

UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE

**TOWARDS A  
KNOWLEDGE-BASED ECONOMY**

**ARMENIA**

**COUNTRY READINESS ASSESSMENT REPORT**



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BASED ECONOMY

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## FOREWORD

*The last decades of the 20th century have represented a turning point in the global development process. It is knowledge that has become the engine of the social, economic and cultural development in the today's world. Knowledge-intensive economic activities are now a factor of production of strategic importance in the leading countries. They have also become the main indicator of the level of development and the readiness of every country for a further economic and cultural growth in the 21st century. Taking into consideration all these factors, the United Nations Economic Commission for Europe has launched an initiative of monitoring and analyzing the development of the knowledge-based economy in all the European countries in transition and emerging market economies.*

*The major goal of this initiative is to stimulate the exchange of national experiences, to identify best practices and to promote region-wide and global-wide cooperation of the UNECE member States, which would accelerate the development of a knowledge-based economy in the countries in transition and emerging market economies. It envisages the preparation of country assessment reports on the biennium basis by national experts, nominated by the Governments, the creation of a High-Level Task Force on the Knowledge-Based Economy, which will consider the reports and provide policy advice and recommendations to the participating countries, and the development of progress measurements and indicators, policy guidelines and tools to assist countries in overcoming obstacles to the development of a knowledge-based economy.*

*We hope that the country assessment reports, showing a detailed level of the countries' potential and providing information on various approaches and solutions, will help policy-makers to take strategic decisions with regards to the challenges facing them in the development of institutions, information and innovation systems, human resources development and other areas crucial for the development of a knowledge-based economy.*

*Brigita Schmögnerová  
Executive Secretary  
United Nations Economic Commission for Europe*



One of the important pre-condition of the development of the knowledge-based economy in every particular country or a region is the promotion of international cooperation. The benefits gained from the cooperation provide cooperating parties with a better vision of global processes and make that process stronger. In this respect, the initiative of the United Nation Economic Commission for Europe to launch an assessment of the situation in the countries in transition is an important step towards the promotion of such cooperation in European continent.

We expect this project to develop a unified methodology of assessment of the knowledge-based economy development process and to enable the participating countries to position themselves in that process. At the same time, we believe that this project will contribute to strengthening the further integration of the participating countries into the emerging global knowledge-based economy and will promote cooperation between them at the levels of the Government, business community and the civil society at large.

We are also grateful to the United Nations Economic Commission for Europe for the considerable work carried out for the organization of the regional conference on the Information Society to be held in Bucharest in November this year. The materials prepared by independent experts will be a solid resource for both the national governments and international organizations in planning, implementation and monitoring of the programs aimed at building a global knowledge-based economy and an information society.

With respect,

Tigran Davtyan  
Deputy Minister of Trade and Economic  
*Development of the Republic of Armenia*

## PREFACE

The industrial revolution of the 19th century and the scientific revolution of the 20th century have prepared the conditions for the rise of the knowledge-based economy. Economic activities associated with the production and utilization of information and knowledge have become an engine of economic growth in the developed market economies, increasingly transforming all the other dimensions of development and the entire societal *modus vivendi* and *modus operanti* of the humanity.

What do we mean by “the knowledge-based economy”?

It is not just the digital economy, which incorporates the production and use of computers and telecommunication equipment. It is not quite the networked economy, which incorporates the telecommunication and networking growth during the last decades and its impact on human progress.

The knowledge-based economy is a much complex and broader phenomenon. There are different dimensions and aspects of the knowledge-based economy:

1. The knowledge-based economy has a very powerful technological driving force – a rapid growth of information and telecommunication technologies (ICT). Every three – four year there appears a new generation of ICT. Today, the ICT companies are among the largest corporations. The ICT sector is among the fastest growing economic sectors.
2. Telecommunication and networking, stimulated by a rapid growth of ICTs, have penetrated all the spheres of human activity, forcing them to work into an absolutely new mode and creating new spheres. The information society has become a reality.
3. Knowledge, based on information and supported by cultural and spiritual values, has become an independent force and the most decisive factor of social, economic, technological and cultural transformation.
4. The knowledge-based economy has allowed a quick integration of the enormous intellectual resources of economies in transition into the European intellectual pool, stimulating the development of the former countries. Every country can benefit from developing a knowledge-based economy to become a more equal participant in the global development process.
5. The emerging knowledge-based economy has been affecting other areas of societal activity in every country, including institutional and innovation system, human resources development and etc. and visa versa. The knowledge-based economy has become an engine of progress in every country. If a country is developed, it has a developed knowledge-based economy, if a country is lagging behind, a knowledge-based economy constitutes just a small fraction of its economy.



The report below was prepared by a national expert, nominated by the Government, and represents an overview of the present situation and an assessment of the emerging trends in all the major areas, constituting the foundation of the knowledge-based economy, such as policy and policy instruments, institutional regime, ICT infrastructure, information system, national innovation capacities and capabilities.

## Contents

Introduction .....	3
1. National strategy and action plan.....	4
2. The institutional regime .....	7
2.1 The General Department of Information and Communication.....	7
2.2 The Ministry of Trade and Economic Development .....	7
2.3 The ICT Development Council.....	7
2.4 The Armenian Development Agency .....	8
3. Present situation and trends in the country's information system .....	9
3.1 Access to the networks.....	9
3.1.1 Information infrastructure.....	9
3.1.2 Access to the Internet.....	10
4. Characteristics of the country's human resources .....	11
4.1 Human capital profile .....	11
4.2 ICT education opportunities .....	11
4.3 Employment opportunities in the ICT sector.....	11
5. National innovation capacities, capabilities and their effectiveness.....	13
5.1 Scientific institutions .....	13
6. Major national initiatives .....	15
6.1 The Business Incubation Project.....	15
6.2 The Open Society Institute.....	15
6.3 The European Commission.....	15
6.4 United Nations Development Programme .....	15
6.5 Eurasia Foundation .....	16
6.6 USAID .....	16
Conclusions .....	17
Annex I - Benchmarking .....	18
Annex II - Knowledge-Based Economy Indicators.....	21

## Introduction

The emergence of information and communication technologies (ICT) has offered Armenia, a country of limited natural resources, with a real opportunity to turn its human capital to economic advantage, thereby stimulating the country's development. In its 11 years of independence, Armenian society has faced serious economic and political challenges caused by the collapse of the Soviet Union. Since independence, Armenia has had to rebuild its economy, its infrastructure and its administrative system. Following ten years of economic decline, the period 2000-2001 has shown improvement for Armenian industry, and the emergence of high-tech businesses is one promising development for the country.

The country's economic and social indicators for the year 2001 are as follows<sup>1</sup>:

- Population: 3,800,000
- Urban population: 2,529,200
- Nominal GDP: 2,288 mil US\$
- GDP per Capita: 602 US\$
- Sectoral contribution to GDP in %:
  - Industry: 22.9
  - Agriculture: 25.8
  - Gross Fixed Capital Formation: 16.6

ICT is considered a unique opportunity for Armenian society to solve both economic and political problems. A number of foreign and local IT companies were established in 1999 and 2000. These companies have formed a solid foundation for the development of a knowledge-based economy and information society. This in turn has encouraged the government to develop a national strategy and action plan for the development of ICT. The development process of the IT sector in Armenia is not easy due to: the low rate of domestic investment; the absence of venture capital; the low income rate of the majority of the population; and, an under-developed infrastructure. In spite of these difficulties, ICT business is becoming a reality, influencing public policy primarily in the areas of education, science, and public administration.

