e-Bulgaria

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ICT DEVELOPMENT AGENCY

BULGARIA DEVELOPMENT GATEWAY

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EXECUTIVE SUMMARY

"**E-Bulgaria**" is a comprehensive assessment tool which measures the state of ICT infrastructure, and the availability and maturity of usage of Internet and other ICT-related services in Bulgarian society, economy, government, and education. The assessment uses a methodology that was developed, and piloted in 2001 with the support of the World Bank's *info*Dev program. It is based on a number of synthetic indicators covering five major categories: ***e-access*** *(to converging ICT infrastructure)*, ***e-education*** *(learning)*, ***e-society*** *(penetration and usage on a personal level)*, ***e-business*** *(economy)*, and ***e-government*** *(and policy)*. A composite **e-Bulgaria Index** is thus constructed on the basis of a questionnaire, and a set of quantitative indicators.

The first report in this series was published in 2002[1], and its findings and recommendations were provided to Bulgarian government institutions, and other key stakeholders in the private sector, ICT industry, NGOs, and the international community. It served as an advocacy tool in sensitizing local politicians and policy-makers on the impact of ICT on the economic and social development of the country; a resource tool for the Ministry of Transport and Communications in preparing its eEurope+ progress assessments; as well as a promotional tool in publicizing Bulgaria's performance with respect to ICT among the international donors and investment community.

The present report traces the progress of Information Society developments in Bulgaria over the period 2002-2004. In an attempt to grasp the different characteristics and phenomena which transform our perception and understanding of the world, economy, and society—reflected in the prefixes assigned to virtually every word, such "***e-***" (for electronic), "***i-***" (for Internet), "***m-***" (for mobile), "***k-***" (for knowledge), and "***w-***" (for wireless)—*e-Bulgaria* emphasizes global **convergence** trends (different infrastructures and access devices, services, applications and content), and their impact on developments in the country. Among other issues, the *e-Bulgaria* assessment considers convergence through VoIP; growing LANs, as a transition step to broadband technology; entertainment uses of ICT; e-learning, and others.

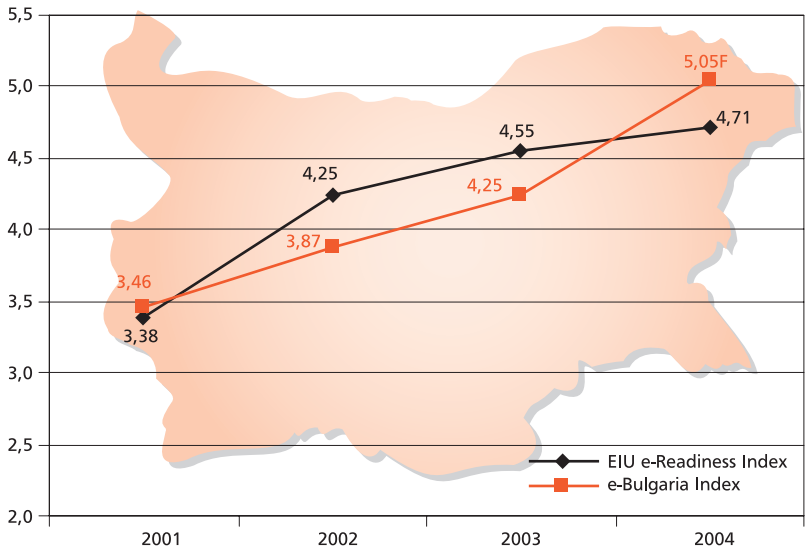
The report is divided in five sections, corresponding to the component categories of the *e*-Bulgaria Index.

[1] As *Bulgaria: ICT Infrastructure and e-Readiness Assessment*, ARC Fund, Sofia, 2002

MAIN FINDINGS

The *e*-Bulgaria Index illustrates a stable improvement in Bulgaria's readiness to utilize the capacity of new ICTs for its sustained economic and social development. The index value is closely linked to GDP, with a linear increase in the ratio of e-Bulgaria Index to GDP growth rate over time. This fact could be interpreted by the *direct effect* of higher ICT spending resulting in increased penetration and usage, and the *cumulative effect* of increased efficiency in the economy due to previous improvements in the *e*-Bulgaria situation.

FIGURE 1: E-BULGARIA INDEX TREND



Source: ARC Fund (index for 2004 is a forecast); Economist Intelligence Unit

The overall *e*-Bulgaria Index shows a linear growth of approximately 0.40 index points per annum in the period 2001-2003, but this growth reveals different dynamics across the specific sectors.

E-ACCESS

In terms of ***network access***, a significant growth in international Internet connectivity—both via terrestrial and satellite lines—is observed (i.e. over 100% growth in total capacity in 2003, following a slow-down in 2002). The ISP market continues to be a typical oligopoly, with a growing concentration over the last two years. Affordability of Internet continues to improve, but is limited by the large share (up to 80%) of telecommunication costs in the end-user total price.

The rapid growth in mobile subscriptions continues the trend from previous years, accompanied by a respective increase in the frequency of use of mobile phones. (15.3% of the population over 18 years of age used mobile daily in 2003, compared to 10.2% in 2002.) Voice over IP (VoIP) has emerged as a service with stable usage parameters. Survey data suggest that VoIP adoption on a personal level remained unchanged in 2003, compared to the previous year, but the penetration and usage by business organizations grew significantly.

In 2004 connectivity is growing even faster (compared to its 2003 level) due to the launch of new international ground lines, further development of high-speed LANs (which could induce a new content divide of locally vs internationally hosted content), increased competition and convergence trends on the mobile communications market, introduction of Wi-Fi hot-spots, and planned integration of the government's physical networks. Affordability marks a marginal increase, as disposable incomes are growing but not enough to cause significant changes in this indicator.

E-BUSINESS

Economy and ***businesses*** experienced the fastest growth over the last three years, compared to the weaker performance of the public administration, society, and, especially, the education system. Despite the fact that in 2004 the majority of active businesses are "***connected***" (i.e. equipped with computers and Internet, and about a third have websites), and with ***improved efficiency*****,** the transformation into "*knowledge businesses*" has not yet taken place. Only a small fraction of firms have installed integrated information systems, and a marginal share is engaged in any form of online commerce. Experience from the implementation of ERP systems in both foreign and domestic companies suggests that *low managerial capacity*, rather than insufficient financial resources or technical labor, remains the major obstacle to greater ICT adoption by the business sector.

E-EDUCATION

The ***education system*** seems less capable of coping with the new demands for digital and life-long learning, which could present a serious long-term threat to the socio-economic development of the country. In 2001 education was assessed as a leader in terms of preparedness to use new ICTs but, since then, its position has deteriorated vis-à-vis other e-readiness categories, such as *e-access*, *e-government,* or *e-business*. The availability of computers at schools continues to be largely insufficient. PCs and Internet are not yet used in teaching of non-IT courses. Where available, the majority of PCs are still relatively outdated, and only a small percentage of schools have websites. Despite the excellent performance of Bulgarian students at international Olympiads in mathematics and informatics—where Bulgaria consistently ranks among the top three countries—the average level of secondary education deteriorates due to chaotic reforms that have failed to enhance the efficiency and quality of the education products. Even one of the country's greatest assets—its trained IT human capital—seems to be the result of self-education and peer-learning, more than a product of the formal education system. The experience of several IT companies which failed to rapidly expand their operations in terms of number of employees indicates *managerial deficiencies and low absorptive capacity*, resulting from an inefficient learning and education system. The recent launch by the Bulgarian government of an ambitious "i-School" program could improve the e-education index performance beyond 2004 but results are yet to be seen.

E-GOVERNMENT

Significant improvements are observed in terms of computerization of government offices, and introduction of several pilot **e-government services,** including also positive developments at the local level related to provision of e-services by several regional courts and municipalities. In general, however, there is still a lack of coordination, strong political will, and dedicated financing for implementing the strategic priorities and policy documents adopted by the Bulgarian Parliament and the Council of Ministers in the field of e-government and ICT sector development. Until now government efforts have focused primarily on the provision of online services to citizens, despite the fact that demand for services to businesses has been greater. Pilot projects implemented by individual ministries seem rather autonomous and fragmented, and are not the result of a coherent e-government strategy implementation.

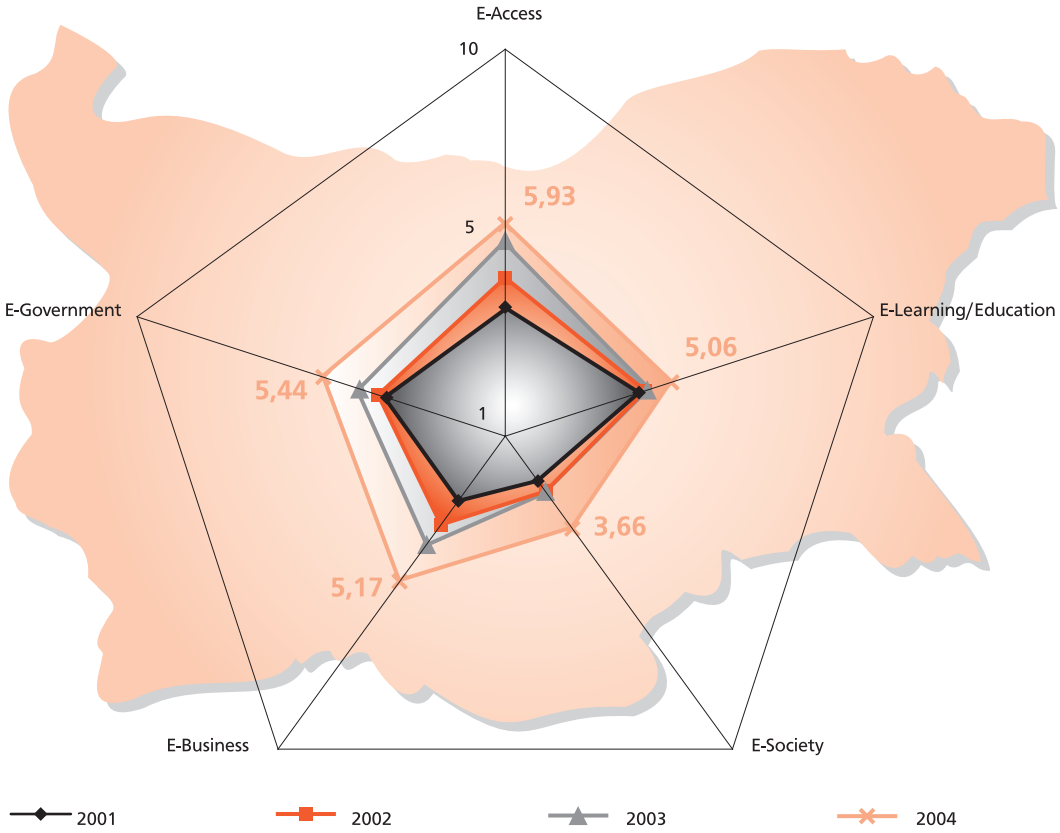
E-SOCIETY

While the share of Internet users continues to grow rather slowly, and the overall levels remain between 12% and 19%, the frequency of Internet usage is growing, suggesting specific consumption patterns related to the use of online media, personal communications and, eventually, online orders, reservations, and payments of utilities. The language divide is no longer considered a great barrier to Internet usage, as it was before 2001.

The levels of PCs and Internet penetration in households continue to be low, compared to other Central and East European countries. The proliferation of online video, music and games is becoming a major factor for the faster uptake of home PCs in 2004.

At present, Internet is predominantly used at workplaces, and this trend is unlikely to change in the foreseeable future. The "Internet services" indicator—the only one to mark any significant change in 2002-2003—continues to grow at a very good rate. Overall Internet penetration (including also secondary school students) is expected to reach over 20% by end of 2004, thus creating a sufficient demand for various e-services.

FIGURE 2: E-BULGARIA INDEX 2001-2004



Source: ARC Fund

E-ACCESS: AVAILABILITY, AFFORDABILITY, AND QUALITY OF NETWORK ACCESS TECHNOLOGIES

This section describes the level of availability, affordability, and quality of key infrastructures supporting electronic communications in Bulgaria. It provides an overview of the level of development of fixed and mobile telephone networks, the provision of Internet access through cable television networks, satellite, or fixed wireless connections. An emphasis is put on the emerging opportunities after the full liberalization of the telecom market in Bulgaria (since January 2003), and the present trends toward provision of affordable services of better quality to end-users. Other issues taken into account include the main actors on the market, and how the competition is driving Internet developments.

1. Telecommunication Networks

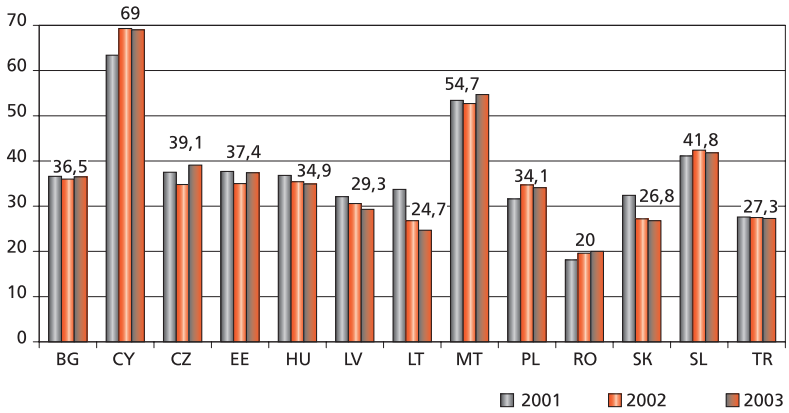
The Bulgarian telecommunication market continues to be dominated by the already privatized, in 2004, Bulgarian Telecommunications Company (BTC Ltd.) Until December 31, 2002, BTC Ltd. had a monopoly on the provision of basic telephone services (local, long-distance, and international) and leased lines.

At the beginning of 2003 the market was fully liberalized, and in the course of 2003 individual telecommunications licenses were granted to 6 new alternative operators: Orbitel, NetPlus, Global Tech Bulgaria, East Telecommunications Company, Nexcom Bulgaria, and BOL.BG. Although most of these operators have targeted mainly corporate clients, there is some optimism for the provision of alternative services to end-users. For example, the company CableTel, which obtained the rights of telecommunications operator through the acquisition of Global Tech, established a fiber optic line between Sofia and Plovdiv, and announced its intention to build a telecommunication network by 2005 in the big cities, aimed at providing telephone, Internet, and cable television (CaTV) services to end-users. CableTel is also planning to provide the "last mile" access to other operators. Other alternatives also exist: The National Electricity Company and Bulgargas have built their own fiber optic networks; the latter has even obtained a license for data provision. The competition potential of the CaTV operators should not be underestimated either, since their networks have penetrated[2] 63% of all households by the end of 2002.

With the coming competition on the market, BTC Ltd. will be forced to focus on the technological upgrade of its network, mainly through new digital switching and transmission infrastructure. Although the digital backbone of the country is already in place, there is still a lot to be done in order to fully digitize the network at the local level. This is extremely important for the development of modern telecommunications and value-added services. Presently, ISDN technology has a very low penetration, and ADSL was only recently introduced at limited locations. The main barrier for them is the low digitization of the network: 25.53% at the end of 2002[3] with estimates of 40-45% at the beginning of 2004. Among the EU candidate countries (CCs) and the new member states Bulgaria has the lowest level of digitization–Cyprus, Malta, Slovenia and the Czech Republic have fully digital networks, while the others have higher than 70% digitization. In addition, it should be noted, that in many cases the replacement of old lines reaches only the residential buildings and not the end-user equipment, thus the expected much better quality cannot be achieved.

Among the CCs, Bulgaria had one of the highest teledensity at the end of 1989: 30 lines per 100 inhabitants, and this number has grown in the past decade. In 2001 the telecommunications penetration reached its limits. As with many CCs, a slight decrease in fixed lines was observed. The rising prices of short and long-distance calls and the growth of mobile phones led to a drop-out rate of 6.6% among home users of fixed telephones in 2003[4]. Nevertheless, in 2003 Bulgaria still had one of the highest teledensity rates among the CCs (lower than Cyprus, Malta and Slovenia)–79 lines per 100 households, and 36.5 per 100 inhabitants.

FIGURE 3: Fixed Lines per 100 Inhabitants in EU CC's



Source: IBM 2nd, 3rd and 4th Report on Monitoring of EU Candidate Countries (Telecommunication Services Sector), 2003

2 This data include all households with access to the CaTV infrastructure regardless of whether the service is actually provided or not. IBM 3rd report on monitoring of EU CCs(2003)

3 CRC Annual report 2002

4 An additional 28.8 % of the population is ready to discontinue their BTC fixed-telephone services due to a further increase of the call costs.

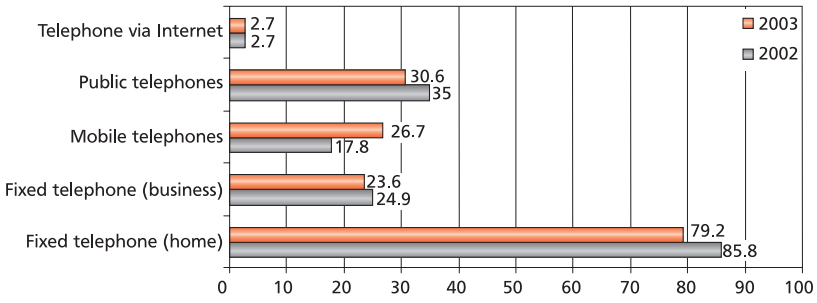
Almost 86% of the population over 18 years (Fig. 4) uses the fixed telephone network, while only 27% use mobile phones. Thus, the fixed telephony remains the most widely used, and is the main option for e-access on the market. At the same time, the insufficiency of mobile penetration presents an excellent opportunity for further development of this market.

The market for mobile telecommunications is characterized by the competition of three operators: one NMT-450–RTC Ltd. (Mobikom), and two GSM operators–Mobiltel (M-tel) and Cosmo Bulgaria Mobile (GloBul). During 2002-2003, Mobiltel and Cosmo continued the deployment of their mobile networks at a growing rate. Cosmo, in particular, is catching up very quickly, with the high levels of investment and subsequent growth of its network: in 2002 Cosmo reported a 213% growth of its ground stations, 42% coverage by territory, and almost 340% growth[5] in subscribers. By the end of 2002, RTC Ltd. and Mobiltel's networks had covered 96% and 92% of the population, respectively. As Mobiltel was for a long time the only GSM operator on the market, it became the dominant mobile operator with the largest market share of subscribers (more than 70%). In order to keep its leadership position after Cosmo's entry on the market, Mobiltel has focused on increasing its subscribers' base, and enhancing the quality of its services.

The rapid growth in mobile subscriptions (50% increase in the period January 2002–May 2003) continued the trend from previous years–around 100% in 2000, 75% in 2001, and 25% in 2002 (Fig. 5). This trend was accompanied by a parallel increase in the frequency of use of mobile phones. In 2003 15.3% of the population over 18 years used mobile phones daily, compared to 10.2% in 2002.

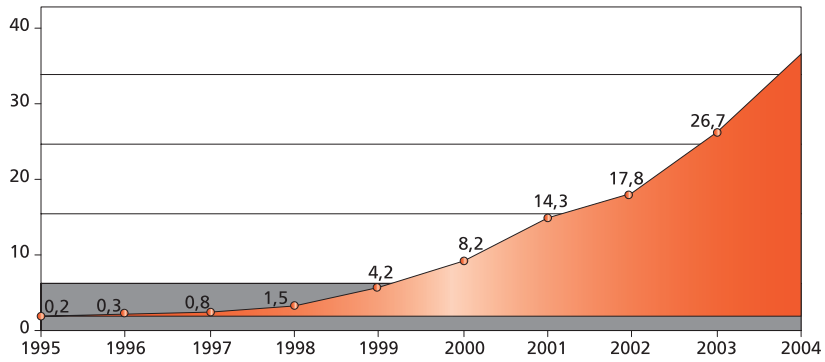
Despite the rapid growth of mobile networks and subscribers in the last few years, Bulgaria still lags behind the other CCs (incl. also the new member states which joined the EU on March 1, 2004). With 34.8% mobile penetration rate, it is below the average level for the CCs (40%), and far below the EU average (75%). Due to the late start of competition on the GSM market, and

FIGURE 4: Percentage of Population over 18 Years who has Access to:



Source: Vitosha Research, National Representative Surveys, January 2002 and May 2003

FIGURE 5: Penetration of Mobile Phones (percentage of population over 18)



Source: Vitosha Research, ISPO, ITU, mobile operators

the low purchasing power of the population, only Romania (24%) among the CCs has lower mobile penetration than Bulgaria.

Looking into e-access availability, it is important also to consider the development of cable television, which creates some opportunities for broadband communications and greater data transmission speeds. Bulgaria has a liberalized CaTV market with about 500 cable operators all over the country. There are about 1,020,000 CaTV subscribers, which represent roughly 13% of the population, and 53.6% of the households. Among the leading companies on the CaTV market (in number of subscribers) are CableTel, EurotourSAT, and Centrum Group. It is interesting to note that the share of subscribers in the big cities (with populations over 100,000) reaches almost 35%, while it is 47% in smaller towns (with populations between 60,000 and 100,000). In the villages with populations of up to 5,000 people, the subscribers are 23%, mainly due to the lower living standards there.

The big competitive advantage of CaTV operators on a fully liberalized market is the fact that their networks practically go into individual homes. CaTV networks reach more than half of all households in Bulgaria. Besides, several CaTV operators provide Internet access in addition to their main services, but the relatively expensive Internet service is not affordable to end-users. Thus, at present, cable operators are not viewed as major competitors to the Internet Service Providers (ISPs). Another disadvantage to be considered is the low quality of CaTV networks, which are not yet comparable with western standards. Huge investments are needed to upgrade the CaTV networks before they can become alternative operators on the telecom market. The fragmentation of the CaTV market is seen as one of its drawbacks, thus a process of concentration and merger of

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capital might facilitate its competitiveness, and prompt further investments in infrastructure development and equipment.

1.1. National Internet Connectivity

During the BTC monopoly, Internet access used to be the only freely open market segment. However, until the end of 2002, most ISPs used leased lines or Frame Relay (FR) services from BTC to provide Internet access to end-users in the country. Some ISPs combined the use of BTC infrastructure with satellite connections. The end of BTC's exclusive rights on the set-up, operation, and maintenance of PSTN has offered new opportunities to the ISPs to establish their own networks.

The national Internet connectivity has shown a significant improvement over the last two years, both in terms of cross-connectivity, bandwidth, and affordability. BTC has opened its national ATM network to commercial use. It currently connects the largest Bulgarian cities, thus increasing long-distance capacity, and significantly reducing prices of data transfer as compared to previously used digital networks. Besides BTC's Metropolitan Area Network (MAN), two additional private MANs were launched in 2002 in Sofia: the networks of Eurocom, and EurotourSAT. Both emerged from CaTV networks, which were upgraded to Gigabit connections over fiber optics, and cover most of the capital. While EurotourSAT seems to be interested in reaching any point-of-presence of a potential customer, and is more inclusive to third-party operators, Eurocom remains more conservative in its business strategy. ISPs are no longer cross-connected with copper lines, but with fiber optics over shared MANs (BTC and EurotourSAT). Point-to-point connections are either "dark fiber" connections (for longer distances), dedicated cables (for shorter distances), or ATM–mainly BTC's international connectivity. It is worth mentioning that middle-sized towns with relatively high per capita income (i.e. Gabrovo) are leading this trend. Currently, national ISPs and other data exchange service providers have more than 400 nodes of presence in the country, accounting for over 100% annual growth compared to 2002 (Fig. 6).

