

UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE

TOWARDS A KNOWLEDGE-BASED ECONOMY

TAJIKISTAN

Country Readiness Assessment Report



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UNITED NATIONS

New York and Geneva, 2003

ECE/TRADE/311/16

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Printed at United Nations, Geneva (Switzerland)

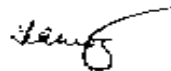
UNITED NATIONS PUBLICATIONS
Sales No.
ISBN

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 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 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 analysing the development of the knowledge-based economy in all the European countries in transition.

The major goal of this initiative is to stimulate the exchange of national experiences, to identify best practices and to promote the 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. It envisages the preparation of country assessment reports on a biennium basis by national experts, nominated by 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 regard 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 Schmognerova
Executive Secretary
United Nations Economic Commission for Europe

PREFACE

The industrial revolution of the 19th century and the scientific revolution of the 20th century 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 operandi* 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 more 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 years a new generation of ICT appears. 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 spheres of human activity, forcing them to work in 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 rapid 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 systems, human resources development, etc. and vice 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.

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INTRODUCTION

Due to the rapid development of scientific and technical progress during the twentieth century, an explosive development of the ICT industry took place. The application of ICT is broadening more and more in the different fields of people's activities. One of the most important tools of development, ICTs significantly promote the increase of the economic, technological, social and cultural development of mankind. Knowledge and information technologies play an important role in raising the economic potential of the countries in the modern world.

Ensuring accessibility of information and expanding the opportunities of people with regard to gaining knowledge and participating in political and social life, ICT promotes increased welfare of the population and sustainable development of human society. Although ICTs are developing with growing speed and sometimes reach the most remote places, the technological divide between the developed and developing countries is rapidly widening – a large part of the Earth's population has access neither to the advanced technologies, nor to the traditional telecommunication services.

The introduction of ICTs in developing countries and those with economies in transition, where natural resources are scarce and geographical location is not favourable enough, may become the driving force of their economic development. The establishment of ICT infrastructure based on advanced digital technologies in LDCs where it is almost completely non-existent will enable them to leapfrog to the higher development level, by-passing the use of analog communication.

Tajikistan gained sovereignty in September 1991, but as a result of the civil conflict which took place in the mid-1990s the country's economy was badly damaged and the Republic's development was brought down to the level of several decades ago. The breaking of economic and trade relations with neighbouring states as well as the transition from a planned to a market economy worsened the situation with regard to poverty. In spite of the steps taken by the Government of the Republic on poverty reduction with the support of international organizations, about 80 per cent of the population is still below the poverty level.

The telecommunications infrastructure inherited from the times of the former Soviet Union was almost completely destroyed and the remaining equipment has exhausted its resources. Much damage was done to the condition of the telecommunications network as a result of a deep energy crisis and the natural disasters which have taken place in Tajikistan over the last years (landslides, avalanches and floods). In the course of the conflict and the difficult economic situation in the country there was a large outflow of qualified human resources, in particular 4,426 experts employed in the telecommunications sector left the country.

The above-mentioned reasons, as well as lack of state budget financing and unsuccessful efforts to attract local and foreign investments to the telecommunication market in the Republic of Tajikistan, led to considerable lagging behind in the development of the telecommunications infrastructure and the introduction of information and communication technologies in Tajikistan. Active development of the telecommunications market and advanced technologies such as Internet, IP-telephony and mobile cellular communications of GSM standard started in Tajikistan in 1998.

Policy and reforms implemented in the ICT sector – including market liberalization, simplification of licensing regime, privatization of incumbent operators, establishment of the new regulatory structure ensuring availability of an independent regulatory authority on the telecommunications market, attraction of foreign investors and creation of favourable conditions for them, improvement of the legal basis and provision of universal services – should encourage their further development in Tajikistan.

The Government understands that the use of ICTs in the various spheres of activities and economic sectors of the country, building and development of knowledge-based economy, will stimulate further economic growth, increase the welfare of the Tajik nation and promote poverty reduction. Thus, recognizing the importance of ICTs for economic development of the country, the Government of the Republic of Tajikistan is treating the ICT sector as a priority and is committed to supporting its development.

By recommendation of the Coordinating Unit for Operational Activities of United Nations Economic Commission for Europe, an assessment of the readiness of the Republic of Tajikistan to build knowledge-based economy was implemented by using the Guide “Capture the Benefits of the Networked World” suggested by the Centre for International Development at Harvard University. The proposed benchmarking and 19 categories of indicators allowed a more comprehensive assessment of the progress made by Tajikistan in building the foundations for knowledge-based economy.

1. Network access

1.1. Information infrastructure

*Only a small proportion of the population has access to telecommunication services. Telephone density is from 2 per cent to 8 per cent per100 people in the cities. This corresponds to **Stage 2**.*

*Telephone density in rural areas and mountainous regions accounts for less than 1 per cent per100 people. Coverage of population with mobile cellular communication services is less than 0.5 per cent per 100 people. Cable TV services are provided but this kind of service is at the initial stage of development. They account for less than 0.5 per cent of the total number of households. This corresponds to **Stage 1**.*

Wireless local loops (WLL) are not in place, however it is planned to use this technology for development of telephony in rural areas.

Telecommunications infrastructure

As already mentioned, as a result of the civil conflict which took place in the mid-1990s, the telecommunications sector was badly damaged. The outdated telecommunications network in Tajikistan built during the time of the former Soviet Union was largely destroyed. Underground and overhead cable lines were broken, switching and transmission systems were out of order in

many regions of the country and the equipment that remained in operation was past its life-span. As a result of the long-lasting decline in economic development which led to deep economic crisis, reduction of standards of living and payment ability of the population, there was a considerable decrease in demand for telecommunication services and rejections by subscribers that has also had a negative influence on revenues of the telecommunication sector. This caused significant lagging behind in the development of the telecommunication sector and a slowing down of the introduction of advanced ICTs in Tajikistan.

Analog equipment, both switches and transmission systems, used in the telecommunication network is physically and morally outdated. It does not comply with the requirements of providing modern services and does not allow the provision of new services. Communications quality is very low and is falling day by day. From the total number of switches, installed capacity of which is 299,620 lines, the share of outdated switching equipment is about 73 per cent, of which 51 per cent are cross-bar switches and 28 per cent are step-by-step ones. The latter are very old switching systems which have exhausted their resources. Digital switches in the network account for only 7.3 per cent or 22,150 lines (ATS-23, ATS-24 in Dushanbe and two ATS in Tursun-zade).

The transmission network in the republic is mainly based on analog transmission systems which are physically and morally outdated and cannot provide the necessary quality of information transmission within the network. Moreover, cable lines have exceeded their life-span and their electrical parameters do not comply with modern technical standards. The length of microwave lines is 248,280 km and cable transmission lines account for 349,260 km. In rural areas overhead lines on wood poles and copper wires are still being used. Fibre-optic lines are almost not available and their length accounts for only 27 km.

The national telecommunication network is operated by the national operator JSC “Tajiktelecom”, which was established in 1996 in the course of restructuring of the communications sector. This was the first phase of privatisation of communication enterprises – 5 per cent of the shares of JSC “Tajikstelecom” were transferred to employees and 95 per cent are owned by the State Property Fund.

Currently, JSC “Tajiktelecom” provides fixed voice telephone services (local, long-distance and international) and leased lines and is a monopoly operator on this segment of the telecommunication market. In addition JSC “Tajiktelecom” provides fixed satellite communication services operating satellite communication network based on DAMA VSAT technologies as well as telematic services such as Internet access (dial-up and dedicated lines) and e-mail by TCP/IP and X-25 protocols.

In 2003 there are 232,300 main lines in urban and rural areas of which 82 per cent are residential. 85 per cent of the main telephone lines are used by the urban population which is 26.5 per cent of the total population of the country. One-third of the main lines are used in Dushanbe where 9.2 per cent of the population live. In most rural regions less than one per cent of the population have access to telecommunication infrastructure. The existing telecommunication system in rural areas is not reliable and often badly damaged. In mountainous regions, for instance in the Mountainous Badakhshan Autonomous Area (MBAA), the condition of the network is much worse. However

the number of residential lines is increasing, demonstrating the growth of demand of the population for telephone services. In 2002 the urban telephone network received 20,400 applications for installation of main telephone lines; 14,800 applications were satisfied, which accounts for 72.6 per cent. The telephone network in rural areas received 560,000 applications of which 59.2 per cent were not satisfied.

Telecommunications indicators, 2000-2002

Indicator	2000	2001	2002
Number of telephone exchanges	325	320	320
Installed capacity of exchanges (thousand lines)	298.0	298.2	299.6
Number of lines used (thousand lines)	221.3	226.8	237.7
Number of main telephone lines of public telephone network (thousand lines), including:	218.5	223.1	232.3
city telephone network	189.9	195.0	204.7
rural telephone network	28.6	28.1	27.6
Number of main telephone lines per 100 people	3.4	3.5	3.7
Residential main telephone lines (thousand lines), including:	172.7	177.6	190.9
city telephone network	153.1	158.3	170.9
rural telephone network	19.6	19.3	20.0
% of main lines connected to digital exchanges	5.42	5.42	7.39
Number of pay-phones (thousands)	0.2	0.3	0.4
Number of long-distance calls (millions)	5.2	8.5	9.8

There were 9,757,900 international and long-distance calls in 2002, 22.7 per cent of which were made to CIS countries (in comparison with 26.9 per cent in 2001) and 2.3 per cent to other countries of the world (in comparison with 2.1 per cent in 2001). From 2001 the number of long-distance calls to CIS countries increased to 13.8 per cent and the number of calls to other countries increased to 46.3 per cent. In general, the increase in demand for long-distance and international services began in the post-conflict period due to the fact that a large number of people left the country and moved to neighbouring states during the conflict and economic crisis.

In spite of the disastrous condition of the telecommunication sector after the end of the civil conflict and the difficult financial situation in the republic during the post-conflict period, some efforts were made to modernize and digitalise the telecommunication infrastructure in cooperation with foreign partners.

In cooperation with “SIEMENS” (Germany) in 1994 the new digital switch – EWSD exchange for 2500 lines produced by “SIMKO” and granted by the Turkish Government – was installed at the long-distance and international exchange in Dushanbe that enabled an international gateway via Turkey to be arranged.

Also in that year a digital telephone exchange for 10,000 subscriber lines produced by “DAEWOO Telecom” was installed at ATS-24 in Dushanbe and in 1997 two more exchanges were installed by “DAEWOO Telecom” in Tursun-zade and at Tajik Aluminum Plant, the total capacity of which accounted for 8,000 subscriber lines.

In 1996-1997 in cooperation with «DEUTSCHE TELECOM» (Germany), the earth station “ORBITA” (Chermazak) and earth station in Khorog (MBAA) were modernized. A digital satellite link for 30 channels (2 Mbps) was established by transit via Germany and direct digital channels Dushanbe-Khorog-Dushanbe, Dushanbe-Moscow-Dushanbe were arranged. As a result of the installation of a new earth station, direct telephone channels to Turkey were established which allowed a significant increase in quality of international telephony.

In cooperation with “SIEMENS” (Germany) the digital exchange EWSD (ATS-51) was modernized and on this basis the International Switching Centre (ISC) was established in 1999. It provides the population of the country to automatically connect to any subscriber in practically any country of the world. In the same year, with the support of Yugoslav experts, the automatic long-distance exchange in Dushanbe was repaired and reprogrammed.

In 2000 a new Automated Billing System (ABS) was brought into operation in the Dushanbe telephone network. The functional abilities to control, authenticate and secure information were improved and protection provided from illegal actions of users and non-authorized access to the system. In the near future it is planned to expand the ABS to cover all regional centres in Tajikistan to solve billing problems and ensure compliance of the billing system with international standards.

In 2000 under the contract with «GILAT» (Israel) 14 satellite communication terminals of the DAMA VSAT system were acquired to establish a satellite communication network in Tajikistan. These terminals were installed and brought into operation in several cities and remote regions: Kurgan-Tjube, Shuroabad, Dangara, Khorog, Darvaz, Garm, Darband, Jirgatal, Tavildara, Khujand, Kuhistoni Mastchokh, Sagirdasht and Mienady. The central station was installed in Dushanbe. The establishment of this DAMA VSAT network provided a high-quality long-distance telephone service both for the capital of the republic and between the above-mentioned and other regions of the country.

In 2001 one more new digital telephone exchange (ATS-23) produced by «ALCATEL CEL» (Germany) was installed in Dushanbe. In 2003 the telecom company “ZTE” (China) granted a digital telephone exchange for 6,000 subscriber lines and installed it in Kurgan to replace one of the outdated exchanges.

There are great hopes with regard to the loan of US\$ 13 million provided to JSC “Tajiktelecom” by the European Bank for Reconstruction and Development (EBRD) for modernization of the national public telecommunication network. It is expected that this modernization project will be implemented within 2-3 years. In 2002 the first international tender for supply of equipment for implementation of the first phase of the project, which includes modernization of the Dushanbe City Telephone Network infrastructure, in particular replacement of all analog telephone exchanges in the city to the new ones and replacement of all connection lines, establishment of transmission fibre-optic and SDH ring in Dushanbe. The winner of the tender was the telecommunication company “ZTE” (China) in cooperation with which it is planned to bring into operation a fully digitalized Dushanbe Public Telephone Network in 2004.

Preparations have started for the second tender under this project. This phase will include modernization of the telephone network in the main cities of Tajikistan, digitalization of microwave transmission lines as well as construction of the Tajik segment of the Trans-Asia-Europe fibre-optic backbone (Dushanbe-Hissar-Shakhrinav-Tursun-zade) based on fibre-optic cable and digital SDH and PDH transmission lines with connection to the microwave link coming to the Republic of Uzbekistan based on equipment to be supplied by “NEC” (Japan).

Implementation of this project will improve communications quality, speed and volume of data transmission in the country, bringing it closer to international standards.

Mobile cellular communication

Development of the mobile cellular communication market in Tajikistan started in 1996. There are five competing mobile operators in the market, four of which are located in Dushanbe and one in Khujand. All five mobile operators provide GSM services and one of the D-AMPS services.

The first company which emerged in the mobile cellular communication market in 1996 was JV “TajikTel”, which started to provide D-AMPS services. It was issued an exclusive license for five years for this kind of service and provided them at very high prices. Only a few very rich people could afford to use mobile phones, the number of subscribers of JV “TajikTel” during five years was therefore barely 2000 people. Currently JV “Tajiktel” continues to provide D-AMPS services, the cost of which has been greatly reduced due to competition, and in 2002 they introduced GSM services, the equipment for which was purchased from «Huawei Technologies» (China).

In 1998 JV «Somoncom» was the first company to provide GSM services in Khujand and Sougd Area (northern part of Tajikistan). Taking into account the high prices set by JV “Somoncom” at the beginning of its commercial operation, the number of subscribers was very low. A gradual decrease in prices led to an increase in the number of subscribers.

In the second half of 2001 CJSC «TT-Mobile», established in cooperation with the large Russian mobile cellular operator “North-West GSM”, entered the cellular communication market. A GSM exchange and other equipment were acquired from the largest and well-known European GSM equipment supplier “NOKIA” – one of the most advanced and reliable. This is the only company providing roaming outside the country, while the other companies cover Dushanbe and the regions close by, some of them cover Kurgan-Tjube and Kulyab and Khujand. At the moment CJSC «TT-Mobile» has the largest number of subscribers in the market.