The Armenian Diaspora plays a significant role in the country's economy. Statistically, the Diaspora is comparable to the population of Armenia. IT professionals who left the country during the period 1996 to 1999 are an important factor in the attraction of investment to the Armenian IT industry. About 60% of recently established IT enterprises have benefited from the support of Armenian professionals living in the USA and Europe. The Diaspora is also an important factor in access to foreign markets by Armenian IT companies, who often cannot afford large-scale marketing and product promotion activities. The combination of opportunities created by the Diaspora, combined with highly-qualified Armenian IT professionals, creates a unique business mechanism that supports the growth of the IT sector.

Several favourable preconditions for the development of the ICT industry and the application of information technology in social and educational sectors are now in place. In spite of this, there are still some administrative, legal and institutional barriers hindering the emergence of a knowledge-based economy and information society in Armenia.

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<sup>1</sup> National Statistics Agency Report, 2001

## 1. National strategy and action plan

Both the Government and the President of Armenia have continuously reiterated that ICT is considered a priority for Armenia. Its development is encouraged in every possible way by the political leadership of the country. The existence of highly-qualified professionals in the fields of software and microelectronics makes Armenia attractive for investments in this area. The government Action Plan specifically declares: “taking into consideration the increasing growth of information technologies in the international economy, the Armenian government shall pay special attention to the development of that field in Armenia”.

On 13 May 2001, the Government approved the Programme for the Development of Information and Telecommunication Industry in Armenia. This programme is based on the ICT Master Strategy, which was developed with substantial technical assistance from both the World Bank and USAID experts. USAID contractors, who report on its progress to both USAID officials and the Armenian Government, regularly review the implementation of the Master Strategy. The reports are analyzed by the ICT Development Council, which then provides the government with relevant recommendations.

The programme and the Master Strategy are the basic guidance documents for both government and donor organizations supporting ICT development in Armenia. The programme specifies government priorities and indicates the main directions for the activities of governmental organizations in this field. According to the programme, the activities of the Armenian government should achieve the following objectives:

- the promotion of ICT applications in different areas of public life;
- the establishment of a legal framework promoting ICT development in the country;
- the construction of a competitive ICT industry which will attract investment;
- the support of innovation as a primary mechanism for economic growth;
- the promotion of favourable conditions for the work of ICT professionals.

The Master Strategy also lists a number of objectives for the development of a knowledge-based economy and information society. These objectives are not limited to areas of government institution responsibility, but also include the potential activities of non-governmental, foreign and international organisations supporting the development of ICT and its applications in Armenia. The Master Strategy is comprised of two documents that serve as a methodological guide for ICT stakeholders. The documents are not official, but are used by both governmental and non-governmental organisations when planning and evaluating their initiatives for ICT growth.

The Master Strategy proposes the following long-term objectives towards a knowledge-based economy:

- the creation of a vibrant and sustainable ICT industry that promotes growth in other sectors of the Armenian economy;
- the inclusion of Armenia in the knowledge-based global economy.

The following conditions are identified as being essential for the development of a successful ICT industry in Armenia:

- the retention of skilled human capital in Armenia as the key to competitiveness;

- the provision of access to capital and the market for emerging ICT businesses.

One focal point of the Master Strategy is the establishment of a business incubator, which will provide small and medium ICT enterprises with: management and marketing training; access to credit; and, access to foreign markets. One of the objectives of business incubation is to facilitate the formation of venture capital in Armenia. The business incubator programme draws on best international practices to accelerate the creation of new ICT firms and aims to improve the survival and growth rates of such businesses. Other focal points of the Master Strategy include:

- the support of an active national ICT association that caters for all aspects of the sector's development by providing services and advice to its members;
- the promotion of a productivity programme to upgrade initiatives with ICT at their centre while, at the same time, developing both the market and businesses capable of supplying goods and services to it;
- the implementation of cluster development programmes to improve business capabilities, starting with the ICT sector, but scheduled to spread rapidly to other sectors.

Significant parts of the ICT Master Strategy address the issues of a favourable investment climate, and of the regulatory framework which supports the growth of an ICT industry. In accordance with the Master Strategy, the following tasks are to be accomplished by the government in order to ensure an investment-friendly environment and favourable legislation:

- the identification of a trade policy that encourages investment and local business development by focusing on simplified customs rules and regulations;
- the exemption of customs duties for products essential for ICT business development;
- the improvement of delivery services for both domestic and international products and of services facilitating e-commerce;
- the adoption of a comprehensive and standardised classification system and clearance procedure;
- the establishment of more detailed statutory regulations for the conclusion and enforcement of electronic contracts, as well as for the use of electronic signatures.

The participation of the business sector in the development of legislation, through representatives of both employers and employees, is seen as a key factor in the successful establishment of a favorable investment climate. This initiative will also ensure that legislation to supports the growth of an ICT industry is in place.

The Master Strategy also stresses the importance of maintaining and further developing human capital by strengthening the educational system and building an effective innovation system. The strategy proposed in this respect consists of:

- the building of a market-oriented higher education system;
- the introduction of computer literacy programs to different categories of state and private sector employees;
- the creation of training courses for the unemployed in order to provide them with employment opportunities in the new economy.

Important factors for the creation of effective education and innovation systems specified in the Master Plan are:

- the availability of a reliable high-speed Internet broadband connection to support remote educational systems, including distance learning software support systems, digital library access systems and logistics support systems;
- the provision of reliable and rapid forms of communication between Armenian academic institutions and their counterparts worldwide.

The Master Strategy addresses the development of a telecommunications market as an important component of the ICT industry, ensuring the growth of knowledge-based companies. The strategy proposed for the improvement of the country's information and communication system includes:

- the establishment of an independent regulatory body;
- the modification of license issued to incumbent telecom operators;
- the development and adoption of standards in the quality of telecommunications services.

The Master Strategy explicitly stresses that the development of high-speed Internet connection is an important prerequisite for the advancement of the country's information system. The expansion of adequate and affordable Internet services to provincial cities should be one of the development priorities of the Armenian telecommunications system.

The adoption of the ICT Development Action Plan is the government's next step in its advancement towards a knowledge-based economy. The Action Plan includes specific tasks and relevant benchmarks. The Ministry of Trade and Economic Development is responsible for its implementation. In addition, and in accordance with a Presidential Decree, an ICT Council has been established to coordinate the implementation of the Action Plan. The Prime Minister is chairperson of the council, which also includes representatives of governmental, non-governmental and private organisations. The council identifies the primary obstacles hindering the development of an ICT industry in Armenia, and prepares relevant recommendations for government.

## **2. The institutional regime**

### **2.1 The General Department of Information and Communication**

The General Department of Information and Communication (GDIC) of the Ministry of Transport and Communication implements state policy in the area of information and telecommunications. This department issues licenses to telecommunications operators and oversees their compliance with technical standards and licensing requirements. Licensing is in accordance with the Armenian licensing legislation and procedures established by the Ministry of Transport and Communication. The department is also responsible for the allocation of radio frequencies and technical standards of radio transmissions.

An additional responsibility of the GDIC is the approval of tariffs for telecommunication services provided on an exclusive basis. The tariffs are approved in accordance with the rules established by the Government of Armenia. These tariffs are calculated by evaluating the actual cost of the services and adding on to this the expenses related to network maintenance and development. The present tariffs of basic telecommunication services attempt to combine the interests of the telecommunications operator and that of different categories of users. Users of public switched telephone network (PSTN) can choose between call metering and flat rates<sup>2</sup>.

The GDIC is also responsible for the coordination and support of scientific research in the areas of telecommunications and information. However, a lack of resources hinders the department from fulfilling its activities in this area. The department is also responsible for the development of quality standards in telecommunications service. Again, this has not been achieved so far due to a lack of human and financial resources. The development and adoption of the Country Telecommunications Programme, another important responsibility of the department, is not in place because of the limited capacity of GDIC.