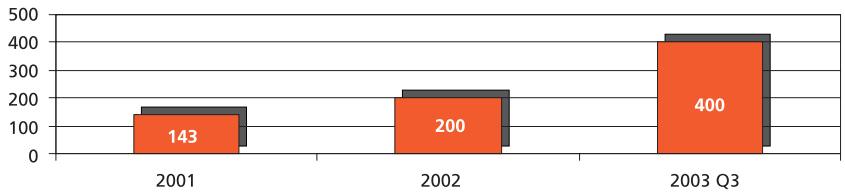
With the end of BTC's infrastructure monopoly, the provision of alternative last mile to ISPs became practically possible during 2003. This was done by opening the EurotourSAT cable network to several competing ISPs, including NET IS SAT, EuroIntegra, Internet Bulgaria, and Bulgaria Online. The expansion of the EurotourSAT network leads to a gradual substitution of leased lines with fiber optics as a reliable and affordable digital medium. Presently, a 10 Mbps port with Ethernet interface could be rented for about 150 Euro per month. At the same rate, BTC leases only a 256 kbps line, bundled with a V.35 interface.

According to industry estimates, it is no longer crucial to monitor the actual average national bandwidth, but rather the strategic transformation of the network, and the boom of virtual private networks (VPN) resulting from significant improvement in cross-connectivity, bandwidth, and affordability of the national data exchange infrastructure.

The years 2002 and 2003 marked a notable growth in VPN development. Although FR is the most widely used technology, the largest share of revenue goes to IP VPNs with 44%, followed by Frame Relay VPNs with 36% (Figure 7). ATM is also commonly used, as it provides integrated services, and supports high rates of data transmission; yet ATM takes only 12% market share in data transmission in Bulgaria.

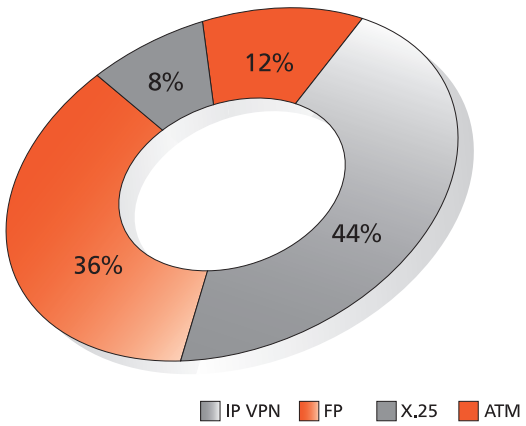
The typical end-user Internet access is still via dial-up (especially newly connected home users and small clubs in remote villages), but the migration rate to faster connections (mainly CaTV and LAN) is growing. The average dial-up speed significantly increased since 2001, reaching 28.8 kbps for analogue lines, and 40 kbps for digital lines in the third quarter (Q3) of 2003. Internet can be accessed also via mobile phones and autonomous networks, around 200 to 300 LANs in major neighborhoods in larger cities. Mobiltel, in addition to its basic services, currently offers data

FIGURE 6: Estimated Nodes of National Data Exchange Service Providers in the Country



Source: BTC Net (as of end 2001), Orbitel (estimates for end 2002, and 2003 Q3)

FIGURE 7: Structure of Revenues



Source: CRC Annual Report 2002

transmission, Internet access on GSM phones, e-mail to SMS, and SMS to e-mail services. Pre-paid Internet cards are actively advertised and offered by many ISPs, and that service is constantly gaining popularity.

Access at public places is essential for making the Internet available to many individuals and small businesses in Bulgaria. Internet and game clubs are very popular, with around 5,000 established throughout the country. The provision of public Internet access points (PIAP) is considered a step forward in closing the digital divide. Here, Bulgaria has reached relatively high penetration rates compared to some of the new member states and CCs–with 0.3 PIAPs per 1000 inhabitants it takes the second place after Malta[6]. However, in 2003 the European Commission changed its methodology of counting PIAPs to exclude private Internet *cafés*/clubs which positioned Bulgaria at the bottom of the eEurope+ ranking with only 0.01 PIAPs per 1000 inhabitants together with Slovakia[7].

It is important to distinguish business users from home users. In Bulgaria, leased lines used to be the dominant way of Internet access for business clients. Some large ISPs, and especially CaTV operators, have even focused predominantly on this segment of the market. At the end of 2002, around 10% of the Internet revenues were generated by leased lines access (and 67% by dial-up access).

ISDN and LAN Internet capacity is usually full 64 kbps. Cable and LAN capacity is typically divided according to destination–64 kbps international and 256 kbps national, reaching to 10 megabits per second depending on local connectivity and number of users when accessing content on internal network servers. Although ISDN penetration continued to grow in 2003, the rate of new subscribers slowed down as compared to 2002 and 2001. Large ISDN Internet users migrated to cable Internet due to much lower prices, and better payment instruments. ISDN is predominantly used by businesses when the quality of analogue lines (also leased ones) is too low, and no other alternatives exist. ISDN use estimated by the Communications Regulation Commission (CRC) accounted for 2% of dial-up users in Q2 2003. The low percentage of digital leased lines could be explained by the high set-up costs (of 250 euro), and rather expensive terminal equipment. Last but not least, ISDN supply is limited to about 20 cities in the country, not even covering all 28 administrative district centers.

Fixed wireless networks are built in the 2.4 GHz range, which is not regulated. Fixed wireless access (FWA) saves high telecom charges, and provides a perfect alternative in small-to-middle sized towns where the penetration of telephone lines is insufficient. At the same time, this technology is less efficient in larger cities due to the following reasons:

- Data loss of 5% and more, which is inherent to the technology and cannot be avoided;
- Limited coverage–reliable connections are possible only within a 2-3 km range from the access point;
- Expensive equipment–even if cheaper than the leased lines, the equipment required to establish a wireless connection costs over 300 USD;
- Low noise protection–most devices use the Direct Spread Spectrum technology, which is not noise-protected, and affects the quality of connection.

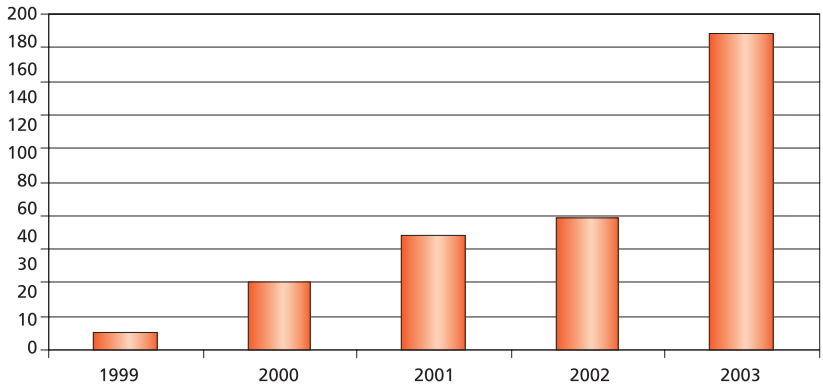
More than 20 wireless networks operated in Q3 2003 in Sofia, resulting in high levels of noise, and constantly worsening conditions of use. At the end of 2002 and the first half of 2003 the Electricity Distribution Company made an aggressive entry on this market, with 25 FWA devices installed in six cities in Northern Bulgaria. With the development of other media, it can be predicted that wireless networks will be used mainly in small-to-middle sized towns, and where—due to logistical constraints—no other opportunities exist. It will be gradually abandoned in larger cities.

1.2. International Internet Connectivity

The last two years have seen a significant growth in international Internet connectivity, both via terrestrial and satellite lines (fiber-optics and VSAT). In 2003 BTC-Net[8] upgraded its bandwidth to a total of 189 Mbps (155 Mbps via France Telecom, and 34 Mbps via Deutsche Telecom), accounting for 139% growth compared to 2002 (Fig. 8), partially as a delayed response to the under-estimated demand in 2002. In addition, around 10 ISPs provided satellite connectivity, e.g. ITD Networks, Digital Systems, etc.

International access has been sold to end-users in two main modes: full duplex fiber-optics channel, and combined outgoing fiber optics with incoming VSAT connectivity. In a positive development, asymmetric and reverse fiber-optic channels were introduced on

FIGURE 8: International Fiber-Optics Connectivity (mbps)



Source: BTC-Net

6 According eEurope+ Progress Report (June 2002), p.21
7 eEurope+ Progress Report (February 2004), p.27
8 BTC-Net is 100% owned by the national telecom and is still the only provider of international fiber-optics connectivity.

the market in 2003 as a response to the growing consumer demand for substantially higher incoming (relatively to outgoing) traffic. Although two-way VSAT connections are also offered as end-user solutions, they have been rather rarely used due to serious quality concerns.

The one-way access (download only) via DVB—although quite aggressively introduced in 2000-2001 as a service targeting home-users and SMEs—has not reached a critical penetration (estimated 100 devices in 2002), and gradually lost its business segment in 2003.

The market impact of the asymmetric traffic via fiber optics has resulted in a web-hosting boom. The incoming terrestrial download traffic has been gradually transferred to satellite, and substituted by voice and data transmission, thus closing the spread between incoming and outgoing traffic.

Industry analysts estimate that the 2002 average Internet traffic was 183 Mbps, with 87 Mbps via terrestrial lines, and 96 Mbps via satellite, corresponding to the total capacity at the end of 2001. The international traffic continued to grow with an average annual rate of 33% in 2003, according to industry estimates. Compared to 2001, when domestic traffic accounted for just 30% of the total, the international traffic currently represents a marginal share of the total Internet consumption, thus allowing for a faster decline in end-user prices.

2. Internet Market Trends

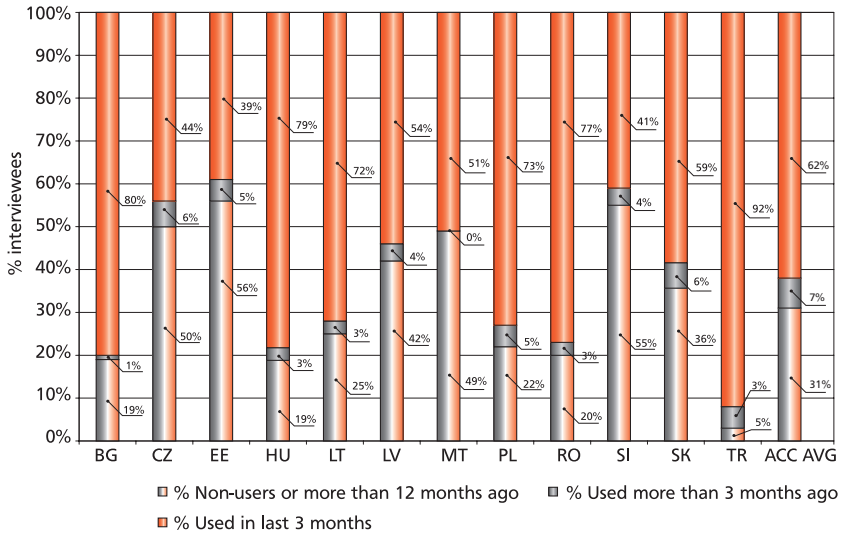
The total number of Internet users was estimated at around 12% of the total population in 2003, including academic, residential, and corporate users. This number has grown steadily since 1995. Compared to some other CCs (measured with different methodologies), Bulgaria is lagging behind leaders of the group (Cyprus, Estonia, Slovenia, Malta, the Czech Republic), but penetration rates are similar to that in Romania and Hungary, and higher than in Turkey (Figure 9). It should be noted, however, that there is a big ambiguity in the data. Some official sources report 12% Internet users in Bulgaria; others, 16% to 18%; while a fourth estimates very low levels– 8% penetration[9]. The latest eEurope+ Progress Report (of February 2004) suggests 19% Internet users, as of June 2003 (incl. people who have used Internet in the last three months).

One of the reasons for the slower development of the Internet market in Bulgaria is the low penetration of personal computers, and the high telephone and leased-line charges relative to the purchasing power of the average consumer. Due to the rather low average monthly income, the Bulgarian market for Internet services is mainly price driven. The largest group of Internet users (34%) are concentrated in Sofia, and only 2%, in villages. This could provide some explanation to the varying data on Internet users, since survey sampling varies quite a lot in respect to inclusion of respondents of smaller towns and villages.

The level of Internet development in Bulgaria can be further illustrated by the growth of hosts and domains in the top-level domain (TLD). Despite the steady rise of DNS hosts by nearly 25% annually for the last three years (Fig. 10), Bulgaria ranked 31st out of 90 countries in August 2003, according to its share of 0.2% of real hosts in the country TLD domain. Compared to other Central and East European Countries, the number of hosts in Bulgaria is almost 4 times less than the CCs average.

The domains in Bulgarian TLD grow rather slowly, by an average of 1.36 domains per day (Fig. 11). The main obstacles to growth should be seen in the complicated registration procedures, unreasonably high prices charged by the monopolist Register.bg, and the lack of

FIGURE 9: PERCENTAGE OF REGULAR INTERNET USERS AND NON-USERS



Source: eEurope+ 2003 Progress Report, February 2004; eEurope Household survey, June 2003. MT: National survey. TR: IDC Turkey.

9 Respectively, Vitosha Research, SIBIS Pocket book 2002/03, Alpha Research and IBM 3rd Monitoring report of EU CCs (June 2003)

on-line registration. As of July 11, 2004, there are 3,052 domains registered in .bg TLD, and more than 16,000 in other TLDs.

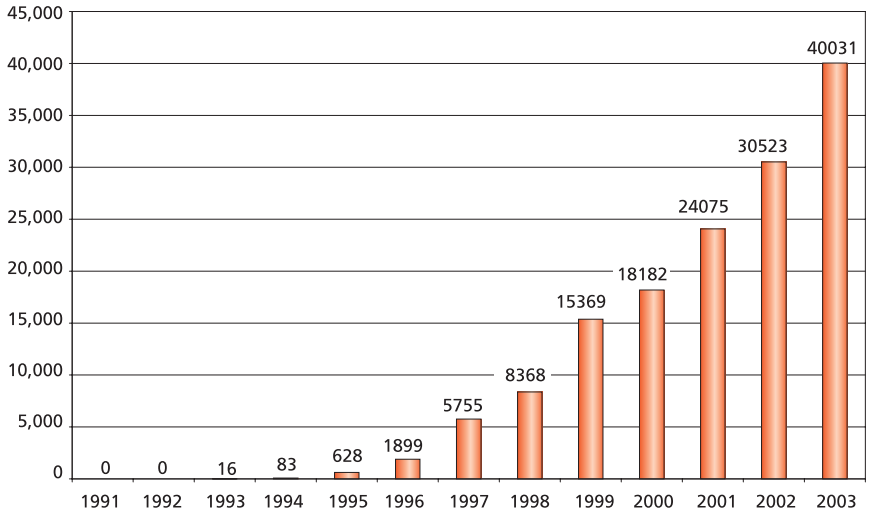
The market for Internet services is estimated at around $57 million. In 2002 it grew by 30% in revenues, compared to 2001. About 170 Internet Service Providers operate on the market. Eleven ISPs (e.g. Orbitel, Spectrum Net, BTC Net, Digital Systems, RTC Ltd., etc.) dominate the market as wholesalers, and the others act locally as retailers. The number of legal or informal entities operating Internet access services may exceed these figures if taking into account ISPs with national coverage (via contractual arrangements with local firms), and cable televisions (technical maintenance and subscription fees collectors are different small firms).

SpectrumNet and Orbitel are the largest ISPs, both with more than 20 offices in the country. For two consecutive years (2001 and 2002) Orbitel ranked as the biggest company (in revenue) in the Internet segment in the annual ranking of IDG Bulgaria Top 100 ICT; yet in 2003 it dropped to a third place. SpectrumNet, as part of Bioteam Group, takes the second place, followed by TPN, Mobikom, NET IS SAT, etc. (Table 1) The largest companies offer a range of services to home and business users: Internet access via dial-up, ISDN or leased lines, VPN, etc. In addition, NET IS SAT, Internet Bulgaria, and a few others are marketing a new service—provision of cable Internet through the CaTV network of EurotourSAT.

Due to the large number of ISPs with rather low capitalization, a consolidation of the Bulgarian Internet market is currently underway, which will reduce the number of ISPs, but will enhance the quality and range of services they provide. The Internet market has already matured through a series of mergers and acquisitions compared to the situation in 2001, when over 200 rather small (and highly dependent on BTC) ISPs existed.

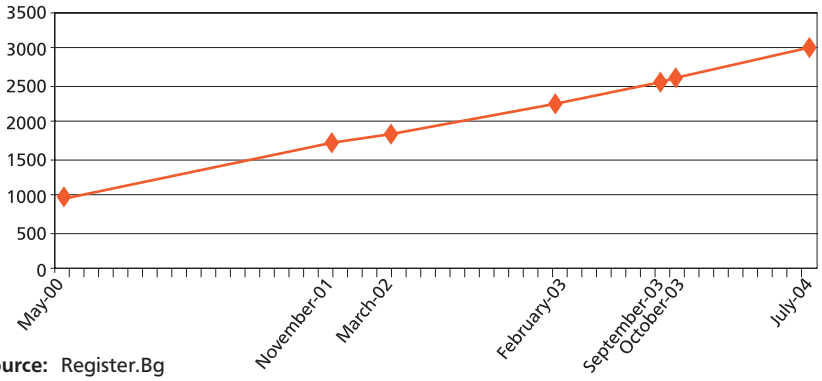
Presently, the Internet market is a typical oligopoly, with a growing concentration in the last two years–the Herfindahl-Hirsch Index (HHI) was 0.19 compared to 2002 (HHI=0.17) and 2001 (HHI=0.13), according to IDG data. The top three ISPs had a 59% market share in 2001, which

FIGURE 10: BG DNS Hosts



Source: RIPE, as of August of each year

FIGURE 11: Growth of .BG TLD Domain Names



Source: Register.Bg

TABLE 1: Top ISPs

Rank	Company	Revenue'03 Euro x 1000
1	BTC-NET Ltd	5444.24
2	Bioteam Group	4696.22
3	Orbitel	4044.32
4	Telecom Partners Network	1619.26
5	RTC Mobikom	1229.15
6	NET IS & NET IS SAT	862.60
7	Internet Bulgaria	685.13
8	Bankservice	437.10
9	Vali	261.99
10	Bulgaria Online	214.08
11	Kontrax Holding	122.71
12	Ro&Ni Ltd.	53.74
13	Information Services Plc	49.80
14	InfoGuard	35.79
15	Electronics NS Ltd.	22.45
	Total in IDG TOP 100	**19778.56**

Source: IDG Top 100, 2004

increased to 67% in 2002, and reached 72% in 2003—a calculation based on revenues from ISP activities. Although a more precise measurement is needed due to missing data, especially for LAN ISPs, and double calculation of the traffic between ISPs in a vertical chain relationship, the overall trend of market concentration with significant control on supply (through a strategic partnership between Orbitel and Spectrum Net in purchasing bandwidth from BTC Net–a total of 36 Mbps in 2002), and market prices is quite obvious.

Three main factors could lead either to a more competitive and coherent data-exchange market or a further strengthening of the oligopoly and price discrimination to be seen in 2004 and 2005:

- The dynamics of mergers, acquisitions, and new entries in the ICT sector;
- The potential rapid growth through new last-mile technologies at competitive prices;
- Convergence trends.

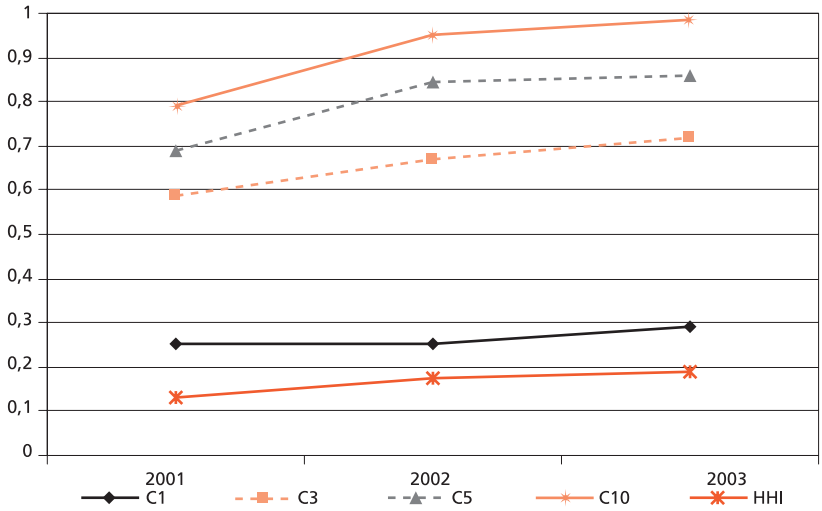
The key variables in this equation are the privatization of BTC and its post-privatization behavior, and the CRC policies and the effectiveness of the Competition Protection Commission.

The VoIP service showed, for the first time, more or less stable usage parameters in 2001. Survey data suggests that while VoIP penetration on a personal level did not change in 2003, compared to previous years, a significant increase of VoIP penetration and usage in business organizations has been noticed.

Being in the early stages of its development, the market for VoIP services shows several peculiarities:

- The market is highly fragmented with many players;
- Large, well-known companies compete with absolute beginners in the business;
- As a result of the previous two, there is a broad variety of prices for the "same" service (or, more precisely, destination);
- As a result of the previous three, customers tend to frequently migrate from one VoIP provider to another, looking for the best value-for-money ratio.

FIGURE 12: ISP MARKET CONCENTRATION[10]



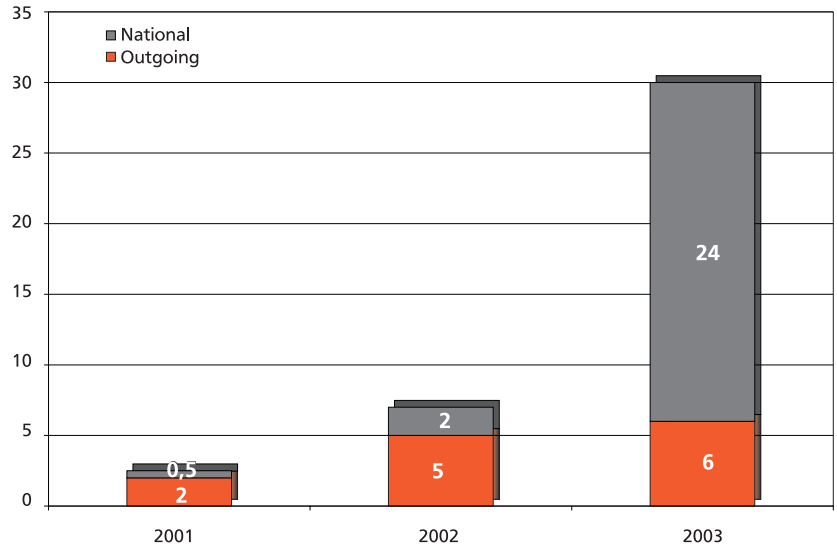
Source: Own calculations based on IDG TOP 100, 2004, 2003, and 2002 editions.

Although a few major companies invested a lot in advertising of VoIP services, and demonstrations of integrated corporate solutions, VoIP does not yet present any serious threat to classic telephony due to several reasons:

- VoIP is cheaper for international calls, but not for domestic long-distance calls. With the current charging scheme of BTC, VoIP can be cheaper than BTC only for calls on distances of 200 km and more.
- VoIP is sometimes cheaper than BTC for calls to mobile phones, but still, the GSM (linked to any GSM operator) gateway is the cheapest possible solution.

2003 marked a substantial difference in terms of the ratio of national to international traffic, from 1:4 in 2001 to 4:1 in 2003. Data on VoIP traffic are highly speculative, estimated between 2.2 million minutes on a monthly basis in 2002, and reaching 7.5 million minutes for a single provider in September 2003. Reported growth rates range from 35% on a quarterly basis to 300% on y-o-y basis. Overall estimates of the VoIP market for 2002 accounted for 2% of BTC's voice market. The VoIP market niche for major tourist destinations (i.e. hotels or public access points) was extensively

FIGURE 13: VOIP TRAFFIC (MILLION MINUTES PER MONTH)



Source: ARC Fund's estimates based on data and projections of BTC-Net and VoIP providers.