In 2002 two more mobile cellular companies started operations providing GSM services – JV “Indigo-Tajikistan” and “Babilon-M”. JV “Indigo-Tajikistan” was established by the Aga-Khan Foundation for Economic Development (AKFED) and the American company “MCT Corporation”. “Indigo-Tajikistan” is planning to emerge with JV “Somoncom”, which was also created by the “MCT Corporation” and thus will become the largest mobile operator in Tajikistan, covering most of the territory of the republic. OJSC «Babilon-M» is a Tajik-American joint venture. Currently, this company’s services cover Dushanbe and Khujand. The technical basis of “Babilon-M” comprises advanced digital equipment produced by “ZTE” (China) including new

technologies of noise suppression and algorithms of voice connection. It can ensure provision of a range of all modern services to subscribers. “Babilon-M” is the first and the only operator using fibre-optic technologies (SDH-ring) for interconnection with city telephone exchanges. Both companies have affordable tariffs for GSM services and in a very short period gained quite a large number of subscribers.

Growth of number of mobile cellular communication subscribers in 2000-2003

Company	Number of subscribers			
	2000	2001	2002	2003
CJSC “TT-Mobile”	-	-	4 000	6 654
JV “TajikTel”	1 000	2 000	3 500	5 000
OJSC “Babilon-M”	-	-	-	3 500
JV “Indigo-Tajikistan”	-	-	2 156	2 156
JV “Somoncom”	-	-	-	4 337
Total:	1 000	2 000	9 156	21 647

Increase of coverage of population with mobile cellular services in 2000-2003

Indicator	2000	2001	2002	2003
Population (million people)	6.21	6.38	6.40	6.40
Number of subscribers	2 220	4 176	16 087	21 647
% of coverage with services	0.0035	0.065	0.25	0.34

The number of mobile cellular communication subscribers in 2003 in comparison with 2001 increased 21.4 times. The gradual rise in living standards and income, as well as competition in the mobile cellular communication market and the slow but stable reduction of prices for services will lead to increases in the number of subscribers and expansion of mobile communications density.

Wireless and satellite communications

At present fixed wireless communication – Wireless Local Loop (WLL) – is not used in Tajikistan. However, the existing telecommunication infrastructure cannot provide all people in the country with telecommunication services, particularly those who live in regions that are remote and difficult of access and rural areas. Due to the mountainous relief – mountains cover 93% of the territory of the Republic of Tajikistan – the most acceptable option for modernization of the primary transmission network is the introduction of digital satellite and wireless communication systems.

Economic analysis has demonstrated that the optimum solution is DAMA VSAT satellite communication systems. This system ensures that payment for a frequency band leased at the satellite depends on the real-time load of the channel. This system also enables reduction of dependence of the primary transmission network operation on the electric power supply. In 1999-2000 the construction of a national satellite communication network based on DAMA

technology was started. Currently, this network is expanding and 16 FarAway VSAT satellite terminals are operating in Tajikistan with the central base station (hub station) in Dushanbe. Every terminal provides 8 voice channels connected to local telephone exchanges and PABX. In the future it is expected that these telephone exchanges will be replaced by digital ones.

By a decision of 21 December 2002 the Ministry of Communications of the Republic of Tajikistan approved the “Programme of rehabilitation and further development of telephone services and wire broadcasting in rural areas in the Republic of Tajikistan for 2003-2005”. Within the Programme a number of projects for establishing advanced regional wireless loops and networks based on new satellite communication technologies are being designed, as such kinds of communications are the most appropriate from the technical point of view and are economically feasible in the conditions of our country.

One of the most effective and flexible wireless technologies enabling all the territory of Tajikistan to be covered, including remote and rural regions, is fixed and mobile cellular communication of CDMA standard. It is planned to implement the project on establishment of a CDMA network on all the territory of the country and to conduct a tender for the supply of equipment for network construction.

Cable TV

This kind of service is only emerging on the telecommunication market of the Republic of Tajikistan. Mainly these services are provided in the cities. In particular, in Dushanbe, in a number of micro regions of the city there are cable TV studios providing connection to several TV channels (5 or 10 Russian and foreign channels). There are no exact data on the number of subscribers using such cable TV services, although they are affordable enough for the population.

In March 2002 JSC “TV-Service” started to provide TV services by connecting subscribers to 12 TV channels of different content (films, entertainment programmes, musical channels, sports channels, etc.) using radio equipment. The cost of the services provided by “TV-Service” is high (connection fee is about US\$ 70) and this is the reason for the small number of subscribers.

In total, there are 547 registered cable TV users including subscribers to “TV-Service”.

1.2. Internet availability

*There are several ISPs providing full Internet access. Subscribers may have some options between various Internet service packages. There are some opportunities for public Internet access (Internet-cafe, public access centres) that corresponds to **Stage 3**.*

*However, there are ISPs providing only e-mail services and users often have difficulty establishing a dial-up connection to a local ISP not only during peak-hours. There is no competition in commercial leased line provision. Businesses may only lease lines from a single telephone operator. That corresponds to **Stage 2**.*

It may be pointed out that development of Internet in the Republic of Tajikistan started in 1994, when “Telecomm Technology Ltd.” Company was issued a license to provide telematic services. At the moment it is one of the leading ISPs in Tajikistan with a large number of subscriber, mainly international organizations, commercial structures, universities and individuals.

One of the first companies to start to provide e-mail services was the international humanitarian organization “Central Asian Development Agency” (CADA). Although CADA does not provide Internet access services, it is the largest e-mail provider in Tajikistan. With a large number of e-mail access centres, CADA provides e-mail services through dedicated lines to various state organizations and educational institutions and with the financial support of the Euroasia Foundation has installed 60 modems there. CADA provides commercial services to international organizations and the private sector and provides scientists and students with free-of-charge access to e-mail services.

In 1998 SC “Intercom” entered the Internet services market in Tajikistan by providing Internet access and e-mail services. SC “Intercom” is also one of the companies which provides IP-telephony services including such service as IP-cards, which is the most inexpensive alternative to traditional fixed telephony. This ISP has the biggest number of call centres in Dushanbe. For instance, the cost of calls to Moscow through IP-telephony is 0.08 cents, which is 5.4 times lower than the cost of a one-minute call via traditional telephony, which accounts for 0.43 cents. However, the quality of communication via IP-telephony is rather low. In 2002 SC “Intercom” introduced wireless Internet connection by means of radio modems.

In 2000 a new ISP, “Babilon-T”, was created, at present one of the largest ISPs in Tajikistan providing Internet access, e-mail and web-design services. The company is actively providing Internet access through wireless communication technologies (ADSL and Home PNA) to the regional ISPs, corporate and individual users. It established a wireless communication link between Dushanbe and Kurgan-Tjube and has direct channels and agreements with other ISPs in Tajikistan, as well as two independent satellite channels with the Russian Federation (1.2 Mbps) and Europe (512 Kbps). «Babilon-T» has subsidiaries in Khujand and Kurgan-Tjube and in 2003 is planning to open the same in Khorog and Kulyab.

At the moment in Tajikistan there are 15 ISPs of which 5 are primary ISPs (including ISP “Istera”, which emerged only in May 2003) and 7 sub-providers. Two companies have been issued licenses for construction of data transmission networks through satellite communication channels and provision of telematic services and e-mail, however they have not yet started operation. Ten ISPs operate in Dushanbe and two in Khujand and Sougd Area. ISPs covering the capital of the country are expanding coverage to the nearest regions and Khatlon Area (Kurgan-Tjube and Kulyab cities).

The total number of registered Internet and e-mail users is 16,255. Most of population uses these services mainly by means of cards, Internet-cafes and public access centres.

Number of registered users of Internet in 2001-2002

Company	2001	2002	Increase (times)
JSC “Tajiktelecom”	114	258	2.3
“Telecomm Technology Ltd.”	400	427	1.06
“Babilon-T”	200	492	2.5
“Intercom”	10	13	1.3
CADA	2 047	15 065	7.4
Total	2 771	16 255	5.8

Coverage of population with Internet services in 2001-2003

Indicator	2001	2002	2003
Population (million people)	6.38	6.40	6.40
Number of users	2 514	16 255	17 777
% of coverage	0.04	0.25	0.3

As mentioned above, in 2000 the national operator JSC “Tajiktelecom” began to provide telematic services – Internet access and e-mail. However, because of its inflexible structure it did not progress much in providing this kind of service on the rapidly developing and competitive market. In 2002 it therefore established a subsidiary company – Republican Data Transmission Network (RDTN).

A telecommunication network based on outdated analog technologies which is mainly used by all ISPs which do not have cable infrastructure cannot ensure high quality of connection and data transmission. During off-peak hours dial-up connection to ISP may be established after more than 10 tries, in peak hours dialling is worse. Data transmission speed via city telephone network lines does not exceed 28.8 Kbps and in some cases is much lower. If the subscriber has a digital telephone line at ATS-24 or 23 the dial-up connection may be established after 5 to 10 tries and data transmission speed is increasing, most quality Internet connection is established by dedicated lines.

1.3. Internet affordability

*Competition between several ISPs exists in the telecommunication market, however the prices for Internet access are high and are not affordable for most of the population; the provision of commercial leased lines is reflected in prohibitively or very high leasing fees. This corresponds to **Stage 2**.*

Currently several ISPs are operating in the telecommunication market in Tajikistan. In spite of the competition, prices remain relatively high – from US\$ 1.5 to 2.5 per hour (there is preferential night surfing). Given that the average salary in the country accounts for about US\$ 10 (in different economic sectors salaries range from US\$ 3 to 40), such expensive services may be affordable only for a small part of the population, i.e. 0.3%.

Most Internet access users represent state agencies, enterprises and organizations, commercial firms, international organizations and students. The population mainly uses Internet access by a card system, in Internet-cafes and public access centres. Mostly Internet access services are provided in the cities, Internet access in rural areas is almost completely unavailable.

Company	Public access centres	Internet-cafes	Total
JSC “Tajiktelecom”	-	3	3
“Telecomm Technology Ltd.”	15	12	27
“Babilon-T”	57	6	63
“Intercom”	19	0	19
Sub-providers	-	6	6
Total	91	27	118

There is an hourly tariff basis for dial-up Internet connection. For unlimited Internet access through dedicated lines a one-time fee should be paid and the average cost of unlimited 24-hours per day Internet access is about US\$ 200 per month. The tables below indicate the tariffs for unlimited Internet access through dedicated lines and leased lines provided by one of the ISPs. The tariffs of the others are not very different from these.

Tariffs for unlimited Internet access by dedicated line

Tariff	Amount in US\$
Monthly fee for 24-hour access	133
Monthly fee for access during the day from 08:00 to 20:00	120
Monthly fee for night access from 20:00 to 08:00	30

Tariffs for Internet access by leased line

Tariff	Amount in USD
One-time:	
Connection to asynchronous line	565 – 16/lines
Connection to synchronous line	806 – 00/lines
Monthly rentals for asynchronous line with speed up to:*	
9.6 Kb/s	145 – 00/line
19.2 Kb/s	290 – 00/line
32.2 Kb/s	483 – 00/line
For data reception/transmission	0 – 0,25/1Kb
Monthly rentals for synchronous line with speed up to:**	
32.2 Kb/s	565 – 00
64 Kb/s	887 – 00
For data reception/transmission	0 – 0,25/1Kb

*User pays rentals per port depending on the speed of connection and for data reception/transmission.

Taking into account the low incomes of the population, tariffs for such services are not affordable for small businesses and individuals.

1.4. Network Speed and Quality

*50-70 per cent of local calls are successful. There are often interruptions and drops in the connection. More than 100 faults are reported per year for every 100 telephone main lines. Speed of data transmission via dial-up connection is from 19.2 to 28.8 Kbps. A few businesses may afford to lease lines with a speed of 32 to 64 Kbps. Packet loss is significant and regularly disruptive for any online activities. This corresponds to **Stage 2**.*

As the telecommunication network is mainly based on old analog equipment (both switching and transmission systems), network quality and speed are not high enough. In general, more than 20 per cent of unsuccessful calls are identified at the public switched telephone network (PSTN), packet loss is considerable, however exact figures on this are not available.

Dial-up Internet connection can be established after 10 or more tries. Dialling is much worse during peak hours. More than 100 faults are reported per every 100 main lines.

Number of faults reported at the telephone network in 2002

Number of lines used	Number of faults	Number of faults per 100 main telephone lines
237 610	315 209	132 faults (due to repeated faults during the year)

PSTN voice connection quality is rather low, there is often noise and interference and cross-talk. As the outdated analog equipment and cable lines more often become out of order, telecommunication services quality is gradually decreasing. To this end urgent digitalization and modernization of the telecommunication network in Tajikistan is needed.

1.5. Hardware and Software

*Hardware and software are mostly imported from neighbouring countries and overseas states. Adapted software in Russian (less often) is imported and widely used. Software in the national (Tajik) language is not available. Hardware and software is affordable for a small minority of individuals, large and medium-sized businesses. The majority of the population and small businesses do not have hardware and software. This corresponds to **Stage 2**.*

The hardware and software market is quite developed. The majority of the hardware and software resellers are located in the capital of the country and in some large cities. In the telecommunication equipment market (e.g. cellular handsets and accessories, mobile satellite phones, fixed phones, PABXs and trunking equipment) 18 licensed resellers are competing.

Hardware and software production is not available in the republic (both PCs and telecommunication equipment), so all PCs and software are imported. Mainly PC components are

imported and are then assembled by the resellers. Already adapted software in Russian is imported from CIS countries and less often non-brand software in English is imported from other countries.

Prices for hardware and software are high enough and mainly affordable for large and medium-sized business. To a lesser extent they are affordable for state agencies and organizations as well as for the minority of the population. For the majority of population and small-sized businesses, particularly in rural areas, hardware and software is practically not affordable.

Prices for hardware do not vary much between resellers. Assembled PCs are mostly non-brand as the cost of brand equipment is very high and resellers will not gain profit buying brand PCs. Most imported software is non-licensed and the quality is not guaranteed.

To ensure import quality ICT equipment into Tajikistan, reduce its prices and its affordability for the population it is necessary to create favourable conditions, for instance to establish preferential custom duties for imported hardware for a certain period.

Software in the national language, i.e. in Tajik, is not available. Currently, a group of enthusiastic people in Tajikistan are trying to adapt Linux to Tajik. However, given that almost all users in the country, including state agencies and organizations, are using Windows and just a few individuals use Linux it will be very difficult and almost impossible to transfer to Linux.

1.6. Service and Support

*Telephone main lines take at least 6 months to be installed from the time the order is placed. It takes over one month for reported mainline problems to be resolved. Providers ensure some technical support to customers. This corresponds to **Stage 3**.*

*A small community of software developers, web designers, network administrators and other technical personnel exists. This corresponds to **Stage 2**.*

It takes about 6 months and sometimes more for main telephone lines to be installed in the cities. The capacity of the existing exchanges is enough in principle to satisfy available orders for installation of main lines. The main reason for such a long period is insufficient cable infrastructure. Rural installation of main telephone lines takes from several months to several years.

It takes from several days to several weeks and sometimes (when cable lines are out of order) several months for reported mainline problems to be resolved depending on the fault and the sophistication of the repair.

The level of customer service at PSTN operated by JSC “Tajiktelecom”, which has a monopoly on this segment of the telecommunication market, is not high enough, although due to the gradual commercialization of “Tajiktelecom” and emergence of new private operators on the other market segments which are providing quite high quality customer service, the level of “Tajiktelecom” customer service is increasing.

Mainly technical staff, particularly software developers, web-designers, local computer network administrators etc. work at telecommunication companies, state agencies, ministries and departments, banks, universities and scientific organizations. On a full day basis software developers, web-designers and system-engineers work mostly in the telecommunications companies and firms supplying PCs and specializing in web-design, in state agencies which have rather large local computer networks. The others work part-time on a contract basis.