### **2.2 The Ministry of Trade and Economic Development**

The Ministry of Trade and Economic Development is also involved in the development of ICT. The ministry is responsible for the implementation of the ICT Development Action Plan and for the coordination of activities of other governmental institutions in this field. More specifically, the ministry is in charge of developing the legal and regulatory framework that supports the development of the ICT industry and of attracting foreign investment in this area of the economy. It is an official recipient of the World Bank Business Incubating project and other initiatives related to the establishment of the ICT industry in Armenia.

### **2.3 The ICT Development Council**

The ICT Development Council and the Council's Secretariat play an important role in the implementation of the ICT Master Strategy and the ICT Development Action Plan. The ICT

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<sup>2</sup> There are two basic telephone tariffs in Armenia. The first tariff includes a monthly fee of 900 drams (1.5 USD), 360 minutes of free calls, and 4 drams (0.006 USD) for every additional minute of telephone call or 1 dram (0.0017 USD) for every additional minute of data transfer (Internet and e-mail). The second type of tariff includes a monthly fee of 2,500 drams (4.3 USD) and unlimited use of voice and/or data traffic.

Council provides Armenian businesses with the opportunity to influence state policy and to promote favourable conditions for the growth of the entire ICT sector. The President of Armenia appoints the members of the ICT Council for a period of one year. The Council's activities include:

- the identification of obstacles hindering the growth of the ICT industry and the development of relevant recommendations for the government;
- a discussion on the implementation of the Action Plan at monthly sessions;
- weekly meetings of six thematic working groups aimed at development assessment of the ICT industry.

## **2.4 The Armenian Development Agency**

A significant part of the responsibilities related to the promotion of foreign investments in the ICT sector is delegated to the Armenian Development Agency (ADA). This agency is a state-owned, joint-stock company established by the government for the purpose of attracting foreign investment to the economy. The Secretariat of the ICT Council is based in the ADA and uses the Agency's facilities for its everyday activities.

In spite of clearly defined responsibilities for state institutions responsible for the implementation of the ICT Master Strategy, the ICT Development Programme and Action Plan suffer from a lack of coordination between different governmental agencies. This situation impedes effective growth of the ICT sector. In some cases, state agencies compete with each other for the responsibilities under a particular governmental initiative.



### **3. Present situation and trends in the country's information system**

#### **3.1 Access to the networks**

Telecommunications in Armenia is dominated by ArmenTel, which is presently the country's sole provider of virtually all telecommunications-related services. The ArmenTel monopoly is complemented only by those firms with internal private networks, as well as by a few Internet Service Providers (ISPs) that provide value-added services (through ArmenTel's networks). ArmenTel is the sole provider of domestic and international commercial landline-based and mobile services, as outlined below. The company is owned by OTE of Greece (90%) and the Government of Armenia (10%). In accordance with ArmenTel's Shares Purchase Agreement, OTE is obliged to make a significant investment in the country's telecommunications system, including the installation of digital telephone switch stations (digitalization) in cities and in 800 Armenian villages. The monopoly position of ArmenTel is for a period of 15 years (1997-2012) for basic services and mobile services.

The telecommunications license issued by the Ministry of Communication to ArmenTel grants exclusive rights for:

- basic domestic, local and international long-distance telephone calls, including leased lines services;
- international voice, data transfer and informational services (including, but not limited to, teleconferences, call-holding, call-waiting and call-transfer);
- use of international satellite telecommunications services;
- mobile and paid public telephone services;
- toll-free services and supplementary telephone services (800 and 900 services);
- any other service that in the future will compete with the above-mentioned services.

From the viewpoint of many different agencies, including government authorities, independent experts, and ISPs, ArmenTel's monopoly has restricted the development of the telecommunications market in Armenia, as well as of other ICT areas. In 1999, a group of Members of Parliament applied to the Constitutional Court of the Republic of Armenia in order to challenge both ArmenTel's license and article 24 of the Law on Telecommunications. This group claimed that these documents contradicted article 8 of the Constitution of Armenia, which guarantees free and equal market competition in the country. The Court ruled that the ArmenTel license and laws adopted subsequently did in fact contradict the Constitution of the Republic of Armenia, and obligated the government and parliament to find a solution to the legal contradictions before the year 2004. Many telecommunications stakeholders are optimistic about the revision of the ArmenTel license and the relevant normative acts. However, state policy in the sphere of telecommunications remains unclear for the operators (Internet and voice-over IP providers) and other actors in the ICT market.

##### **3.1.1 Information infrastructure**

The total number of telephone landlines in Armenia is 531,269, with 17.6 phones per 100 people. Growth has been relatively flat in recent years. The percentage of digital telephone

lines has increased from 9.7% in 1996 to 26.7% in 2001. The International Telecommunication Union's (ITU) data for mobile phones reflects rapid growth, although this is based on the relatively low starting figure of 7,000 in 1998 (this low figure is due, in part, to relatively high costs at that time). By 2001, the total number of mobile phones had reached 40,000 or, 8.33 per 100 people. In spite of the high cost (15 USD monthly fee and 0.18 USD per minute charge), there is great demand for this service<sup>3</sup>.

### **3.1.2 Access to the Internet**

Growth in Internet and e-mail use has been marked in recent years. There are 17 Internet Service Providers (ISPs) in Armenia, virtually all servicing the city of Erevan. A few of these companies provide limited support in other cities. The declared speed of Internet connections is 44,000 Kbit per second for analogue phone lines and 56,700 Kbit per second for digital phone lines. However, the actual speed is 20% less than that declared by the ISPs. ISP services include dial-up and dedicated-line services provided via leased lines and radio modems. The number of clients serviced by ISPs varies from 4,000 for big providers to 50 – 300 subscribers for the medium and small companies. In spite of relatively high rates of Internet services, ISPs offer flexible tariffs from 10 USD per month (night tariffs) to 60 USD (unlimited access).

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<sup>3</sup> At the time of reporting there were no mobile phone subscriptions for a period of three months due to the restricted lack of operator network capacity.

## **4. Characteristics of the country's human resources**

### **4.1 Human capital profile**

As a former Soviet Republic, Armenia has always been relatively developed in high-tech production. Armenian industry was closely linked with the Soviet military industry and a substantial part of the country's human resources was involved in the production of semiconductors, mainframe computers, hardware and software. Following the collapse of the Soviet Union, many Armenian professionals, previously involved in the high-tech sector of the economy, were forced to seek jobs abroad or in other sectors of the economy. A significant number of young engineers either emigrated to the USA or the EU, or lost their qualifications. However, in spite of a marked increase in emigration, the Armenian education system has preserved its scientific traditions with experienced academic staff continuing to contribute to the development of the country's human capital.

### **4.2 ICT education opportunities**

The main institutions of higher ICT education in Armenia are:

- Erevan Engineering University (departments of System Programming, Computer Engineering, Radio Engineering);
- Erevan State University (department of Applied Mathematics); University of Management and Information Technologies (department of Information Technologies);
- The French University.

The number of young people interested in technical subjects (mainly software programming) has increased in response to the demands of industry. These institutions prepare about 300 ICT professionals annually. There also exists a number of vocational training centers that offer various short-term training courses for both beginners and advanced professionals.