[10] C*N* is a concentration measure for the first *N* largest ISPs share in the market (limited by the IDG ranking)

tested in 2003, and implemented in 2004, showing a high growth potential over the next couple of years

2.1. Internet affordability

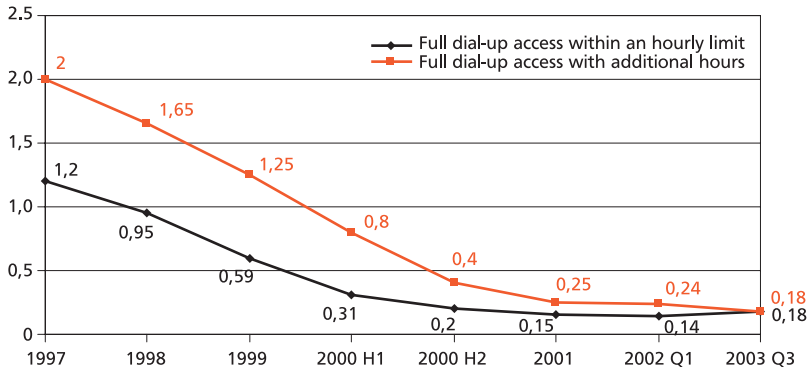
Competition on the Internet market has led to a diverse price range of Internet access supply. As seen in Figure 14, the end-user price for Internet access has dropped more than 5 times over the last 5 years. The cheapest Internet is provided at 8 euro cents per hour–mostly promotional prices, bound to limited quantities, and offered in a single town only. Night-time Internet access is down to 5 c/h, with the average being 7 c/h. The median price per hour is not bound to quantities purchased, and the average actual price charged with time-zones dependent rates is between 14-19 euro cents per hour. The most expensive dial-up access runs from 38 to 51 euro cents per hour, and is provided by the most reliable ISPs, during working hours, and/or with the possibility to have access from any location around the country. Mobile access is charged at 2.5 cents per minute, but due to the very low bandwidth of 9.6 kbps, it is only marginally used.

The majority of ISPs also provide flat-rate, unlimited access with a speed (up to 56kbps) that is not guaranteed. Prices range from 7 euro (in non-business hours, and with limitations on international traffic) to 13 euro per month, with the average price (without restrictions) being 11 euro per month. Industry estimates suggest that no further decrease in dial-up prices should be expected (except to manage the balance between peak and off-peak traffic) since they have reached the self-sustainability minimum.

In addition to Internet access cost, users must also pay local phone costs. Within the process of rebalancing of telecom tariffs, the prices for local calls are growing, thus making dial-up access more expensive. An expected result of this is a decreasing share of dial-up access users. In 2002, local call prices grew by 20%, and since July 2003, an additional 14.3%. In 2004 BTC also introduced per-minute charges for analogue lines, which has driven the telecom costs to a level of 80% of the overall dial-up access costs. By comparison, in 2001 the level was estimated at 70%, and in 2002, at 75%. It should be noted that among the new member states and CCs, Bulgaria has the lowest local call charges–their nominal value is 3-4 times lower than the EU average. However, in purchasing power parity (PPP) equivalent, these charges almost reach the EU average level. Subsequently, Internet access costs in off-peak hours are much higher than the EU maximum costs in PPP equivalent, while their nominal value is higher than the EU minimum.

Due to the high total cost of Internet services, dial-up users limit their Internet access time to only a few hours per month. The prospects are even less optimistic given the rebalancing of BTC tariffs, and the lack of alternative operators. In fact, the new entrants on the voice telephony market presently compete only in international telephony, offering VoIP services at lower prices than the international calls of BTC. Thus, the competition is not likely to result in lower dial-up access charges for Internet users any time soon.

FIGURE 14: Dial-up Affordability (access prices in USD per hour)



Source: Bulgaria Online (estimate of average price), 2003

Internet access via ISDN or leased lines is even more unaffordable to end-users and small businesses due to the high BTC tariffs. Only the largest Bulgarian companies, which operate widely dispersed offices inside and/or outside the country, can afford leased lines.

Better prospects are offered by CaTV and LAN Internet connections. A big disadvantage for CaTV is the high price of cable modems (60-80 Euro), while LAN connections do not require any additional equipment to be purchased by end-users. Both are fairly new services on the market, developing swiftly after the end of BTC's monopoly. In particular, LAN access seems to offer the best prices–in Sofia, unlimited (independent of traffic and time) Internet access at 256 kbps (32 kbps international) is provided at 12 Euro per month. For the same price, users can get dial-up Internet access of up to 56 kbps, excluding telephone charges. Internet via CaTV network is also more expensive–unlimited access at 256 kbps (64 kbps international) costs around 30 Euro a month. The advantages of LAN and CaTV access–high speed and permanent connection without additional phone charges–are beginning to convince more and more end-users to migrate to these services which provide Internet access at better prices, and higher quality.

3. Quality and Security of Services

In Bulgaria, similar to the other EU CCs and new member states, the quality of telephone services is consistent with the European standards ETSI EG 201, and the older one ETSI ETR 138. Traditionally, several indicators are being monitored, which indicate an increasing quality of the telecommunications network in the last few years (Table 2). With the modernization of BTC's network, and the set-up of new exchanges, a considerable reduction in waiting lists (e.g. the number of applications for new telephone lines) is seen–23% less than in 2001. At the same time, the improved quality of the facilities results in a steady decline of failed connections, and less customer complaints.

TABLE 2: Quality of the Telecommunications Network

Quality indicators	1998	1999	2000	2001	2002
Waiting lists	416 000	331 785	245 414	187 000	151 854
Monthly faults per 100 telephone lines	4.6	4.2	4.04	3.76	3.53
Average number of faults eliminated within 24 hours	83.9%	87.4%	89.91%	90%	88.21%
Average number of complaints for connection quality, per 1000 subscribers	1.1	0.2	0.13	0.33	0.08

Source: BTC Ltd., quoted in CRC Annual Report 2002.

As far as Internet quality is concerned, in the early years of its development in Bulgaria, it was quite common to have a ratio of 15 or more users per single entry point, which fell to 8 users per dial-up port in 2000. Bulgaria Online considers[11] that the current figure of 6.2 users per dial-up port shows that most ISPs have reached their optimum level in terms of per-user investments.

The levels of security–concerning both data and privacy—are crucial to the successful development of e-access, and the uptake of various electronic applications. In the late 1980s to early 90's, Bulgaria was heavily associated with production of viruses, and with "hackers and crackers" activism in the late 90's. Presently, regular Internet users are not really concerned about Internet security. In a comparative perspective[12] only Hungarians are less concerned about issues of Internet security among the EU members and CCs. Only 6% of regular Internet users are very concerned about online security in Bulgaria, while the average figures for the CCs and new member states are 13% for data security, and 20% for privacy and confidentiality. In the EU these levels reach 26% and 35%, respectively. This discrepancy might be due to the actual absence of serious online fraud within the country, the dominant use of Internet in primarily low-risk areas, and some underestimation of the problem. The Bulgarian Internet security market shows a steady growth in the last few years. There are expectations that with the increased use of e-commerce and Internet banking, the concern over Internet security will also grow. Presently, the biggest Internet security users in Bulgaria are commercial banks, the Bulgarian government, and international corporations. All of the existing Internet security technologies—such as authentication, authorization, firewalls for secure transactions, encryption, antivirus screening, etc.—are known and used in Bulgaria. Cisco and Microsoft are clear market leaders in offering hardware and software for Internet security; several smaller companies offer cheaper products and seem to have a good growth potential.

[11] Accepted also by BAIT, see: ISIS, Analysis of SEE Information Society Environment, Synthesis Country Report (September 2002)
[12] SIBIS Pocket book 2002/03, p. 28

4. Summary and Conclusions

The end of BTC's monopoly on the provision of basic telephone services and leased lines has prompted some changes in the telecom market. Alternative last mile is already provided to ISPs. CaTV networks have reached more than half of all households in Bulgaria, thus providing a better opportunity for Internet connectivity. The emerging competition has driven BTC to invest in the upgrade of its network and further digitization at the local level. Subsequently, ISPs are no longer cross-connected by copper lines; instead, they use fiber optics over shared MANs. A strategic transformation of the network, and a boom of VPN development occurred in 2002 and 2003.

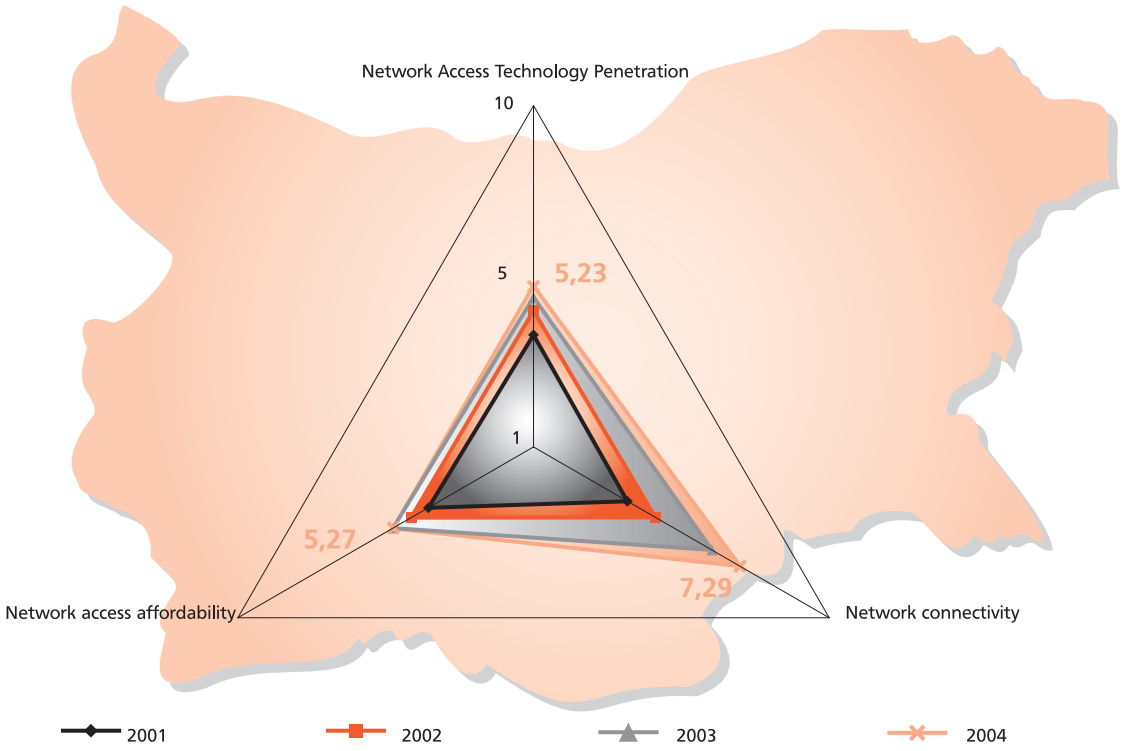
The high growth in mobile networks and users has had no direct impact on Internet penetration growth. Dial-up access continues to be the dominant Internet access mode, but growing local phone charges lead to a migration to LAN and CaTV connectivity. A significant part of business users of ISDN Internet access are also migrating to cable Internet, due to much lower prices and more convenient payment arrangements. Still, CaTV operators are not perceived as major competitors to the ISPs, as the relatively expensive Internet service via CaTV networks is unaffordable to home users. PIAPs have developed as an affordable option for low-cost Internet access, and have reached a higher penetration level than in many CCs. In small-to-middle sized towns with insufficient penetration of telephone lines, fixed wireless access provides a very good alternative.

The Internet market is growing in terms of hosts, TLD, and users' penetration. Although the total number of Internet users was estimated at around 12% of the population in 2003, Bulgaria still lagged behind the leading CCs (Cyprus, Estonia, Slovenia, Malta, and the Czech Republic). Further progress is held back by the low penetration of personal computers, and high telephone charges relative to the purchasing power of the population. Subsequently, 34% of all Internet users are concentrated in Sofia, and only 2% in villages.

Due to the large number of ISPs with rather low capitalization, a consolidation of the Bulgarian Internet market is currently underway, which will reduce the number of ISPs but will lead to a substantial increase in the quality and range of services provided.

For a number of years the overall scores of the **e-access index** (4.00 in 2001, 4.68 in 2002, and 5.55 in 2003) exceed the average e-readiness indicators (3.46, 3.87, and 4.25, respectively). The e-access index for 2002 and 2003 is larger in absolute terms than all other sub-indexes, and demonstrates the highest growth rate in 2003–19%. This positioning is definitely due to the growth in network connectivity (22% in 2002, and additional 37% in 2003). The

FIGURE 15: E-Access



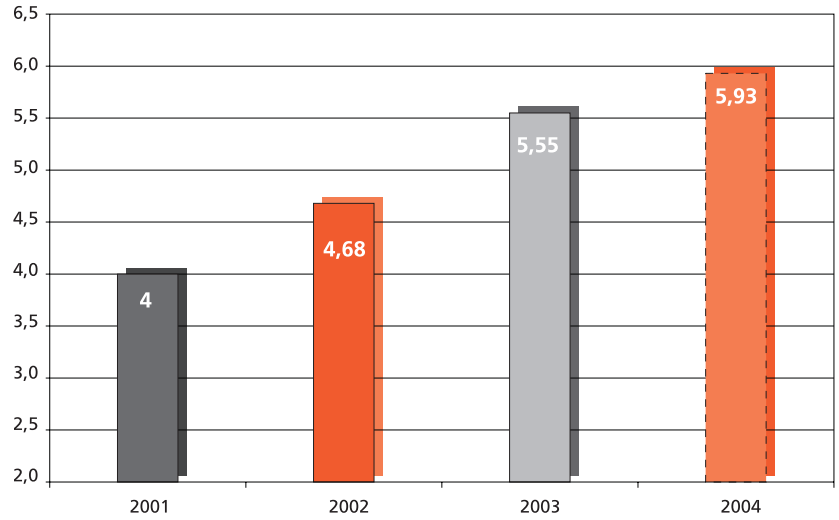
Source: ARC Fund (2004 is a forecast)

steady and reinforcing technological growth witnessed in 2001 continued into 2002 and 2003, fueled by positive developments in technology affordability, diffusion and convergence.

Further strong developments, but at a slower pace, are being witnessed in 2004 mainly due to network effects (computer and Internet use in business, education, and society), expected fresh investments by newly licensed, fixed-telephony competitors, and e-government related spending.

The most critical is the slow development in four network access sub-areas where no significant improvement relative to other indicators has been observed in recent years. This concerns ISDN penetration, nation-wide access to Internet via cable, and mobile Internet penetration, as well as the associated high costs and very low levels of PC use in households. The respective indicators take a value of 1.0 for three consecutive years.

FIGURE 16: E-ACCESS TREND



Source: ARC Fund (2004 is a forecast)

E-SOCIETY

This section analyzes personal access to PCs and Internet, emphasizing trends, location and mode of access, and frequency and purpose of usage. It also considers reasons for non-access, and barriers to Internet access. Patterns of e-behavior—such as frequency and type of content/sites visited on Internet, electronic communication (e-mail, chat, SMS), and e-commerce—are also discussed here.

1. PC and Internet Penetration in Bulgarian Society

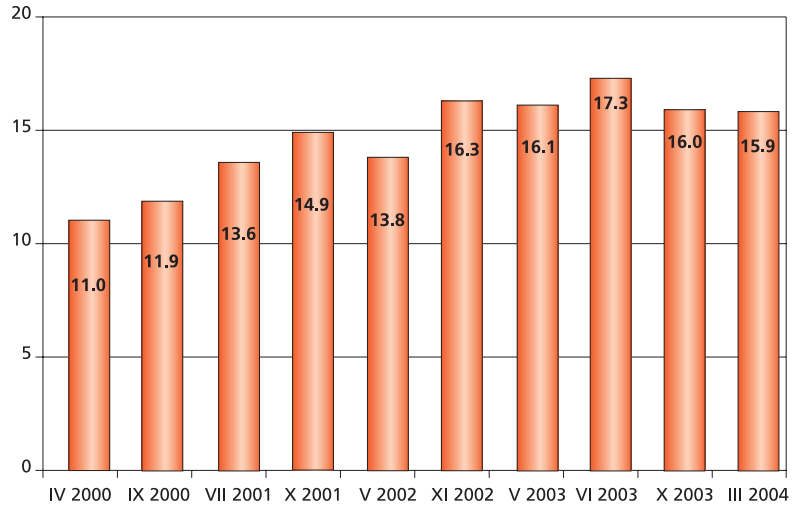
1.1 Computer Access and Usage

The almost linear growth in Bulgarian society's access to computers—from levels of 11% of the population aged 18 and over in the beginning of 2000—plateaued around 16% in 2003 (Figure 17). Projections for faster diffusion of PCs based on y-o-y growth in October 2001 (25% at the time) have proven unrealistic (with actual levels of 3-4% for 2002 and 2003) due to the fact that (a) new PC purchases remained stable in the last 2-2$^1/_2$ years, mostly as upgrades of existing hardware equipment and not expanding the user base; and (b) new PC purchases were channeled to Internet and game clubs, which, in turn, attracted students and those younger than 18 years of age (and thus not reflected in national representative surveys), or old equipment from private companies was transferred to homes (again predominately used by people who already had access to PCs, or high-school students).

The most popular computer access places are presented in Table 3. The office, or workplace remains the typical access point to computers. The share of "home" users stabilized around 6.5% in 2003, in contrast to the obvious fluctuations seen in 2001 and 2002. The most evident change occurred during 2003, which, compared to 2002, doubled or even tripled the share of those using PCs at computer clubs, schools, and universities (summarized as "other places").

Home computer users represent a specific group of IT users, and attract special attention from researchers, policy makers, and hardware retailers. The data for 2003 suggests that entertainment and games are the main purposes for people using computers at home—more than half of all respondents. A similar share of people declares using PCs for Internet surfing. Special emphasis is also given to e-mail usage, which is one of the most frequently mentioned Internet applications.

FIGURE 17: Access to Computers



Source: Vitosha Research, representative surveys of population aged 18+

TABLE 3: Places with Access to Computers

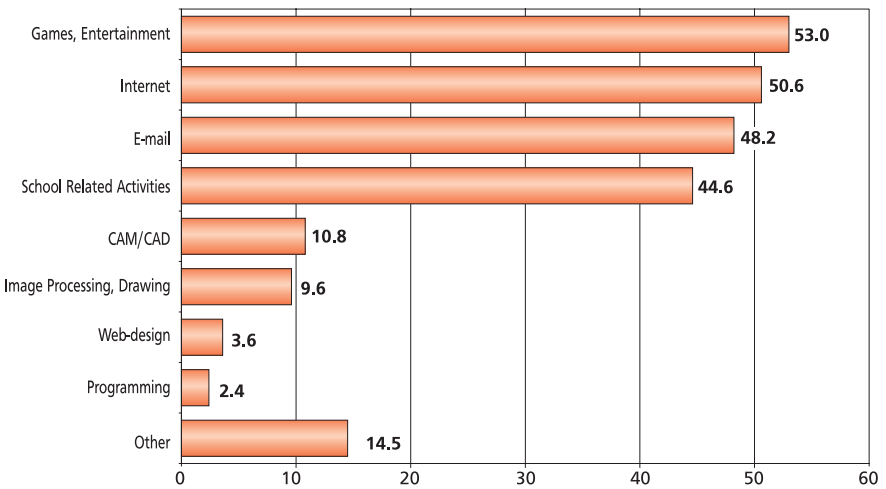
	IV 2000	IX 2000	VI 2001	X 2001	V 2002	X 2002	V 2003	VII 2003	X 2003	III 2004
At home	2.6	4.4	5.3	7.5	4.8	5.2	6.2	6.5	6.9	7.2
At work	6.3	7.5	72	7	9.1*	7.3	8.5	8.3	7.9	7.1
At home and work	1.24	0.94	1.51	3.19	1.52	1.88	1.75	2.66	2.26	2.27
Other places *	3.1	2.1	6.5	4.1	2.5	2.5	6.1	7.3	7.7	5.7
Base: All respondents 18+	1161	1158	1066	971	1170	1079	1107	1054	1098	1080

Source: Vitosha Research representative surveys (2000-2004)

* *Schools, friends or relatives, Public places, etc.*

** *The value for May 2002 includes the share of those having access to computers at their workplace or/and at schools, universities, etc.*

FIGURE 18: Main Computer Usage at Home (%)



Source: Vitosha Research, October 2003

Other applications, like web design, image processing, or CAD/CAM systems are less frequently used (due to their specific scope).

Almost a third of the people who have computers at home normally use them at least once a day. A similar share uses their home computers at least once a week.

1.2 Internet access

The overall share of people using Internet is still rather small (11.6%, as of October 2003) compared to the EU+10 new members. Yet, the year 2003 marked a significant increase in the number of Internet users, continuing the stable trend since May 2002 (estimated inflex point of the S-shape growth curve). In the past 3-4 years, the number of people declaring they have access to Internet, and use it ever more frequently, has increased several-fold (see Figure 20), and will continue to grow.

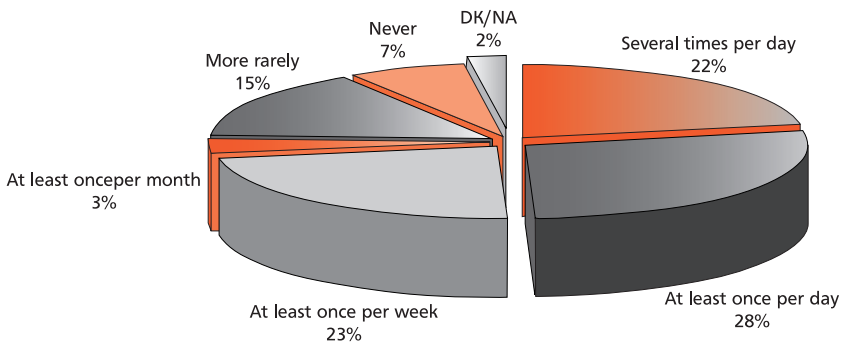
In general, home Internet users use more traditional devices. Despite various ranges of opportunities available on the market, the most typical access to Internet is by PC (in almost all cases) through a dial-up connection (67%).

Other devices (like mobile phones or PDAs) are already making their modest contribution to Internet penetration. Actually, the share of people accessing Internet through laptops is identical to those using mobile phones for the same purpose. Two out of five people access Internet at home via LAN or cable modem.

1.3. Factors Influencing Internet Usage

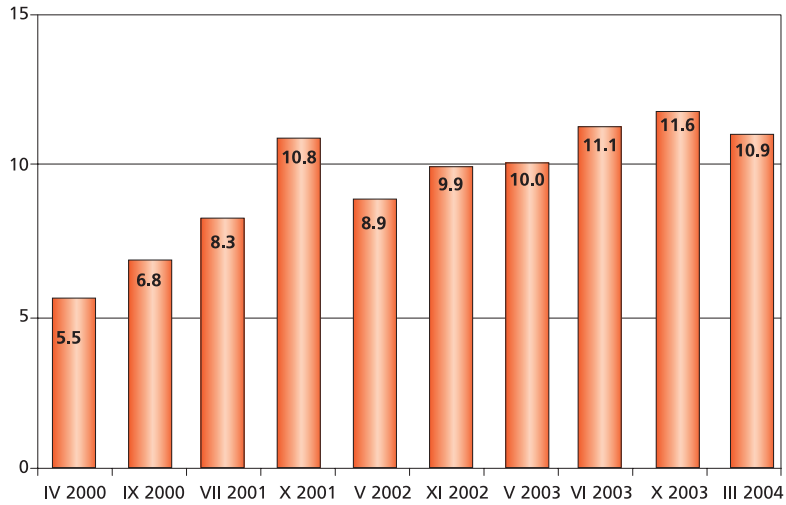
The trend of growing Internet use is further demonstrated by the distribution of those having access to PCs. Despite some fluctuations, the share of Internet users continues to grow (in just a few months in May-October 2003 it went up 13%). This upward trend is explained by the fact that more PCs are being connected to Internet, mainly due to new purchases of PCs at workplaces and public access points.