The majority of software developers, system-engineers, network administrators, web-designers and technical staff are graduates of local technical universities and specialized in automated management systems or other technical fields. Only a few of them have attended training courses arranged by large well-known companies, e.g. Microsoft, and have an appropriate internationally recognized certificate. This is because such training centres are located only in CIS countries and establishment of similar centres in Tajikistan is only planned.

2. Networked learning

2.1. Schools' access to ICTs

*The majority of primary and secondary schools do not have computers. They are mainly available in schools in urban areas are not in the schools in rural areas. Computers in schools are not connected to Internet or e-mail. This corresponds to **Stage 1**.*

*If there are computer laboratories in the schools there may be about 10 PCs for classroom group work. Computer laboratories are open only for computer studies during the day and are closed after school, or may be open for teachers for class preparation but closed for students. This corresponds to **Stage 3**.*

*Computers tend to be older generation models, such as stand-alone 486 PCs or the equivalent. Where multiple computers are installed, they are not networked. Use of computers is limited to electronic documents that are available on the hard drive or diskettes. This corresponds to **Stage 2**.*

There are 3,729 primary and secondary schools in the Republic of Tajikistan. Computers are either available in schools or not. Computers are available mainly in city schools; in the majority of rural schools computers are not available. In city schools with computer laboratories, there may be about 5 to 10 computers in the lab. In rural areas computer laboratories at schools do not exist.

Computers at schools tend to be mostly older generation models such as stand-alone 486 PCs or the equivalent. Computers at schools are not usually networked and are used mainly for studying of informatics and computing in senior classes and for work with electronic documents using appropriate office applications. Connection of PCs in schools to Internet or e-mail is not available.

Unfortunately, the majority of schools cannot purchase and install computers and arrange computer classes for studying computer skills due to the high cost of hardware and lack of budget financing for these purposes. Mainly computers at schools are granted by international organizations working in the education sphere.

Computers and computer laboratories at schools

Number of schools	3729
Number of pupils	1638106
Number of computers at schools	9904
Number of school having computer laboratories	593
Number of computers per school	2,7/school
Number of pupils per computer	165,3 pers./PC
% of schools with computer laboratories	15,9%
Number of computers connected to Internet	105

2.2. Access of higher educational institutions to ICTs

*At the university level there are computers and computer laboratories. About 10 to 15 computers may be found at the laboratories for classroom group work. Computer labs are generally only open for computer studies during the day and closed after school, or may be open for teachers for class preparation but closed for students. Most computers are older generation models, such as 486 PCs, but there are some new computers (up to Pentium-IV), and they may be networked with a file and mail server. At many universities there are internal Local Area Networks (LANs). The network lab achieves connectivity through a dial-up connection to the Internet, which supports limited World Wide Web access. This corresponds to **Stage 3**.*

In comparison with primary and secondary education, in the field of higher education ICTs are being introduced and used more actively. Over the last years higher educational institutions have been considerably computerized. Most universities and institution have computers and computer labs with internal Local Area Networks (LAN) in place. In some universities there are connections to Internet and e-mail. Networks connecting universities and institutions in Dushanbe and the whole of the country do not exist. However, the Tajik Academic, Research and Educational Networks Association (TARENA), including workers and computer networks of scientific and research institutes of the Academy of Sciences of the Republic of Tajikistan, is planning to establish a unique corporate computer network for the Academy of Sciences and universities in Tajikistan connected to the Internet.

To a great extent the universities and institutions with faculties related to ICT are being computerized: Tajik State National University, Tajik Technical University and Tajik Technological University. The largest number of computers (398) and computer laboratories (25) are registered at the Tajik State National University including its subsidiary in Khujand.

The most advanced is the Tajik Technological University which has begun actively to introduce ICTs. The Computer Centre at the Tajik Technological University began functioning as of 1 November 1999 and was established with the support of the Government of the Republic of Tajikistan, UNDP and UNESCO.

Computers and computer laboratories at higher educational institutions

Number of higher educational institutions (including subsidiaries)	33
Number of students	96583
Number of computers at higher educational institutions	1087
Number of computer labs at higher educational institutions	101
Number of computers per higher educational institution	33 PC/inst.
Number of students per computer	88.8 pers./PC
Number of computers connected to Internet	105

Students of Tajik Technological University, pupils of “Dushanbe” gymnasium, employees of Tajik Technological University and the students and employees of other universities in Tajikistan study at the Computer Centre. During classes they learn the advanced achievements in the field of ICTs, learn advanced software, use e-mail services and have Internet access. The Computer Centre works 24 hours per day. Since its establishment more than 2600 users have graduated from it.

The Computer Centre is equipped with modern computers (Intel Pentium II/III/IV PCs, scanners, printers, plotter, copying machines, fax, TV and video sets and cameras, etc.). All computers are networked and a LAN is in place. It is connected to Internet through a dedicated line (128 Kbps). Highly qualified experts who studied in CIS and other countries work at the Computer Centre.

In 2002 for the first time in Tajikistan a local networking academy of CISCO was opened on the basis of the Tajik Technological University Computer Centre. Currently equipment is being supplied to create a computer lab at the Computer Centre where network technologies CISCO certificate courses will be held. At the moment two CISCO trainers there, who studied the same courses in Ukraine, work there.

Tajik Technical University, which is one of the leading higher educational institutions in Tajikistan, graduates students studying at the engineering and ICT related faculties, in particular Automated Management Systems and telecommunications faculties. It has one of the most developed scientific and technical bases. About 40 per cent of the teachers at the Tajik Technical University have scientific degrees and ranks including 20 professors and doctors of sciences. There are computer labs equipped with modern PCs and advanced new technologies. There is a centralized computer centre with a new PC network and advanced computer equipment at the faculties. In cooperation with humanitarian organizations the following centres have been established and are functioning at the Tajik Technical University:

- Computer Design Centre (Aga-Khan Foundation)
- Business Resource Centre (Aga-Khan Foundation)
- Centre human nature study (Aga-Khan Foundation)
- E-mail Centre (CADA)
- with the support of the Republic of Korea and the Tajikistan Friendship Society computer laboratories have been created at all faculties to improve the process of study.

In total there are 13 computer laboratories at Tajik Technical University and a total of 180 computers.

Great support in computerization of higher educational institutions, establishment of local computer networks at the universities and Internet access is provided by the private ISPs – “Babilon-T”, “Telecomm Technology Ltd.” and the national operator JSC “Tajiktelecom”.

2.3. Enhancing Education with ICTs

Primary and secondary schools

*Only a few teachers and students of primary and secondary schools use computers in a very limited fashion or not at all. 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. Computers are mainly used at the university level. This corresponds to **Stage 2**.*

Few teachers and students at the primary and secondary schools use computers during the studying process. In the senior classes of secondary schools there are lessons of informatics and computing equipment where mainly the basic theoretical knowledge of simple operational systems such as MS-DOS and the programming languages (e.g. BASIC, ALGOL etc.) are learnt. This training curriculum is very outdated and needs to be updated. It is necessary to include training of manipulation with new graphic operation systems and applications (at least Windows 95 and Microsoft Office 97). Moreover, it is necessary to train the teachers and raise their qualifications to achieve a level permitting them to use computers efficiently in their work and integrate them in the study process.

As a result of non-availability of Internet connection at schools, teachers and students do not have access to on-line resources and do not use them during studying/teaching.

Higher educational institutions

*In the universities and institutions the teachers and students use computers to support traditional work and study. Teachers who use computers are generally proficient with work processing applications and may access information offline from CD-ROMs. They may employ computers in some basic drill-and-practice lessons. In some cases, teachers access and organize information from the World Wide Web in their work, share information using e-mail, and create information in electronic format to share with others both inside and outside the school. This corresponds to **Stage 3**.*

The level of computerization of universities and institutions and the use of computers in teaching activities is gradually increasing. Mostly computers are used by the teachers at technical faculties (automated management systems, engineering, telecommunications etc.), for practical and laboratory work. Other teachers are also beginning to use computers in the teaching process. Some

teachers are rather skilled in work with Internet and get there the information necessary for their lessons.

Students more often use computers for acquiring knowledge in the process of studying. Engineering faculties, in particular automated management systems and telecommunications, become more popular, and prestige ones. Students are some of the most active Internet users, getting thereby information necessary for their studies.

2.4. Developing the ICT Workforce

*There are limited opportunities for training in ICT skills development, e.g. installation and technical maintenance of hardware, web-design and other professions related to ICTs. This corresponds to **Stage 2**.*

*Some employers offer training in the use of information and communication technologies to their employees. This corresponds to **Stage 3**.*

Training at the faculties related to ICTs is provided by the universities, the majority of which are located in the capital, Dushanbe. These are Tajik State National University, Tajik Technical University and Tajik Technological University which have faculties of mathematics, applied mathematics, automated management systems, informatics and computing equipment, telecommunications and radio electronics. Students studying at those faculties acquire certain knowledge in the field of ICTs, however they are trained by outdated curricula which do not include skills of work with advanced technologies. Practical studies are conducted mainly with old generation computer models. Many of the students who have graduated from the above-mentioned universities and studied at the ICT related faculties need to train themselves, supplementing their knowledge. Recently, due to the introduction of new telecommunication services and ICTs, the technical faculties have become more and more popular. In the senior classes of secondary schools, informatics and computing equipment are studied, where only basic knowledge and limited skills of computer use and programming are provided.

Besides the universities there are a number of private training centres conducting training courses in computer skills, use of operating systems and office applications, programming, web-design and work with graphic applications, as well as use of Internet and e-mail. After completion of study at these courses people receive a certificate. Such training courses are not affordable for the majority of the population because of the high prices.

Some employers provide their employees with training in the use of information and communication technologies. Businesses and organizations implementing computerization send their employees to private training centres and computer literacy courses in order to raise their qualifications, or arrange training during work time hiring the ICT experts on a contract basis.

3. Networked society

3.1. People and organizations on-line

*The majority of the population have never heard of the Internet and most people do not know anyone who has ever used it. About 0.3% of the population have used the Internet recently, and few are regular users. Some local businesses and institutions have registered domain names. Advertising of ISPs by newspapers, on TV and radio is available mainly in the cities. Advertising of on-line resources is not in place. This corresponds to **Stage 3**.*

Insufficiently developed infrastructure, several years of conflict and further economic crisis have led to the considerable lagging behind with regard to introduction of ICTs in Tajikistan. Development of Internet in the country started just several years ago when political stability was achieved in the country and the economy began gradually to recover. The majority of ICT services are provided in the capital of the country and largest cities, so ICT services are used mainly by the urban population. The population in rural areas, about three-quarters of the total population, has very limited access to Internet and telecommunication services, in some places access is not available at all. The main reasons are insufficiency of telecommunication infrastructure and high prices for services which are not affordable for the rural population where the poverty level indicators are highest. Expansion of infrastructure to the remotest regions of the republic and rural areas may become the key purpose for poverty reduction and sustainable development.

The number of registered Internet users is 16,255 according to data provided by ISPs. However, this figure may be much higher as the majority of users have Internet access at public access centres and Internet-cafes and are not taken into account. Hardware prices are very high and only few people with high incomes can afford to purchase PCs. Competition between the ISPs is causing a gradual reduction of prices for Internet services, however they are still remain non-affordable for the majority of the population.

The main Internet and e-mail users are young people between the ages of 30 and 35, working in the various state agencies and private businesses, engineers and technical staff of ICT related companies, journalists, scientific workers, etc. Most of them have higher education and all of them have secondary education. Regular Internet users are also the students and pupils of senior classes at schools. Males prevail among the Internet and e-mail users.

3.2. Locally relevant content

*Few websites covering local topics exist, and most of them are created and hosted outside the community. Most local websites carry static content and are updated infrequently. There is little use of online bulletin-board systems, Usenet groups, newsletters, and/or listservs. This corresponds to **Stage 2**.*

*Few or no websites are available in local languages or a dominant Web language spoken locally (i.e. Tajik language). This corresponds to **Stage 1**.*

In Tajikistan there are about 200 websites located on the local IPS hosts. Most of the websites are created by organizations – telecommunications companies (including ISPs themselves), state agencies and businesses, universities and institutions. A small number of websites are personal ones. Many websites about Tajikistan are created outside the country by people who have left it or citizens of Tajikistan working or studying in other countries.

The majority of websites containing information on local topics are in Russian. Some websites created by organizations and agencies, telecommunication companies, universities and institutes have an English version.

Mainly the content of local websites is static and the information placed there is not frequently updated. Some websites are updated upon availability of new items, holding of certain events or other things happening.

There are several catalogues of resources on Tajikistan and in Tajikistan, the most popular being: www.somoni.com and www.tj-max.com. There are also websites rating in Tajikistan www.toptj.com and some chatrooms actively visited by young people and teenagers.

Within the CCTLD TJ domain the number of websites registered by people or organizations in Tajikistan is very low, as in 1997 this domain name administrator became the American company “TJ Network Services”. During the period of administration of CCTLD TJ by the American company there was the use of the TJ domain, which symbolizes the country, to indicate Internet resources with illegal content, particularly porno websites and servers. The Internet society of Tajikistan with the support of the Government drafted a Declaration expressing protests against such use of CCTLD TJ, which was submitted to ICANN . After that ICANN started the process of redelegation of the administration function to Tajik organizations.

3.3. ICTS in everyday life

*Information and communication technologies (telephones, fax machines, pagers and computers) are used to a limited degree by some members of the community. Public telephones are available mainly in the cities and are used rather regularly by many community members. Only very few people have Internet access at their home. This corresponds to **Stage 2**.*

*Growing numbers of community members use telecentres, cyber-cafes and other businesses that offer computer use and online services to the public for a fee. This corresponds to **Stage 3**.*

The most popular communication facility in Tajikistan is the fixed telephone. Given that people have low incomes, the local telephone service is the most affordable kind of telecommunications services. The fee for installation of a main telephone line for the population is US\$ 3.67, monthly rentals are US\$ 0.37. Local calls are free of charge as there is no metering payment system at most of the analog telephone exchanges. The digital ones have a metering system and the tariff for local calls is US\$ 0.003.

Tariffs of JSC “Tajiktelecom” for international telephone calls are rather high – US\$ 3.5–4 per minute. The great difference between the tariffs for local and long-distance or international calls is explained by the fact that local telephony should be affordable for the majority of the population under the conditions of low population income and tariffs are socially oriented. In such a situation, when in 2001 IP-telephony appeared on the telecommunication market and the cost of international and long-distance IP-calls became much lower, it became very popular. Most users of long-distance and international telephone services preferred IP-telephony to the services provided by JSC “Tajiktelecom” which caused a certain decrease of its traffic.

Less affordable telecommunications services, but gradually entering the life of the country’s population, are paging, Internet access, e-mail and mobile cellular communication. There are two paging operators in Tajikistan – JV “Jahon Page” and “Somon Page” LLC. For example, prices for paging services provided by “Jahon Page” are as follows: monthly rentals are from US\$ 7 to 12, network connection is free of charge. There is roaming Dushanbe-Khujand-Gafurov-Chkalovsk the cost of which is US\$ 3.1 per month. The cost of a pager is about US\$ 40-50. Paging communication users are state agencies, private businesses, banks, individual businessmen and students.

The cost of Internet access and e-mail is rather high and they are therefore affordable for a minority of the population. However, demand for this kind of service is gradually increasing due to economic growth in the republic. The number of individual users who are not regular Internet users and are visitors by necessity of Internet-cafes and public access centres is also increasing. Quite affordable are e-mail services provided by the humanitarian organization CADA, to which there are 15,065 registered subscribers. Mostly, Internet access and e-mail services users are state agencies and organizations, private businesses, international organizations, students and teenagers. Very few people are able to purchase a home PC and connect it to Internet from their home.