### **4.3 Employment opportunities in the ICT sector**

During the period 1999 – 2000, Armenia experienced an IT boom. The number of both local and foreign companies investing in software production increased dramatically during these years. According to a survey conducted by the Union of Information Technologies Enterprises (UITE), there are approximately 60 companies running IT-related businesses. About 35% of these companies are software developers, employing from 20 to 200 people. IT education and services is the second largest category of Armenia's IT sector with about 35% of the companies catering for this category. 15% of companies are EDP hardware developers and 15% are ISPs. About 45% of IT enterprises working in Armenia are subsidiaries of foreign companies.

Many computer software and hardware professionals work for computer services and maintenance firms. There are approximately 30 companies selling computers in Armenia that also provide relatively good consumer support and maintenance services. Some ICT

graduates work as network administrators or provide in-house services to different categories of medium-sized enterprises.

However, the emigration of ICT professionals and other highly qualified human resources is still a problem in Armenia. According to a survey carried out by the UITE, since 1995, about 20% of professionals have left Armenia for other labour markets, primarily in the USA and the EU. In spite of a well-developed higher education system, many Armenian IT companies report that the deficit of qualified human resources is increasing. This is mainly due to emigration and growth of the IT sector.

## 5. National innovation capacities, capabilities and their effectiveness

### 5.1 Scientific institutions

Armenian society is traditionally strong in terms of scientific and innovation potential, and has always placed a high value on knowledge and education. Scientists in Armenia have achieved much in the areas of radio physics and electronics, geology and seismography, laser technique and non-linear optics, fundamental and applied mathematics, mechanics, astrophysics, biotechnologies, pharmacy, chemistry, solid-state physics and semiconductors. Major scientific research has been focused on fundamental science rather than on technological solutions.

As with other former Soviet Republics, scientific institutions in Armenia can be subdivided into three categories:

- scientific institutions carrying out fundamental research;
- scientific organisations carrying out applied research and high-tech production;
- universities and institutes combining educational processes with scientific research.

The radical shift from a state-planned economy to a market economy in the early 1990's significantly changed the country's academic system and has had negative effects on the activities of scientific institutions. Many scientific organisations have significantly decreased research activities due to a lack of funding. Those organisations that did survive did so as a result of grants from foreign organisations and small state subsidies.

The new economic environment demands that Armenia's scientific institutions turn to applied and technological research. Some scientific institutions have already launched production departments to sustain fundamental research and to promote innovations. However, the total volume of scientific work has dramatically decreased compared to the late 1980's and the early 1990's. As with engineers, many Armenian scientists emigrated to western countries, or found employment in the private sector. During the 1990's, Armenian science survived only because of its strong historical traditions and the enthusiasm of scientists that continued their work in extremely difficult conditions. Although science in Armenia still faces serious difficulties, the situation in the area of fundamental and applied research is at present relatively stable, with some positive tendencies being observed.

- Including universities and small-scale laboratories, the total number of scientific organizations formally operating in Armenia is 88.
- The total science budget in 2000 was 1,519.1 million drams, equivalent to 2,618,960 USD<sup>4</sup>.
- In the year 2000, the number of scientists and support staff working in Armenian scientific organisations was 7,309<sup>4</sup>.
- The total volume of scientific and technological research carried out in 2000 amounted to 2,649.1 million drams, equivalent to 4,816,545 USD, of which:
  - Research and development: 2,491.7 million drams (4,530,363 USD)

<sup>4</sup> National Statistics Agency Report, 2000.

- Technological services: 157.4 million drams (286,181 USD)

The primary weakness in Armenia’s scientific and innovation systems lies in an absence of links between scientific institutions and the private sector. Meanwhile, the existing scientific system of Armenia does not encourage that scientific research be utilised. In fact, science funding in Armenia has not undergone substantial change in recent times. The absence of scientific priorities and an effective funding system based on competitive grants, means there is a failure to stimulate the growth of technological innovations and to utilise scientific results. The lack of efficiency in the organisation of scientific and technological research results in an unfilled potential in the country’s scientific foundations. The absence of a legal framework encouraging local philanthropy is also a serious gap in the Armenian scientific system. Lack of philanthropic traditions and motivation of enterprises to invest in scientific and technological research also results in lost opportunities for the country’s innovation system.

## **6. Major national initiatives**

### **6.1 The business incubation project**

One of the main initiatives for development of the ICT industry in Armenia is the Business Incubation Project. This project, funded by a World Bank loan, aims to train emerging ICT companies in management and marketing; to assist them in developing their marketing policies; and to enable them to access capital and foreign markets. As previously noted, the ICT business incubator is an important component of the ICT Master Strategy and the governments Action Plan. Other World Bank activities for the development of the country's information system include the assessment of the telecommunications regulation system, and the development of recommendations for the introduction of effective approaches in this field.

### **6.2 The Open Society institute**

A number of important initiatives in the areas of education and Internet policy are sponsored and implemented by the Open Society Institute – Assistance Foundation Armenia (OSI). One such initiative is a project aimed at providing the Armenian academic community with access to a virtual library. This initiative is important for sustaining science and education in Armenia and for providing the country's academic system with updated information. OSI provides grants for different Internet policy related initiatives and supports the development of local Internet contents.

### **6.3 The European Commission**

Valuable contribution to the development of ICT education is expected from the European Commission. According to a preliminary agreement between the government of Armenia and the European Commission, approximately 1.5 million Euros are to be allocated to the development of an ICT educational system, as well as to the improvement of the related legal framework and public policy. The main recipient of this funding will be the French University of Armenia, one of the institutions offering ICT-related education.

### **6.4 United Nations Development Programme**

The United Nations Development Programme (UNDP) plays an important role in building the country's information system. The Freenet project, implemented by UNDP in Armenia, provides large sections of the population with free e-mail services and access to local Internet resources. The UNDP country office in Armenia is implementing a pilot project to establish an electronic government system in one district. It also coordinates the activities of donors and foreign organisations involved in the creation of an information society in Armenia.

## **6.5 Eurasia Foundation**

Significant financial assistance to ICT-related initiatives is provided by the Eurasia Foundation (EF). EF has supported the establishment of certified training centers for leading software and hardware companies. A cycle of projects, aimed at the commercialisation of scientific achievements, thus facilitating innovations in different technological areas, was also supported by the EF. The foundation has also provided financial support to the Union of Information Technologies Enterprises for the ICT enterprise survey and the assessment of the ICT market in Armenia. In addition, the Eurasia Regional Cooperation Program has recently supported an initiative of partner organisations from Armenia, Azerbaijan and Georgia, to study the telecommunications sector in the South Caucasus and the development of relevant recommendations for the integration of the countries' telecommunication systems.

## **6.6 USAID**

The activities of USAID, one of the major donor organisations in Armenia, cover different areas of ICT development including the formation of ICT policy and legislation; the development of the education system; the reform of the regulatory system regarding telecommunications; the improvement of the business environment; and the support of other initiatives contributing to the development of the ICT industry, education and policy in Armenia. The US State Department also provides valuable assistance to Armenian society, primarily by supporting the initiatives of US NGOs (IREX, Project Harmony) that assist the development of local information resources and provide students and school children with access to the Internet.