FIGURE 19: Average Computer Usage at Home



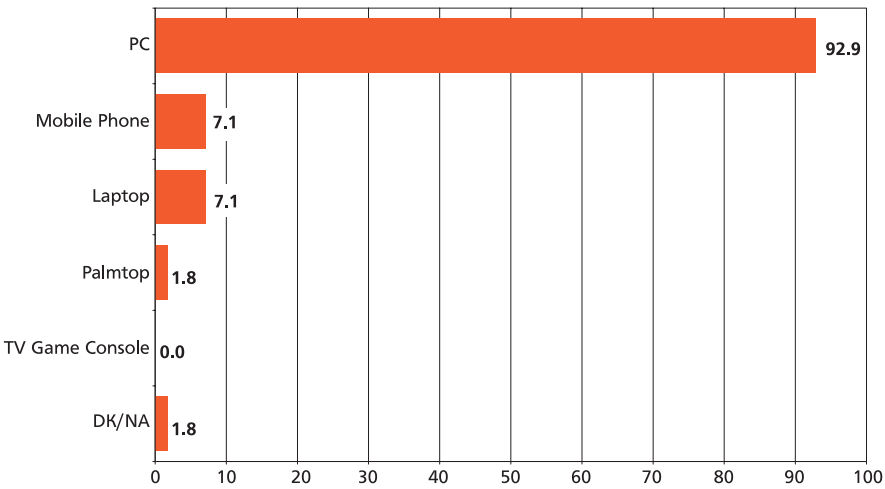
Source: Vitosha Research, October 2003

FIGURE 20: Share of Those Having Access to Internet



Source: Vitosha Research, 2003

FIGURE 21: Sources of Internet Access at Home



Source: Vitosha Research, 2003

Lack of interest and financial constraints could be outlined as the main factors for not using Internet, at least for 86% of the population aged 18 and over (table 4). Bearing in mind that the predominant part of these are elderly people (61% are aged 50 and over), residents of small villages, or people with secondary or lower education degrees (the percentage in this case is close to 90%), the above figures may not seem surprising at all.

Technical reasons are given lesser importance as barriers to Internet access. The existence of inappropriate content (such as pornography, violence, etc.) on the Internet is not of great concern either. Thus, it could be concluded that at the current stage, non-users of Internet are much more influenced by objective reasons, including financial difficulties, poor Internet connections, or technical incompetence, rather than moral or ethical concerns.

1.4. Frequency of Internet Usage

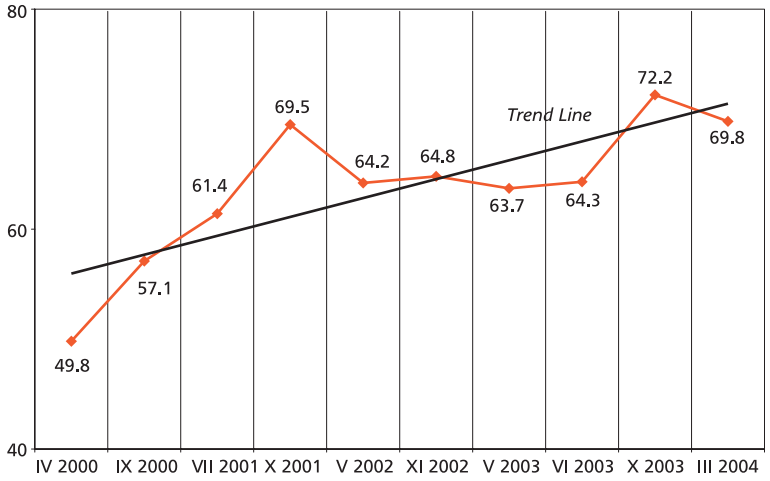
Measuring the frequency of Internet use on an individual level provides valuable information about the extent to which Internet is integrated in everyday life.

Internet consumption grows not only in terms of number of users, but also by frequency of its usage. Both indicators are interlinked by the maturity of users. Around a quarter of Internet users (close to those using Internet in 2000) access it on a daily basis. Around 15% of them stay online more than two hours a day.

The reasons why people are unwilling to spend more time online can be divided in two groups. The first is linked to the time budget and disposable income of each individual. Nearly every fifth person is content with the amount of time s/he spends online, and does not wish to use it longer. Half of them fall in the "1 to 3 years" user group (see Table 5).

Another group of users–mostly people with less than a year of Internet experience—do not have enough time and/or access to spend more time online.

FIGURE 22: Share of Internet Users of Those Having Access to Computers



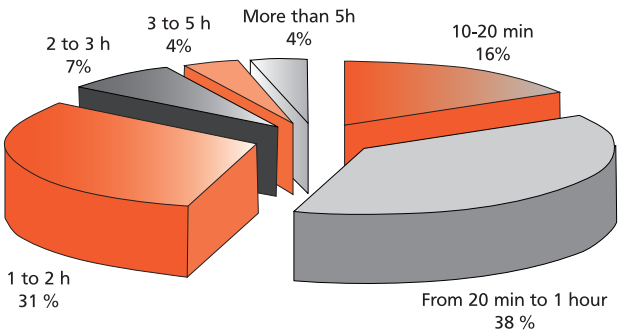
Source: Vitosha Research

TABLE 4: Main Reasons for Not-using Internet

	%
I am not interested	39.6
It is very expensive	30.2
I do not know any foreign languages	24.5
Don't know how to work with the Internet	18.9
I don't have computer at my disposal in order to work on the Internet	18.9
My computer is not well-equipped	13.2
Fears regarding confidentiality of personal information	3.8
Connection is very slow	3.8
It is very hard to log on	3.8
Other	13.2
Don't know/No answer	9.4

Source: Vitosha Research, 2003

FIGURE 23: Frequency of Daily Internet Use



Source: Vitosha Research, 2003

TABLE 5: MAIN REASONS FOR NOT USING INTERNET LONGER PER DAY

	Less than 6 months	6 months to 1 year	1 to 3 years	3 to 5 years	More than 5 years	Total
It is very expensive	14.3	9.5	57.1	9.5	9.5	13.8
I do not have time	2.0	20.4	57.1	20.4	0.0	32.2
I do not have access and time	14.7	26.5	44.1	11.8	2.9	22.4
The quality is not good	16.7	0.0	50.0	0.0	33.3	3.9
Other	0.0	33.3	33.3	33.3	0.0	3.9
The time I use the Internet during the day is absolutely sufficient	5.6	13.9	50.0	19.4	11.1	23.7
Total	**7.6**	**18.5**	**51.0**	**15.9**	**7.0**	**100.0**

Source: Vitosha Research, 2003

2. Main Tendencies in Using Internet Opportunities

2.1. Access to Internet Content

Currently, the Internet is most commonly used for education purposes and gathering information. The same tendency is preserved from previous periods. Online information about different opportunities for continuous education and life-long learning makes the Internet a valuable and preferred resource, since such information is sometimes impossible to find by other means. Similarly, various Internet sites publish raw data and economic analyses, which are rather difficult to obtain by conventional methods. Subsequently, the share of users with business interests is relatively high. The Internet is also used for entertainment, and for accessing alternative sources of world news, including arts, sports, fitness, etc.

Portals and search engines are the most frequently visited Internet sites, followed by business websites. Users are also attracted to the specialized IT or entertaining content provided on ISP websites. NGO's and government websites are among the least visited ones. Government institutions, in particular, are facing a big challenge of revamping their websites, and changing the general perception of them by offering more and richer content and/or e-services.

TABLE 6: THE MOST FREQUENT ONLINE ACTIVITIES AND INTERESTS

	2003	2001
Education	32.6	34.4
Business and Economy	30.7	43.3
Music	29.5	25.6
Leisure Activities	25.8	15.6
Games	25.3	20.0
Culture and art	16.0	25.6
Computers and IT	14.8	21.1
Sport	9.9	11.1
Tourism	8.6	8.9
Medicine, healthcare, fitness	7.7	5.6
Humor	7.6	10.0
Politics	5.0	12.2
Erotic	0.9	0.0
Religion	0.0	2.2
Other	9.3	8.9

Source: Vitosha Research

2.2. Personal communications

Survey data indicates that personal communications are among the most popular Internet applications. More than half (62%) of Internet users appreciate the "chat" opportunities it provides. A considerable number of people believe that Internet chats allow them to stay in touch with friends and family, and people with whom they share similar interests. As a result, this new type of communication is becoming a valuable source not only for information, but also for meetings, "gossip sessions", etc., for many social groups, thus forming a new type of informal communities which go beyond the boundaries of a single city, country, or continent.

A closer look at the detailed data reveals several features which distinguish the so-called group of "online chatters":

- There is a notable differentiation in chat behavior according to gender. Females tend to stay and communicate online longer. The share of women who chat between 20 minutes to an hour is two times higher compared to men (see Table 8). Apart from that, 6.3% of females use different types of chat servers between two and three hours.

- The so-called "hard chatters" are concentrated in the 15-17 age cohort. Half of them do not spend more than one hour chatting.

- People with the highest levels of education have more diverse patterns of using this Internet opportunity. Compared to respondents with other education levels, those holding university degrees sometimes spend up to three hours chatting with friends.

E-mail remains one of the most popular Internet applications. The percentage of people who use e-mail (on a regular basis) of the population aged 18 years and over varies around 8%. The number of people who use e-mail at least once a month has grown substantially in the last few years.

E-mail proves to have other applications as well. More than half (58%) of the people who have access to computers have sent at least one SMS from their e-mail accounts instead of their mobile phones. This functionality is more frequently used by younger users (below 18 years of age). The following chart (Figure 24) offers a different perspective to this user group. Two age groups can be considered quite "active" regarding the use of e-mail, not only in its standard uses. Every fourth person aged 15 to 17 has sent SMS by e-mail. More than 60% of the people in this group own a cell phone, and nearly 40% use e-mail at least once per week. The second group consists of people aged 20 to 30 years. They tend to send SMS by e-mail with almost the same frequency, but access e-mail more rarely–once a week for around 20% of the group.

TABLE 7: Frequency of Accessing Different Types of Internet Sites (%)

	At least once per day	At least once per week	Rarely	Never
Portals / search engines	20.1	36.1	20.8	22.9
News Online	9.7	18.8	25.0	46.5
Media Online	6.3	24.6	21.8	47.2
Government Institutions	3.5	15.4	18.2	62.9
NGO's	0.7	15.0	12.1	72.1
Business sites	11.6	22.4	12.2	53.7
Art sites	5.6	29.2	23.6	41.7
Universities/Schools	4.1	29.9	20.4	45.6
ISP sites	1.4	10.6	16.9	71.1
Entertainment sites (music, video, games, etc.)	10.7	55.7	16.1	17.4

Source: Vitosha Research, 2003

TABLE 8: "Chatter" Demographics (%)

	10-20 min.	20 min to 1 h.	1 to 2 h.	2 to 3 h.
Gender				
Male	66.7	22.2	11.1	0.0
Female	25.0	56.3	12.5	6.3
Age				
15-17	22.2	55.6	22.2	0.0
18 - 19	0.0	100.0	0.0	0.0
20 - 29	50.0	50.0	0.0	0.0
30 - 39	50.0	50.0	0.0	0.0
40 - 49	60.0	20.0	20.0	0.0
60 - 69	0.0	0.0	0.0	100.0
70 - 79	100.0	0.0	0.0	0.0
Education degree				
Basic and lower	30.0	50.0	20.0	0.0
Secondary	60.0	40.0	0.0	0.0
Semi-high	50.0	50.0	0.0	0.0
High	37.5	37.5	12.5	12.5
Size of settlement				
1 000-4 999 people	50.0	0.0	50.0	0.0
5 000-19 999 people	50.0	50.0	0.0	0.0
20 000-99 999 people	20.0	60.0	10.0	10.0
100 000-499 999 people	75.0	25.0	0.0	0.0
Sofia	42.9	42.9	143	0.0

Source: Vitosha Research, 2003

TABLE 9: How Often do You Use E-mail?

	IX 2000	VI 2001	X 2001	V 2002	XII 2002	V 2003	VI 2003	X 2003	III 2004
Several times per day	1.0	0.8	1.0	1.1	0.8	1.0	0.6	0.3	0.5
At least once per day	1.4	1.3	1.8	1.2	2.1	1.5	1.5	0.9	2.2
At least once per week	1.8	2.3	3.2	3.0	3.0	2.2	2.8	1.6	3.1
At least once per month	0.5	1.0	0.7	1.1	0.6	0.7	1.5	4.2	0.6
Rarely	1.3	1.4	2.6	1.3	1.0	0.8	0.9	0.8	0.9
Total	**6.0**	**6.8**	**9.3**	**7.7**	**7.5**	**6.3**	**7.3**	**8.3**	**7.3**
Base: All respondents 18+	***1158***	***1066***	***971***	***1170***	***1079***	***1107***	***1054***	***1098***	***1080***

Source: Vitosha Research (2000-2004)

In general, people with access to more than one communication device (e-mail, mobile phones, etc.) are willing to use all of their functionalities, as compared to those who own only a single device. The main conclusion is that the technical literacy of the population is related, firstly, to age; secondly, to the available IT access and, finally, to the frequency of IT usage.

2.3. Electronic Commerce

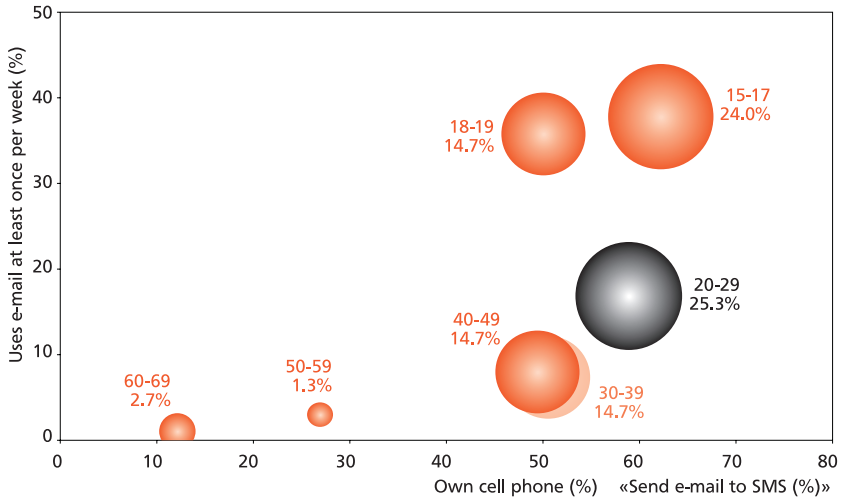
Data from representative surveys clearly indicates that e-commerce is not very popular among Bulgarian users. Only 3.8% of the people with access to IT have ordered or bought any accessories online. Basically, this share represents only 0.5% of the population aged 18 and over,[14] i.e. irrespective of the access to Internet or computer. Even if this fact is usually explained by security concerns, data presented in the "e-access" section of this report suggests that Bulgarian Internet users are quite ignorant about Internet security issue, so the explanation should be sought in the insufficient supply of online products and services, and the lack of enough approbation time.

Despite the small number of e-commerce users, some items are already been sold online. Printed materials, such as books, magazines, catalogs, etc., are among the most preferred choices by online users.

2.4. The Language Barrier to Internet Penetration

Similar to other non-English speaking countries, the predominance of English on the Internet poses a serious obstacle

FIGURE 24: SMS Habits according to Age Groups[13]



Source: Vitosha Research

TABLE 10: Preferred Accessories for E-commerce

	%
Printed materials, magazines, books etc.	50.0
Food, products, flowers, gifts	16.7
Software	16.7
Hardware	16.7
Electronic appliances	16.7
Financial and/or bank transfers	16.7
Tourist services	16.7
Home bills (water, electricity etc.)	16.7
Tickets for various events	16.7
Movies, music, CD	0.0
Garment, shoes, accessories	0.0
Sweepstakes tickets, betting	0.0
Other	16.7

Source: Vitosha Research, 2003

13 Data should be interpreted in three different directions. The size of the "bubble" corresponds to the percentage of SMS messages sent by e-mail. Axis X (horizontal) gives the percentage of people who own a mobile phone. People who use their e-mail accounts at least once every week are accounted for on the vertical axis.

14 Roughly, that makes around 33,500 people under the presumption that 1% of the sample represents around 67,100 people of the population aged 15 and over.

to the integration of various user groups in Bulgaria. This fact has prompted some of the largest websites to design mirror versions in different languages. For example, the world leader among search engines, Google.com, created an equivalent of its search engine entirely in Bulgarian, which forced many local competitors to adapt their websites to the changing demands of users in terms of offering Bulgarian language content. Hence, Bulgarian users look more frequently into websites in their own language (see Figure 25), thus partially offsetting the dominant presence of English on the global web. Over a two-year period, the share of those who normally visit websites in Bulgarian has grown by more than 10%, while the number of users who visit English language websites has dropped by nearly 20%.

The experience of Google.com has given a strong boost to the development of Bulgarian web-content. The situation has presented good opportunities to Bulgarian companies and non-profit organizations to develop locally-relevant content and services. It should be noted that local web-developers have reacted adequately to this situation, and that users are likewise adjusting rapidly.

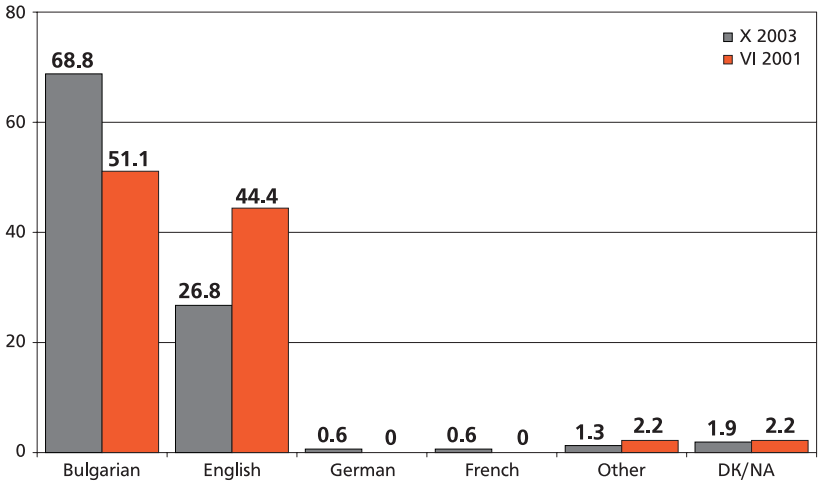
2.5. The Internet in Everyday Life

Besides its other functions, the Internet also has an important social and psychological role. The growing public awareness of various web applications leads to the formation of certain social groups who share common values and perceptions. Such unique communities are formed not only by young people, but they affect much larger groups of Internet users as well. Thus, the Internet "era" is also changing people's way of thinking and perception of reality.

The majority of people subscribe to the view that economic difficulties should not stand in the way of ICT development in Bulgaria. In their opinion government priorities should not try to focus on social and economic development, and neglect ICT penetration and e-development.

A growing share of people prefer Internet as the only means of communication (up 15% since 2001).

FIGURE 25: The Most Frequently Visited Sites by Language (%)



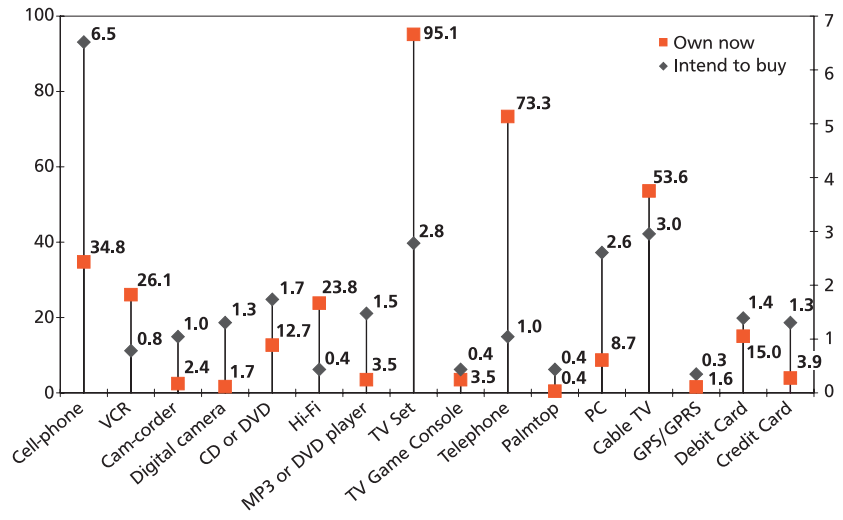
Source: Vitosha Research, *Base 2003 N = 150; 2001 N = 90*

TABLE 11: The Role of ICT in Everyday Life

	Disagree		Neither agree, nor disagree		Agree	
	2003	2001	2003	2001	2003	2001
Presently, Bulgarian society faces other problems, and development of ICT is not relevant.	86.2%	76.7%	5.7%	8.9%	7.3%	10.0%
I prefer Internet to any other means of communication	31.0%	36.7%	24.2%	13.3%	46.6%	31.1%

Source: Vitosha Research

FIGURE 26: Technical Devices at Individual Users' Disposal: Current and Future



Source: Vitosha Research, 2003

Regarding current and potential consumption of ICT, there are several issues to be considered:

- Basic electronic appliances for home use have a relatively high penetration among Bulgarian households, but capacity for future consumption is relatively limited. The predominant part of the respondents own TV sets, telephones, and cable TV. At the same time, intentions to buy such devices

in the future are constant, and even low, compared to ownership of other ICT accessories.

- Cell phones have the greatest potential for growth in the future. Nearly every third person owns a cell phone at the moment, and another 7% intend to buy one in the coming months. This share is the largest compared to other items on the list.

- Hi-tech devices are still unpopular among Bulgarians: e.g. less than 10% own PCs, Cam-corders, MP3 and DVD players, PDAs, etc. The main reason for this could be the socio-economic difficulties of households, and lack of technical literacy.

3. Summary and Conclusions

The penetration of IT in Bulgarian society could be characterized by the following:

- The level of computer access **is gradually picking up**. Although its general level is still assessed as relatively low, the penetration rate accelerates. Computers are normally accessed **at the workplace**, and less often at home.

- **Entertainment and games** remain the main reason for using computers at home.

- **The number of Internet users** is also rising, and the trend is quite stable since May 2002. In the past few years the number of people declaring they have access to Internet, and use it ever more often **has increased several times.**

- The reasons for non-use are mostly objective (i.e. **financial difficulties, poor connections, or technical incompetence**), rather than **moral or ethical**. Lack of interest and financial constraints can be outlined as the major factors for not using Internet.

- Currently, the Internet is most commonly used for **education purposes and gathering information**. This tendency is preserved from previous years. Online information about different opportunities for further education makes the Internet a valuable and preferred resource.

- Available data also indicates that **personal communications are among the most popular Internet applications.** People who have access to more that one communications device (e-mail, mobile phone, etc.) are generally willing to use all of their functions and technical capabilities. The **technical literacy of the population depends, firstly, on the age; secondly, on the available IT access, and finally, on the frequency of IT usage**.

- Low usage of e-commerce is mostly attributed to insufficient supply of online products and services, and the normal approbation time for e-commerce. Initial delays are also explained by a delayed penetration of debit and credit cards (still very low, especially for credit cards).

