, charity and volunteer activities.

http://www.synopsys.com

4. MINISTRY OF ECONOMY OF THE REPUBLIC OF ARMENIA

The history of the Ministry of Economy goes back to 1965 when Material and Technical Supply Department within the government of the Soviet Armenia was established by the decree of the Supreme Council of Armenian SSR. In 1978 the Department was renamed to Material Supply State Committee, and later in 1992 the Committee became the Ministry of Material Resources of the Republic of Armenia. During 1995-2002, the Ministry of Material Resources, the Ministry of Trade, and the department of Foreign Tourism, and later the Ministry of Industry, and the Ministry of Economy merged together and then in 2002 were reorganized into the Ministry of Trade and Economic Development. According to the President's Decree on April 21, 2008, the Ministry was renamed to the Ministry of Economy of the Republic of Armenia. The Minister of Economy is Mr. Nerses Yeritsyan.

Today the Ministry covers a number of areas including economic policy, regional development, science and innovation policy, foreign cooperation and FDI policy, information technology industry development, EU and WTO, natural resources, trade policy, standardization and metrology, intellectual property, tourism sector development, and others.

The 3-year strategy of the Ministry recently adopted by the Government aims at: creating a productive and transparent management system, forming an environment supportive to the stable long-term development of the Armenian economy, building an entrepreneurial and investment-friendly business environment, supporting productive public-private sector cooperation, improving Armenia's competitiveness and increasing its integration in the global economy, designing and implementing a diversified industrial policy aimed at developing priority sectors of the economy, and supporting the transition of Armenia towards a knowledge based economy.

The Ministry of Economy of the Republic of Armenia
5 Mher Mkrtchian street, Yerevan 0010, Armenia
Phone: +374 10 566 185, Fax: +374 10 526 577
http://www.mineconomy.am/

5. ENTERPRISE INCUBATOR FOUNDATION

Enterprise Incubator Foundation or EIF is a business development and incubation agency operating in Yerevan, Armenia. EIF was established by the Government of Armenia within the framework of the World Bank's "Enterprise Incubator" project to support the development of Information Technology sector in Armenia. EIF objectives are to improve competitiveness of Armenian IT companies in the global marketplace, build linkages with business communities in key technology markets, improve access of local companies to knowledge and information on best practices and experience, and assist Armenian firms with attracting local and foreign investors.

Enterprise Incubator provides a comprehensive package of services via its two major components:

Business Services focuses on assisting Armenian technology firms in a variety of areas including business development, marketing and promotion, management, accounting and finance, legal, and other areas vital to the success of a company. Business Services unit helps existing companies in growing their businesses within Armenia and internationally, facilitates the development of start-ups, and assists local entrepreneurs in building their ideas into successful businesses. As part of its assistance, EIF helps companies to improve professional and business skills of the employees and managers via provision of short-term advanced trainings and seminars and creation of learning partnerships within the industry and the universities.

Facility Services component provides high-end facilities to existing technology companies and newly created start-ups. Options included in the base package are high-quality office space, shared meeting and conference rooms, shared resource center with access to literature and other information resources, high-speed Internet connection, receptionist and security, cleaning and utilities, and parking. The facilities are located at the premises of the Russian-Armenian (Slavonic) University, one of the major educational institutions in Armenia.

EIF signifies the development of long-term relationships with organizations and individuals worldwide interested in mutually beneficial business collaboration. It works closely with many technology companies in Armenia and may serve as a major channel to creating successful partnerships with Armenian enterprises. Individuals and companies interested in developing partnerships or investing in Armenia are encouraged to contact EIF at the below address.