## Conclusions

Armenia is a country with a significant history of high-technology production and education. However, a new, solid foundation must be developed before a vigorous, knowledge-based economy and information society can develop. Historical advantages, skilled human resources and the unique potential of the Diaspora could be lost, unless they can be used to build a background for economic growth and social development. The ICT Master Strategy, the Programme of the Development of the ICT Industry, and the ICT Development Action Plan, are powerful instruments for the development of an ICT industry and an information society in Armenia. However, a more proactive attitude on the part of government, and well-coordinated activities of donors, are important preconditions for the realisation of these strategic documents. The following are key requirements in this context:

- the Armenian institutional regime requires considerable changes in the regulation of the telecommunications market. The establishment of an independent regulator, the development and adoption of service quality standards, and the liberalisation of the market, are the most urgent tasks that need to be accomplished by the government;
- business legislation does not sufficiently encourage investment and support for the development of ICT in e-commerce, e-government and e-education. A liberal tax regime is also required;
- in spite of the existence of skilled human resources, the further development and introduction of effective educational and scientific systems are to be ensured in order to protect human capital and preserve the country's academic traditions;
- Armenia needs to introduce an effective innovation system that creates a balance between fundamental and applied research. A legal framework promoting local philanthropy as an alternative source of funding of research and innovation should be adopted within a short time-frame;
- further coordination of the activities of different government institutions and donor initiatives is required to avoid overlapping and duplication. Additional funding and staff are required for the ICT Council Secretariat, which lacks the necessary resources for fulfilling its functions.

## Annex I - Benchmarking

**Table 1**

Stage	Information Infrastructure	Internet Availability	Internet Affordability
Stage 3	<p>A sizeable portion of the community has good access to telephone services. Growth in mobile telephony is accelerating. Roughly, teledensity is between 8 and 40 mainlines per 100 people. Mobile wireless penetration is between 3% and 14 %. Between 5-10% of households in the community subscribe to cable services.</p>	<p>There are between 0.5 and 1 million inhabitants per local ISP. ISPs provide full Internet access. Subscribers may have options between various Internet service packages. There are some opportunities for public Internet access. It is normally possible for users to establish a dial-up connection to a local ISP, except during peak hours. One or two private providers lease lines to businesses.</p>	<p>Telephone charges for Internet access reflect emerging competition in the telecom market, yet they are high enough to discourage extensive use by some potential users. Internet is priced within the reach of the majority of citizens. Competition in leased line provision for businesses has been introduced, and prices are falling but are still high.</p>

**Table 2**

Stage	Network Speed and Quality	Hardware and Software	Service and Support
Stage 3	<p>70-90 % of domestic telephone calls are successful. Connections are dropped with noticeable frequency and are somewhat disruptive. Fewer than 50 faults are reported per year for each 100 mainlines. Users have access to dial-up modem transfer speeds of up to 28.8 Kbps. Leased lines with transfer speeds of up to 64 Kbps are widely available for businesses and ISPs. Limited higher-speed lines are available in some areas. Facilities servicing the community are usually sufficient, although regular peak demand periods result in slower network response times. Packets loss by the network may occur but it is not generally disruptive.</p>	<p>Most ICT products are sourced from abroad, but there is a strong and growing industry to adapt products to local needs. Some software appropriate to local needs and language is available. A variety of hardware and software solutions are available and affordable to most small and medium-sized businesses, as well as to many individuals.</p>	<p>Mainlines take at least one month to be installed. It takes over a week for reported mainline problem to be resolved. There is a growing customer service ethic among service and support providers, although it is not a priority for most. Some ICT maintenance and technical support services are available. A nascent software industry is present in the community, and there are growing numbers of hardware technicians, web designers and network administrators.</p>

**Table 3**

<b>Stage</b>	<b>Schools' Access to ICTs</b>	<b>Enhancing Education with ICTs</b>	<b>Developing the ICT Workforce</b>
Stage 2	<p>Where there is ICT in schools, it is primarily at university level, and there are generally fewer than five computers in a school or faculty.</p> <p>Access to the computer(s) is limited to computer teachers and/or administrators.</p> <p>Computers tend to be older generation models, such as stand-alone 486 PCs or the equivalent. Where there are multiple computers installed, they are not networked.</p> <p>Use of the computer(s) is limited to electronic documents that are available on the hard drive or diskettes.</p> <p>There may be connectivity for store-and-forward e-mail.</p>	<p>Only a few teachers use computers, and then in a very limited fashion.</p> <p>Teachers' basic computer literacy involves skills such as use of the keyboard and mouse, a basic understanding of the computer operating system, manipulation of files, and cutting and pasting.</p> <p>Computers are mainly used at the university level.</p>	<p>There are limited opportunities for training in ICT skills development.</p>

**Table 4**

<b>Stage</b>	<b>People and Organizations Online</b>	<b>Locally Relevant Content</b>	<b>ICTs in Everyday Life</b>	<b>ICTs in the Work-place</b>
Stage 3	<p>Most of the population has heard of the Internet, although few have used it.</p> <p>Less than 10% of the population uses the Internet regularly.</p> <p>The overwhelming majority of Internet users are males between the ages of 10 and 35.</p> <p>The number of registered domains locally is at least two per 1000 people.</p> <p>Advertising in traditional media for online companies or resources is infrequent.</p>	<p>Some local websites are available, though most carry static content and are updated infrequently.</p> <p>Websites carry diverse information relevant to different groups within the community.</p> <p>Many websites are available in local languages or a dominant web language spoken locally.</p> <p>There is some use of online bulletin-board systems, Usenet groups, newsletters, and/or listservs.</p> <p>There are opportunities for web-related training, although they may be expensive and accessible only in certain areas.</p>	<p>Public telephones may be found in most parts of the community and are heavily used.</p> <p>Some members of the community have Internet access at home.</p> <p>Growing numbers of community members use telecenters, cyber-cafes and other businesses that offer computer use and online services to the public for a fee.</p>	<p>Organisations improve efficiency through some degree of deployment of ICT systems in their internal workings.</p> <p>Many computers in offices are internally networked for data processing, management reporting, and other enterprise applications.</p> <p>Some employees conduct research and business transactions over the Web, although they often use a shared workstation to do so.</p> <p>Some employees use e-mail for internal communications.</p>

Table 5

Stage	ICT Employment Opportunities	B2C Electronic Commerce	B2B Electronic Commerce	E-Government
Stage 2	Although there are some employment opportunities that call for technical skills, most workers with ICT experience must either leave the community to find employment or are unable to find work in their field.	Some businesses operate websites. The basic information they provide is static and infrequently updated. Some businesses accept orders by phone or fax. Some businesses distribute hard-copy catalogues for remote browsing of goods and services.	B2B interactions remain insufficient with little transparency. Faxes and telephones are commonly used to facilitate orders or for remote client support, although some paper-based transactions (e.g. signature) are still required.	A few government websites exist, providing basic information, often directed at parties outside of the community. This information is static and infrequently updated. Some limited interaction with the government is possible by phone or fax. The government distributes some information about services, procedures, rights and responsibilities in hard copy.

Table 6

Stage	Telecommunications Regulation	ICT Trade Policy
Stage 1	There are no plans for the liberalisation of the community's telecommunications sector. There are no regulatory provisions that promote universal access to telecommunications services. A single operator provides all services, whether private or state-owned. Voice and data service choices are limited.	Trade in equipment for ICTs is impeded by high tariffs and other restrictions, including cumbersome technical standards or licensing requirements. Service sectors are not open to trade, creating a barrier for electronic commerce and the building and operation of ICT networks. Domestic regulation may create <i>de facto</i> trade barriers for ICT use. There is little or no direct foreign investment.