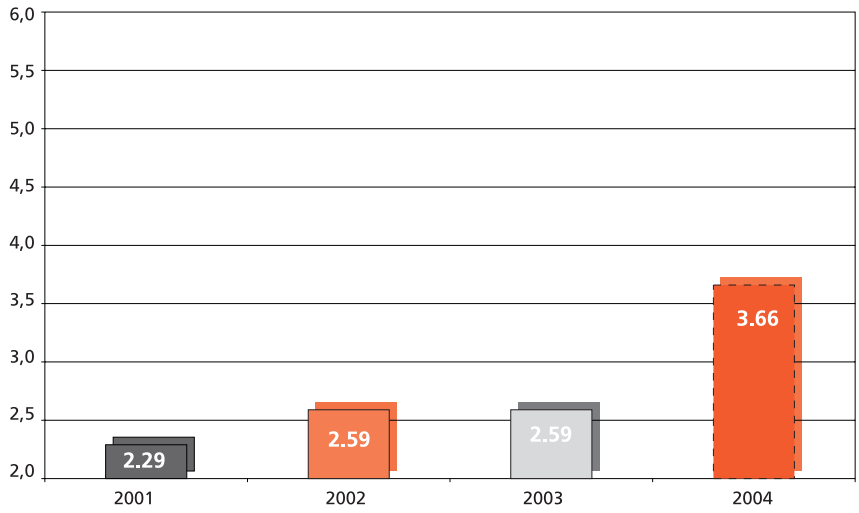
- The growing public awareness of web applications leads to the formation of certain **social groups** who share similar values and perceptions. Such "communities" are typical not only for young people, but for larger groups of Internet users as well. **Thus, the Internet "era" is changing people's way of thinking and perceptions of reality**.

Despite some positive aspects in ICT penetration in Bulgarian society, its overall level remains rather low, as compared to other countries. The major obstacle to this should be seen in the overall economic environment, the low living standards and poverty which affect a great part of Bulgarian society. In this respect, the problems which Bulgarian society faces are mostly social and economic in nature, rather than technical. Nevertheless, Bulgarian users are trying to cope with this difficult situation by seeking cheaper (or even free), easy to use, and relatively wide spread Internet applications. Free SMS services, chat discussions, and online phones are just a few examples of positive impact on people's perceptions and willingness to stay in touch with the virtual world around them.

Despite the positive developments in the e-society field described above, the e-readiness instrument did not capture any qualitative change in all but one indicator–Internet services, measured by provision and usage of Bulgarian content on the Internet, and the increased frequency of Internet usage (mainly by matured users). This indicator grew by 150% in 2002, and remained at the same level in 2003, resulting in a 13% growth of the aggregate e-society index.

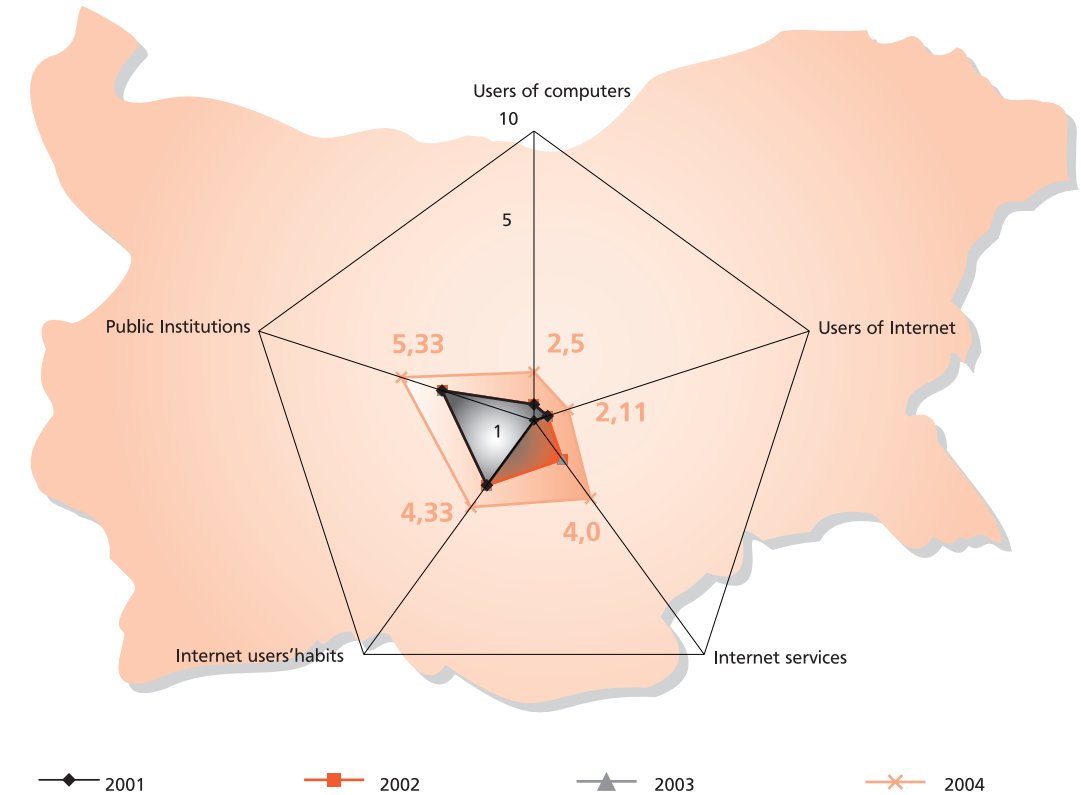
The fact that the e-society index has remained insensitive to the described improvements could be attributed, in part, to the early stage of e-society development in Bulgaria, which requires more time (and higher levels of technology penetration, and service provision) to account for a significant change on a national level. Part of the explanation may be that developments are most dynamic within the age groups under 18 years who are usually not captured by the omnibus surveys we use. In all three years, the e-society index has taken the lowest values among the other categories of e-readiness. While 2004 is seeing further improvements, the overall e-society readiness is likely to remain low. This situation calls for urgent and well-designed policy measures to support a more aggressive development of e-content and e-service, as well as greater PC penetration at homes and workplaces.

FIGURE 27: E-SOCIETY TREND



Source: ARC Fund (2004 is a forecast)

FIGURE 28: E-SOCIETY INDICATORS IN PERSPECTIVE



Source: ARC Fund (2004 is a forecast)

E-EDUCATION AND E-LEARNING

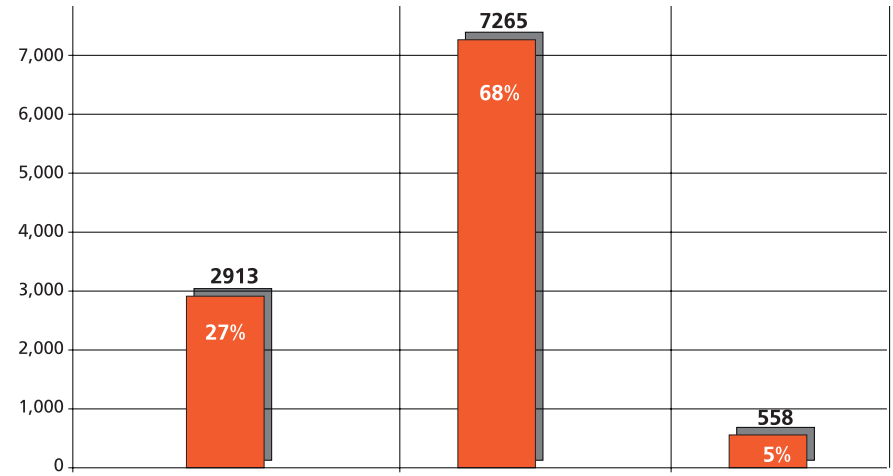
The section devoted to ***e-education and e-learning*** considers issues of ICT infrastructure in schools and universities (i.e. computerization and Internet penetration), their presence on the Internet (i.e. availability and quality of websites), impact of Internet and related technologies on the education curricula, as well as teacher skills and capabilities to integrate ICTs in the education process. A final section on life-long learning discusses aspects of ICT training, and the creation of skills in the labor force, and opportunities existing beyond the traditional education system.

1. Availability of ICT in Bulgarian Schools

1.1. Computers in Schools

According to data provided by the Ministry of Education and Science, there were approximately 10,838 computers in 3,270 schools (primary and secondary) in Bulgaria at the beginning of 2003, but not every school had computers. The typical computer systems available in schools could be classified in three categories according to the processor type, memory, and hard disk capacity. The data presented in Figure 29 clearly shows that most schools are equipped with already outdated computer systems. (Some 102 first-generation computers—of 8 and 16 bits—were not even counted in categories 0, 1, and 2). Figure 30 illustrates the large disparities in the regional distribution of computers in schools in each of the 28 regions of the country. Figure 31, which presents the number of students per single PC, shows the extent to which school computer facilities are able to meet the real needs in the regions. All Figures 29 to 31 illustrate the limited quantity and quality of the school computer equipment available in the country.

FIGURE 29: Number of Computer Systems by Category



Computer system	Category 0	Category 1	Category 2
Processor type	286/386/486	486DX/Pentium 75-466MHz	Pentium 500-1000MHz
RAM (MB)	Up to 8	from 16 to 64	From 64 to 256
Hard disk (GB)	Up to 1	from 1 to 10	from 10 to 40

Source: Ministry of Education and Science, 2002

A more in-depth assessment of the technical infrastructure at secondary schools, in particular, is provided by the Ministry of Transport and Communications, which commissioned a specialized survey in the second half of 2003[15]. According to the findings of this study, Bulgarian schools had on average 3.6 telephone lines per school, with only 13% of the schools reporting more than 6 lines. About half of the schools had no digital phone lines, and only 4.6% used ISDN. These figures are rather discouraging, taking into account the fact that fixed telephone lines remain the most common means of Internet access.

The available computer equipment is very unevenly distributed among various schools. Due to significant differences in the size of the schools, their curricula and practical use of computers vary greatly from town to town, and from school to school.

In terms of software, most schools use Microsoft tools, but alternative operating systems exist as well–4% of the schools use Linux and 3% use MacOS.

The overall penetration of computers used in secondary education in Bulgaria is still rather low–4 PCs per 100 students (for the MTC study) or 3.21 PCs per school (based on MES data). In this respect, Bulgaria falls seriously behind most of the new EU member states and candidate countries.

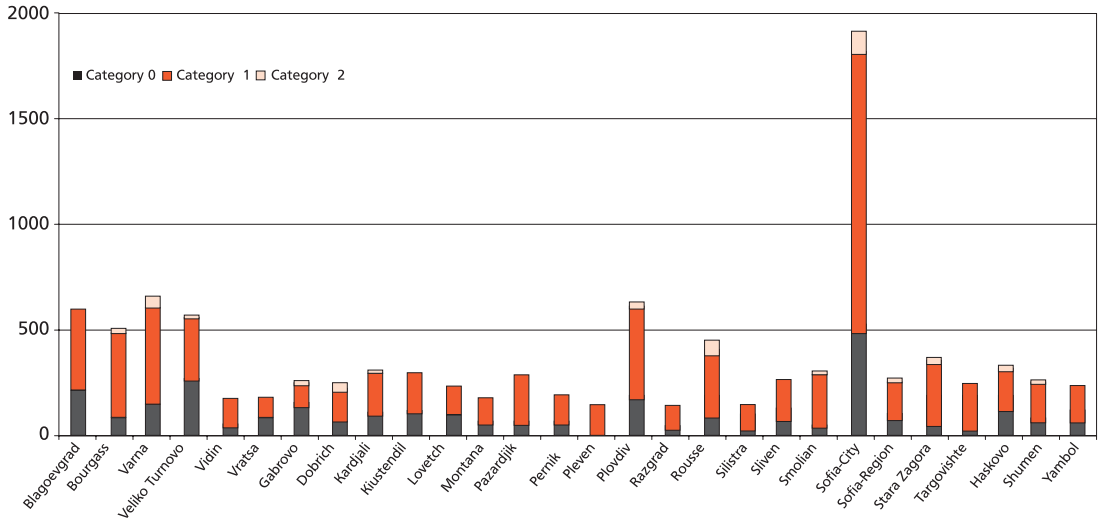
The situation is worse at the level of primary schools. According to an international comparative study[16] focused on primary education and the role of computer literacy, only Sweden outperforms the Netherlands, the United States, and Bulgaria in average achievement in reading for literary purposes. At the same time, computer availability for reading instruction varies dramatically from country to country. Whereas almost all students (more than 90%) in Canada, England, Iceland, the Netherlands, New Zealand, Scotland, Singapore, Sweden, and the United States have computers available in the classroom or elsewhere in the school, the large majority (more than 80%) have no access to computers in Belize, Bulgaria, Colombia, Greece, Iran, Kuwait, Macedonia, Moldova, the Russian Federation, Slovak Republic, and Turkey.

According to the most recently available PIRLS study, it is believed that only

[15] Ministry of Transport and Communication (MTC), Pilot study of secondary education and trends in e-learning services provision, Executive summary, October 2003. Base: 261 surveyed schools in all 28 regions.

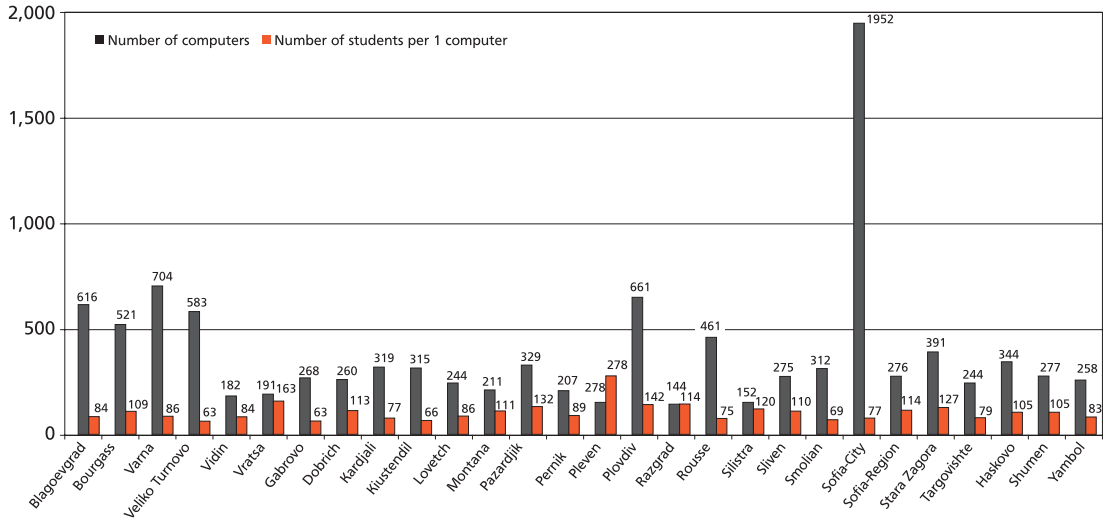
[16] International Comparisons in Fourth-Grade Reading Literacy: Findings from the Progress in International Reading Literacy Study (PIRLS) of 2001, released April 8, 2003

FIGURE 30: Regional Distribution by Number and Category of Computer Systems



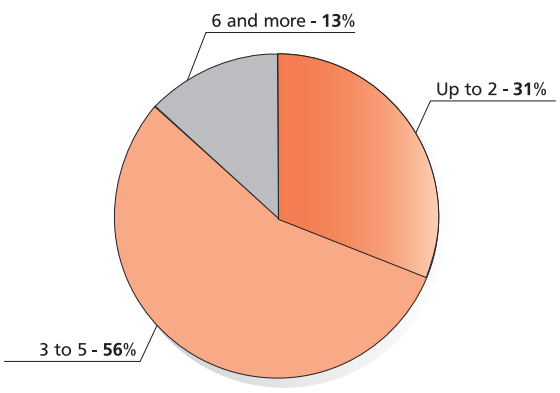
Source: Ministry of Education and Science, 2002

FIGURE 31: Distribution of School Computers in the Regions



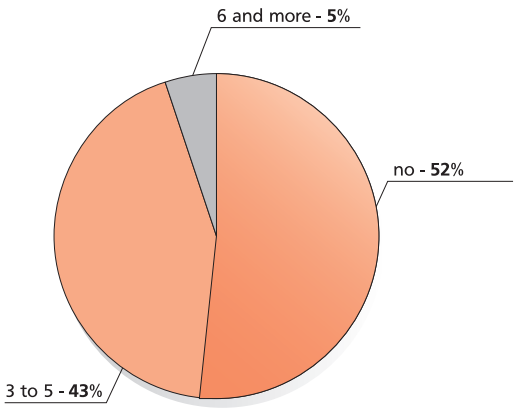
Source: Ministry of Education and Science, as of end 2002

FIGURE 32: Number of Telephone Lines per School



Source: Ministry of Transport and Communications, 2003

FIGURE 33: Digital Telephone Lines



Source: Ministry of Transport and Communications, 2003

29% of Bulgarian schools have PCs for education up to 4th grade. Of those which have computers, 82% have less than 10 PCs. 45% of computers are connected to Internet, but still 64% of the schools with computers are not yet connected to Internet.

1.2. Internet access

The **Internet connectivity** of PCs used for education and training purposes in Bulgarian schools is very limited. As an illustration, 40% of the schools surveyed in the MTC study reported the lack of a single connected computer for education purposes. Around 2/3 of the schools are connected to Internet (60% have Internet access for students, and another 16% have access only for the school director and/or teachers). Thirty percent of the schools have up to 10 PCs connected to Internet, but the quality of Internet access is still rather poor.

TABLE 12: Computer Labs in School

Computer labs in school	Schools	%
Up to 1	119	46.9
2	85	33.5
3 and more (max 9)	50	19.7
Base	**254**	**100.0**

Number of computers per computer lab	Schools	%
None	8	3.1
Up to 7	61	23.8
8 to 15	96	37.5
16 to 24	56	21.9
Over 25 (max 52)	35	13.7
Base	**256**	**100.0**

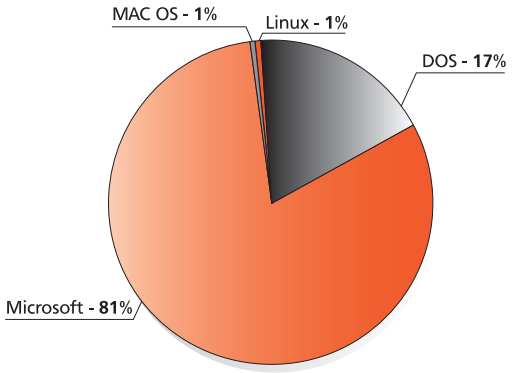
Source: Ministry of Transport and Communications, 2003

TABLE 13: Number of Connected-to-Internet Computers Used for Education

Number of connected-to-Internet computers used for education	Schools	%
None	103	39.5
1 to 5	34	13.0
6 to 10	57	21.8
11 and more (max 42)	62	23.8
Base	256	98.1

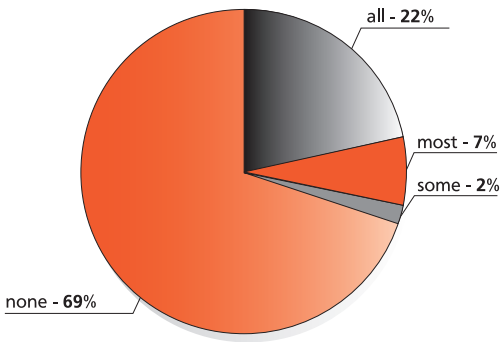
Source: Ministry of Transport and Communications, 2003

FIGURE 34: Distribution of OS in Computers at Schools



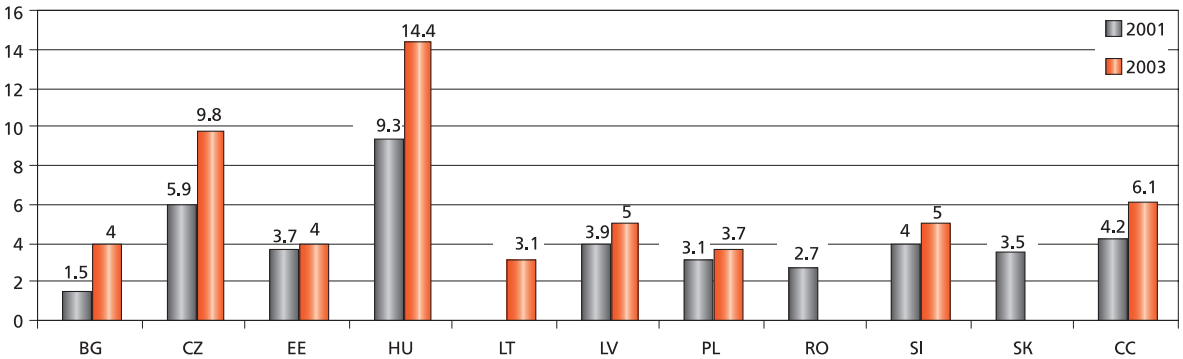
Source: Ministry of Transport and Communications, 2003

FIGURE 36: PC's with Access to Internet



Source: PIRLS (2001, 2003)

FIGURE 35: Number of Computers per 100 Pupils in Secondary Education



Source: eEurope+ Education Ministry Survey, June 2003

1.3. Web presence

The number of school websites is growing fast. Around 150 schools were reported to have their own websites in early 2004. Some schools have more than one website (i.e. usually unofficial websites developed by the students). Internet is not yet used for presentation of systematic education resources, but it is more often used for research and information gathering, locating materials for college-acceptance exams, or international language tests. Many students use Internet to look for information when applying to foreign universities, and completing the application forms. An encouraging fact is that most newly-published textbooks for the secondary schools contain a bibliography with Internet resources. This has a positive impact on promoting the educational uses of Internet.

Quite naturally, the capital Sofia is the leader in web-presence with 18% of the schools having websites. Somewhat surprisingly, it is followed by three regions with relatively smaller towns as their regional centers: Gabrovo, Pernik, and Targovishte (with 9%). Larger (and richer) regions seem to lag behind: Plovdiv (3%), Varna (8%), Bourgas (5%), and Rousse (7%). On average, only about 4% of Bulgarian schools have official websites.

A much larger share of the schools are reachable by email–an average of 18% (data from the official registry). Schools in Sofia again take the lead, with 37% of them having email. A surprisingly high ratio (almost the same as in Sofia) is seen in Silistra (36%), followed by Varna and Veliko Turnovo (31%). Even though the data from the national school registry may be objected to, on account of the frequency and mechanisms of updating the registry, the figures are indicative of the perceived importance which school administrations attribute to Internet communications (whether they report, or not, their email and web addresses to the Ministry of Education and Science).

TABLE 14: School E-Connectivity

Region	Number of schools	Number of computers per school	% having official email	% having official web site
Blagoevgrad	172	3.58	12	1
Bourgas	181	2.88	12	5
Varna	162	4.35	31	8
Veliko Turnovo	128	4.55	31	2
Vidin	56	3.25	9	0
Vratsa	119	1.61	8	0
Gabrovo	54	4.96	28	9
Dobritch	97	2.68	18	6
Kardjali	124	2.57	9	2
Kiustendil	71	4.44	8	1
Lovetch	85	2.87	14	0
Montana	93	2.27	5	0
Pazardjik	145	2.27	15	4
Pernik	57	3.63	21	9
Pleven	152	1	16	4
Plovdiv	235	2.77	14	3
Razgrad	85	1.68	13	4
Rousse	98	4.7	28	7
Silistra	73	2.08	36	1
Sliven	103	2.67	11	1
Smolian	94	3.32	11	2
Sofia-city	289	6.75	37	18
Sofia-region	128	2.16	10	0
Stara Zagora	155	2.52	21	2
Targovishte	94	2.6	13	9
Haskovo	123	2.8	16	4
Shumen	127	2.18	24	2
Yambol	72	3.58	10	0
Abroad	3	n.a.	67	33
Total	**3375**	**3.21**	**18**	**4**

Source: Own calculations based on data from the Registry of Schools, Ministry of Education and Science, Bulgaria Online, as of November 2003

1.4. ICT Training

ICT training (as a separate subject) is included in the compulsory curriculum, but only at upper-secondary levels (grades 9 and higher), and it is not yet part of the curriculum for the lower-secondary level and primary education. The Internet is not studied in computer science classes in more than 60% of the schools, and such training is mainly included in the curriculum for 9th grade (60% of the schools, 2 hours per week), 10th grade (less than 50% of the schools), and the senior years - 11th and 12th grades (less than 33% of the schools, according to the MTC study). Even when computers are available, the qualification of teachers remains a serious obstacle to the effective use of this equipment (e.g. 25% of the schools have no teachers with IT qualifications). The vast majority of teachers (almost 2/3) do not use new ICTs. Yet in some schools (11%, according to the same study) there are already (at least 6) "modern-minded" teachers. Expectations are that such people, who form a critical "inner core," will be able to push harder for changes in the education curricula and methods of teaching in the near future. Even when there are qualified teachers in ICTs (computer science, informatics, etc.) the constant changes in the specialized curriculum, often without planned or additional teacher training, leads to situations when students are much more knowledgeable and advanced than their teachers.