Demand for mobile cellular services, especially GSM services, is becoming greater. The growth in the number of cellular phone subscribers in 2003 is 21.4 times in comparison with 2001. However, prices for services provided by mobile cellular operators are major conditions which subscribers take into account connecting to their networks. The key factor preventing consumers from subscribing to a mobile company is the rather expensive services. This, in particular, does not permit the population to use widely mobile cellular communication in everyday life. Mostly, mobile phones users are to a large extent individual businessmen, businesses, employees of telecommunication companies, and to a lesser extent employees of state agencies and organizations as well as some students.

In 1998 JSC “Tajiktelecom” connected to the X.25 network of «Global One» company. This encouraged the development of electronic banking operations of the National Bank of Tajikistan and work with credit cards at “Agroinvestbank”. CJSC “ComSiTel” (Dushanbe) provides electronic inter-bank transfers.

3.4. ICTs in the work-place

*Organizations achieve sporadic efficiency gains through limited deployment of ICT systems in their internal workings. All employees have unlimited access to local telephone services and limited access to long-distance and international telephones. Few offices have computers that are networked for internal files sharing and basic enterprise applications. In offices where there are computers, only some employees use them for their work, although not for electronic communications. This corresponds to **Stage 2**.*

Many organizations and businesses, both public and private, recognize that the introduction of advanced ICTs will increase their operation's efficiency, most of them have computerization plans and ICT equipment installation. However, the main problem for the application of ICTs in organizations and businesses is the high cost of the ICT equipment and computer illiteracy of the staff, who need appropriate training. Computers are mostly used for work with documents in text processing applications, office applications and accounting.

The most popular kind of ICT equipment used in organizations and businesses is usual the fixed telephone. Some organizations have fax machines and a minority have Internet access and e-mail. Employees have unlimited access to local phone calls due to non-availability of a metering payment system or very low rates for local calls in the case of digital lines. There are certain limitations with regard to long-distance calls and very few employees may have access to international calls or mobile handset.

If an organization has dial-up Internet access and e-mail, very few employees may use them. If there is a local computer network in the organization, single workstations may use Internet access through the server. In such cases employees have a certain period for work with e-mail and Internet. Few employees have their own e-mail account, but many of them have a personal e-mail address at virtual servers.

Some organizations and institutions equipped with PCs often network them in order to facilitate work with documents within the organization and increase work effectiveness. However, very few employees use the network, many of them continue to work with hard copies, printing them and distributing manually. The opportunity of communication between employees by means of chat software is also very rarely used by employees, who prefer personal communication.

4. Networked economy

4.1. ICT Employment Opportunities

*Although there are some employment opportunities that call for technical skills, most workers with ICT experience must either must leave the community to find employment or are unable to find work in their field. This corresponds to **Stage 2**.*

*Technical skills in the community are becoming a source of competitive advantage and are beginning to attract investment and employment opportunities by companies from outside the community. This corresponds to **Stage 3**.*

Employment opportunities for people with higher technical education are wide enough, however they cannot be compared with those ones existing outside the country. Many highly qualified experts and teachers of technical subjects left the country during the conflict and subsequent economic crisis.

Due to the development of the telecommunication market, and the emergence of new companies, such as mobile cellular operators and ISPs, new workplaces have been created for highly qualified technical experts. But work in these companies requires knowledge in the field of advanced information and communication technologies and appropriate skills for operating such equipment. Not many engineers who graduate from technical universities have sufficient knowledge and experience of operating such equipment, as the universities mainly train the students with outdated curricula. For this reason, some telecommunication companies need to train groups of their employees outside the country at special courses. Many engineers need to train themselves additionally at their own expense or get some knowledge by themselves.

The majority of small and medium-sized businesses do not include ICTs in their development strategy due to the high costs of purchasing ICT equipment and having a computer literate work force, although they recognize that organizations may achieve efficiency gains through the use of ICTs.

4.2. Electronic commerce (B2C)

*Some businesses have their own websites. The basic information they provide is static and infrequently updated. Some businesses accept orders by phone or fax. There is little awareness of online business, and all dealings between businesses and consumers consist of oral and /or paper-based transactions. Very few businesses use Internet access and e-mail for correspondence. There are no on-line transactions. This corresponds to **Stage 1**.*

Electronic commerce in Tajikistan is not developed at the moment and is not regulated by legislation. The first virtual shop was opened in the Republic in Summer 2002. Currently, there are three Internet-shops, one of which is a Tajik-Australian joint venture. The consumers of these new services are mainly international organizations, private firms and embassies in Dushanbe.

Internet shops have also been created by the two telecommunication operators “Babilon-T” and “Telecomm Technology”. They created websites and offer such opportunities as order, account and payment.

Most private businesses in the country do not have their own websites. Generally, websites are owned by companies related to the provision of ICT services, some state agencies and public businesses, universities and individuals.

Websites of companies, state agencies and other organizations contain basic information on their activities. The content of such websites is static and is updated infrequently, about once a year, and they are used as an information platform.

Commercial transactions are carried out in person or remotely through paper-based transactions; correspondence and communication related to their business may be carried out by telephone, fax and e-mail. A non-electronic signature is necessary for money transfer.

Development of the B2C segment is being slowed down due to lack of appropriate legislation (for instance, Law “On digital signature”, “Law on electronic commerce”, etc.). Local companies do not use Internet as a tool for running their business because of their low awareness of what marketing opportunities may be provided by Internet. Moreover, payment technologies are not sufficiently developed and the population has a very low level of trust in banking systems and electronic payments. The Internet market is not large, only 0.3 per cent of the population is covered by Internet services, most users are concentrated in the capital, Dushanbe. These reasons are also preventing expansion of B2C in Tajikistan.

4.3. Electronic business (B2B)

*Businesses have few sources of market information. The efficiency of most B2B interactions is hampered by this lack of transparency, as are prospects for new business opportunities. B2B transactions are carried out in person or remotely through paper-based transactions. For B2B transactions a non-electronic signature is required. This corresponds to **Stage 1**.*

B2B, like B2C, is at a very early stage of development in Tajikistan. The majority of businesses do not use Internet for electronic transactions and marketing of the goods they produce. The reason is that the computer literacy level among the managers of the companies is very low. Most of the managers are not aware of the marketing opportunities offered by Internet. There are few business websites, the general information on the activities of the companies placed on these websites is mainly static.

Developing B2B is complicated due to the fact that in order to carry out the transaction and transfer money it is necessary to put a non-electronic signature on the document. To facilitate electronic transactions it is necessary to certify digital electronic signatures.

Transactions are carried out in person or remotely through paper-based transactions and correspondence and communication related to running of businesses is carried out by phone, fax and e-mail. There is some expansion of the basis for provision of financial electronic services. In the course of development, banks will introduce electronic transfer systems with direct access to clients' accounts.

Sources of information on the market are almost completely unavailable; there are very few websites where such information can be obtained. Information is not sufficiently transparent. By decision № 115 of 31 March 2003, the Government of the Republic of Tajikistan set up the

“Interstate programme of information and marketing centres network establishment for promotion of goods and services on national markets of CIS Member States for the period until 2005”. The establishment of such an information and marketing centres network was recognized as necessary due to the low level of information available on the commodity market of CIS countries. Currently, technical requirements on the establishment of this network are being developed and the distribution of executive functions between the ministries and departments concerned is being carried out. Implementation of the programme will ensure transparency of the information on the market not only within the country, but in CIS countries.

To develop B2B in Tajikistan a national strategy of electronic commerce development should be adopted, a system of investment preferences and preferential taxation for the companies and investors involved in the ICT sector should be provided, a moratorium for taxation of electronic commerce should be ensured by legislation and the necessary laws and legal acts regulating the ICT sector should be enacted.

4.4. E-government

*A few governmental websites exist, providing basic information, often directed at parties outside 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. This corresponds to **Stage 2**.*

The majority of governmental agencies and public administration do not have websites. Generally, basic information on the activities of the agency or administration is placed on the website. It is mostly static and is updated infrequently.

There is partial electronic interaction (except for citizens) between the governmental agencies and public administration via e-mail. In most cases governmental agencies and citizens interact in person or by means of hard copy documents and letter correspondence, by phone or fax.

In execution of the Decree of the President of the Republic of Tajikistan of 16 September 1999 «On measures for ensuring of access to global information networks” and with the purpose of establishing a centralized e-mail node, the creation of conditions for prevention of threats with regard to security of information resources of governmental agencies, the Government of the Republic of Tajikistan (№ 354-14 of 4 September 2002) set up a project of organization of a corporate computer network of all state administration agencies of the Republic of Tajikistan (in total 65 agencies). The goal of this project is to establish an inter-departmental corporate network connecting state administration agencies to provide documentation exchange by means of e-mail.

In 1996 at the Executive Administration of the President of the Republic of Tajikistan a local computer network was established. With the use of computers about 1200 legal acts are being prepared each year. But this progress is insufficient. In the end there is the same hard copy document, as the other sectors have not started to introduce advanced technologies, which is

duplicated and distributed by the executives by means of traditional postal services. It is necessary to introduce an automated system of document processing in all stage agencies and public administrations in order to increase and facilitate their interaction.

5. Networked policy

5.1. Telecommunications regulation

*Plans for the liberalization of telecommunications services are in place and being implemented. Such services as data transmission, paging and mobile cellular communications are provided by private operators. This corresponds to **Stage 3**.*

*A number of legal acts including that regulating licensing, tariffs, interconnections and universal access to telecommunication services are being elaborated. Alternative carriers compete for private network services, leased lines and other telecommunications services for businesses do not exist. The incumbent operator is not open for competition through interconnection and/or unbundling obligations. This corresponds to **Stage 2**.*

In order to ensure successful introduction and development of ICTs, as well as to ensure overall (universal) access to the information and communication services, favourable conditions should be created, for example a modern digital infrastructure should be established, investments should be attracted, reforms of the institutional structure of the ICT sector should be implemented, a regulatory structure should be developed and the existing legislation in telecommunication sector should be improved.

The main telecommunication sector development policy trends are institutional restructuring, liberalization, provision of universal services and privatization. Reform in the telecommunication sector started in 1996 when it was restructured and the JCSs were created and delegated the operational functions of the Ministry of Communications: JSC “Tajiktelecom” (telecommunication services), JSC “Teleradiocom” (broadcasting and television services), State Department “Post of Tajikistan” (postal services). Moreover, the initial stage of privatization was carried out – 5 per cent of shares are owned by the employees and 95 per cent are owned by the State Property Fund. At that moment the Ministry of Communications retained its regulatory functions in communications sector, TV and broadcasting, particularly in the field of tariffs regulation, sector policy development and investment policy.

At present, regulation of the ICT sector is carried out in accordance with the following basic laws and legal acts:

Decision of the Government of the Republic of Tajikistan № 389 of 8 August 2001 “On establishment of the Republican Data Transmission Network and measures on ensuring access to global information networks, as well as the approved rules of Internet service provision of the territory of the Republic of Tajikistan. JSC “Tajiktelecom” was obliged to establish a republican data transmission network with the further connection to it of a corporate network of governmental

agencies and public administrations which is formed according to the above-mentioned decision of the Government of 1997. The 2001 Decision of the Government ensures protection of information resources, non-distribution of information containing summons for violence and cruelty, racial, national, social and religious enmity.

In 2001 the Laws of the Republic of Tajikistan “On informatization” and “On electronic documents” were enacted. The Law “On informatization” regulates the legal relations appearing in the process of formation and use of documented information and information resources, creation of information technologies, automated information systems and networks, defines procedures for protection of information resources as well as the rights and obligations of all entities participating in informatization processes.

The purpose of the Law of the Republic of Tajikistan “On electronic documents” is to establish a legal basis for the use of electronic documents, define the basic requirements with regard to electronic documents as well as the rights and obligations of all participants of legal relations appearing with regard to the exchange of electronic documents.

The Government of the Republic of Tajikistan elaborated the “Concept of formation and development of information space of the Republic of Tajikistan and appropriate state information resources”.

Activities in the field of telecommunications is regulated by the Law of the Republic of Tajikistan “On telecommunications” enacted by the Decision of the Majlisi Oli of the Republic of Tajikistan in April 2002, as well as the other legal acts in particular regulating such aspects as licensing (Licensing regulations, 1994), interconnections (Rules of corporate and independent telecommunication networks interconnection with public telecommunication network, 1999) etc. A Draft Law was elaborated in cooperation with the international consultant “DETECON GmbH” within the Programme of regulatory development and improvement of legislation in the telecommunication sector in the Republic of Tajikistan financed by the European Bank for Reconstruction and Development (EBRD). The new law fully complies with international principles, regulations and standards.

In accordance with the new Law of the Republic of Tajikistan “On telecommunications” the main principles of activities in the field of telecommunications are as follows:

- equal access of all legal and physical persons to a modern and efficient telecommunications infrastructure and to telecommunications services;
- promotion of effective and fair competition in telecommunications markets in the interests of users;
- establishment of conditions that are favourable for attracting foreign investments in the field of telecommunications;
- public network access and interconnection conditions that guarantee in an objective, transparent and non-discriminatory manner equal conditions on the market and the possibility of unrestricted communications among users;

- promotion of reliable and high quality traditional telecommunications services, introduction of non-traditional services and ensuring of compatibility of telecommunications networks with the international telecommunications networks;
- provision of universal services affordable throughout the Republic of Tajikistan in the light of national conditions and peculiarities;
- respect by the telecommunications network operators of the confidentiality of the information transmitted by users;
- provision of accessibility to the telecommunications networks during emergency situations and for the purpose of state administration, defence, national security, and law and order.

Pursuant to the Law “On telecommunications”, state administration of the activities in the field of telecommunications and radio frequencies in the Republic of Tajikistan is carried out by the Government of the Republic of Tajikistan and the Ministry of Communication. Activities in the field of telecommunications are regulated by the authorized Agency of the Republic of Tajikistan on regulation of communications and State Inspectorate of Communications at the Ministry of Communications.

Ministry of Communications of the Republic of Tajikistan

The Ministry of Communications of the Republic of Tajikistan is assigned the following main powers:

- elaboration of the general policy for the telecommunications sector in the Republic of Tajikistan in compliance with the principles set out in the Law;
- implementation of such policy with a view to expanding the scope of coverage of telecommunications systems to meet the needs of economic and social developments in the Republic of Tajikistan;
- of draft laws and other normative legal acts as well as standards, norms and rules governing the activities in the telecommunications sector;
- creation of necessary conditions to attract foreign and domestic investments in the telecommunications sector and creation of a competitive environment among operators and providers to ensure access of users to advanced telecommunications services;
- conduct of negotiations with other states and governments in the field of telecommunications, if the appropriate authority is granted, and conclusion of corresponding agreements;
- carrying out activities within the regional and international organizations in the field of telecommunications as the uniform administration of communications.

Authorized Agency of the Republic of Tajikistan on regulation of communications

Some of the main functions and powers of the authorized Agency of the Republic of Tajikistan on regulation of Communications are as follows:

- control (regulation) and promotion of free (fair and effective) competition between all telecommunications operators;
- ensuring equal access of all users to the public telecommunications networks based on the

provision of high quality telecommunications services and of confidentiality of messages, and nondisclosure of private information on users;

- issue of authorizations and regulation of radio frequencies within the frequency bands used by the operators and providers providing commercial telecommunication services;
- elaboration and control of execution of national numbering plan of the Republic of Tajikistan, allocation of numbers to the telecommunication operators;
- control of the quality of telecommunication services and technical condition of telecommunications facilities;
- issue of licenses and control of execution of license conditions;
- type approval and issue of type approval certificate for telecommunication equipment and services (or procedure of use of certificates issued in the other countries);
- in cooperation with the State Committee for Antimonopoly Policy taking measures on prevention of activities against competition in the telecommunication sector;
- regulation of tariffs and services provided by telecommunication networks, approval of the tariffs for telecommunication services provided by telecommunication operators dominating the telecommunication market;
- regulation of the interconnections of telecommunication networks with the public telecommunication network;
- approval of the tariffs for interconnections for provision of services by the telecommunication operators dominating the telecommunication market;
- establishment of clear procedure of regulation and settlement of disputes between the telecommunication operators and users of telecommunication services; etc.