Enterprise Incubator Foundation
123 Hovsep Emin street, Yerevan 0051, Armenia
Phone: +374 10 219 797, Fax: +374 10 219 777
E-mail: info@eif.am, http://www.eif-it.com

6. COMPETITIVE ARMENIAN PRIVATE SECTOR PROJECT

The Competitive Armenian Private Sector Project (CAPS) is a three to five year program of assistance funded by the United States Agency for International Development (USAID). CAPS is based on a cluster approach which focuses on improving the business environment and fostering cooperation among enterprises in a particular industry sector. Specifically CAPS is engaged in the following activities:

- Building Cluster Competitiveness by assisting industry clusters to identify and achieve strategic objectives. The cluster-based actions serve the common needs of the collective participant companies, improving their ability to market products and influence government, while providing a sound platform to develop and implement their individual objectives. CAPS works within the information technology (IT), tourism, pharmaceuticals and engineering services clusters, but may select another during program implementation. CAPS offers sector specific expertise in strategy, marketing, financial management and human resources management, as well as cost-shared assistance for event participation, training, infrastructure development and more.

- Strengthening Business Capacity by supporting the ability of companies to manage and grow their businesses. CAPS works closely with Armenian business service providers to help companies to improve productivity, upgrade marketing practices, introduce good governance and upgrade the quality of products. CAPS develops and disseminates world class consulting materials then empowers local business service providers to deliver training and consulting services at the cluster and enterprise levels.

- Developing Policy and Advocacy Capacity of Associations by strengthening business association sustainability and their ability to lobby for industry friendly laws and regulations. Efforts include sponsoring research, particularly by Armenian associations and think tanks, in the areas of competitiveness and facilitating public-private dialogue. CAPS delivers consulting and training to managers of associations, assists in developing new fee-based member services, expands and builds capacity in public relations, and offers cost shared grants for research initiatives and even infrastructure.

- Enhancing Workforce and Skills Development by improving the skills of the workforce while building job-seeker networks to match suitably qualified labor with employer needs. CAPS co-sponsors the development of career fairs and university career centers, assists in the development and placement of new curricula for both university and professional development needs, and provides consulting and training to add capacity to job seeker network managers.

And CAPS has other tools at its disposal to support private sector led growth via cross-cutting initiatives that promote gender equality, expand diaspora linkages, and encourage information sharing on relevant topics with a wide range of stakeholders.

Competitive Armenian Private Sector Project
26/3 Sarian str, 3rd Floor, Yerevan 0002, Armenia
Phone/Fax: +374 10 500 612 / 500 613 / 500 614
E-mail: office@caps.am, http://www.caps.am

7. UITE, ARMENIAN IT ASSOCIATION

The Union of Information Technology Enterprises (UITE) is the primary IT Association in Armenia. It was formed in 2000 as a non-profit association of ICT companies operating in the Republic of Armenia. UITE was established by the private sector to consolidate industry's advocacy efforts, facilitate business, and encourage advancement of research in the ICT sector. Member firms are involved in offshore development, Internet applications, e-commerce, IT services, chip design, and other areas. Several UITE members are global players with office locations all over the world. From May 2004, UITE is a member of World Information Technology and Services Alliance (WITSA).

UITE is involved in a variety of activities such as:

- advocacy of member interests,
- organization of trade shows and programming contests,
- workforce development through custom training programs,
- design of online information and collaboration portals on IT sector,
- conducting industry surveys and research,
- assisting its members with business development.

UITE leads a number of policy related initiatives aimed at the development of ICT sector in Armenia. As part of these initiatives, the association formed seven working groups, which will formulate Armenian ICT sector development strategic plans and activities. Groups cover different areas vital to the sector development including regulatory environment and advocacy, ethics, global marketing and promotion of the industry, education and workforce development, telecommunications infrastructure, domestic ICT market development.

One of the key events organized by the association is the annual DigiTec Expo technology tradeshow, which was first held in September 2005 in Yerevan. The exhibition attracts a variety of domestic and foreign businesses, educational institutions, and other organizations active in the ICT sector. 2005 and 2006 events together hosted nearly 100 exhibitors and welcomed around 30,000 visitors from

various countries. Several major corporations participated in the tradeshow including HP, Microsoft, Mitsubishi Electric, National Instruments, Synopsis, Sun Microsystems Inc., and Virage Logic.