TABLE 15: Number of Teachers Using Internet in Teaching of Non-mathematical Courses

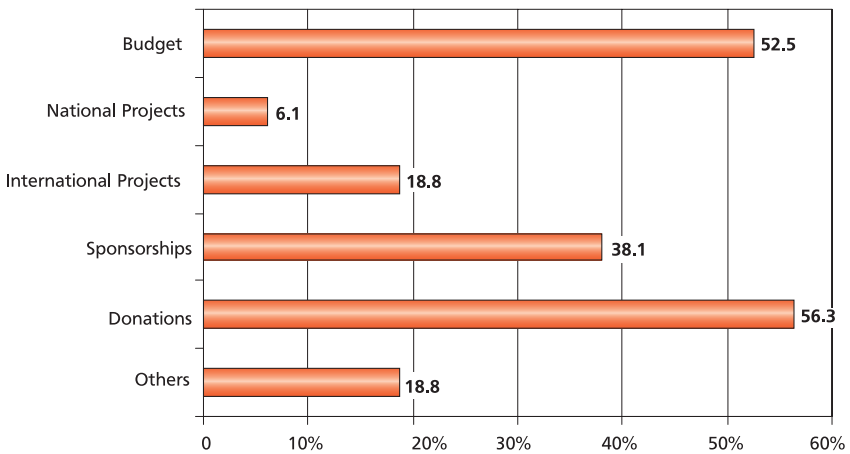
Number of teachers using Internet in teaching non-mathematical courses	Schools	%
None	165	63.2
Up to 5	62	23.8
6 and more	28	10.7
Responses	255	97.7
Missing	6	2.3
Total	**261**	**100.0**

Source: Ministry of Transport and Communications, 2003

1.5. Funding for ICT at Schools

The penetration of new ICTs and their effective use in education require serious financial commitments on the part of the government, schools, and local communities. It should be noted that, until now, the Bulgarian government has played a rather modest role in the computerization of the schools, or in upgrading the old equipment. This continues to be a strong deterrent to the introduction of modern standards and methods of education. (For a comparison, a country like Estonia with a population of only 2 million people commits $4 million a year through the Tiger Leap Foundation—which was established by the Estonian Ministry of Education, and 37 private companies and individuals as early as 1990.) At the same time, the influence of the private and non-governmental sector in providing ICTs to the schools has grown. International donor programs have played a very important role as well (see Figure 37). Some schools have been able to overcome the financial constraints by organizing strong advocacy campaigns: lobbying for donations, corporate sponsorships, or projects funded by national or international programs. Sometimes parents' organizations finance the purchase of computers, the upgrade of existing equipment, or Internet connectivity at the schools. In some cases, parents even pay for, or hire additional school instructors for their children. In all of these cases the school boards, and, especially, the school directors play an instrumental role.

FIGURE 37: Sources of Financing for ICT at Schools



Source: Ministry of Transport and Communications, 2003

2. ICT in Universites

Bulgaria has over 40 universities[17] in 26 cities across the country. Around 50% of them offer computer specialties. Out of a total of 230,513 university-level students[18], over 6,000 (around 3% of all) are enrolled in computer science majors, and another 5,000 study engineering, mathematics, physics, and biotechnology. Research and development in the area of computer science and ICT is largely concentrated at universities, and research institutes and laboratories of the Bulgarian Academy of Sciences.

All accredited higher education institutions offer some level of computers and Internet access to faculty and students. In most cases, this level is only sufficient to cover the minimum requirements set by the National Agency for Assessment and Accreditation, but compared to the growing needs of the academic community, it is largely insufficient in terms of quality (number of computers, capacity and speed of Internet connections), and reach (practical accessibility for all staff and students).

A second important constraint to a wider implementation of ICTs in tertiary education is the lack of adequate human resources. Administering and maintaining complex computer networks, and providing good quality Internet and Intranet services require highly qualified professionals who are rather expensive, and often unaffordable to the universities. Most often, the reason is shortage of funds, but sometimes also a lack of flexible management, and not very good understanding of the importance of using modern technologies for learning purposes. Such attitudes can result in unreliable network operations, and poor ICT support to the research and education process.

Methodologies and tools for online teaching and learning are not yet widely implemented at Bulgarian universities, but some efforts and modest developments are already visible in this direction (i.e. Sofia University, Plovdiv University, Technical University-Sofia, Technical University-Rousse, Medical University-Sofia, etc.) Even if there is an evident need for e-learning solutions–at least on the part of students, and the more "innovative" faculty–the wide implementation of e-learning requires more than just development of technological platforms. Changes in the institutional vision, management, and organization, as well as in the attitudes and practices of administrative and teaching staff, are also required. The latter seem to be even more difficult to achieve than technological innovation.

3. University platforms for e-learning

A number of Bulgarian universities have already recognized the need for integrated e-learning platforms, and have taken steps for their implementation. The decision to develop their own platforms is usually justified by two main reasons: (i) products available on the market are too expensive, and (ii) building their own tools allows greater flexibility, and closer adaptation to the specific institutional needs and practices. Sustainability, however, is a very important issue here. Putting such systems in practice requires high levels of robustness and reliability, as well as continuing support. Universities, therefore, need commercial partners to market and support such products. Another crucial issue is the need to train users and implement changes in the academic culture.

[17] The numbers do not include 12 non-accredited foreign universities with unknown number of students, some of which provide training in IT-related subject areas.

[18] Academic year 2002/2003; Source: National Statistica Institute

Box 1: Examples of E-Learning Platforms Developed by Bulgarian Universities

Sofia University: ARCADE (Architecture for Reusable Courseware Authoring and DElivery) system (http://arcade.fmi.uni-sofia.bg:8080/arcade/)

ARCADE is an integrated software platform for authoring and delivery of Internet-based distance learning courses. It was developed by a team of researchers and students at the Department of Information Technologies, Faculty of Mathematics and Informatics. The system includes the following modules: User Management, Course Delivery, Curriculum Management, Student Assessment, and Communication. ARCADE serves five categories of users: *Student, Course Author, Instructor, Course Administrator, and System Administrator*. Different system functionalities are defined for each role, and any user can play more than one role.

All functions implemented in ARCADE are accessible by a web browser. Users are not required to install browser plug-ins. This makes the system platform independent and provides flexibility to students, instructors, and administrators.

The system's modular architecture makes it applicable for universities, or other educational institutions. The ability to acquire knowledge at any time and any place makes it suitable for the purposes of life-long learning, especially in such dynamic areas as ICTs. The system is currently in its pilot-testing phase.

- **Medical University – Sofia: Flexible Problem-solving oriented Web based *e-learning* system**

The Medical University-Sofia, supported by the Open Society Foundation, has taken the first steps in introducing a flexible problem-solving oriented web based *e*-learning platform in Biochemistry to serve as a model to the other university departments.

The collaboration among specialists in Biochemistry and Informatics has led to the successful design and development of two course support systems (CSS) through which two fully operational websites have been created for a Web-based course on "Interactive Biochemistry":

- http://biochemistry.dir.bg (JavaScript-HTML CSS) – developed in 2000 in collaboration with specialists from the Department of Information Technologies at Sofia University;
- http://biochemistry.orbitel.bg (PHP-based) – developed in 2002 in collaboration with a commercial partner, Netage Solutions Inc.

Both systems support the following modules for students: "Lectures" (a source of knowledge), interactive "Tests" for (self)-assessment, and interactive "Clinical Case Simulations," to improve and assess professional skills. Thousands of pages are generated dynamically by these modules. The lectures are richly illustrated, incl. with animations and virtual models. The tests permit different ways of question distribution: consecutively or randomly.

The administrative module provides a useful tool for creating and editing on-line courses by teachers with only limited web-design skills. The dynamic database contains information about the users and their rights, teaching units, and sub-units. The system allows insertion of multimedia files, creation of links within and between different course sections or external sources, reports on students' progress, and quality of test questions.

The original course on "Interactive Biochemistry" is a good example of the integration of the latest achievements in biochemistry (modern content), information and communication technologies (Web environment), pedagogy (flexible learning), and medicine (problem-based learning). These new methods are well-accepted by both regular and correspondence students, as well as by lecturers who appreciate the usefulness of the course and the usability of the system.

University of Plovdiv is also developing its own e-learning system, **PeU** (http://peu.pu.acd.bg). It is a platform for developing and maintaining a Web-based environment for modeling the process of teaching and learning. There are two types of elements in this system: *subjects* (students, teachers, authors, guests, administrators) and *objects* (syllabi, courses, instructional materials, test, etc.) and five *subsystems* (for training, course authoring, testing, communication, and administration).

Technical University–Rousse. A Virtual Center—a platform for developing Web-based courses (http://ecet.ecs.ru.acad.bg/else/index.php)–has been in use here since March 2002. So far, 15 courses have been integrated into it, and this number is planned to grow to 150 by the end of 2004. About 200 students are enrolled in courses using this system.

4. Life-long Learning with an Emphasis on ICT

Continuous adult education is quite well developed in large urban centers, but in smaller villages and rural areas training opportunities are very limited or non-existent. Several actors are involved in the life-long learning system: state and municipality bodies, private organizations, enterprises, and others providing training services of a different range and quality. In most cases, emphasis is put on meeting the labor market objectives, but a coherent concept on life-long learning is still missing. The Law on Encouraging Employment, in force since January 2002, is the first legislative act focused on life-long learning as part of the government's labor policy.

Many government and non-government initiatives are currently underway that try to respond to the increase in training needs, and focus on building an open, flexible, and transparent life-long learning system in Bulgaria. In most cases, more attention is paid to areas where the demand and potential for economic gain are the greatest–e.g. business, ICTs, foreign languages, among others. Serious efforts have been invested in setting up programs for reintegrating people into employment. The Labor Offices of the National Employment Agency provide various IT courses to the unemployed, ranging from basic IT skills to knowledge of CAD-CAM systems, and web design.

Due to high unemployment rates among young specialists, the Ministry of Labor and Social Policy launched in 2002 a national program on *Computer Education of Youth (2002-2005)*. Its objective is to improve ICT access and knowledge of young people, and subsequently, to enhance their employability. The program is focused on unemployed young people up to 29 years of age. During the period 2002-2005 the program has set out to provide training to a total of 12,965 young people.

A number of professional training centers have been licensed by the National Agency for Vocational Education and Training, many of them focusing on basic IT skills for employees. A few centers also provide specialized IT training.

According to a survey conducted by the National Statistical Institute[19], the majority of company managers (72.5%) believe their employees need further training. At the same time, professional training is not considered a company priority, and only 12.6% of enterprises have any training plans/programs in place, while only 6.6% allocate budgets for training. The shortage of funding is considered to be the main reason for the lack of training at many enterprises (45.7%). When training is provided, it is done mainly by external organizations (62.7%); only $^1/_4$ of enterprises are engaged in any sort of continuous vocational training activities. Public sector enterprises account for 58.2% of the training and qualification courses in place. A large share of training participants (39.0%) focus on technology and production, quality control, and development of new materials and products.

Recognizing the deficiencies of the traditional educational system, and the disparity between skill levels and industry needs, some companies have designed their own programs in order to retrain their staff. Internal training courses are most common in the following sectors: telecommunications and postal services (83.3% of companies), electricity, gas, water supply and heating (70.6%), and about 2/3 of the enterprises in finance and insurance. In the total number of training courses provided to employees, however, computer courses take only around 7%, which is a rather low percentage compared to most of the new EU member states and candidate countries (excluding Romania and Estonia), or EU members where this share varies between 10% and 25%[20]. More courses are being offered in areas such as finance, management, or accounting, where the needs are perceived to be higher.

Companies attach high priority to employee certification according to internationally recognized standards. The tendency of acquiring private certification is particularly important for companies in ICT development and maintenance, as well as the major users and providers of knowledge-intensive services. World leaders like HP, IBM, Microsoft, Novell, and Cisco provide a variety of training courses to students and employees. Certificates provided by the Cisco training academy (in the area of computer networks and communications) are highly valued by the industry. They include Cisco Certified Networking Associate (CCNA) and Cisco Certified Networking Professional (CCNP). The Microsoft IT Academy Program is also very popular in Bulgaria. It provides internationally recognized Microsoft certificates for Solution Developer (MCSD), System Administrator (MCSA), System Engineer (MCSE), Database Administrator (MCDBA), Office Specialist (MOS), and Trainer (MCT).

Among the global e-learning providers, Brainbench is especially attractive to job seekers in Bulgaria since its online certification is highly valued by a number of IT companies around the world. Bulgaria is one of the world's top countries according to the number of certified specialists by Brainbench. At the same time, one of the most popular certificates in Europe–the European Computer Driving License (ECDL)—is not yet provided in Bulgaria. Bulgaria is the only country among the new EU entrants and candidate states which has no national center for ECDL training and certification[21].

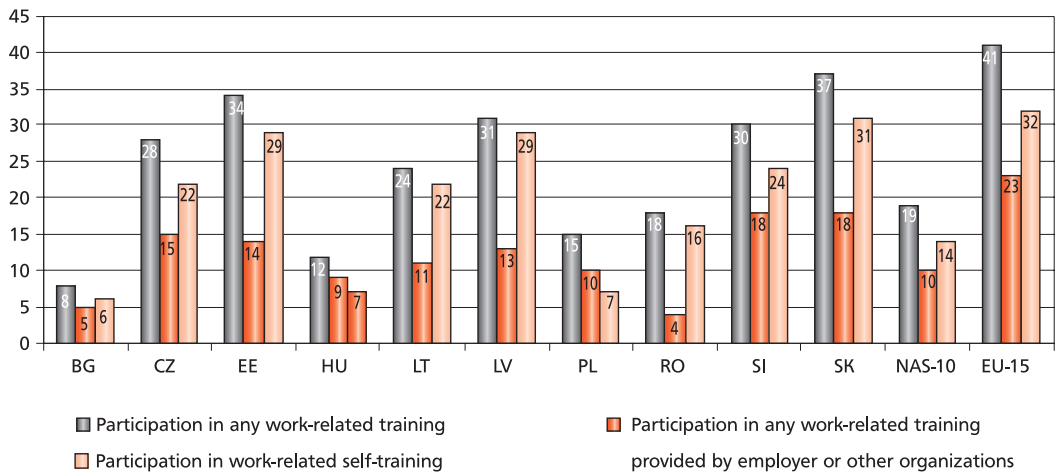
The overall participation of the Bulgarian population aged 25-64 in continuing education and training is still rather low. The share of people taking part in work-related training is 8% in Bulgaria, but this figure is higher in most of the new EU member states.

19 NSI 2002, Bulgaria 2001: socio-economical development, quoted in Vocational education and training in Bulgaria 2001–2002
20 Based on a Eurostat 2002 survey on continuing vocational training in enterprises in Europe.
21 See http://www.ecdl.com/country/index.html

The share of employees engaged in self-directed learning is also rather low in Bulgaria (6%), far below the leader among the new member states—Slovakia (31%). Besides, only 2% of employees are reported to use online e-learning tools for life-long learning, and 1% offline, compared to 15% on average in the EU, and 5% in the new member states and CCs.

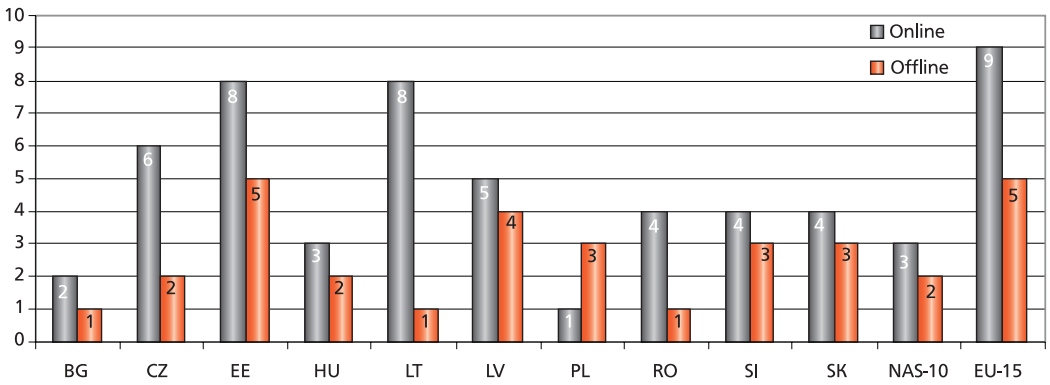
As demonstrated by Figures 38 and 39, Bulgaria has a long way to go before a culture of life-long learning is established, and electronic life-long learning takes root in the country, but the first milestones are already in place.

FIGURE 38: Participation Rates in Life-Long Learning in EU Perspective



Source: Empirica, 2003 and SIBIS Pocket Book 2002-2003

FIGURE 39: Usage of Electronic Tools for Life-Long Learning (% of population)



Source: Empirica, 2003 and SIBIS Pocket Book 2002-2003

5. Summary and Conclusions

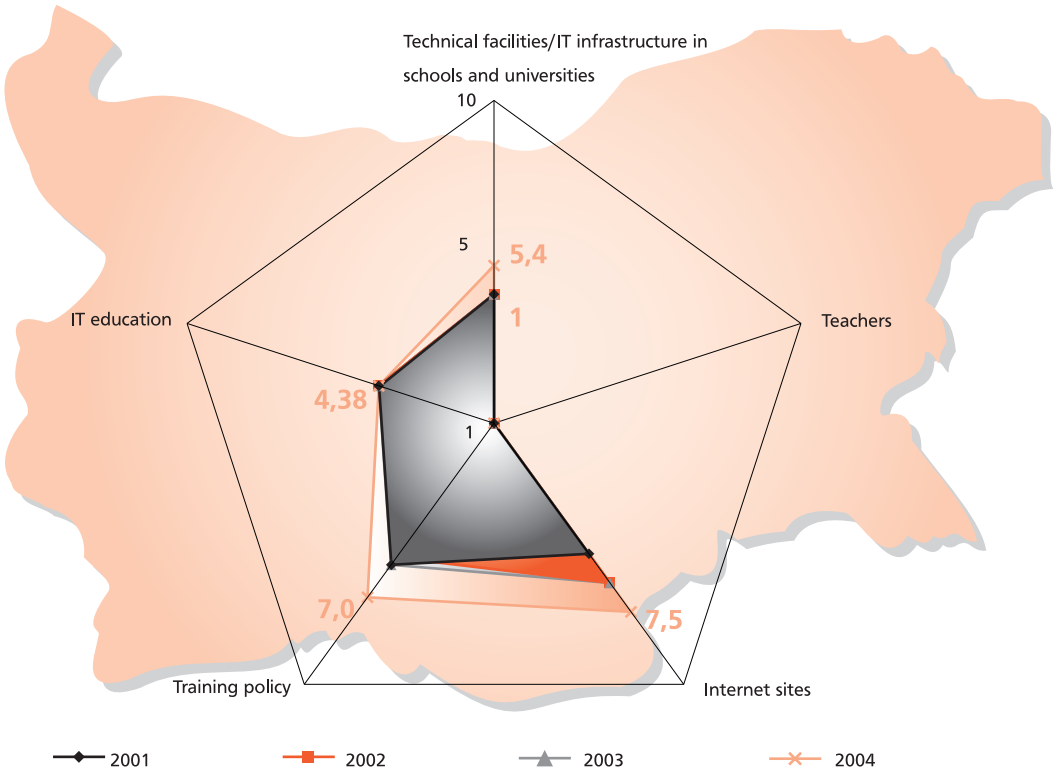
The economic reforms taking place in Bulgaria in the past 14 years have had a negative impact on many aspects of the education system. Voices of concern are more often heard from various quarters that Bulgarian education is declining in quality, and that further erosion could be expected unless more innovation is brought both to the education curricula and training and learning methods. This trend is confirmed by the aggregate *e-Bulgaria Index* where "e-education and e-learning" mark the slowest growth area since 2002.

- At the level of primary and secondary education, the low computerization and Internet penetration in schools remains one of the key barriers. While the joint efforts of the Ministry of Education and Science, individual school boards, local communities, and generous supporters (incl. international donors and private sponsors) have brought more computers into the classrooms (especially in secondary schools), Bulgaria continues to fall behind (3 to 10 times) the targets set out in the eEurope Action Plan (5 to 15 computers per 100 pupils). This lag is also visible in cross-country comparisons which place Bulgaria at a relatively disadvantaged position vis-à-vis the new member states and candidate countries, and far behind the EU 15.

ICTs are not yet integrated into the education process, especially in the teaching of non-ICT disciplines. Pupils do not receive the necessary digital skills at school. Except in upper secondary levels, ICT training is not yet part of the compulsory curriculum. The ability of teachers to effectively adapt, and integrate new technologies in the learning environment is very problematic. The lack of appropriate e-learning resources (e.g. electronic books or multimedia content and tools) in Bulgarian language further hampers the use of ICT in education.

- At tertiary education levels, the data concerning availability and quality of the ICT infrastructure is rather fragmented, and does not allow for an accurate and comprehensive assessment. There are some isolated "pockets of excellence" where both students and teachers enjoy satisfactory access to ICTs (e.g. American University in Bulgaria, New Bulgarian University, and a few others.) E-learning elements are slowly being integrated into the curricula at several universities, but these are rather isolated cases. University libraries are not yet fully computerized, and there is a need to develop adequate online library services. The use of digital radio and interactive TV as education media is still largely underestimated. Two projects currently underway are expected to provide a strong impetus to the wider implementation of ICTs in university education: the completion of the national research and education network connected to GEANT,

FIGURE 40: E-Education Indicators in Perspective



Source: ARC Fund (2004 is a forecast)

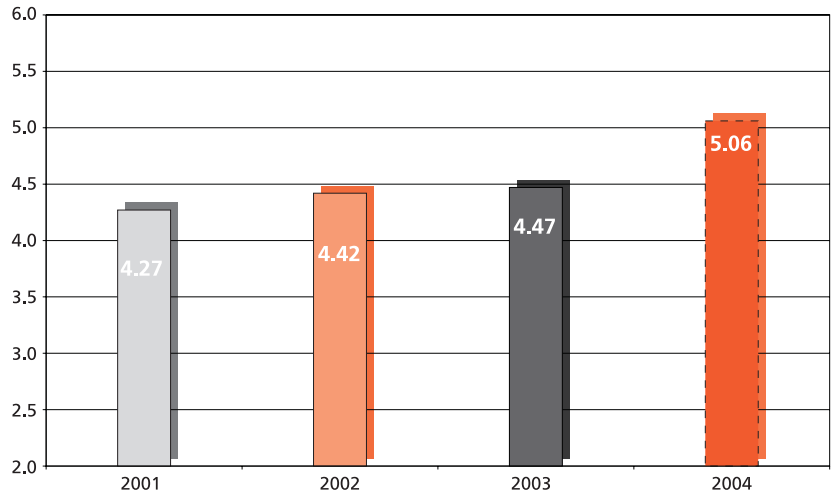
and the launch of a virtual computing lab among 15 universities nationwide.