## Annex II - Knowledge-Based Economy Indicators

### 1. Network access

#### 1.1. Information infrastructure

- Telephone penetration (number of mainlines per 100 people):  
*17.6 per 100 people*
- Mobile wireless penetration (%), growth trend:  
*Mobile penetration is 1.3% of the population. Growth trend is about 60%, but limited to the operator's capacity.*
- Total number of mobile telephone subscribers:  
*40 000.*
- Total number of mobile telephone subscribers per 1000 people  
*8.33 mobile subscribers per 1000 people*
- Wireless penetration (percentage of the population)  
*Information not available (N/A)*
- Growth trend  
*N/A*
- Total number of cable TV subscribers:  
*Cable TV does not exist in Armenia as an industry. A few small area TV networks exist, but do not provide multi-channel services. There are two cable Internet providers that have a small number of clients.*
- Cable TV subscribers, % of households:  
*The largest cable TV network provider serves about 200 people. The network was created in early 1990's, but has not grown since then.*

#### 1.2. Internet availability

- Total number of ISP providers:  
*17 providers, a limited number of which operate actively in the market.*
- Prevailing types of ISPs' networks (microwaves/radio...):  
*ISPs' networks are built on both radio and microwaves transmission, however networks based on radio connections prevail.*
- Percentage of unsuccessful local calls:  
*From 60% percent for analogue lines to 20% for digital lines.*
- Is there competition among ISP providers?  
*Strong competition between ISPs in the capital city. However, only a few ISPs offer their services in rural areas.*
- What are opportunities for public Internet access (libraries, Internet-café, etc.)?  
*Last year, a rapid growth in Internet public access points was recorded. Internet-café remain the most common public access point. However, due to the support of international and foreign sponsors, the Internet is available for free in some public libraries. Public access points exist only in Yerevan and some other relatively big cities. In rural areas (villages and cities with a population under 50,000) Internet public access points do not exist.*
- Are there dedicated line lease possibilities? Are there competing providers?  
*Dedicated line services are available from almost all ISPs. However, ISPs do not have their own networks and therefore re-lease lines from the incumbent telecom operator.*

### 1.3. Internet affordability

- What are the prices of Internet access (unlimited access, per minute charge)?  
*Depending on the ISP, Internet access can be charged on a time and traffic basis. Usually, ISPs combine time and traffic tariffs to offer more flexible prices to their clients. Unlimited access to the Internet (unlimited time and traffic) costs from 35 to 50 US dollars. The average per minute price of dial-up access is 0.01 USD/minute.*
- Is it affordable for the majority (compared with average salary/income)?  
*ISPs offer flexible tariffs including night tariffs. The most affordable price is 10 USD for night tariff, i.e. unlimited access during the night (depending on the ISP “night access” may start at 20:00 - 00:00 and end from 8:00 – 11:00). Night tariffs are primarily used by students, university professors, scientists and other professionals paid by the government. However, the majority of the population cannot afford full time unlimited Internet access services.*
- What are the rates for leasing lines?  
*Vary from 120 to 180 US dollars.*
- Are the rates affordable for small businesses or individuals?  
*Leased lines services are affordable only for a very limited category of the population and medium-sized businesses.*

### 1.4. Network speed and quality

- What is the percentage of successful calls?  
*According to non-official statistics (consumers unions and professional associations), the percentage of successful calls varies from 40% (for analogue to analogue line calls) to 80% (for digital to digital line calls).*
- What is the quality of voice connection?  
*There are no national standards for voice telephony in Armenia. However, the quality of voice connection differs from area to area. In the centre and some other parts of the capital city where digital switch stations are used (about 50% of the city), the quality of voice connection is satisfactory and provides clients with a reliable connection for both voice and data transmission. In areas with analogue stations the quality is comparably worse, is not always stable and sometimes not acceptable for use of Internet and e-mail.*
- How many faults are reported per year for each 100 telephone mainlines?  
*N/A.*
- How long does it take to clear faults (48 hours, a week, month)?  
*Depending on the fault, from one day to one week.*
- Which services are supported by local telecommunications infrastructure: e-mail, high-speed modem connection, what is the maximum speed?  
*E-mail, with a declared highest speed of 56,700 kb/sec and an actual speed of 44,000 kb/sec.*
- Are there sufficient backbone facilities/networks? Even for peak demand?  
*The network facilities are underused due to the ineffective policy of the incumbent operator.*
- What is the percentage of packet loss by the network?  
*N/A*

## 1.5. Hardware and software

- Are there local IT hardware/software sales points?  
*Approximately 30 computer stores in the capital city as well as a few hardware/software sales points in provincial cities.*
- Is the price of IT hardware/software affordable for majority/minority of citizens/businesses?  
*Affordable only for a small section of the population (about 10%). The majority of small and medium sized businesses can afford computer equipment. However, not all of them can afford professional software, such as accounting or warehousing software products.*
- Is there software available in local languages?  
*There are a few software products in the local language. Basic software products (operation systems, word processors, Internet and e-mail applications) are in English and Russian. Specific software products, such as accounting programs, legal databases, and library application exist in Armenian.*
- Is software imported or adapted locally? (Percentage of the imported, adapted, produced locally hardware or software in total number in circulation)  
*Basic software products (operation systems, word processors, communication software) are imported. Both personal computers and specific hardware (medical and scientific computer equipment, telecommunication hardware) are also imported. However, there is local production of fax modems and specific hardware (mainly scientific).*
- Is there a broad variety/some/very few software business applications?  
*There are a few types of software business applications. Accounting and logistics software is the most commonly used application. Some consumer “tailored” software (databases, computer applications for industrial processes) are developed by local companies. Local companies have also produced large databases for the State Labour Agency and the Ministry of Social Security.*
- Are the IT software/hardware retail and wholesale markets competitive and vibrant?  
*There is strong competition among hardware retail companies and dealers of worldwide brands. There is also competition among local software companies for public procurement contracts and client-tailored products.*

## 1.6. Service and support

- How long is the waiting period for telephone line installment? (Total number of those on the waiting list; waiting period: days, weeks, months, years)  
*In urban areas, telephone line installation may take from one week to one month, depending on technical capacity of the branch office of the incumbent telephone operator.*
- How long is the waiting period to repair reported telephone line problems? (Minutes, hours, days, etc.)  
*Depending on the problem reported, from one hour to one day (cable repairmen).*
- Are there software developers, web designers, network administrators and other technical personnel, and how many (working where, employed/unemployed)?  
*There are a number of professionals in area of software development and web design. There are fewer network administrators in the country, but the market demands for this kind of professional is satisfied.*

## 2. Networked learning

### 2.1. Access by schools to ICTs

- Are there computers in schools? How many students per computer? On which level (university/secondary/primary)?

Number of schools	1,446
Number of computers in schools	300
Number of schools with computer labs	70-75
Number of computers per school	0.2-0.25
Number of students	564,000
Students per computer	1,700
% of schools with computer labs	11

- Who has access to computers (technical staff/faculty/students)?  
*Access dictated by the rules of a particular school and the curriculum. Usually, students are provided with access to computers under the supervision of technical staff and instructors.*
- What is the quality of hardware (386/486/Pentium...)?  
*Computers are generally modern (Pentium), but in many schools older computers such as 486 or 386 PCs are in use.*
- Are there LANs in schools? Regional WANs? National school networks?  
*LANs exist in the majority of well-equipped schools (those with five or more computers).*
- Do schools have connection to the Internet? Is it dial-up or through a leased line, wireless?  
*About 80 schools in Armenia have Internet access.*

### 2.2. Enhancing education with ICTs

- What is the percentage of students and teachers who use computers? (Universities/primary schools/secondary schools)  
*The percentage of students using computers is different from faculty to faculty and varies from 10% to 60%.*
- What are the computers used for? What is the level of computer literacy/skills?  
*In universities, computers are mainly used for training students in computer literacy. In universities with well-equipped computer labs students may use computers for Internet and/or database access.*
- What is the level of information and communication technologies integration in the curriculum?  
*Informatics and computer literacy are mandatory subjects in all Armenian universities. The number of hours and curriculum depends on the computer labs' technical capacity.*