Union of Information Technology Enterprises
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8. METHODOLOGY

In this section, we describe how we have estimated various industry figures, what sources of information and data were used, our assumptions, possible issues with gathering and analyzing information and data, as well as other aspects important for understanding the value and limitations of this Report.

INFORMATION AND DATA

While developing the Report, we had to rely on the data provided by the industry representatives during their interviews. Although we believe that information and data gathered during these interviews were mostly reliable, however, not all of the companies provided all the information we required. Since in a number of cases, we did not have data at all, we had to extrapolate various figures based on what we had at hand.

We understand that because of the unavailability and, in some cases, unreliability of the data, the Report is based, to some extent, on our estimates and analysis. However, based on our experience with the industry, estimates provided in other reports and publications, and other sources, we believe that the Report offers reliable description of the industry, its main trends and characteristics, as well as overall prospects.
Unless otherwise specified, all information and data in this report are based on EIF estimates and analyses and are for the year 2008. All monetary units are in the United States dollars.

DEFINITIONS

Software and IT consulting 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, multimedia applications; chip and IP design; and provision of engineering and R&D services. Internet services includes companies offering mainly access to internet (wholesale and/or retail) through various channels; this does not include VoIP businesses or Internet cafes. While companies included in our research may engage in a number of other activities within the technology

sector, the above two components generate the major share of the firms' revenues. Respectively, only software and ISP segments of those companies were used in estimating industry figures.

Locally owned or local companies are defined as enterprises that have operations in Armenia, and at least 51% of their equity is owned by citizens or permanent residents of Armenia or locally owned firms. *Foreign branches or companies* are defined as enterprises that have operations in Armenia, and at least 51% of their equity is owned by foreign citizens, residents, or firms.

ASSUMPTIONS AND ESTIMATION METHODS

Industry revenues were estimated, when we did not have data from the companies, based on the number of employees, average salary levels, as well as non-wage related costs, and respective profit margins. We tested our assumptions against reliable revenue figures from several companies, and, therefore, we believe that our industry revenue estimates provide reasonable approximation to the actual amounts. Our calculations do not include hardware and high-tech companies, as well as temporary donor-funded software projects for the Government.

Productivity was estimated based on the annual revenues per employee. Two set of figures are calculated: one was mere a division of all industry revenues by the total workforce; second was annual revenue of each company per its employee, which was then averaged for the total industry using revenues as the weight factor. While the second estimation provides a better picture of the productivity, it complicates the forecasting of the industry's growth. Therefore, industry projections are estimated using the first set of figures. Productivity calculations for 2008 were made only for software development companies because significant differences exist between these firms and ISPs in terms of how their revenues are generated.

Workforce was estimated, when we did not have data from the industry, based on the average number of employees per company. Average figures were calculated using a sample of local and foreign companies, where the outlier companies with largest and smallest staff were excluded. This method allows estimating average employee quantities that better reflect the actual state of the industry.

For *forecasting industry growth,* we assumed that the local and international demand for the products and services from Armenian companies keeps with the supply, and, therefore, we did not consider directly the demand side in our forecast. January - June 2008 average exchange rate of US dollar against Armenian Dram (1 USD = 307.64 AMD) was used in currency translations.

DESCRIPTION OF INDUSTRY SURVEY

This report is based on the industry survey conducted by EIF in July-September of 2008. The survey covered three groups: companies engaged in software

development and IT consulting, internet services providers, and IT related faculties of major educational institutions. The survey covered a number of areas important to the development and growth of the industry including business and legal environment, educational framework, human resources, managerial capacity, marketing channels, product development, and others. The report also includes information from EIF previous industry surveys conducted in 2003-2006.

The 2008 survey covered 71 software and IT consulting firms, 15 internet service providers, and 10 IT related faculties of 5 universities.