- Even if training opportunities—including those for ICT skills creation—exist beyond the formal education system, a true system of life-long learning is only now beginning to take shape in Bulgaria. The imbalances between existing skills and the needs of companies or public administration are only partly being addressed by on-the-job training or other forms of professional training (e.g. professional training centers, employment offices, private companies, etc.)

The e-education/e-learning index has shown a rather modest growth over the past four years. In 2001, when the first e-readiness index was published, e-education/e-learning had the highest value (4.27 index points) among all category-level indexes, which was fully compliant with the wide-spread belief that Bulgarians had an excellent educational background. But since then, developments in education and learning capacity have continuously been loosing momentum. In 2003 the index measured 4.47 points, accounting for a third place after e-access (5.55 points), and e-government (4.56 points). The overall growth of the e-education/e-learning index is only 5% (in 2001-2003), against an average (overall e-Bulgaria index) growth of 23%.

Three indicators—*Technical facilities/IT infrastructure in schools and universities*; *Teachers;* and *IT Education*—have remained unchanged since 2001, while *Training policy* recovered to its 2001 level after a slight drop in 2002 (the only decline observed in any of the e-readiness indicators).

FIGURE 41: E-EDUCATION TREND



Source: ARC Fund (2004 is a forecast)

E-BUSINESS

E-business is defined as the conduct of business over the Internet. It also includes the development of intra- and extranets, and the provision of e-services by the application service providers. (This definition is taken from the Techtarget IT online resource http://whatis.techtarget.com.) E-business requires that companies, their employees, their customers, and partners have the necessary knowledge, infrastructure, and security to carry out online transactions. This section explores Bulgaria's readiness to do e-business, and summarizes the major developments in this field.

1. Computers in the Business Sector

The overall number of computers in use in the country was estimated at 520,000 to 600,000 at the end of 2003. About half of these (270,000–310,000) were operated in the business sector. The rising U.S. dollar, and the increased costs of software property rights compliance (brought about by several anti-piracy campaigns carried out jointly by law-enforcement agencies and software producers), slowed down the rate of new computers penetration in 2000 and 2001. Businesses began to renew their computer equipment in 2002 and 2003, and about a third of computers currently in business use are less than two years' old. This positive trend is likely to expand even further in 2004, fueled by a decline in the U.S. dollar value, and continued good domestic economic growth.

Looking at aggregate figures, there are three types of companies depending on the level of computer usage by their employees (see Figure 42): *digitally divided* companies with no access to computers (47%), *digitally mainstream* companies with up to 75% of employees using PCs (mostly administrative and managerial staff) (34%), and *wired* companies with practically all employees having (sometimes shared) access to PCs (18%).

The digital divide is most evident at micro-firm level (less than 10 employees) (see Figure 43). On one hand 96% of the companies which have declared they do not have a computer are micro-firms, and 62% of the micro-firms have no computers at all (see Box 2). On the other hand, the typical *wired* firm (with over 75% of the employees using PCs) is a micro-firm, accounting for 80% of the cases. Another 10% of the *wired* companies are such employing 11 to 50 people. Larger firms tend to use computers on a regular basis. Between 29% and 41% of companies with over 10 employees grant PC access to 10-24% of their staff.

Box 2: The Economic Approach to E-Business Statistics

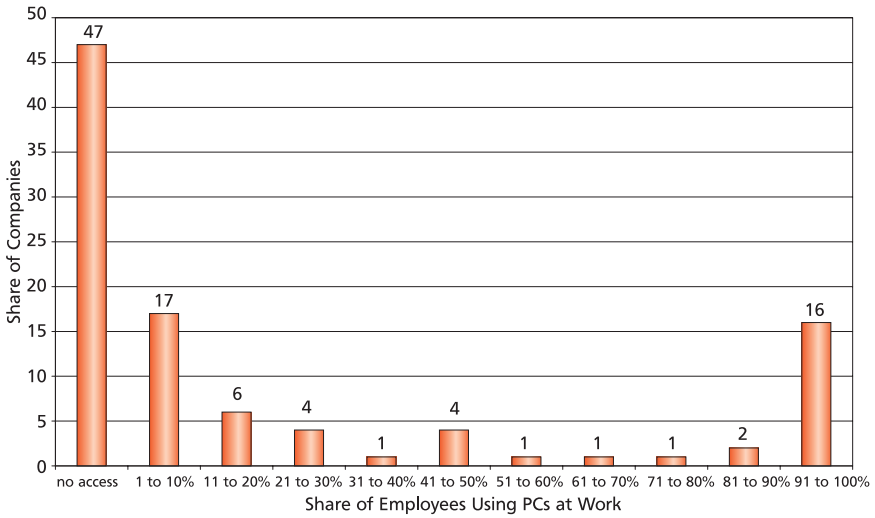
The lack of reliable statistical IT data in Bulgaria is a major impediment to good policy formulation. In the drive to fill this gap, a number of research agencies, institutes, and projects have provided survey data, which in most cases display large, unaccounted for discrepancies. A good part of these discrepancies are due to the choice of the base and sample size for the surveys, and especially to the share and type of micro-firms surveyed.

In this report ARC Fund has chosen an economic, rather than a statistical approach to defining business samples for its IT data collection. The statistical approach to business requires that all companies, which are registered and report to the National Statistical Institute should be accounted for. The economic approach takes into account that in a dynamic transition environment, a good number of statistically registered and reporting companies are not active business entities, and should therefore be excluded from business analysis. These are (1) "frozen" companies, i.e. registered companies which do not do business or pay taxes; (2) forced self-employment micro-companies (sole proprietorships) that represent survival strategies of individuals who do not have business plans but cannot find a job on the atomized and underdeveloped labor market, most of which keep single-entry book keeping; (3) companies that are part of a group, and do not have a separate business strategy (e.g. taxi drivers); and (4) "shell" companies which represent hollow business structures used for tax avoidance and/or evasion. When used carefully, the economic approach delivers more policy-relevant and comprehensive results, while safeguarding statistical correctness.

To avoid the number volatility of newly created companies, the year 2000 company statistics were used for the IT surveys. According to the National Statistical Institute, some 211,000 enterprises submitted their annual reports in 2000. Applying the above assumptions, ARC Fund estimated that in 2000 there were about 120,000 active businesses in Bulgaria, of which only 70,000 operated double-entry book keeping with an annual turnover higher than 10,000 BGN (contributing to over 90% of the value added). These 70,000 companies are the reference base for the calculations; they shape the bulk of the IT landscape of the country. The example below gives an idea of how initial assumptions change IT numbers, and might lead to false policy responses. This applies for all economic analyses conducted in this country.

If all 120,000 active businesses are taken as a base, then—on average—only 40% of the companies have at least one computer. However, the number is much smaller for the 50,000 forced self-employment micro-companies (15–20%). For the core IT sample used by ARC Fund, the number stands at 54.3%. This suggests that the main constraint to a wider IT usage in Bulgarian companies is the lack of education and skills for growing a business, which leads to focus on low value-added/low IT culture businesses. The number of such low IT culture companies in Bulgaria seems substantial, compared to the total number of companies, and thus pulls down the overall IT performance.

FIGURE 42: Distribution of Firms according to Employees' Computer Usage



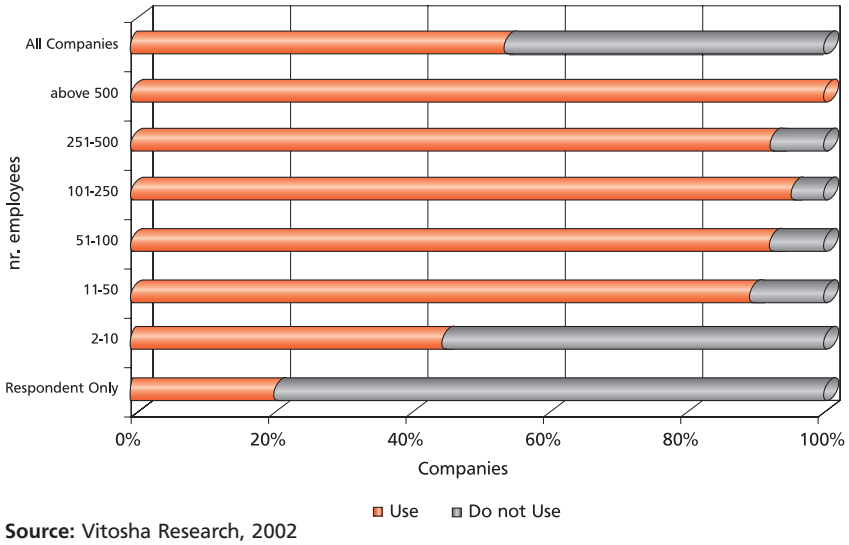
Source: Vitosha Research, 2002

Average figures give further insight into the characteristics of a typical company, representative for the respective employment categories. On average, 16% of the workplaces in the country are equipped with computers. Computers are often shared by more than one person, which allows on average 24.7% of the employed (see Figures 43-44) to have PC access at work. In the typical company employing more than 51 persons, between 23% and 26.7% of the employees have computer access. The number is similar for self-employed persons when taken to the economy as a whole (21%). This could imply that—given the current legislative, institutional, and market setting— the equilibrium level for company computer penetration for the country is around 25%. Companies that have higher computer penetration might be considered computer intensive and, most probably, represent the most knowledge intensive high-growth companies to be monitored in the future. Such companies belong primarily to the 11–50 employment category, though computer intensity grows even higher in the group of 2–10 employees. The average computer penetration in separate employment classes, on the other hand, could provide better benchmarks for IT, and knowledge-intensive companies in the respective class.

Computers are still being used by the bulk of businesses predominantly as "intelligent typewriters," as well as for accounting purposes, usage of legal information systems, and entertainment. One of the big auditing companies in the country has organized a training course in Microsoft Office products for its staff, which revealed that—on average—people used only a third of the available options of the applications.

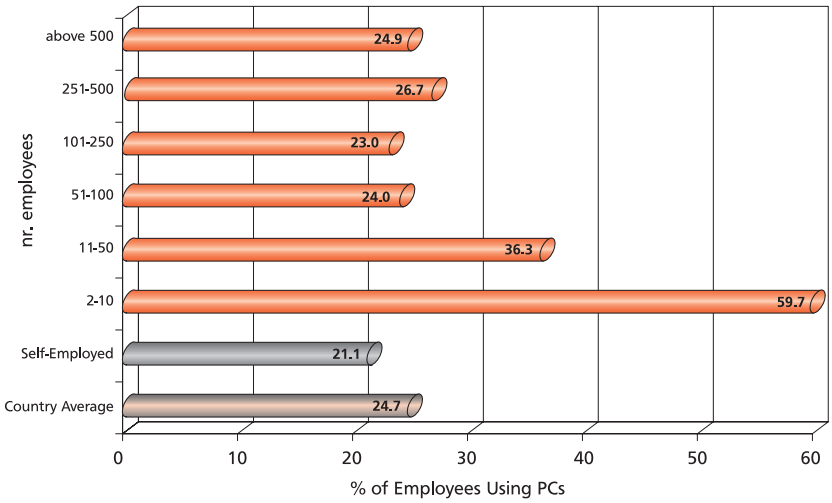
It is estimated that only about 14% of all companies have built internal networks, or intranets. Though these are still mainly used for easier file transfer and management, the last two years have seen a significant improvement in terms of enterprise resource planning, data warehouse, document and project management, and other specialized software penetration, and utilization in firms. The Bulgarian market for integrated business management systems is relatively young, but has a significant

FIGURE 43: PC USAGE ACCORDING TO COMPANY SIZE (% OF COMPANIES IN EACH EMPLOYMENT LEVEL THAT USE, OR DO NOT USE COMPUTERS IN THEIR WORK)



Source: Vitosha Research, 2002

FIGURE 44: AVERAGE NUMBER OF EMPLOYEES USING COMPUTERS ACCORDING TO COMPANY SIZE



Source: Vitosha Research, 2002

Note: The self-employed number in the table represents the number of self-employed respondents who use computers as a percent of all self-employed in the survey sample.

growth potential. Around 50 systems are supplied on the market (excluding individually designed projects). A marketing survey conducted in 2003 by LLP Sofia (an ERP systems provider) showed that 4% of the manufacturing companies (base 1500), and 7% of the firms in commerce and trade (base 5,000) used integrated information systems (IIS) of some kind. New IIS introductions grew by 8% on an annual basis in 2003[22].

An important factor for computer penetration and usage is the type and cost of software applications, and the cost of maintenance and service. High software costs and low enforcement measures have led to a proliferation of pirated software in the early years of transition. While, at the beginning, this might have provided an impetus to business and IT development, nowadays it has become a serious obstacle to e-business development. Pirated software creates unfair competition, and is a considerable threat to a company's long-term development.

Computer piracy is gradually decreasing due to the joint efforts of law-enforcement agencies and big international producers. Still, the International Intellectual Property Association estimated that in 2002 a sizable 73% of the

[22] Nadia Krusteva, Management information systems in 2003, IDG, November 2003, PowerPoint Presentation

TABLE 16: ESTIMATED TRADE LOSSES DUE TO PIRACY (IN MILLION USD) AND LEVELS OF PIRACY

Industry	2003		2002		2001		2000		1999		1998	
	Loss	Level	Loss	Level	Loss	Level	Loss	Level	Loss	Level	Loss	Level
Motion Pictures	4.0	25%	3.0	20%	3.0	20%	3.0	25%	4.0	25%	4.0	35%
Records & Music	7.0	80%	7.2	83%	3.0	65%	NA	NA	NA	NA	125	90%
Business Software Applications	NA	NA	7.0	72%	8.3	75%	8.1	78%	9.1	80%	10.7	93%
Entertainment software	NA	NA	21.9	91%	NA	84%	NA	NA	NA	NA	66.5	99%
Books	0.3	NA	0.3	NA	0.3	NA	NA	NA	NA	NA	0.5	NA
TOTALS	**NA**		**39.4**		**14.6**		**8.1**		**NA**		**207.7**	

Source: 2004 Special 301 Report, International Intellectual Property Alliance (IIPA)

business software in Bulgaria had been pirated (see Table 16). Piracy levels remain relatively high for all major "imported" business applications, despite the legalization campaigns that dominated 2003. Piracy in entertainment software even increased its share (from 84% in 2001 to 91% in 2002, according to IIPA) due to the fast growth of Internet and Game clubs. The overall Microsoft product piracy (the major piracy target) fell below 50% in 2003, and is projected to lose another 10% (mainly SOHO[23]) till end of 2004. Increasingly, companies that face high software costs but would rather avoid the risk of using pirated products, migrate to open source software. Though migration is still difficult to quantify, it is likely to be a viable and, in many cases, the only option for e-business start-ups.

2. Internet Usage by Business

37.9% of businesses in the country were connected to Internet in 2002[24]. This figure remained unchanged in 2003, i.e. about 70% of businesses with computers used Internet (see Figure 45). 2004 showed a slight improvement both in terms of business computers connectedness to Internet, and new firms equipped with computers reaching over 40% for this indicator. Should all micro-firms be taken into account, the level of Internet usage would drop to 25–30%. Data shows that Internet usage is positively correlated to the size of the company. Higher levels of Internet connectivity are also associated with higher computer density in firms. The latter comes to confirm that the more knowledge-intensive a company is (represented by higher use of Internet resources), the more likely it would have computer penetration higher than the industry average. On average, between 10.8% and 14%[25] of the employees have access to the Internet.

The Internet is still viewed by Bulgarian businesses predominantly as a resource and communication tool, rather than as an effective environment for doing business. In more than half of the cases, businesses use Internet mostly for communication (e-mails—32.6%, and interaction with institutions—18.5%), and searching for information and analyses (34.7%). Online marketing (6.2%) and e-commerce (4.7%) remain only marginal (see Figure 46). Certain disclaimers apply, however. These figures reflect managerial perceptions, or rather "wishful thinking," about the ways in which Internet is used in their companies (at least measured in time-budget). The most frequent purposes for using Internet cited by the population are leisure and individual learning activities, which implies that employees would also tend to "steal" time for such activities, however unwilling they are to disclose it. Further, e-mail correspondence has a large "junk" component–international spam, chain letters, pictures, or short clips, which further reduces the time for effective business use of Internet. The same applies to instant-messaging.

ISP sources suggest that about 70-80% of their traffic goes to music, films, and erotic websites downloads. Although LANs and cable networks have allowed in recent years for faster and cheaper access to Internet at home, this fact alone cannot explain the high levels of entertainment traffic. It could suggest that a large portion of this traffic goes

23 Small Office and Home Office
24 Vitosha Research
25 10.8% represents a weighted average by the average number of employees in each employment group, while 14% represents the statistical mean.

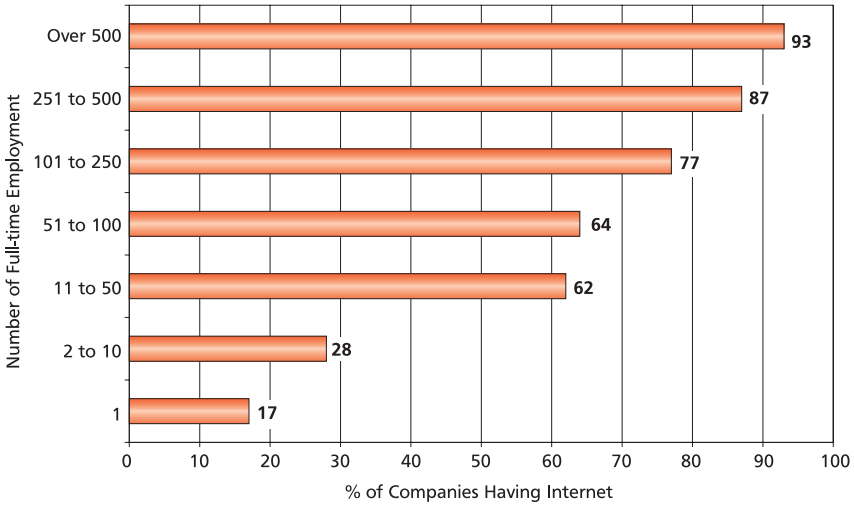
through "business" and "government" Internet. Faced with this reality, some employers have tried to block access to certain websites, though not quite successfully. ISPs have generally opposed such filtering on technical and ethical grounds, but a serious business case lies beneath–traffic is essential for the ISPs' business. It is likely that filtering will become more commonplace in the future, as business owners and managers become aware of the true costs to work efficiency, and productivity of excessive entertainment Internet use at work.

The size of the company is instrumental for using Internet for interactions with institutions, the downloading of documents, and various forms of e-mail usage. Actually, large companies are relatively strong drivers of e-government services, and the optimization of communication and customer/client relations through ICTs. "Online marketing" and "e-commerce" remain at low and stable levels for all companies, while "searching for information and analyses" varies widely, and differences cannot be explained by the size of the firm.

Roughly half (52%) of the firms using Internet for e-commerce (the most widely spread e-business practice) report that they do it for both selling and buying. Yet, 16% report only buying and 4% only selling online. Although online buying is more frequently observed, the absolute and average transaction volumes are much smaller (average 940, min 200, max 2,000 BGN) compared to selling (average 5,900, min 700, max 15,000 BGN). This might be explained by some specific features of the online market in Bulgaria, which are probably common for all transition countries. Buying is "cheaper" as the customer does not have to make any considerable investment in order to shop on the Internet from anywhere around the world. On the other hand, selling in an underdeveloped market requires more upfront investment, and businesses would naturally prefer higher value deals, which will allow them to spread the fixed costs.

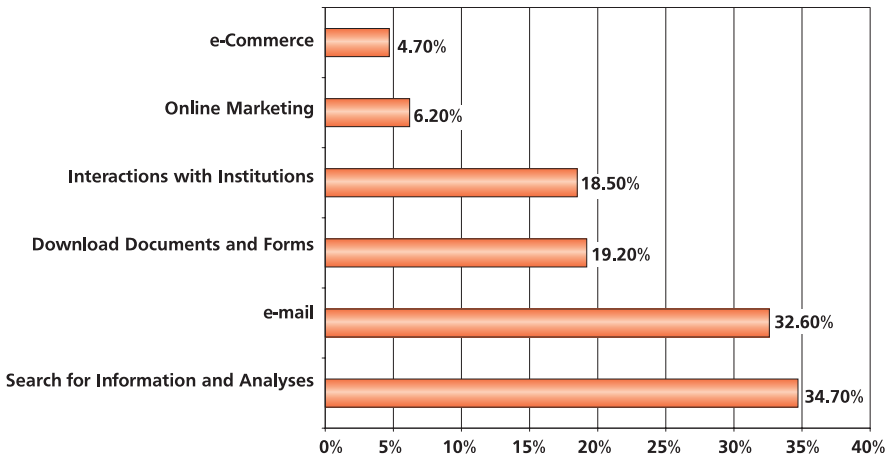
8.7% of the companies had websites at end of 2002, i.e. roughly half of the companies that used Internet had a corporate website, while at the beginning of 2004 almost $^{3}/_{4}$ of those com-

FIGURE 45: USAGE OF INTERNET ACCORDING TO FIRMS' SIZE



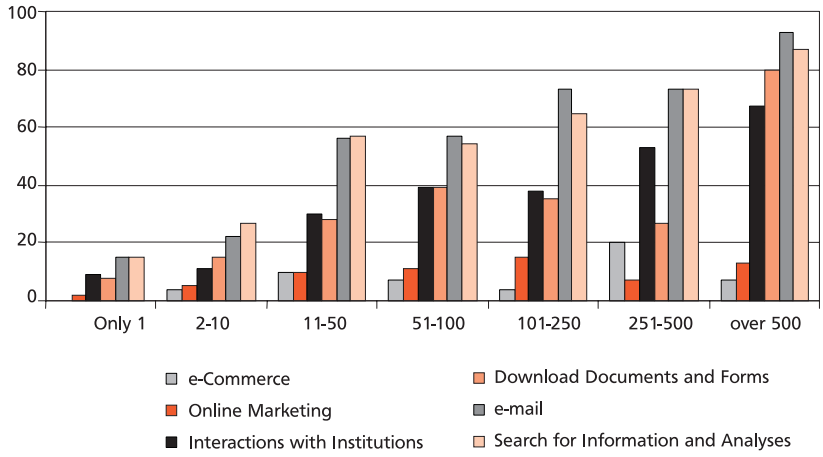
Source: Vitosha Research, 2002

FIGURE 46: **INTERNET IS USED IN BUSINESS FOR:**



Source: Vitosha Research, 2002

FIGURE 47: MAIN USE OF INTERNET ACCORDING TO COMPANY SIZE

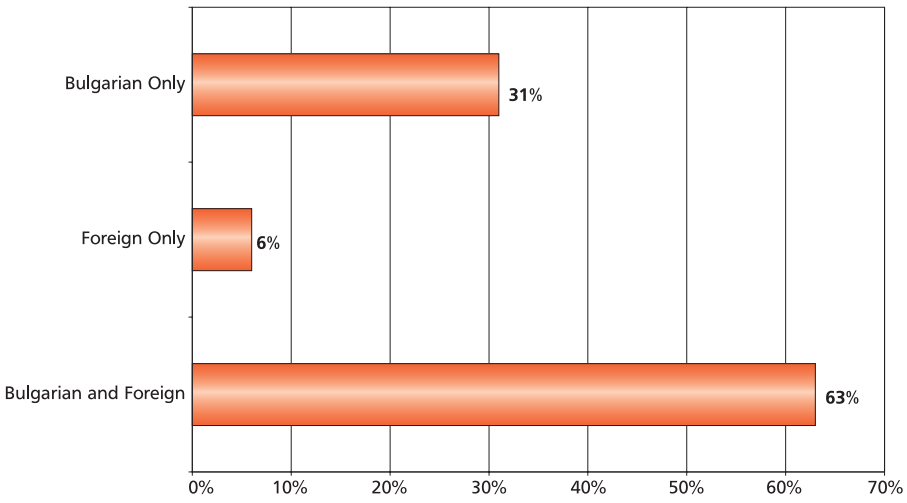


Source: Vitosha Research, 2002

panies with access to Internet already have websites, accounting to a little less than a third of active companies. The number of non-personal and non-governmental websites, however, is much larger since the majority of the financial sector (which has not been taken into account in the survey), as well as NGOs, have websites. A large number of TV and radio shows, marketing campaigns, and development projects also have their own websites, independent of the sites of the legal entities to which they belong. Sites are primarily used as marketing and promotion tools rather than as business platforms.