State Inspectorate of Communications at the Ministry of Communications of the Republic of Tajikistan

Some of the main functions of the State Inspectorate of Communications at the Ministry of Communications of the Republic of Tajikistan are as follows:

- issue of authorizations and regulation of radio frequency spectrum excluding frequency bands used for commercial provision of telecommunication services and data transmission;
- issue of authorization for import of radio electronic facilities and high frequency facilities giving radiofrequency emission or which are the source of electromagnetic waves to the territory of the Republic of Tajikistan.

During 2003 in the course of the second stage of the Programme of regulatory development and improvement of legislation in the telecommunication sector in the Republic of Tajikistan, a number of legal acts such as “Regulations on licensing”, “Regulations on tariffs”, “Regulations on universal services”, “Regulations on authorized Agency of the Republic of Tajikistan on regulation of communications” and “Regulations on interconnections” should be elaborated and submitted to the Government of the Republic of Tajikistan for approval and enactment.

5.2. ICT Trade Policy

*Restrictions for tariffs or other restrictions in the field of ICTs do not exist. The main barrier to trade in the field of ICTs is the high price of ICT equipment. Foreign direct investment is allowed in network sectors under certain conditions. This corresponds to **Stage 2**.*

*Service sectors are not open to trade, creating a barrier for electronic commerce and the building and operation of ICT networks. This corresponds to **Stage 1**.*

*Foreign direct investment is allowed in network sectors under certain conditions. This corresponds to **Stage 2**.*

The main barrier to trade of ICT equipment is high tariffs. Customs duties for imported equipment are rather high and given that there is no production of ICT equipment in the republic, the cost of imported ICTs is not decreasing.

The legislation of the Republic of Tajikistan does not consider ICT equipment as a stand alone category of goods and does not offer special stimuli to foreign companies investing in the ICT sector.

The main kinds of taxes paid by the companies working in the ICT sector are profit tax (30 per cent), VAT (20 per cent), customs duties and excise.

6. Mass media

6.1. Radio, TV and newspapers

According to the information provided in the “Report on the media situation in Tajikistan” prepared by CIMERA in 2000, in Tajikistan 250 mass media are listed including:

- 191 newspapers
- 50 magazines
- 7 news agencies
- 19 TV stations

The following registered mass media:

- 43 newspapers
- 4 magazines
- 6 news agencies
- 18 TV stations

are non-governmental, i.e. private or belonging to different companies (enterprises) or political parties. However, for the past two years these figures have changed due to the appearance of several new mass media.

Electronic mass media

At present, there are about 35 TV and broadcasting stations operating in Tajikistan, the vast majority of which are regional and, in principle, non-governmental.

The legal basis of the e-media in Tajikistan is established by the Law of the Republic of Tajikistan “On TV and broadcasting”, adopted on 14 December 1996 and amended on 30 June 1999. This Law provides the State Committee on Television and Broadcasting with the power to issue licenses to private TV and broadcasting stations. In addition to broadcasting licenses, TV and broadcasting companies need to get technical authorization for broadcasting from the State Inspectorate of Communications at the Ministry of Communications of the Republic of Tajikistan. In practice, this can be a lengthy procedure, the outcome of which has little to do with feasibility, quality, or demand, but rather relations with the local authorities.

The Tajik state television programme (TVT) has a national audience of 85 per cent of the population according to Internews and CIMERA estimates. TVT has always been considered the main source of official state information. It broadcasts 12 hours per day. As TVT was rarely accessible in the mountain villages in Badakhshan, in 1996 the Ministry of Communications established the first national satellite TV station to reach this area, although certain parts are still not covered. TVT includes a regional branch office in Khujand and uses TV organizations in all other provincial centres. The latter are small separate companies broadcasting on the frequency of the national TV programme functioning de facto as provincial branches broadcasting a mixture of TVT and local content.

The republican broadcasting programmes include the Tajik state broadcasting stations “Sadoi Dushanbe” (“Voice of Dushanbe”), Radio-i-Tajikistan, Inoveshanie (“International messages”, state programme that broadcasts news summaries in Farsi/Dari and English) and broadcasting of the Russian channel “Mayak” (“Lighthouse”), as well as the private Russian FM music station Russkoye radio 2, beamed in for Russian border guards, but still accessible to large segments of the population. “Sadoi Dushanbe” is the most popular because of its unusual approach for state media, broadcasting interactive talk-shows, debates and modern Tajik and foreign music.

None of the private broadcasting station in Dushanbe received a license until July 2002, when by the Order of the President of the Republic of Tajikistan, the “Asia-Plus” radio station was issued a license and on the Anniversary of Tajikistan’s independence, 9 September 2002 finally started broadcasting programmes in Dushanbe. The potential audience of the “Asia-Plus” station is up to one million people. Although currently only broadcasting 14 hours a day, it is planning in the near future to start 24-hour broadcasting. Very recently, in 2003, the other broadcasting station “Radio Vatan” appeared and started operating in Dushanbe.

Thirty local and regional TV and broadcasting programmes operate in different districts of the country, but none of them has national coverage. All regional e-media in Tajikistan are TV channels except for the “Tiroz” broadcasting station in Khujand. Their average time of broadcasting accounts is 6 hours per day. Regional TV is becoming an ever more important information channel in the provinces, since printed media rarely appears due to the geographic

isolation and the high cost of transport. Many rural households still own a radio or TV from the Soviet era. As such and because the population of Tajikistan is predominantly rural, local media have a large potential role in conflict prevention efforts, advocacy campaigns and strengthening administrative decentralisation and local governance.

The Russian TV programmes RTR and, until late 2001, ORT may be seen across almost the whole country and were broadcasted on the basis of an intergovernmental agreement with the Russian Federation. ORT and RTR are popular and major sources of information not only for the Russian-speaking population, which comprises ethnic Russians, but also for the urban Tajiks and many provincial Tajiks who speak Russian. According to a poll conducted by the NGO “Shark Research Centre” in January 1999, 77 per cent of Dushanbe’s TV audience gets the news from these two programmes.

In October 2001, however, the Ministry of Communications had ORT switched off and the broadcasting time of RTR reduced because officially the Russian State Broadcasting Company had not paid its US\$ 180,000 debt for transmission. In September 2002 RTR paid its debt and broadcasting was resumed. ORT has not solved this problem yet and thus it is not broadcast.

Satellite TV

A relatively new phenomenon is the spread of satellite TV in Tajikistan. Although it is not as widespread as in other countries, satellite dishes have become a familiar sight in Dushanbe and to a lesser extent in Khujand. Satellite TV has also become the main way to continue watching TV channels like ORT. A handful of companies now sell antennas and provide installation services for up to 270 channels – with Russian, Iranian, Arabic and Italian TV programmes particularly well-presented along with world news stations like the BBC, CNN and Euronews in Russian. Since getting satellite TV means an investment of about US\$ 250 to 450, thirty to fifty times the average monthly income, this form of information dissemination is only affordable to a very small percentage of the population.

7. Intellectual Capital

7.1. Copyrights, Patents and Trademarks

Copyright protection is crucial not only for the protection of local producers, but also for international corporations and investors. A clear commitment to protecting international and national patents and copyrights demonstrates that Tajikistan is a willing partner in the emerging global market.

The National Centre for Patents and Information (NCPI) was established within the Institute of Scientific and Technical Information of the Ministry of Economy and Foreign Trade. Its function is to protect state interests in the field of inventions, industrial patents, trademarks, services and other objects of industrial property in the country and abroad.

According to the Declaration of the Government of Tajikistan, a number of conventions and treaties ratified by international organizations and government, such as the World Intellectual Property Organization Convention (1967), Eurasian Patent Convention (1995), Patent Cooperation Treaty (1970), Paris Convention for Protection of Industrial Property (1883, amended 1976 and 1979) etc., are valid in Tajikistan.

To demonstrate further the clear and lasting commitment to the protection of intellectual property rights on an international scale, the following treaties and conventions must also be analysed and considered:

- The Patent Law Treaty (2000) and the Trademark Law Treaty (1994);
- The Vienna Agreement Establishing an International Classification of the Figurative Elements of Marks (1973);
- The Hague Agreement concerning the International Registration of Industrial Designs (1925).

These factors are crucial as Tajikistan builds upon its bid, initiated in 2001, to join the World Trade Organization.

In 1993-2001 NCPI received 619 requests for the issue of patents for inventions; 262 decisions on the issue of patents were made. During the same period there were 23,095 applications for registration of trademarks, of which 5,338 within the national system, 18,567 within the Madrid Agreement. During this time 4,895 trademarks were examined within the national system and 16,518 within the international system; 4,499 trademarks were registered, of which 4,043 certificates were issued.

Who is registering trademarks and inventions and what is registered? According to the book “Inventors in Tajikistan” published by the Director of NCPI, Mr. Takhirov, there are 165 patented inventions in the various field of the activities of the people. The inventors are mainly working at the Academy of Sciences of the Republic of Tajikistan and scientific and research institutes. They are professors of the universities, ministries employees, directors and employees of the plant and factories and other enterprises. About 85 per cent of inventors are males. Inventions are mostly related to chemistry (11%), medicine and pharmacy (14%), geology and construction (7%), metallurgy (8.5%), agriculture (14%), physics (15%), light industry (8%), electric engineering (6.7%), instrument-making (4.3%), mechanical engineering (4%) and other fields.

Unfortunately, among the inventions there are none related to ICTs. However they comply with the requirements of the market in Tajikistan, promote energy sustainability, expansion of exports of main kinds of raw-materials such as aluminium and cotton. ICTs may increase export expanding markets, enhancing management of businesses, arrange effective production, attract financing, raise the quality of services provided to customers and promote B2B.

7.2. Licenses

Licenses for activities in the field of communications in the Republic of Tajikistan are issued by the State Inspectorate of Communications at the Ministry of Communications. According to the data provided by the State Inspectorate of Communications, about 55 licenses were issued during the period up to 2002. They were issued both to legal and physical persons and include those permitting construction of telecommunication network and provision of telecommunication services, as well as licenses for the sale of terminal telecommunication equipment.

Licenses are issued by the State Inspectorate of Communications pursuant to the “Regulations on licensing of the activities in the field of communications” approved by the Ministry of Communications in 1994, which defines procedures and conditions of licensing. At present, with the financial support of the EBRD and in cooperation with the international consultant “DETECON GmbH” (Germany), the second phase of the Programme of regulatory development and improvement of the legal basis of telecommunication sector is being carried out. Within the second phase the elaboration of the new “Regulations on licensing” will clarify and simplify the licensing regime and procedures.

7.3. Scientific and/or Technical Associations

Science and Education Development Association

In April 1999 in Tajikistan the Science and Education Development Association was created, on the basis and by the initiative of the eight largest higher educational institutions of the country, as an organization uniting employees of scientific and research institutions, higher educational entities and secondary schools in the Republic of Tajikistan. In December 1999 the Association entered the Academy of Sciences of Tajikistan as an honorary member.

The Association is the first and the only national, non-governmental, public organization which is setting the following goals:

- encourage introduction and development of new ICTs in the system of secondary and higher education in the republic;
- promote introduction of international educational standards in the system of secondary and higher education, arrange international exchange of experience in this field;
- develop scientific research both in higher education and in scientific and research institutions of Tajikistan, arrange effective information support to scientific activities;
- participate in development of models and methods of training in new conditions, application of new information technologies including distant learning;
- promote establishment of electronic libraries.

For the time being the Association, with the support of the first ISP in Tajikistan “Telecomm Technology”, has arranged Internet connection and free of charge Internet access for eight higher education institutions and for the Ministry of Education of the Republic of Tajikistan. It gave them the opportunity for unlimited use of e-mail by time and volume on a grant basis. Currently, the

Association has developed a project of establishment of Internet access centres in universities and has submitted it for consideration by international organizations.

TARENA

In 1994 the Academy of Sciences of the Republic of Tajikistan, the first in Central Asia, addressed the Science Programme of NATO with the project of establishing an academic computer network with a connection to Internet. With the support of the Tajik Subsidiary of the Open Society Institute and CADA and the technical cooperation of the Association of Communication Operators, in 2000 at the Academy of Sciences a wireless network based on Radio Ethernet technology connected seven academic institutes. In 2000 in order to implement the project “Virtual Silk Road” which will provide high speed capacity and channels for Internet access for eight Central Asian and Caucasus countries, the Academy of Sciences and universities established and registered TARENA – Tajik Academic, Research and Educational Computer Network users Association. TARENA has received a second grant from NATO for the creation of the Dushanbe corporate network (DuSciNet) connecting 18 universities and academic institutes in Dushanbe with one computer LAN. DuSciNet will be the platform for implementation of the “Virtual Silk Road” NATO project and should be connected to the satellite communication channel in 2002-2004. The capacity of the first connection will be 1 Mbps; in 2003 it will be increased to 2.5 Mbps and in 2004 TARENA will get a communication channel of 4 Mbps. TARENA carried out the two conditions for project implementation, it was registered and it was issued a license for provision of services to its members on a non-commercial basis. After issuance of a license for use of the satellite channel TARENA to prepare a strategy of Internet development in academic society, NATO will deliver the earth station and other network equipment to Dushanbe.

At the end of 2002 TARENA planned to install the earth station of NATO and Dushanbe Scientific Network. In 2003 with the help of the other donors, TARENA should expand its services and cover Khujand and Khorog, thus establishing the largest network in the Republic, which will efficiently promote Internet development in Tajikistan. Within the TARENA network – at the institutions, universities, schools and libraries – students in Tajikistan and future managers will get Internet access and training that will lead to more material in the Tajik language being put on Internet and expansion of digital opportunities in the twenty-first century.

8. Education

8.1. Higher education

During the years of the conflict, the education system in Tajikistan, which had been at a high level during the times of the former Soviet Union, was seriously damaged. The instability and deep economic crisis led to a great outflow of the highly qualified teachers from the country and thus damaged the human resources base of higher and secondary education institutions. The technical and scientific basis of the universities was also badly damaged during that period. Assets and equipment were plundered, training materials and aids were lost. During the post-conflict period as a result of efforts made by the Government and with the support of international organizations, the education system was partially recovered and achieved some development progress. At the

moment education in the republic is a priority and over the last years focused work has been carried out on reforming of higher education system taking into account the real changes in economy and social life with the purpose of its integration into the global education system.

Currently, there are 33 state higher education establishments training highly qualified specialists in the Republic of Tajikistan including 7 subsidiaries. All higher education establishments are state-run, not private. The total number of students at higher education establishments in 2002 was 96,583 of which 60,050 (62.2 per cent) were studying at full-time faculties. The number of students studying at correspondence faculties of the higher education establishments was 36,533 or 37.8 per cent of the total number of students.