### 2.3. Developing the ICT workforce

- Are there training opportunities for programming, maintenance, and support?  
*All types of training opportunities exist in Armenia.*
- Who is offering them (public/private centers)?  
*More complicated training (low level programming, hardware maintenance) is offered mainly by the faculty of Computing Technique at the Armenian State Engineering University. Less complicated training (high level programming, hardware maintenance software support) is offered by both state and private centers, but the majority of training in this area is delivered by private centers.*
- Are they affordable for majority/minority of the population?  
*State universities provide free training to faculty students admitted on comparative basis. Private centers offer computer literacy courses that are affordable for the majority of the population. More complicated courses (programming, use of professional software) are offered at a higher cost, although this is still affordable for 20-30% of the population.*
- Is on-line training available?  
*There are at least two distance learning centers actively advertising their services.*
- Do employers offer training?  
*Only a few employers offer training to their staff.*

### 3. Networked Society

#### 3.1. People and organizations online

- What percentage of the population:
  - is aware of the existence of the Internet?  
*According to different sources, between 40% and 60% of the population is aware of the Internet, but only 15% really understand the benefits of its use.*
  - has used the Internet recently?  
*About 3% of the population uses the Internet, according to a survey conducted by the Center for Social Technologies. However, only 1.5% have Internet accounts: other users share Internet accounts with a friend, family members or use office facilities and public access points.*
  - uses the Internet regularly?  
*According to the same survey, 2% of the population regularly uses the Internet.*
  
- What is the structure of users by gender, age, social and educational status?  
*There are no official statistics on the structure of users. However, according to Armenian ISPs, the largest user group includes young people (students and office clerks).*
- What is the number of locally registered domain names (per 1000 people)?  
*N/A*
- Is there advertising for online companies, and how common is it?  
*In spite of the fact that many Armenian companies have web sites, online advertising is not properly developed in the country. An Internet banner network was created, but is not actively used.*

#### 3.2. Locally relevant content

- Are there (and how many: no, few, some, many) websites:  
*The number of websites significantly increased in 2000-2001.*
  - Providing local topics?  
*Most of the websites registered in the AM zone provide local topics (news, company/organization information, entertainment, cultural and educational content).*
  - In local languages?  
*Many websites are in two or three languages (Armenian, Russian, English). However, there are also some solely Armenian, Russian or English sites.*
  
- How often are they updated and is content static or dynamic?  
*The majority of news websites are regularly updated. In general, websites administrated from Armenia are dynamic.*
- Are the above websites created in the community?  
*N/A*
- Are bulletin board systems, Usenet groups, newsletters, and/or listservs in use?  
*There are many commercial newsletters distributed for free. Usenet groups and listservs are in use, but not on a large scale.*

- Are there opportunities for Web-related training?  
*There are many web design and publishing training centers in the capital, but very few exist in the provinces. Centres offer web training primarily on a commercial basis, but there are some donor-supported initiatives offering free training.*

### 3.3. ICTs in everyday life

- Does the population include information and communication technologies (phones, faxes, pagers, computers) in everyday life?  
*Phones are widely used in everyday life, but primarily by the urban population. Computers are used by a limited section of the population due to the high cost of computer equipment.*
- Are there phones, wireless phones, digital assistants, pagers, PCs and are they being used regularly? Are they used for household commerce (banking, online shopping, investing) and social and commercial interaction (bartering, online chat and etc.)  
*Phones are widely used by the majority of the urban population. Phone use in villages is limited due to insufficient number of telephones. Wireless phones are regularly used by 13% of the population. Pagers are not widely used. Telecommunications are not used for household commerce due to the absence of efficient electronic payment systems.*
- Are there PCs with e-mail capability available (cyber cafés, telecenters) and are they being widely used?  
*There are many Internet cafés in the capital city, Erevan. They are widely used, primarily by 14-28 year olds.*

### 3.4. ICTs in the workplace

- Do employees have:
  - (Un)limited access to phones?  
*Yes, in most cases*
  - Personal e-mail accounts?  
*Many government employees have personal e-mail accounts. Employees of consulting companies, banks, and other intellectual businesses also usually have e-mail accounts. Only a few employees of large trade and service companies would have personal accounts.*
  - Internet access from personal workstations?  
*Employees of consulting companies, banks, other intellectual businesses usually have free access to Internet. Many office clerks employed by large trade and service companies have Internet access from personal workstations.*
  - E-mail and web addresses on business cards?  
*The majority of government officials and employees of large companies have e-mail address on business cards.*
- What percentage of businesses and government offices have computers, how many of them, how many employees use them?  
*There are no precise statistics about the penetration of computers into business and government offices. However, normally if there are computers in an office*

*they can be accessed by the majority of staff members.*

- Are they networked?  
*Computers are networked in a few business offices. Computer networks usually exist only in large companies (in Armenian terms) employing 50-100 people. Government offices usually have computer networks (ministries and agencies).*
- Is business mostly conducted in person or by e-mail, or is there data-sharing, enterprise, reporting, transaction, and research applications? How intensively are they used?  
*The majority of Armenian businesses communicate in a traditional way: face-to-face, by fax, or by phone. Data-sharing, reporting and research applications are used in a few advanced business offices.*
- Are there efficiency gains resulting from the use of ICT systems?  
*There is marked efficiency gain from the use of ICT systems in many advanced businesses, such as, consulting and in large trade and service companies. Accounting and database software is used by many offices, but many companies still use “paper work”.*

## 4. Networked economy

### 4.1. ICT employment opportunities

- Are there opportunities for technically skilled workers within the country?  
*There are limited opportunities for technically skilled workers in Armenia. However, some professionals, such as programmers, are in great demand.*
- Are companies from outside of the country investing in IT related projects?  
*During the period 2000–2001 a number of US companies opened branches in Armenia employing from 20 to 200 programmers.*
- What is the proportion of knowledge-workers and information-related businesses in the economy? (Percentage of labour force, percentage of GDP)?
- Are businesses considering IT in their strategies?  
*The number of businesses considering IT in their strategies is rapidly growing, with the number of companies with websites increasing dramatically during the last two years. However, the vast majority of small and medium enterprises do not make use of IT.*

### 4.2. B2C electronic commerce

- Do local businesses have websites and how many? Is content current or static?  
*According to different online catalogues, the number of company websites varies from 59 to 94. The majority of online business resources are relatively static (updated once a year or less).*
- Are there online B2C transactions, or are transactions mainly oral and/or paper-based, phone or fix-based?  
*There are no B2C transactions in Armenia. Some companies offer online catalogues, but the transactions are made by phone or in writing.*
- Is online retail a noticeable component of overall commercial activity?  
*No*

### 4.3. B2B electronic commerce

- What are the sources of market information and are they sufficient for providing transparency?  
*There are some sources for marketing information, but not sufficient to carry out significant market research.*
- Are there online B2B transactions, or are transactions mainly oral, paper-based, phone or fax-based?  
*There are no B2B transactions in Armenia. The majority of transactions between companies are made on paper or by fax.*
- Can transactions be conducted online without paper documents? Is the process automated? Does it allow online tracking, monitoring?  
*Armenian legislation allows companies to make online transactions. However, development of this practice is prevented by the absence of electronic payment systems.*
- What portion of B2B activity is conducted on line? Is there gain in efficiency?  
*No*