Survey coordinator: Sophia Muradyan, EIF
Data analysis and report development: Norayr Vardanyan, EIF
Cover design: Broncoway

9. INDUSTRY STATISTICS

	2008	% from Industry	2006	% from Industry	% change 2008/2006	CAGR 2008/2006
Number of Companies						
Industry	175	100%	160	100%	9%	4.6%
Local firms	119	68%	112	70%	6%	3.1%
ISPs	20	11%	16	10%	25%	11.8%
Foreign branches	56	32%	48	30%	17%	8.0%
ISPs	3	2%	2	1%	50%	22.5%
Company Ownership Geography						
Industry	175	100%	160	100%	9%	4.6%
Armenia	119	68%	112	70%	6%	3.1%
USA & North America	36	21%	32	20%	13%	6.1%
Europe	9	5%	11	7%	-18%	-9.5%
Russia & NIS	10	6%	4	3%	150%	58.1%
Other	1	1%	1	1%	0%	0.0%
Exports Geography, millions of U.S. dollars						
Industry	$69.4	100%	$53.3	100%	30%	14.1%
USA & North America	$41.0	59%	$31.7	59%	29%	13.7%
Europe	$12.7	18%	$9.9	19%	28%	13.1%
Russia & NIS	$11.8	17%	$8.6	16%	37%	17.1%
Other	$4.0	6%	$3.2	6%	24%	11.6%
Productivity (weighted average output per technical employee excluding ISPs), U.S. dollars						
Industry	$29,300	100%	$26,500	100%	11%	5.2%
Local firms	$27,500	94%	$22,500	85%	22%	10.6%
Foreign branches	$30,400	104%	$28,900	109%	5%	2.6%

Industry Turnover, millions of U.S. dollars	2008	% from Industry	2006	% from Industry	% change 2008/2006	CAGR 2008/2006
Industry	$111.3	100%	$84.2	100%	32%	15.0%
Local firms	$50.1	45%	$36.7	44%	37%	16.9%
Foreign branches	$61.2	55%	$47.6	57%	28%	13.4%
Domestic market	$41.9	38%	$30.9	37%	36%	16.4%
Local firms	$31.1	28%	$25.0	30%	24%	11.5%
Software and IT consulting	$21.4	19%	$17.3	21%	24%	11.3%
Internet services	$9.6	9%	$7.7	9%	25%	11.9%
Foreign branches	$10.8	10%	$5.9	7%	83%	35.4%
Software and IT consulting	$5.1	5%	$4.6	5%	11%	5.5%
Internet services	$5.7	5%	$1.3	2%	338%	109.2%
Exports	$69.4	62%	$53.3	63%	30%	14.1%
Local firms	$19.1	17%	$11.6	14%	64%	28.2%
Foreign branches	$50.3	45%	$41.7	50%	21%	9.9%
Industry	$111.3	100%	$84.2	100%	32%	15.0%
Software and IT consulting	$96.0	86%	$75.2	89%	28%	13.0%
Internet services	$15.3	14%	$9.0	11%	70%	30.5%

Salary Levels (gross annual), millions of U.S. dollars	Local firms, 2008	Foreign branches, 2008	Local firms, 2006	Foreign branches, 2006	Local firms, CAGR 2008/2006	Foreign branches, CAGR 2008/2006
Developer, entry level	$4,800	$6,000	$3,600	$5,000	15.5%	15.5%
Developer, 2-year experience	$8,400	$9,600	$5,100	$6,900	28.3%	28.3%
Developer, experienced	$13,200	$14,400	$7,600	$10,600	31.8%	31.8%
Project manager	$11,400	$16,200	$8,900	$15,400	13.2%	13.2%
Test engineer	$6,000	$7,800	$5,000	$7,000	9.5%	9.5%
System administrator	$10,800	$12,000	$5,300	$7,700	42.7%	42.7%
Support	$4,800	$6,000	$4,300	$4,500	5.7%	5.7%
Management	$12,000	$16,800	$9,300	$16,100	13.6%	13.6%