Distribution of students by specialization in 2001/2002 and 2002/2003

Specialization	Number of students			
	Total, pers.		incl. women	
	2001/2002	2002/2003	2001/2002	2002/2003
Total	84 360	96 583	20 594	24 025
specializing in:				
Natural sciences	7 914	11 448	2 058	3 337
Humanitarian and social	32 475	34 634	7 706	9 579
Education	12 081	7 334	3 871	2 815
Health care	3 331	3 687	1 445	1 640
Culture and arts	582	683	124	156
Economy and management	17 089	26 626	4 311	5 190
Interdisciplinary natural and technical specializations	498	990	57	170
Mechanical engineering and metals processing	548	203	68	5
Technological machines and equipment	417	570	11	151
Electrical engineering	482	210	18	10
Instrument making	-	33	-	-
Electronic engineering, radio engineering and telecommunications	326	439	18	50
Informatics and computer engineering	1 105	1 189	155	
Agriculture and fish-breeding	2 666	2 897	146	157
Ecology and use of natural resources	262	251	16	17

In Tajikistan there are 19 universities including their subsidiaries in the area and regional centres, the majority of which are located in Dushanbe. Specialists in subjects related to ICTs are trained by the Tajik State National University, Tajik Technical University, Tajik Technological University and Russian-Tajik Slavic University.

Technological University of Tajikistan.

The Technological University of Tajikistan was established in 1991. This is now the eleventh year that all interested young people who wish to acquire modern knowledge on different areas of life, such as economics, textile and food technologies, information and communication technologies, study at our University.

More than 500 highly qualified high-qualified specialists in different areas of Tajikistan's economy have graduated from the University and now work in different organizations, institutions and enterprises both in Tajikistan, and in CIS and other countries.

The Technological University of Tajikistan is the only University of the Republic of Tajikistan, which prepares specialists in eight fields and 25 specializations in different areas of food and light industry as well specialists in the field of marketing, international relations and information and communication technologies.

Within the structure of the Technological University of Tajikistan function its branch in Khujand city, the American International College (now American Branch of the International Faculty), Technological lyceum, gymnasium "Dushanbe", Technological College in the town of Isfara, base high-schools in different regions of the republic. In 1995 the Military department was established.

The Technological University of Tajikistan cooperates with more than 40 foreign higher education Institutions. Thanks to developed foreign affairs, membership of the International Association of Universities (IAU, 1998) and the International Association for the Exchange of Students for Technical Experience (IAESTE, 1992) etc., as well cooperation with many International Organizations and Foundations, annually a number of students and professors from the Technological University of Tajikistan go abroad for traineeships and fellowships. In addition foreign professors come to the University to give lecture courses on different subjects.

In 1997 the Technological University of Tajikistan passed the State Attestation and Accreditation and at present prepares specialists with a layered system of education: bachelor – 4 years, graduated (certificate) – 5 years and Master of Science – 6.5 years.

Since 1 November 1999 there are post-graduate courses at the Technological University of Tajikistan.

By the decision of the Government of Tajikistan with the support of UNDP and UNESCO, the modern-strategic Computer Centre was established at the University, providing computer learning courses, technical support and other kinds of help to the academic and research institutions of the republic, physical and legal persons. The Computer Centre is a modern Centre for training and research in the field of Information and Communication Technologies.

8.2. Primary and Secondary Schools

In 2002 there were 3,729 primary and secondary schools. In 2002-2003 they trained 1,638,100 pupils. Primary education has a special priority in the system of national education, as practically all the population believe that their children should have primary education. Children from 7 years old are enrolled in primary schools. Taking into consideration the improvement of the economic situation in the country it is planned to enrol children in primary schools from 6 years old and to increase the period of study at secondary schools up to 12 years old.

In the mid-1990s the number of pupils at schools decreased due to the conflict. In the post-conflict period the number of pupils increased and reached 1.6 million children. The Government of Tajikistan with the support of the World Bank and other international organizations made efforts to reduce poverty and assist poor families in providing education for their children. Assistance from the World Bank, Islamic Development Bank and Asian Development Bank in the field of education enabled school places to be provided for more than 100,000 children. Within the educational project of the World Bank over 20 pilot schools are being rehabilitated. They have also arranged publication of modern textbooks, and carry out work with parents, pupils and communities on maintenance of school infrastructure.

Special attention was drawn to talented children. Specialized schools such as gymnasiums and lyceums train talented children using special programmes and curricula providing comprehensive study of humanitarian, natural, mathematical and technical subjects. There are eight private secondary schools which are training 850 children.

However, there are many problems in the education sector. According to UNICEF data, in 1995 in the republic there were 60,000 orphans. Over the last several years more than 10 boarding schools for orphans have been opened, but it is not possible to cover all children in need by education at the expense of the state budget.

8.3. Distant learning

In August 1999 the Centre of Distant Learning (CDL) started to function at the Tajik Technical University. Currently, through this Centre 84 students are studying at the Moscow University of Economy, Informatics and Statistics and at the Moscow Institute of Steel and Alloys, in the following specialities:

- management – 26 students
- financing and loans – 14 students
- accounting and audit – 14 students
- raising of qualification – 6 students
- black and colour metallurgy – 24 students.

Sixteen students with basic higher education would like to obtain further education. Mainly employees of the Tajik Aluminium Plant, Tajik Energy Company “Barki Tajik”, Anzob Mining and Processing Enterprise and Ministry of Industry are studying there. There are more than 50

teachers providing training. The students may gain new skills and knowledge at the prestige universities of Moscow without leaving Tajikistan. Tajik Technical University entered the Association “Virtual University of Europe and Central Asia”, which includes 35 other higher education establishments. Although distant learning courses are not yet provided, there is an exchange of curricula.

For the successful introduction of a distant learning system it is necessary to implement the following priority objectives:

- Elaborate a National Programme for Distant Learning development in Tajikistan;
- Establish a national distant learning system based on open knowledge banks, training materials and methodical manuals;
 - Establish ICT equipped CDLs and provide a human resource basis in the regions of Tajikistan ensuring equal access;
 - Create CDL network connecting territorial and multi-level education systems with their integration in global society;
 - Attract investments covering lack of state budget funds.

At present there are no legal acts regulating distant learning, however taking into account the message of the President of the Republic of Tajikistan to the Parliament indicating the urgent necessity of using computers in the education sector, the Law of the Republic of Tajikistan “On education” was reviewed and amended recognizing the new methods of education. The draft Law of the Republic of Tajikistan “On higher education” also states the need for the introduction of distant learning in a more comprehensive manner. These are useful, positive steps as Tajikistan moves toward formulating a broader National Programme for Distant Learning.

9. Labour force

9.1. Employment in Science and Technical Fields

In 2001 the total number of employees with a scientific degree or scientific rank in Tajikistan was 3,062, of which 649 doctors of sciences and 2,413 candidates of sciences. There were 4,999 employees in the field of science and engineering in 2001, of whom 1,369 had scientific degrees, 304 were doctors of science and 1,065 were candidates of sciences.

There were 811 post-graduate students in 2001, in particular in the field of physics and mathematics (47) and engineering (39).

The number of potential inventors was 306 people.

9.2. Employment in Telecommunication Sector

The current situation with regard to employees in the telecommunication sector is complicated and is distinguished by the insufficiency of highly qualified specialists as well as the lack of appropriate training and methodical basis for training of telecommunication sector employees in

the field of telecommunications. The reason is the extensive outflow of qualified employees from the country during the last decade due to the conflict. In the period from 1991 to 2000 and because of the consequences of the conflict, 1,824 people employed in the telecommunication sector left the republic. There is a significant lack of qualified staff for maintenance of telecommunication equipment in the rural regions in particular.

Employment of telecommunication sector in 2002

Total number of employees	4 990
Number of managers of different levels	110
Number of specialists with secondary and higher professional education	1 851
Number of employees who have raised their qualifications	295

Education establishments training specialists for the telecommunication sector do not have sufficient qualified teachers, appropriate methodical basis and curricula for the training of skilled experts working in the field of advanced technologies, and they have an outdated technical basis.

Due to limited financing there is no opportunity to train a sufficient number of specialists outside the country, particularly in CIS countries.

10. Research and development

10.1. Research institutions

In 2002 in the country 60 scientific institutions and organizations were engaged in the field of research and development, which includes design and development organizations, independent scientific and research organizations, scientific and research laboratories and design departments at industrial enterprises, as well as higher educational institutions carrying out scientific and engineering research.

Within the structure of the Academy of Science of the Republic of Tajikistan there are 22 institutes, at the Academy of Agricultural Sciences there are 11 institutes. The other scientific institutions are within the structure of the other ministries and departments. In total there are 41 independent scientific and research organizations.

In 2001 scientific and research establishments carried out work to the amount of US\$ 675,290.3, including scientific and engineering works to the amount of US\$ 607,838.7. Scientific and research work was implemented to the amount of US\$ 411,612.9 including fundamental work (US\$ 278,709.6) as well as design and technological work (US\$ 1645.1).

Academy of Sciences of the Republic of Tajikistan

The Academy of Sciences of the Republic of Tajikistan was established in 1951 based on the Tajik subsidiary of the Academy of Science of the Soviet Union and there were 700 scientific workers. The first founders became academicians (10) and correspondent members (14).

The Academy comprised two departments – department of natural sciences and department of social sciences. The establishment and successful activities of the Academy of Sciences considerably accelerated the process of creation of the new academic and industrial scientific institutions and the inflow to science of talented young people.

At present, the Academy of Sciences of the Republic of Tajikistan is a large modern scientific centre carrying out research on the most important problems of natural and social sciences. It defines the main trends of scientific research and coordinates the activities of scientific institutions.

The Academy of Sciences includes 17 independent scientific organizations acting in the following fields:

- physics and mathematics, chemical and geological sciences (Including Centre for Space Research);
- biological and medical sciences;
- social sciences.

Within the structure of the Academy of Sciences, the Khujand scientific centre and Pamir subsidiary are included which unite scientific centres located in Khujand and Khorog. There are 31 active members (academicians) and 51 correspondent members.

Given the new social and economic conditions in the republic, to achieve real sovereignty the necessity of fundamental restructuring of the economy and education is increasing. This requires sound scientific justification and development. The strategy of the further development of the republic, and comprehensive utilisation of its scientific, technical and industrial potential requires significant raising of the fundamental role of science in this process.

The Academy of Sciences is establishing broad international relations with scientific centres in the neighbouring and other countries of the world. International scientific and technical relations are regularly expanded on the basis of intergovernmental agreements and direct contracts between the Academy of Sciences of the Republic of Tajikistan and research centres in other countries. In particular, relations with the academies of science of the Russian Federation, Ukraine, Belarus, Uzbekistan, Kazakhstan, Kyrgyzstan and Turkmenistan are being strengthened.

Scientific activities with the Academy of Science of China are being developed, joint research is being carried out and there is an exchange of information in the field of geology and seismology. Scientific relations with some universities in the United States of America and organizations in Iran, Pakistan and Turkey are being created and strengthened. Scientists of the Academy of Sciences actively participate in the work of the International Astronomic Union, European Archaeological Association and other international organizations within UNESCO.

Over the last years the scientific and research institutions of the Academy of Sciences have received over 150 copyrights and patents of the Republic of Tajikistan and Russian Federation. This research is already being put into practice by the most important sectors of the economy such as agriculture, construction, metallurgy, chemical industry, geology and health care.

The Academy of Sciences unites the large scientific centres such as the Institute of Seismic Construction and Seismology, Institute of Chemistry, Institute of Written Heritage, Institute of Philosophy and Laws, etc.

The perspectives of the development of international relations of the Republic of Tajikistan with the countries of Europe, Far East, Middle Asia, Arab countries and United States of America are defined. Initial provisions for the integration of Tajikistan's economy into the global economy, particularly the factors and methods of economic reforms in the Republic of Tajikistan, are developed. Information and analytical reviews on the economic, political, social and cultural life of foreign countries are prepared.

Tajik Technical University

Tajik Technical University (TTU) is one of the leading higher education institutions, carrying out scientific and research activities in Tajikistan. Currently, there are about 400 teachers at the 45 faculties of the university, of whom approximately 40 per cent have scientific degrees and ranks, including 20 professors and doctors of sciences. Due to the considerable contribution of some scientists of TTU to the development of science and engineering, most of them are elected to International and Republican industrial Academies as active and correspondent members.

The growth of the scientific potential of TTU was to a great extent promoted by the establishment of post-graduate studies and the opening in 1995 of two specialized councils for defending theses for candidates of economic and architectural science.

TTU scientists participated in International competitions held in Moscow, Bulgaria and Mongolia and received awards. The scientists of TTU received over 60 copyright certificates and more than 80 positive decisions. They carry out research carried in the development of different sectors of economy of the republic of Tajikistan. The wide range of topics of the scientific research reflecting regional peculiarities is included in the republican and industrial scientific and technical programmes with regard to energy savings, natural environment protection, cleaning of water, search and use of the new highly efficient materials and constructions.

Tajik Technical University has close relations with the universities of the Russian Federation among which the Moscow State Construction Institute, Moscow Bauman Technical Institute, Moscow Energy University, etc. TTU is a member of a number of Associations of technical universities of CIS, has a cooperation agreement with universities in foreign countries and is a member of the Engineering Universities Association of Islamic States.

There is a post-graduate study faculty, doctor's degree study and training course for raising specialists' qualifications. The issue of establishment of industrial institutes of energy and communications, chemical technology and metallurgy and transport institute is currently under consideration. An Agreement has been concluded between the TTU and the Academy of Sciences of the Republic of Tajikistan.

10.2. Investments in Research and Development

Total investments in scientific research and development in 2002 were US\$ 771,645.1 (according to data provided by the 60 scientific and research organizations). Financing of scientific research and development from the state budget accounted for 91.8 per cent, financing from customers was 3.9 per cent, own investments were 2.3 per cent and external budget funds accounted for 2 per cent. Expenses for science from the state budget in 2002 were US\$ 762,709.6.

11. Other issues

11.1. Internet society initiatives –First National Conference on ICTs (19-21 December 2002)

The purpose of the National Conference was coordination of the efforts made by the interested parties in the field of development of the information society of the country which is a necessary condition for the integration of Tajikistan in the global information society.

Experience gained by the countries which have achieved considerable success in the field of ICTs, and their aspiration to utilise advanced technologies as a tool for finding their place in the global economy, bear witness to the importance of the introduction of ICTs. The Tajikistan Internet society has been significantly strengthened over the last years and it has gained sufficient experience to demonstrate how its participants may cooperate for the welfare of the country. The holding of the National Conference on the issues and achievements in the ICT sphere in Tajikistan, organized by governmental agencies, ICT associations, providers and international organizations, was not only a good example of the cooperation between these three sectors, but also helped to accelerate reduction of the internal and external digital divide by:

- increasing interest of the state authorities in the further development of legal environment and taxation;
- increasing the inflow of investments to this sector and other sectors of the economy;
- increasing the culture of the main participants of this process in the regions, which are the local authorities (khukumats);
- raising the activities of secondary and higher education establishments in the country with regard to graduation of qualified specialists that promotes development not only of mass service consumption, but also the production of these services;
- increasing of scientific potential in the field of ICTs;
- promoting local production of ICTs development that in turn will lead to accessibility of ICT equipment for all society and increase in employment of the population;
- increasing of e-readiness that will cause development of e-services (e-business, e-government, e-commerce, e-health and e-learning);
- introducing ICTs into the other sectors of the economy.

The organization of the National Conference on ICTs is an important step towards defining the main principles of the draft National strategy of ICT development.

Moreover, holding the conference at this stage may be considered as one of the preparatory events for the World Summit on the Information Society which will be held in two stages – the first stage in Geneva in December 2003 and the second stage in Tunis in 2005. This is a global initiative the purpose of which is to draft a Declaration on bridging the digital divide and setting the principles for establishing a global information society. The event is being organized by the International Telecommunication Union and is held under the auspices of the United Nations.