#### 4.4. E-Government

- Number of government resources online? Do they include information, hours of operation, any services? Is information current and relevant?  
*There are a few online government resources. Those resources include official web sites of the President of Armenia, Ministry of Foreign Affairs, Armenian Development Agency, National Statistics Committee, Ministry of Environment, National Patent Agency, Central Bank of the Republic of Armenia and General Department for Information and Communication. All of these sites contain mission statements and at least a general description of the responsibilities and structure of the relevant state institution. As a rule, there is no information provided on operation hours, specific responsibilities of departments/officials or other similar content present on government sites. Only some agencies regularly update their websites. Some websites contain document templates and service rules/procedures.*
- Is there online interaction between government and citizens, or is interaction mainly oral, paper-based, phone or fax-based?  
*There is no online interaction between the government and citizens. Normally, citizens communicate with government official by phone or in writing.*
- Is there online interaction between government and suppliers and contractors, or is the interaction mainly oral, paper-based, phone or fax-based?  
*Communication between contractors/ suppliers is normally oral or paper-based and, less frequently, fax-based.*
- Is it possible to download applications from the websites?  
*At the moment this type of service is offered only by the National Patent Agency. The State Procurement Agency and the Ministry of Foreign Affairs are planning to start an online publication of application forms.*
- Can citizens apply for permits, licenses, and taxes on line?  
*No, these services do not exist in Armenia.*

## 5. Network Policy

### 5.1. Telecommunications regulation

- Is liberalisation of the telecommunications sector planned or implemented?  
*Given the terms and conditions of the exclusive license issued to a non-governmental provider of basic telecommunication services, the liberalisation of the telecommunication market may be seen as an aspiration rather than a concrete plan. In spite of the fact that the government is aware of the necessity to liberalise the telecommunications market, it will not take steps in this area because of the enormous compensation that would have to be paid to the incumbent telecommunication operator in case of termination of the license.*
- Is there competition between telecommunications service providers?  
*Competition exists only between Internet Service Providers.*
- Is broadband Internet access offered?  
*No*
- Is regulation set and enforced by an independent body?  
*No, at present the telecommunication market is regulated by the Ministry of Transport and Communication*

### 5.2. ICT trade policy

- Do tariffs or other restrictions (technical standards, domestic regulation, etc.) exist?  
*Telecommunications tariffs are provided on an exclusive basis (non-governmental monopoly). They are regulated by law and are subject to government approval.*
- Are there restrictions in the service (including information services) sector?  
*There are no restrictions for business activities in Armenia. However, production of some types of services/products is subject to licensing.*
- Are there disproportional taxes on electronically delivered services?  
*According to Armenian tax legislation all businesses are taxed at the same rate. No tax benefits are prescribed for a particular type of business activities, including electronic commerce and electronically paid services.*
- Is Foreign Direct Investment in IT sector existent, and is it encouraged, discouraged, restricted?  
*There is a substantial foreign investment in the ICT sector in Armenia. However, investment is limited to software and microchips design and production. According to official information, the incumbent telecommunications operator failed to meet investment requirements set up in the contract between the government and OTE, the owner of Armenian telecommunications company ArmenTel JSC.*

## **6. Media**

### **6.1. Radio, TV and newspapers**

- Number of radio and TV stations, newspapers  
*There are approximately 35 television and radio stations in Armenia, but only four stations broadcast nationwide. There are also seven radio stations operating in the capital city and five in other districts. The number of officially registered newspapers is 400, but only 50 of these are published regularly.*
- The size of audience/circulation.  
*The actual audience for major TV stations broadcasting varies from 50,000 to 300,000 people. Rural TV stations have an audience of 100–5,000. Newspaper circulation varies from 1,000 to 5,000 copies.*

### **6.2. Employment in the media**

- Number of employees in the media  
*There are approximately 2,500 people employed in the field of mass media.*
- Trend: is the number increasing/decreasing?  
*According to the data provided by Erevan Press Club number of media employees is increasing, but not dramatically (0.5% - 2% per year).*



## 7. Intellectual Capital

### 7.1. Patents

- What is the number issued per annum?  
*200 patents were issued by Armenian Patent Agency in 2001 with 156 issued to residents.*
- What are the trends?  
*The number of patents is decreasing, but not rapidly (0.5%-1%)*

### 7.2. Copyrights

- What is the number issued per annum?  
*Copyrights are not subject to registration in Armenia. According to Armenian copyright law and neighbouring rights, copyright is obtained by the fact of the creation of an artistic or literary work.*
- What are the trends?  
*N/A*

### 7.3. Licenses

- What is the number issued per annum?  
*Copyright and patent licenses are not subject to registration in Armenia.*
- What are the trends?  
*N/A*

### 7.4. Trademarks

- What is the number issued per annum?  
*Last year, 954 trademarks were registered by the Armenian patent agency.*
- What are the trends?  
*The total number of trademarks registered during the last 10 years is 6255 with a growth of 10%-15% per year (non-official data collected by the author).*

### 7.5. Scientific and/or technical associations

- List with a brief profile
  1. **The Union of Information Technologies Enterprises (UITE)** unites different categories of IT companies including software developers, hardware firms and ISPs. The association's activities include the protection of common interests of UITE members and the promotion of favourable conditions for industry growth.
  2. **The Optic Society** is a professional association uniting specialists of optic communications and laser technology. The main objective of the Society is to sustain research in optics and laser technologies.
  3. **The Information Technologies Foundation.** Activities are aimed at supporting the development of an information society and ICT in Armenia.

## 8. Education

### 8.1. Higher education

- Total number of higher education establishments (public/private).  
*Public – 19; private – 7; accredited private establishments - 28*
- Total number of students (total average per annum, in both the private and public sectors)  
*state - 43,000; private – 17,000*
- Prevailing specialisations. (distribution of students among the fields)  
*Prevailing specialisations are as follows<sup>5</sup>:*
  - *Economics and law - 6800 students*
  - *Medicine – 5,800 students*
  - *Education – 3,700 students*
  - *Transport and communication – 3,400 students*
  - *Arts and cinema – 2,500 students*
  - *Industry and construction – 2,200 students*
  - *Agriculture – 400*
  - *Other- 2,100*
- Cumulative number of population with higher education degrees (total in the fields of both science and technology)  
*Degrees in science field - 4970; degrees in technology field – N/A*

### 8.2. Distant learning

- Distant learning facilities  
*Two permanently operating distance-learning facilities including the Russian Modern Humanitarian University (Armenian branch)*
- Number of students trained per center  
*20-30 students attend each center*

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<sup>5</sup> Report of National Statistic Agency, 2000.

## **9. Labor Force**

### **9.1. Employment in science and technical fields**

- Number of employees and trends in the fields  
*According to official statistics, the number of people employed in the field of science is 7,320. No significant changes during last two years.*
- Compensation rates in the fields (average salaries)  
*Average salary in the field of science is 17,725 drams or 32USD*  
*Average salary in the field of industry is 33,626 drams or 61USD*

### **9.2. Employment in the electronics industry**

- Number of employees and trends in the fields  
*No official or other statistics concerning the number of people employed in the electronics industry. For industry I, the general number of employees is 81,000 or 27.3% of the total working population.*
- Compensation rates and trends in the fields  
*Average salary in the electronics industry is 33,626drams or 61 USD.*

### **9.3. Employment in telecom industry**

- Number of employees and trends in the fields  
*Total number of employees in transport and communication - approximately 19,000 (27% of the working population)<sup>6</sup>.*
- Compensation rates and trends in the fields  
*Average salary in the telecommunications sector is 48,425 drams or 88 USD.*

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<sup>6</sup> Separate data for employed people in field of transport and communication was not published.

## **10. Research and development**

### **10.1. Research institutions**

- Number of research institutions  
*88 research institutions currently operating in Armenia.*

### **10.2. Investments in research and development**

- The total amount  
*Total science budget in 2000 - equivalent of 2,618,960 USD.*
- Government and private business breakdown of total investment in research and development  
*N/A*

## **11. Other issues**

See Chapter 1 of this report.