Workforce Distribution*	2008	% from Industry	2006	% from Industry	% change 2008/2006	CAGR 2008/2006
Industry	4,890	100%	4,020	100%	22%	10.3%
Technical specialists	4,250	87%	3,390	84%	25%	12.0%
Management	640	13%	630	16%	2%	0.8%
Software and IT consulting	4,220	86%	3,660	91%	15%	7.4%
Local firms	2,100	43%	1,690	42%	24%	11.5%
Foreign branches	2,120	43%	1,970	49%	8%	3.7%
Internet services	670	14%	360	9%	86%	36.4%
Local firms	360	7%	320	8%	13%	6.1%
Foreign branches	310	6%	40	1%	675%	178.4%
Local firms	2,460	50%	2,010	50%	22%	10.6%
Technical specialists	2,110	43%	1,640	41%	29%	13.4%
Management	350	7%	370	9%	-5%	-2.7%
Foreign branches	2,430	50%	2,010	50%	21%	10.0%
Technical specialists	2,140	44%	1,750	44%	22%	10.6%
Management	290	6%	260	6%	12%	5.6%
Software and IT consulting	4,220	86%	3,670	91%	15%	7.2%
Technical specialists	3,680	75%	3,100	77%	19%	9.0%
Management	540	11%	570	14%	-5%	-2.7%
Internet services	680	14%	350	9%	94%	39.4%
Technical specialists	580	12%	290	7%	100%	41.4%
Management	100	2%	60	1%	67%	29.1%

* Totals may differ due to rounding

Customer Distribuion, 2008	% of companies 2008	% of revenues 2008	% of companies 2006	% of revenues 2006
Foreign entities	33.6%	62.4%	47.0%	64.6%
Government agencies	13.2%	8.3%	10.6%	9.1%
Individuals	6.0%	2.5%	4.6%	1.5%
Local SMEs	21.8%	7.3%	14.6%	7.3%
Local large companies	19.3%	16.1%	17.2%	12.2%
NGOs, international organizations	6.0%	3.5%	6.1%	5.3%

Specializations, % of firms	Industry, 2008	Local firms, 2008	Foreign branches, 2008	Industry, 2006	Local firms, 2006	Foreign branches, 2006
Customized software and outsourcing	20.6%	20.1%	21.0%	28.9%	17.3%	11.6%
Chip design, testing, and related	15.8%	2.2%	26.9%	6.6%	2.2%	4.4%
Internet service provider	13.8%	19.2%	9.3%	11.3%	10.0%	1.3%
Networking systems and communications	9.5%	4.4%	13.7%	4.6%	1.7%	2.9%
Internet applications and ecommerce	8.4%	3.2%	12.7%	4.9%	3.9%	1.0%
IT services and consulting	6.2%	10.4%	2.8%	5.5%	3.9%	1.6%
Accounting, banking, and financial software	6.3%	11.8%	1.9%	7.8%	5.8%	2.0%
Web design and development	3.5%	5.8%	1.7%	13.1%	12.4%	0.6%
Computer graphics, multimedia, and games	3.1%	6.8%	0.1%	6.2%	4.6%	1.6%
Databases & MIS	2.8%	4.8%	1.2%	6.2%	4.8%	1.4%
Other	10.0%	11.4%	8.8%	5.1%	3.4%	1.7%