Results of the National Conference - Resolution

The first National Conference devoted to the development of the new ICT sector in the country started the process of discussion of the problems and perspectives of establishing and developing the information society in Tajikistan. The Conference was attended by representatives of governmental structures, Parliament, private sector and civil society as well as representatives of international organizations and experts from CIS countries.

The Conference stated the following achievements:

- understanding that the introduction and development of ICTs in Tajikistan is one of the priority trends promoting the bridging of the digital divide and integration of Tajikistan into the global information society;
- developing cooperation between state authorities, non-governmental organizations, commercial structures and international organizations in development of the information society in Tajikistan;
- activities on popularization of ICTs and raising awareness of the population of the benefits of ICTs.

The Conference stated the main problems:

- considerable difference in the level of access to information resources between the various social categories, urban and rural population, men and women.
- problem of focusing donor funds;
- availability of barriers for access to telecommunication infrastructure including entrance to the market of new operators.
- existing legal basis of telecommunication sector which does not comply with the advanced requirements;
- limited number of open resources of statistical information on ICT market;
- insufficient number of qualified employees in ICT sector.

The Conference proposed the following recommendations:

to the Government of the Republic of Tajikistan

- to elaborate and implement the National strategy of ICT development in Tajikistan;
- to improve the existing legal basis of the ICT sector;
- to elaborate and implement a programme of computer literacy raising for the managing staff of state administration authorities;
- to reform the existing taxation system in the republic in order to stimulate ICT development in Tajikistan;

to the Ministry of Communications of the Republic of Tajikistan

- to make efforts in modernization and development of the telecommunication infrastructure which is a platform for ICT development in the republic;
- to support all operators acting on the telecommunication market in introducing ICT services on all the territory of Tajikistan;

to the Ministry of Education of the Republic of Tajikistan

- to develop a concept of the introduction of e-education in the Republic of Tajikistan;
- to draft and adopt amendments to the Law of the Republic of Tajikistan “On education” with regard to distant learning.

11.2. Analysis and monitoring of ICT sector and elaboration of the National Strategy of ICT development in the Republic of Tajikistan and Action Plan

As mentioned above, in the course of the First National Conference of ICTs held in Dushanbe in December 2002 there was a recommendation to the Government of the Republic of Tajikistan to elaborate a National Strategy of ICT development in the Republic of Tajikistan in order to ensure effective introduction and development of ICTs in Tajikistan. It was also recommended to develop an Action Plan (investment projects plan) to define the concrete measures to be taken for the introduction of ICTs in the country. In the meantime it was also recommended to implement the analysis of the ICT sector (i.e. e-readiness assessment) and monitor further developments.

In this connection and in implementation of the resolution of the Government of the Republic of Tajikistan by the Order of the Minister of Communications of the Republic of Tajikistan № 6 of 21 January 2003, a Working Group on analysis and monitoring of the ICT sector and elaboration of the National Strategy of ICT development in Tajikistan was established at the Ministry of Communications. Currently the Working Group, which comprises the representatives of the republic’s Internet society including state authorities, ministries and departments, NGOs and international organizations, has started its activities. The initial stage of the analysis is the collection of information on the condition of the ICT sector including telecommunications infrastructure and the situation with regard to the introduction and utilization of ICTs in the different sectors of the economy. The main problem is the difficulty in obtaining information from all the participants of the Working Group who provide very limited data which are insufficient for implementing a comprehensive analysis. The draft National Strategy of ICT development in Tajikistan should be submitted to the Government for approval by 1 November 2003.

11.3. Global Internet Policy Initiative (GIPI)

The Public Fund Civil Initiative on Policy of Internet (CIPI) is a non-governmental and non-profit making Tajikistani organization. The CIPI objective is promoting ICT as an enabler of development in Tajikistan. Although it was established as a separate legal entity in February 2003 CIPI started its activity as the Global Internet policy initiative project of the Internews Tajikistan. This joint project of two American non-profit making organizations Internews Network (<http://www.internews.org>) and Centre for Democracy and Technology (<http://www.cdt.org>) was launched at the beginning of 2001 and has been implemented in many CIS and some other

developing countries. The GIPI goal is to promote adoption of the political and legal frameworks that support the development of Internet and other ICTs in these countries. The experience of this global project has demonstrated the efficiency of developing it into the local legal entities in many countries as well as Tajikistan. As a result the Public Fund CIPI is now continuing to implement the project goal within its framework in the country.

CIPI believes that partnership of the public and private sectors and civil society is one of the most efficient ways to make use of the benefits of ICT for the development of society. That is why CIPI closely collaborates with all local ICT stakeholders and the state ministries and agencies. To formalize partnerships CIPI has signed a number of bilateral and multilateral agreements with the Ministry of Communications, universities, associations and Internet service providers.

It is a well-known fact that new technologies constantly change the development process in the world and are considered as an enabler of:

- Human development;
- Economic development of society;
- Poverty reduction;
- Job creation;
- Equal access to ICT benefits.

ICTs are considered as a robust enabler of development as well as a promoter of the globalization process. The unprecedented opportunities of digital technologies are enhancing the development of the global information and knowledge-based society.

Tajikistan as a country in transition recognizes the benefits of ICTs and is endeavouring to use them as a tool for the socio-economic development of the country.

CIPI in collaboration with its partners has organized various ICT events in the 18 months of its activity. The main objective of these events was raising population awareness on ICT potential to develop different industries as well as to promote overcoming the growing digital divide in the country.

A few of the events organized by CIPI in 2002 are listed below:

- 16-18 January, Seminar on “ICT for Education Development”. The targeted group was university teachers of information technologies (IT). It was organized in collaboration with TARENA¹ and the Technological university of Tajikistan (TUT);
- 15 February, Roundtable discussion on “Internet and Legislative Authority”. The targeted group was representatives of Majlisi Namoyandagon (lower chamber) of the Majlisi Oli (parliament) of Tajikistan and the Administration of the President of Tajikistan;
- 8-22 August, mobile roundtable discussions on “ICT as Enabler of Development” held in the country’s Southern cities such as Qurghontepa, Kulob, Khorugh and Gharm;

¹ TARENA – Tajik Academic Research Educational and Networking Association works to develop computer networking in the academic community of the country and build its national intranet. It is an official partner of the NATO Science Programme.

- 5 November, Seminar on “Digital Divide to Digital Opportunities”. Organized in collaboration with the Tajikistan President Administration, UNDP, associations of Communications operators and TANTIS², internet service provider BabilonT, and other Internet stakeholders;
- 19-21 December, First National Conference on “Tajikistan integration in the Global Information Society”. Organized in collaboration with the Tajikistan President Administration, Ministry of Communications, OSI Tajikistan, UNDP, Tajik Development Gateway project of the Communications operators associations, TUT, TANTIS, TARENA, providers Babilon-T and CADA.

Each event had an outcome consisting of recommendations of participants. In addition each event was a consequence of the previous one. For instance a working group was created from among the representatives of partners to organize efficiently mobile roundtable discussions. This working group has played an important role in forthcoming ICT events and promotes fair competition in the Internet local market. It is one of the founders of a newly created association of Tajikistani Internet users (November 2002) ISOCToj.

The November seminar proposed providing a tax incentives environment as one of the efficient ways to achieve new technologies penetration throughout the country. This recommendation was sent to the Government of Tajikistan and it is now under the consideration of the authorized ministries.

One of the efficient results of the local ICT stakeholders’ partnership was organizing the first National Conference on the information society. The conference recommendation to create a working group comprising experts of various industries in order to work out a national strategy on ICT for development was supported by the Government of Tajikistan. Supervised by the Ministry of Communications, this working group was established in the beginning of this year and has been working on its mission. It is a privilege for CIPI to be also part of this group.

CIPI activity is financially supported by the Open Society Institute – Aid Foundation in Tajikistan (Soros Foundation), United Nation Development Programme, Internews Network, Markle Foundation that considers new technologies as an enabler of development.

11.4. Association of Communications Operators (ACO)

ACO was registered on 28 December 1998. Its main objective as laid down by its Statutes is to establish a system of mutual support within the framework of professional solidarity and protection of rights of all ACO members. The association aspires to promote mutually beneficial relations between its members in the sphere of communications. Listed below are ACO member agencies:

- Joint stock company “Elecom” – mobile radio communication services (Kurgan-Tube);
- Joint stock close company “Zenit” – satellite communication systems;

² TANTIS – Tajik Association for New Technologies and Information Systems unites a number of ISPs and news agencies to develop the information society in Tajikistan.

- Ministry of Communications;
- Joint stock company “Badr” – telecommunication services (regional centre of Khujand);
- Joint stock close company “Trunk” – trunking communication systems;
- “Telecom Technology” – the first Internet Service Provider in the Republic of Tajikistan;
- “Jahon page” – paging communication systems;
- “Babilon – T” – a major Internet Service Provider in the Republic of Tajikistan;

ACO members participated in implementation of the following projects:

1. Installation of a Wave-LAN network between various institutions of the Tajik Academy of Sciences.
2. Organization of an e-mail centre on the premises of the Tajik Academy of Sciences (both projects provide a direct link to the rest of the world for scientific workers of the republic).
3. Opening of free e-mail centres in 6 cities of the republic (about 20,000 people use the services of the free e-mail centres);
4. Development of a project aimed at establishing a digital ring in the republic with the participation of several independent providers;
5. Participation in negotiations between ISPs and governmental agencies about price formation policy, etc.;
6. Participation in “TARENA” project implementation (installation of a computer network to include institutions of higher education and research institutes for them to participate in the virtual Eastern European University).

The projects were supported by Soros Open Society Institute, Academy of Sciences of Tajikistan, CADA. Technical assistance was provided by engineers – members of the ACO.

Conclusion

The Republic of Tajikistan, like many developing countries, is in a period of economic transition, where the population has low incomes, purchasing ability is low, and the majority of population is below the poverty level and cannot afford to use the new ICT services that have appeared due to the introduction of advanced technologies. This situation was to a great extent caused by the civil conflict in the republic that occurred in the mid-1990s after the country gained its sovereignty. As a result of the conflict, the economic growth of the country collapsed, enormous damage was done to the country’s infrastructure, a deep economic crisis took place due to which the population’s standard of living declined. The telecommunication sector was also badly damaged during the conflict, leading to a considerable lagging behind in its development and slowing down of introduction of advanced information and communication technologies.

However, in spite of the serious consequences of the conflict, a gradual rehabilitation of the economy is taking place and people’s lives are returning to normal. Over the last years, due to the efforts of the Government with the support of international organizations, a certain economic growth was achieved, the gradual recovering of infrastructure including telecommunications is continuing and the population’s standard of living is rising. One of the major elements of state policy is the reduction of poverty by means of implementation of the Poverty Reduction Strategy.

Notwithstanding the existing difficulties, at the moment the Republic of Tajikistan has a certain potential for building the foundation for knowledge-based economy. The building of knowledge-based economy, and the introduction and use of advanced information and communication technologies may lead the country to a new, higher level of development in all spheres of human activities and ensure integration of the country into the global information community. The main objectives for building the platform for knowledge-based economy are bridging the digital divide within and outside the country and ensuring universal access to ICTs.

Each person should have the opportunity to access information and ICTs irrespective of sex, nationality, religion and place of residence. Modern ICTs provide new opportunities for activities in the field of improvement of people's health (telemedicine), raising of education level (comprehensive information resources of Internet, distant learning), stimulating economic development (e-commerce), as well as broadening of people's opportunities for participation in political and social life. The introduction of ICTs and building the knowledge-based economy in Tajikistan significantly assist raising the welfare of the population and reducing poverty.

The country should pass through the process of creation of an information society, development of the concept of and establishment of conditions for transition to knowledge-based economy. Thus, it is necessary to elaborate and implement the national strategy for ICT development with the participation of the related ministries, private sector, NGOs and civil society. This strategy should also be oriented to strengthening international cooperation of Tajikistan with foreign countries, attracting investments in the ICT sector, at the local, regional and international levels, adaptation of the experience of the other countries, use of new technologies in government, economy and the social sector.

To reach the above-mentioned goals with regard to ICT introduction and development and successfully build the knowledge-based economy, the assistance of the donor community would be necessary and appreciated.

ANNEX

KNOWLEDGE-BASED ECONOMY INDICATORS

1. Network Access

1.1. Information infrastructure

- Telephone penetration (number of mainlines per 100 people)
Fixed telephone penetration is 3.71% in the whole country and 1% in rural areas.
- Mobile wireless penetration (%), growth trend
Mobile cellular penetration is 0.34%. Number of mobile cellular subscribers in 2003 was 21.4 times the number in 2001.
- Total number of mobile telephone subscribers
Number of mobile cellular communication subscribers is 21,647.
- Total number of mobile telephone subscribers per 1000 people
Total number of mobile cellular subscribers per 100 people is 3.4.
- Wireless penetration (percentage of the population)
Wireless technologies (e.g. wireless local loop or WLL) are not yet used, but it is planned to use them for rural areas.
- Total number of cable TV subscribers
547 registered cable TV users (including “TV-Service”), however, in reality this figure is a little higher.
- Cable TV subscribers, % of households
Approximately less than 0.5% of households.

1.2. Internet availability

- Total number of ISP providers
6 primary ISPs and 7 sub-provider ISPs. 2 companies have been issued licenses, but have not yet started commercial operations.
- Prevailing types of ISPs’ networks (microwaves/radio...)
Mainly public telephone network’s infrastructure operated by JSC “Tajiktelecom” Some ISPs use the Radio Ethernet and ADSL technologies.
- % of unsuccessful local calls
On the public telephone network more than 20%.
- Is there competition among ISP providers?
ISPs are competing in providing more and more affordable tariffs for Internet access and e-mail services, most hard competition is in Dushanbe.
- What are the opportunities for public Internet access (libraries, Internet-cafes, etc.)?
Mainly public access centres and Internet-cafes.
- Are there dedicated line lease possibilities? Are there competing providers?
It is possible to lease dedicated lines, however JSC “Tajiktelecom” has the monopoly.

1.3. Internet affordability

- What are the prices of Internet access (unlimited access, per minute charge)?
Average tariff per hour is US\$ 1.5-2.5, unlimited Internet access is about US\$ 200.
- Is it affordable for majority/minority (compare with average salary/income)?
Due to the low income of population when average salary in the country is US\$ 10 the prices for Internet are not affordable for the majority of population.
- What are the rates for leasing lines?
About US\$ 400 (lump-sum) plus monthly rentals from US\$ 135 to 2000 depending on speed of data transmission.
- Are the rates affordable for small businesses or individuals?
These tariffs are not affordable for small businesses and individual businessmen.

1.4. Network speed and quality

- What is the percentage of successful calls?
At the PSTN 50% to 80%. Mobile GSM operators 80% within the city and over 90% within the network.
- What is the quality of voice connection?
Rather low, there is often noise and interference as well as cross-talks, dialling is worse during peak hours.
- How many faults are reported per year for each 100 telephone mainlines?
More than 100 per year for each main line.
- How long does it take to clear faults (48 hours, a week, month)?
Several days to several weeks, sometimes (when cable lines are out of order) several months for reported mainline problems depending on the fault and difficulty of the repair.
- Which services are supported by local telecommunications infrastructure: e-mail, high-speed modem connection, what is the maximum speed?
Local telecommunication infrastructure (PSTN) supports dial-up Internet access with a speed of 33.6 Kbps, Internet access by dedicated lines with speed of 33.6 Kbps and 56 Kbps and e-mail by TCP/IP and X-25 protocols.
- Are there sufficient backbone facilities/networks? Even for peak demand?
Backbone network based on outdated analog equipment is insufficient leading to permanent overloads and low communication quality. Quality of data transmission through the network is significantly reduced during peak hours.
- What is the percentage of packet loss by the network?
Significant and regularly disruptive for any online activities.