Specializations, Revenues, millions of U.S. dollars	Industry, 2008	Local firms, 2008	Foreign branches, 2008	Industry, 2006	Local firms, 2006	Foreign branches, 2006
Customized software and outsourcing	$22.9	$10.1	$12.8	$18.1	$7.3	$10.7
Chip design, testing, and related	$17.5	$1.1	$16.4	$13.2	$0.9	$12.3
Internet service provider	$15.3	$9.6	$5.7	$8.9	$7.7	$1.3
Networking systems and communications	$10.6	$2.2	$8.4	$8.0	$0.7	$7.3
Internet applications and ecommerce	$9.3	$1.6	$7.8	$7.4	$2.5	$4.9
IT services and consulting	$7.0	$5.2	$1.7	$5.4	$2.7	$2.7
Accounting, banking, and financial software	$7.1	$5.9	$1.2	$5.2	$3.4	$1.7
Web design and development	$3.9	$2.9	$1.0	$4.1	$2.7	$1.4
Computer graphics, multimedia, and games	$3.5	$3.4	$0.0	$4.0	$3.7	$0.3
Databases & MIS	$3.1	$2.4	$0.7	$3.0	$1.5	$1.4
Other	$11.1	$5.7	$5.4	$7.0	$3.4	$3.6

10. Costs of Operating a Software Company in Armenia

Annual Costs of Operating an Outsourcing Office in Armenia, Small Scale			
Employees	**Persons**	**Salary**	**Total**
Developer, entry level	3	$6,000	$18,000
Developer, 2-year experience	5	$9,600	$48,000
Developer, experienced	5	$14,400	$72,000
Project manager	2	$16,200	$32,400
Test engineer	1	$7,800	$7,800
System administrator	1	$12,000	$12,000
Support	2	$6,000	$12,000
Management	2	$16,800	$33,600
Total staff expenses	21		$235,800
Infrastructure and other	**Units**	**Monthly cost of sq.m.**	**Total**
Office space, 8 sq.m. per person (utilities included)	168 sq.m.	$25	$50,400
Internet, dedicated 128 kbps symmetric DSL	1	$2,000	$24,000
Other, $200 per person	1	$4,200	$50,400
Total infrastructure and other expenses			$124,800
Total operating costs			**$360,600**

Annual Costs of Operating an Outsourcing Office in Armenia, Large Scale			
Employees	**Persons**	**Salary**	**Total**
Intern	10	$600	$6,000
Developer, entry level	30	$6,000	$180,000
Developer, 2-year experience	30	$9,600	$288,000
Developer, experienced	20	$14,400	$288,000
Project manager	7	$16,200	$113,400
Test engineer	6	$7,800	$46,800
System administrator	3	$12,000	$36,000
Support	10	$6,000	$60,000
Management	3	$16,800	$50,400
Total staff expenses	119		$1,068,600
Infrastructure and other	**Units**	**Monthly cost**	**Total**
Office space, 10 sq.m. per person (utilities included)	1,190 sq.m.	$25	$357,000
Internet, dedicated 512 kbps symmetric fiber	1	$7,700	$92,400
Other, $400 per person	1	$47,600	$571,200
Total infrastructure and other expenses			$1,020,600
Total operating costs			**$2,089,200**

11. ARMENIA ON THE INTERNET

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12. ABBREVIATIONS

CAD	–	Computer Aided Design
CAGR	–	Compound Annual Growth Rate
CAPS	–	Competitive Armenia Private Sector project
CIS	–	Commonwealth of Independent States
CMMI	–	Capability Maturity Model Integrated
DSL	–	Digital Subscriber Line
EDA	–	Electronic Design Automation
EIF	–	Enterprise Incubator Foundation
EU	–	European Union
FDI	–	Foreign Direct Investment
GDP	–	Gross Domestic Product
ICT	–	Information and Communications Technologies
IC	–	Integrated Circuit
I/O	–	Input/Output
IP	–	Intellectual Property
ISDN	–	Integrated Services Digital Network
ISP	–	Internet Service Provider
IT	–	Information Technology
ITU	–	International Telecommunication Union
M&A	–	Mergers and Acquisitions
MIS	–	Management Information Systems
NIS	–	Newly Independent States
R&D	–	Research and Development
US	–	United States
USSR	–	Union of Soviet Socialist Republics
VC	–	Venture Capital
VLSI	–	Very Large Scale Integration
Wi-Fi	–	Wireless Fidelity, wireless network
WiMAX	–	Worldwide Interoperability for Microwave Access, wireless broadband network
WTO	–	World Trade Organization

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