1.5 Hardware and software

- Are there local IT hardware/software sales points?
There are many hardware and software resellers mainly located in the capital of the country and the largest cities. There are 18 licensed suppliers of telecommunication equipment. Almost all ISPs are engaged in supply of IT hardware/software.

- Is the price of IT hardware/software affordable for majority/minority of citizens/businesses?
Affordable mainly for medium and large-sized business and less affordable for small businesses, public organizations and in the lowest extent is affordable for individuals. For the majority of the rural population IT hardware/software is not affordable
- Is there software in local languages?
Not available.
- Is software imported or adapted locally? (percentage of the imported, adapted, produced locally hardware or software in total number in circulation)
All software is imported. Already adopted software in Russian is imported from CIS countries, to a lesser extent software in English is used.
- Is there a broad variety/some/very few software business applications?
Imported software business applications for different kinds of activities are available. Production of software in the country is not available.
- Are the IT software/hardware retail and wholesale markets competitive and vibrant?
Quite developed and competitive, however, in spite of competition prices remain high and are not affordable for the majority of the population.

1.6. Service and support

- How long is the waiting period for telephone line installation? (total number of those on the waiting list; waiting period: days, weeks, months, years)
Main telephone line can be installed within several weeks or months is there is a technical possibility, if not people can wait for years (cable lines available). In rural areas people can wait for the main line installation for several years.
- How long is the waiting period for reported telephone line problem to be fixed? (minutes, hours, days and etc.)
Telephone line faults – may be from several days to several weeks depending on the complication of the faults; cable line faults can be fixed within several months.
- Are there software developers, web designers, network administrators and other technical personnel, and how many (working where, employed/unemployed)?
Mainly technical personnel, web-designers, network administrators etc. employed by ICT related companies, state agencies and organizations, banks, higher education establishments and scientific organizations. They can be employed full-time and many of them work part-time on a contract basis.

2. Networked Learning

2.1. Schools' access to ICTs.

- Are there computers in schools? How many students per computer? At which level (university/secondary/primary)?
The majority of primary and secondary schools do not have computers. Mainly available in schools in urban areas, not available in schools in rural areas. 2.7 pupils per computer per school. Computers are available mainly at university level.

- Who has access to computers (technical staff/faculty/students)?
Teachers and technical staff have unlimited access. Students can use computers for group work in classes, after classes student access to computers is closed.
- What is the quality of hardware (386/486/Pentium...)?
In schools –old generation models such as 386 and 486; at university level 386 and 486 as well as some of the newer generation (Pentium-II, III and even IV).
- Are there LANs in schools? Regional WANs? National school networks?
LANs in schools are not available. There are LANs in the universities. Universities and institutes are not connected by the LAN.
- Do schools have Internet connectivity? Is it dial up or through a leased line, wireless?
No. In universities and institutes 105 computers are connected to Internet.

2.2. Enhancing education with ICTs

- What is the percentage of students and teachers using computers? (in universities/primary schools/secondary schools)
*1,638,106 students at primary and secondary schools, with 165 students per PC.
96,583 students at universities and institutes, with 88 students per PC.*
- What are the computers used for? What is the level of computer literacy/skills?
Few teachers and students at primary and secondary schools use computers during the studying process. In the senior classes of secondary schools there are lessons of informatics and computing equipment including computer practice. Computers are more often used by teachers and students at university level.
- What is the level of information and communication technologies integration in the curriculum?
ICTs are not integrated in the curriculum except for some technical subjects.

2.3. Developing the ICT workforce

- Are there training opportunities for programming, maintenance, and support?
There are limited opportunities for training in ICT skills.
- Who is offering them (public/private centres)?
There are technical universities which train specialists in the field of automated management systems, informatics and computing and telecommunications. There are private training centres which provide certificates upon graduation. Prices for private training are high and not affordable for the majority of the population.
- Are they affordable for majority/minority of the population?
Training at universities is either free of charge, but the competition for entering these faculties is strong, or on a contract basis, but the cost is high. Cost of private training is high and not affordable for the majority of the population.
- Is there an on-line training available?
No.
- Do employers offer training?
Training is offered by those employers who have computers and LANs.

3. Networked Society

3.1. People and organization online

- What is the percentage of the population which:
 - Is aware of Internet existence?
Majority of population have not heard about Internet and do not know anyone who has ever used it. Mainly urban population know about existence of Internet.
 - Has used Internet recently?
Less than 0.5% of the population. Mainly used by people living in urban areas.
 - Uses Internet regularly?
16,255 regular Internet users is. Majority of users do not use Internet access regularly, only when necessary through Internet-cafes and public Internet access centres.
- What is the structure of users by gender, age, social and educational status?
Mainly 30-35 age group, working for state authorities, public and private organizations, ICT related companies, businessmen, journalists, etc. Most have higher education and all have secondary. Majority of users are male.
- What is the number locally registered domain names (per 1000 people)?
About 200.
- Is there advertising for online companies, and how common is it?
Mainly advertising local ISPs and mobile companies through newspapers, radio and TV.

3.2. Locally relevant content

- Are there (and how many: no, few, some, many) websites:
 - Providing local topics?
Yes, mainly in Russian and some have an English version.
 - In local languages?
Websites in national language (Tajik) are almost not available.
- How often are they updated and is content static or dynamic?
Content is mainly static and is not often updated. The information sites is updated in connection with certain events.
- Are the above websites created in the community?
Yes; there are also websites created by Tajiks who live or work outside the community.
- Are bulletin board systems, Usenet groups, newsletters, and/or listservs in use?
Yes, but not widely enough.
- Are there opportunities for Web-related training?
Yes, provided mainly by private training centres.

3.3. ICTs in everyday life

- Does the population include information and communication technologies (phones, faxes, pagers, computers) in everyday life?
A minority of the population has the possibility of using ICTs in everyday life.
- 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.)
All mentioned kinds of ICTs are available, however the more affordable for the population are fixed phones, less affordable are paging, Internet, e-mail and mobile phones. They are not widely used for household commerce and in everyday life.
- Are there PCs with e-mail capability available (cyber cafés, telecentres) and are they being widely used?
Yes, at 188 Internet-cafes and public Internet access centres. Minority of individuals do not have own PCs at home with e-mail connection.

3.4. ICTs in the workplace

- Do employees have:
 - (Un)limited access to phones?
Limited access to fixed phones, they may use them for unlimited local calls. For the long-distance calls there are limitations. Very few employees (managers) have service mobile phones and international calls.
 - Personal e-mail accounts?
The majority do not have personal e-mail accounts.
 - Internet access from personal workstations?
The majority do not have access to Internet from their workstations. If there is corporate network (LAN) connected to Internet they may have limited access.
 - E-mail and web addresses on business cards?
If corporate website or e-mail account is available it is indicated on employees' business card. Personal e-mail accounts and websites may be indicated only on personal business cards.
- What percentage of businesses and government offices has computers, how many of them, how many employees use them?
Majority of businesses and government organizations, mostly in the provincial centres and cities of the Republic, have PCs. More than 40% of the employees use PCs in their daily work.
- Are they networked?
A minority of businesses and organizations have local computer networks.
- Is business mostly conducted in person or by e-mail, or are there data sharing, enterprise, reporting, transaction, and research applications? How intensively are they used?
Almost all business is carried out in person, by phone or fax or paper-based; correspondence and exchange of data by e-mail is at the initial stage.

Are there efficiency gains resulting from the use of ICT systems?
It is recognized that use of ICTs will lead to efficiency gains in the business. The main barrier to introducing ICTs in business is the high cost of the equipment and telecommunication services as well need to train employees in computer literacy.

4. Networked Economy

4.1. ICT employment opportunities

- Are there opportunities for technically skilled workers within the country?
Yes. As a result of telecommunication market development, demand for highly qualified specialists is increasing, however their number is decreasing because of migration.
- Are companies from outside of the country investing in IT related projects?
Local investments in ICT-related projects in large amounts are not available. There are some foreign investments in established private operators (mobile and ISPs) and loans for modernization of PSTN from EBRD. Local investors invest only in small business.
- What is the portion of knowledge workers and information related business in the economy? (percentage of labour force, percentage of GDP)?
According to preliminary assessment in 2002 share of communications sector in total GDP accounted for 0.7%.
- Are businesses considering IT in their strategies?
Majority of small, medium and even large-sized businesses do not include ICTs in their strategies due to high costs, but they recognize that ICTs may help to gain efficiency.

4.2. B2C electronic commerce

- Do local businesses have websites and how many? Is content current or static?
The majority do not have websites. Mainly, companies related to ICT services provision, some state authorities, higher education establishments and individuals have websites. Content of the websites is mostly static.
- Are there online B2C transactions, or are transactions mainly oral and/or paper-based, phone or fax-based?
Mainly, B2C transactions are oral, paper-based, phone and fax-based. Correspondence related to business activities are carried out by phone, fax or e-mail.
Is online retail noticeable component of the overall commercial activity?
No. The B2C segment is at the initial stage of development.

4.3. B2B electronic commerce

- What are the sources of market information, are they sufficient to provide transparency?
Almost completely unavailable. There are a few websites where it is possible to obtain such information. They are not sufficient to provide transparency.
- Are there online B2B transactions, or are transactions mainly oral, paper-based, phone or fax-based?
Mainly transactions are oral, paper-based, phone and fax-based, correspondence and communication related to business activities is carried out by telephone, fax and e-mail.

- Can transactions be conducted on-line without any paper documents? Is the process automated? Does it allow on-line tracking, monitoring?
Transactions cannot be conducted on-line. To carry out transaction and transfer money a non-electronic signature is required.
- What portion of B2B activity is conducted on line? Is there gain in efficiency?
A very small part of B2B activities is conducted on-line.

4.4. E-Government

- Number of government resources online? Does it include information, hours of operation, any services? Is information current and relevant?
Most government organizations do not have websites. Mainly, general information on the activities of governmental organizations is placed on websites, static and rarely updated.
- Is there online interaction between government and citizens, or is interaction mainly oral, paper-based, phone or fax-based?
Interaction between the government and the citizens is mainly oral, paper-based, phone and fax-based. There is partial electronic documents exchange between the governmental agencies by e-mail, but not with citizens.
- Is there online interaction between government and suppliers and contractors, or is the interaction mainly oral, paper-based, phone or fax-based?
Mostly oral, paper-based and phone or fax-based.
- Is it possible to download applications from the websites?
No. It is sometimes possible to download some documents.
- Can citizens apply for permits, licenses, and taxes on line?
At the moment citizens do not have any possibility of doing this.

5. Network Policy

5.1. Telecommunications regulation

- Is liberalization of telecommunications sector planned or implemented?
Mostly telecommunication market is liberalized, there are several private operators on the market of mobile cellular communications, paging and data transmission (Internet and IP-telephony). In 2006 it is planned to liberalize international telephony.
- Is there competition between telecommunications service providers?
Yes, in the mobile cellular communications, paging and data transmission markets (Internet access and IP-telephony). There is a monopoly in the market of fixed telephony (local and long-distance) due to lack of operators able to build appropriate infrastructure. Monopoly for international telephony will remain until 2006.
- Is broadband Internet access offered?
No.
- Is regulation set and enforced by an independent body?
By the end of 2003 it is planned to establish an independent regulatory authority in the field of communications to carry out licensing, commercial radio frequency spectrum, control of fair competition, tariffs regulation etc.

5.2. ICT trade policy

- Do tariffs or other restrictions (technical standards, domestic regulation, etc.) exist?
No. The barrier to trade in the field of ICTs is the high price of ICT equipment.
- Are there restrictions in the service (including information services) sector?
There is the restriction of tariffs for socially important ICT services which should be affordable to low income categories of the population.
- Are there disproportional taxes on electronically delivered services?
There are no non-proportional taxes for the electronically delivered services.
- Is Foreign Direct Investment in IT sector existent, and is it encouraged, discouraged, restricted?
Direct investments to ICTs sector exist (e.g. EBRD loan to JSC “Tajiktelecom” in the amount of US\$ 13 million). Favourable environment for foreign investments is being created, legal basis is improved (e.g. new Law of the RT “On telecommunications”).

6. Media

6.1. Radio, TV and newspapers

- Number of Radio and TV stations, newspapers
Currently, about 35 TV and broadcasting stations most of which are non-governmental and about 106 printed editions.
- The size of audience/circulation.
Tajik State Television (TVT) covers 85% of the population or 5,419.1 million people. Number of printed editions per year is 7.2 million.

6.2. Employment in the media

- Number of employees in the media
Information not available.
- Trend: is the number increasing/decreasing?
Given the increase of number of mass media, the number of employees is increasing.

7. Intellectual Capital

7.1. Patents

- What is the number issued per annum?
From 1993 to 2001 the National Centre for Patents and Information received 619 applications for issue of patents for inventions; in 262 cases a patent was issued.
- What are the trends?

7.2. Copyrights

- What is the number issued per annum?
Data not available.
- What are the trends?

7.3. Licenses

- What is the number issued per annum?
Ministry of Communications (State Inspectorate of Communications) issued about 60 licenses from 1994 to 2002 for different kinds of activities in the field of communications.
- What are the trends?

7.4. Trademarks

- What is the number issued per annum?
In 1993-2001 the National Centre for Patents and Information registered 4,499 trademarks of which certificates were issued for 4,043.
- What are the trends?

7.5. Scientific and/or tech associations

- List with a brief profile
In Tajikistan a number of scientific and technical associations exist, Science and Education Development Association and TARENA work particularly in the field of ICTs.

8. Education

8.1. Higher education

- Total number of higher education establishments (public/private).
33 including subsidiaries, all of them are public.
- Total number of students (total average per annum, in the private and public sector)
96,583
- Prevailing specializations (distribution of students among the fields)
Most popular are specializations related to economy, finance and loans as well as law. Table of students' specialization distribution by field is provided in Chapter 8 above.
- Cumulative number of population with higher education degrees (total and in science and technology fields)

8.2. Distant learning

- Distant learning facilities
Mainly carried out by letter correspondence, Internet and e-mail.
- Number of students trained per centre
84 students at the Centre of Distant Learning of the Tajik Technical University.

9. Labour Force

9.1. Employment in science and technical fields

- Number of employees and trends in the fields
In 2002, 4,200 employees in the field of science and scientific service, actual number of people employed in the field of information and computing service was 400. There is little increase of the number of employees in these fields.
- Compensation rates in the fields (average salaries)
Average salary in the science and scientific service US\$ 12 in 2002, in the information and computing service – US\$ 10.3.

9.2. Employment in electronics industry

- Number of employees and trends in the fields
Information on the exact number of employees in the electronics industry is not available.
- Compensation rates and trends in the fields
Information on compensation rates is not available.

9.3. Employment in telecom industry

- Number of employees and trends in the fields
4990 employees in telecommunication sector, 373 people employed by private telecom operators. In the course of telecommunication market development the need for technical specialists is considerably increasing.
- Compensation rates and trends in the fields
Average salary in telecommunication sector is US\$ 36.7, there was a salary increase of US\$ 9 from 2001.

10. Research and Development

10.1. Research institutions

- Number of research institutions
In 2002, 60 scientific institutions and organizations engaged in research and development, including design and development organizations, independent scientific and research organizations etc.

10.2. Investments in research and development

- The total amount
In 2002, US\$ 771,645.1 investments to scientific and technical research and development.
- Government and private business breakdown of total investment in research and development
Financing of scientific research and development from the state budget accounted for 91.8%, financing from customers was 3.9%, own investments were 2.3%, external budget funds were 2%. Expenses for science from the state budget in 2002 were US\$ 762,709.6.