An interesting peculiarity of the Bulgarian market is the registration of domain names. The high prices and low quality of BG top-level domain (TLD), compared to international providers, have forced many companies to find ways of evading the .bg domain. In 2000 and 2001 the fashion dictated that companies register their domain name with major ISPs and portals, the national leader being Dir.bg with a few regional clusters. In 2002 and 2003 this trend changed, and companies migrated outside of the BG TLD. Currently, the number of websites registered outside BG TLD is at least 10 to 12 times larger than the ones registered in .bg. High registration costs also block domain name trade, which explains the large number of registered but unused names.

FIGURE 48: THE LANGUAGE OF WEBSITES



Source: Vitosha Research, 2002

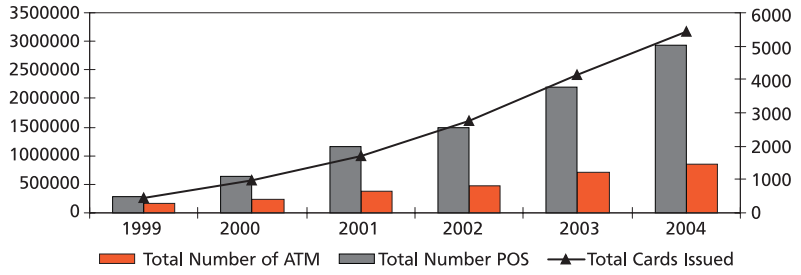
Bulgarian is the dominant language of most company websites (see Figure 48). Though 63% of companies claim their sites are bilingual, expert assessments point to large discrepancies in the content, and updates of the different language versions. A small number (6%) of companies, whose websites target foreign customers, do not maintain Bulgarian versions of the site at all.

3. Availability of e-Payment Instruments

True e-business solutions require well functioning, and secure e-payment systems. Therefore, the availability and use of e-payment instruments and services are telling of the maturity of e-business in a given country, and the level of e-readiness as a whole. E-payment still remains limited in Bulgaria, though the prerequisites for its growth appear (i.e. the deployment of a better e-payment infrastructure, and accumulation of more debit and credit cards in the population), and online transactions are expected to grow steadily, albeit from a very low level. The most challenging long-term barriers to e-payment have less to do with infrastructure, and more so with the lack of proper e-education and e-culture, and low per capita income of the population.

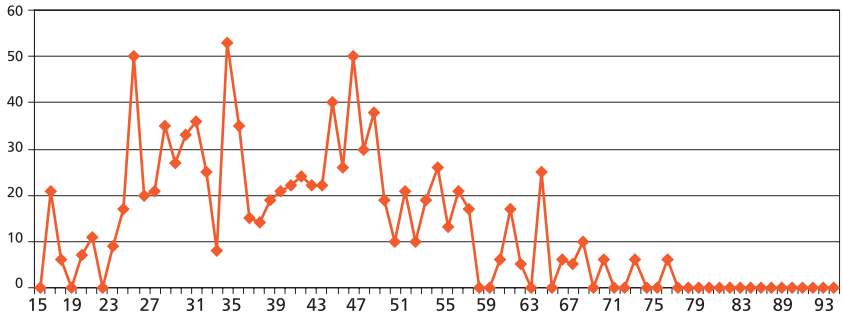
The available e-payment infrastructure has improved considerably since 2001. The number of ATMs grew annually by 187 in 2002 and 293 in 2003. As of the end of 2003 there were 1,222 ATMs. POS terminals grew even faster than ATMs—by 586 in 2002, and 1,200 in 2003. By the end of 2003, they totaled 3,754. Both ATMs and POSs will grow even higher in 2004, following the introduction of greater competition on the market of card transactions. (Several banks have left, or are expected to leave Borica[26] and establish new card operations, while some non-bank card operators have already started their own programs.) The penetration of debit and credit cards—the major e-payment instruments on the international and national e-markets, respectively—is also on the rise (see Figure 49). The number of electronic cards grew annually by 100%, and 50% in 2002 and 2003, respectively, and amounted to 2.4 million (30% of the population) at the end of 2003. However, survey data reveal that the average share of the adult population (over 16 years of age) using debit cards is much smaller—around 15%, as of October 2003 (see Figure 50). The latter is the more important number regarding the capacity and readiness of the population for online business. The discrepancy is due to various reasons– some people use more than one card, some cards expired but were not discounted from the total volume, and sometimes more than one card services the same account (usually additional cards provided to a dependent child or pensioner for easier cash transfers). Since 2003, there seems to be a gradual saturation on the market for debit cards, and a slight expansion of the credit cards market. Still, only about 4% of the population[27] uses credit cards for electronic transactions.

FIGURE 49: E-Payment Infrastructure[28]



Source: Borica

FIGURE 50: Share of Debit Cards Holders per Age



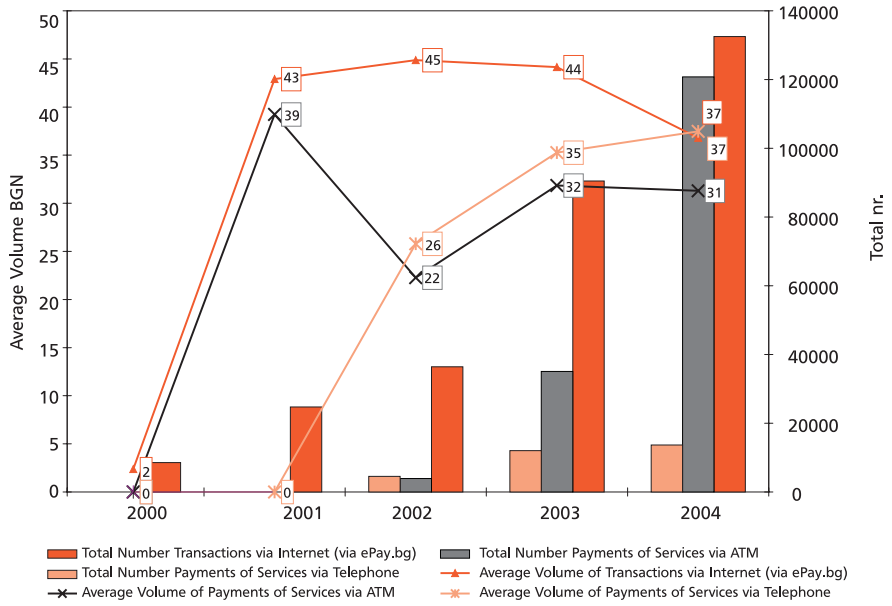
Source: Vitosha Research, 2003

The majority of transactions via ATMs are cash withdrawals with an average value of 84 BGN[29]. Only a marginal share (0.1%) is payments through ATMs. The daily frequency of withdrawals per ATM grew from 33 per day in 1999 to 61 in 2001, and 87 in 2002. The numbers reveal the overwhelmingly "cash character" of the Bulgarian economy, and the low average income in the country. With the introduction of more POS terminals the numbers will gradually change, but a qualitative change in the characteristics of the economy cannot be expected in the next 3-5 years.

The growth—both in total number of cards issued, and the share of people using electronic cards—is mainly supply-driven, which comes to explain the relatively low impact this growth has had on e-payment and e-business. Institutions with large daily turnovers or large payroll numbers were the first to

26 The banks' association for electronic transactions
27 Vitosha Research, 2003
28 Total number of ATM and POS are measured on the right scale, while total cards used – on the left scale.
29 There is a limit of 200 BGN per transaction and 400 BGN per day.

FIGURE 51: E-PAYMENTS IN BULGARIA



Source: Borica

recognize the cost reduction benefits resulting from the use of debit card payments. The majority of large private companies, government institutions, universities, and schools started paying out salaries through automatic bank transfers, thus minimizing their costs. This, however, incurred costs on the respective recipients of these payments, as the cost of using the cards remain high as a percentage of the average monthly income. Cash is by far the predominant mode of payment, and security has not increased. Growing competition on the bank cards market is expected to bring service costs down. This, in turn, will stimulate the use of electronic cards and e-commerce[30] rather quickly in the coming years. The rapid expansion of bank credits has also contributed to the growth of debit cards, since banks require debtors' salaries to be transferred to an account within the bank. Large retail stores were the first to introduce POS on a large scale. High upfront POS installation costs, low average transaction volumes, and the high share of hidden economy are the major challenges to a wider introduction of POS terminals in smaller retail stores.

2004 is already seeing a surge in demand-side cost cutting, which is expected to drive e-payments more vigorously up than many of the supply-side measures introduced in previous years. In 2003 some companies, most notably large utility monopolies, tried to induce their clients to start using e-payment for their regular bills by introducing various sweeteners (bill waivers, in-kind awards, etc.) for online payments. The aim was to reduce the companies' customer servicing costs and, simultaneously, enhance consumer satisfaction by cutting waiting and servicing costs. These measures are likely to have greater success in 2004, but they remain constrained in the long-run by low incomes and lack of an e-payments culture. In the short-run, however, they are likely to win support, should e-payment operators (both banks and Internet) manage to transfer operating costs to suppliers, and reduce direct e-payment costs for customers.

E-payment transactions via Borica (e-Pay) grew by about 50% on an annual basis in 2002 (36,441 transactions worth 1.6 million BGN), and by 150% in 2003, but the average transaction value remained low, declining from 44 BGN in 2002 to 37 BGN in 2003 (see Figure 51). The numbers reflect the increasing familiarity and use of online payments by Bulgarian customers, though it is still mainly used out of curiosity, and for payment of utility bills. This market has a good growth potential for 2004, as suggested by an almost 250% jump in the number of transactions via ATM, which service the same phone/utility payments. However, ATM customers will likely need more incentives and training before they move to Internet payments. Payments via telephone (mainly fixed digital lines) nearly tripled in 2002, compared to 2001, but remained almost flat in 2003. Phone payments are less readily available, and far less advertised than the other two options. They also involve a much higher security/trust premium–customers are much better aware of the security breach possibilities that exist over the phone network. In 2003, mobile phones were also used as e-payment tools via short-messages (for GSM melodies, and other services).

[30] One commercial bank has already slashed ATM withdrawal fees to 0 for its clients when using its ATM network.

4. ICT Employment Opportunities

ICT employment opportunities—both as a share of total employment, and as employment dynamics—is one of the most comprehensive indicators of the level, and direction of e-readiness. The demand for ICT labor shows the level of development, and the integration of the national ICT market into world markets. The supply of ICT labor also indicates the long-term domestic potential for ICT growth.

The Bulgarian ICT labor market showed some fluctuations during the aftermath of the *dot com* bubble in 2002 and 2003, which shows that it is already well-integrated into international markets. The NASDAQ crisis in 2001 did not directly affect the Bulgarian market, with just a few exceptions (e.g. Rila Solutions), but worldwide gloom over ICT pushed the average salaries in 2002 below their 2000 levels (see Tables 17-18). A further decline was observed in foreign owned companies in 2003. At the same time, local demand thrived, and total workplaces within the IDG Top 100 companies grew by 44%. Average salaries in domestically-owned companies grew by 12% on an annual basis in 2003. As mentioned in previous sections of this report, demand for local IT content and design has boomed in the last two years, partially offsetting the external shock. It might reasonably be expected that national ICT employment opportunities will grow, which—in combination with the increased international competition for IT talent, and the gradual convergence of Bulgarian to European income levels—will keep a moderate to strong upward pressure on industry salaries.

TABLE 17: IT Salaries accordining to Employers

Average salaries	2003	2002	Growth (%)
IDG TOP 100	535	545	-1.8%
- FDIs	652	882	-26.1%
- Bulgarian	454	405	12.1%
Software developers	622	593	4.9%
System integrators	620	700	-11.4%
Hardware suppliers	497	535	-7.1%
Communications suppliers	455	520	-12.5%
Distributors	516	447	15.4%
Assemblers	422	569	-25.8%
ISP	537	426	26.1%
Telecommunications	677	n/a	N/A

Source: IDG, 2003

TABLE 18: IT Salaries according to Employees

Position	Average Salary, BGN
IT director	2,200
IT manager in FDI company	1,445
Software developer in FDI company	1,007
IT team leader in Bulgarian company	900
Web-designer	780
Software developer in Bulgarian company	725
Network engineer	570
System administrator in Bulgarian company	562
System administrator in FDI company	562
Hardware specialist	518
System administration in state administration	385
Software developer in state administration	265

Source: IDG, July 2002

Excluding telecom companies, TOP 100 ICT companies employ a total of 5,500 people, according to IDG. The total number of ICT workplaces is estimated at 16,000-18,000. Most job opportunities are provided by hardware companies, followed by ISPs, and software developers. Average salaries for the industry are between two (for entry levels) and four times (for mid-level or experienced entry level) higher than the national average, and can reach up to 8-10 times the country average salaries for top level managers and highly specialized staff.

5. Summary and Conclusions

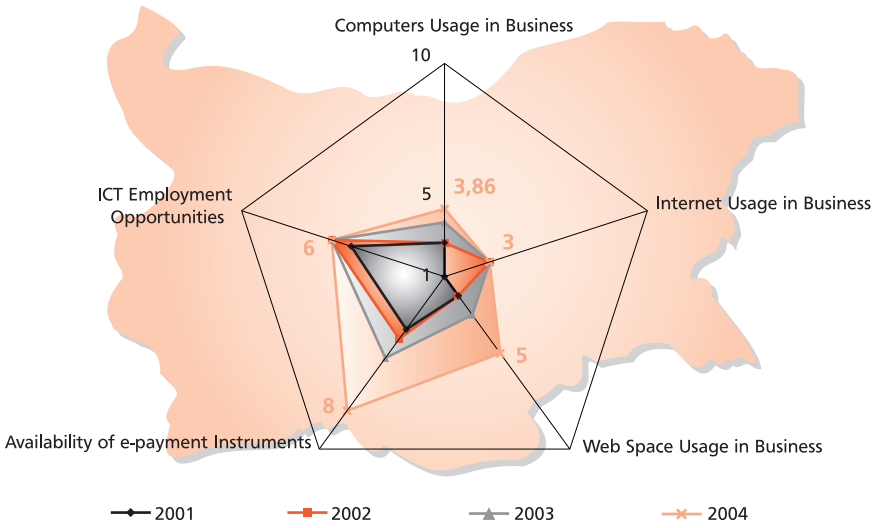
E-business—even in its most widespread form, e-commerce—is still rudimentary in Bulgaria, though experts see 2003 as the starting point of sustained growth in this area. The underlying infrastructure continues to improve, computer and Internet access are expected to boom in the coming years, and the ICT sector seems vibrant and ready to take more challenges. Incomes seem poised to rise steadily, though still at a very low level. However, a few long-term barriers to e-business development exist:

- lack of a consistent innovation-oriented government economic policy; efforts are still focused on first tier reforms (privatization and liberalization, company registration, regulatory regimes) rather than on more advanced issues (competition, IPR, technology transfer, and innovation);
- absence of a straight-forward and coherent e-government introduction, which would create opportunities for doing e-business with the single biggest economic agent on the market–the government;
- inadequate computer education and e-culture, especially among the general population and smaller businesses (under 50 employees);
- considerable share of informal economic activity in the sector;
- lack of trust in the reliability of e-payments.

It might be expected that the introduction of e-government at a faster and more predictable pace in 2004 would encourage businesses to match the government's investments in ICT on a higher than 1:1 ratio.

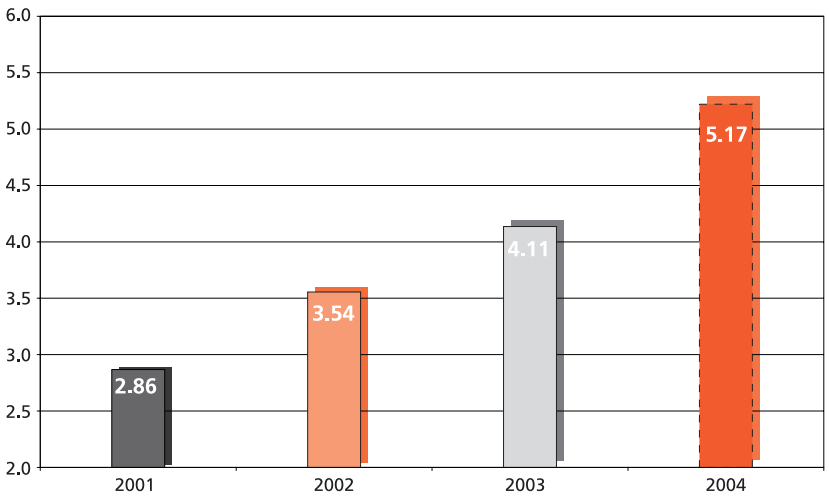
The "e-business" category showed the most dynamic development among all other categories of the e-Bulgaria Index, and had the highest growth in 2002 (24%) and the highest cumulative growth of 44%. This growth is naturally linked to positive developments in "e-access". The composite "e-business" indicators underwent significant growth (over 35% to 300% measured by index points), with the exception of "ICT employment opportunities," which could be explained by the relatively high levels of this indicator—6 index points (only two of all 19 indicators included in the e-Bulgaria Index take higher values). Further Internet and web-developments and usage are being witnessed in 2004.

FIGURE 52: E-Business Indicators in Perspective



Source: ARC Fund (2004 is a forecast)

FIGURE 53: E-Business Trend



Source: ARC Fund (2004 is a forecast)

E-POLICY AND E-GOVERNMENT

This section considers the institutional set-up, relevant public policies and the regulatory framework for e-government in Bulgaria. It provides an overview of the level of government ICT infrastructure deployment and the scope of e-government services provision. Unlike the earlier version of the e-readiness assessment (Bulgaria: ICT Infrastructure and E-Readiness Report, 2002) the current report considers e-government as a stand-alone category – independent of the e-economy index where it was previously included, following the Harvard University E-Readiness Guide model. This change reflects the increased strategic importance and the impact which e-government has on the overall level of e-development in Bulgaria.

1. Information Society Policy and Institutional Set-up

Already in the late 1990's, the Bulgarian government announced development of information society as a political priority, and identified adoption of ICTs as essential for the country's successful economic and social development. However, there have been few coherent public policies in this area to enable a real uptake of information society and ICTs in the country. Developments in recent years have been motivated in part by the EU accession process, and the requirements for compatibility with the eEurope standards and guidelines. The eEurope 2005 Action Plan[31] and related eEurope+ Action Plan[32] for the accession countries have provided strong incentives for e-development in Bulgaria.

The institutional framework for development of an information society has undergone several changes over the last 5-6 years, and is still not very well defined. In 1998 the government established a Coordination Council on Information Society issues, which brought together all relevant ministries, as well as representatives of civil society, academia, and the private sector. A year later (1999) it adopted two framework documents: "Strategy on Information Society Development of the Republic of Bulgaria" and a "National Program on Information Society Development of the Republic of Bulgaria." In 2000 the government also passed the "National Strategy for e-Commerce." However, the implementation of these strategies has been mediocre at best, which is partially explained by overly ambitious goals, and partially by lack of financial resources, and insufficient political vision and leadership.

Under the incumbent government—in office since 2001—policy priorities have shifted from a holistic approach to the information society to a more focused one, emphasizing development of ICT industry and e-government, in particular. Although all previously adopted IS strategies, programs, and action plans continued to exist, at least on paper, they were neither updated nor implemented, and the coordination body ceased operation in 2001.

One of the current IS priorities is development of e-government, which is closely linked to the ongoing administrative reform and modernization of public administration efforts that emphasize provision of citizen-centered administrative public services. Under the current institutional set-up, the Minister of State Administration is also responsible for e-government. A special **Coordination Center for Information, Communication, and Management Technologies (CCICMT)**[33] was established in February 2002 under the auspices of the Council of Ministers with a mandate to coordinate the implementation of information, communications, and management technologies in public administration, and the introduction of e-government services. The Center provides support to the Minister of State Administration in all matters related to e-government development. It was established as a joint partnership project between the Government of Bulgaria and UNDP, the latter providing start-up financial support in the first two years of operation.

In additional to this center, an **Interdepartmental Committee on e-Government** was also established at the end of 2002 with Decision No. 866 of the Council of Ministers. The Committee acts as a coordination body and a focal point for the activities related to improvement of administrative services provided by the public administration, and the implementation of e-government. Each ministry is represented on this committee by its Secretary General or a Deputy Minister. Members of the Committee are also the Director of CCICMT, and the Directors of the State Administration, and Information and Communication Technologies Directorates at the Council of Ministers. The Committee is co-chaired by the Ministers of State Administration and Finance.

The priorities for development of e-government in Bulgaria have been laid out in a specific **E-government Strategy**[34], adopted by the Council of Ministers in December 2002. This strategy is the result of a public-private partnership, which involved consultations with a wide range of private sector organizations and individual experts. The document provides the guidelines for the selection and implementation of specific (ongoing and future) e-government projects. It reflects the strategic vision for the development of e-government in Bulgaria, which envisages the provision of modern and efficient governance, and use of information technologies in meeting the real needs of citizens and businesses at any time and any place.

The implementation of this vision, and the strategic goals, focus upon the introduction of services which save time and effort to citizens and businesses, bring down administrative barriers, and accelerate economic and social development. Priority is given to 20 e-government services (12 for citizens and 8 for businesses) defined in the eEurope Action Plan.

An **Action Plan for Implementation of e-Government Strategy** (2004-2005) was adopted on March 11, 2004, almost a year after the adoption of the e-government strategy. This document provides the operational framework for the implementation of e-government services, and the underlying ICT infrastructure.

At present, the implementation of e-government in Bulgaria faces a number of constraints. The first major problem is the lack of sufficient funding. For instance, funding was not allocated to the implementation of the E-government Strategy in the budget for 2003,

31 http://europa.eu.int/information_society/eeurope/2002/news_library/documents/eeurope2005/eeurope2005_en.pdf
32 http://europa.eu.int/information_society/topics/international/regulatory/eeuropeplus/doc/eEurope_june2001.pdf
33 www.ccit.government.bg
34 http://www.ccit.government.bg//common/documents/RetriveDocument.aspx?DocID=45&LanguageID=2

neither planned for 2004. The Ministry of Finance is one of the few exceptions which devotes part of its own budget to development of e-government applications (e.g. use of online procurement for small tenders, use of digital signatures, etc). Most other e-government related projects (at central and local government level) are being implemented through foreign donor assistance (EU programs, UNDP, and others). Regarding institutional IT projects, funding for basic systems is available at some ministries (e.g. Ministry of Finance and its subordinate agencies; National Social Security Institute; National Health Insurance Fund), but financial shortages are rather acute in the municipalities, the judicial system, healthcare, education, and some central government administrations. Most e-government programs are conducted on a largely autonomous and fragmented basis which leads to inefficiencies, duplication and incompatibility.

Adequate management structures for e-government implementation have not yet been established, even though this is considered a key factor for the implementation of the already established strategic framework.

In the field of information and communication technologies the key policy-maker is the **Ministry of Transport and Communications**. In 2002, an **ICT Development Agency** was established in the framework of this ministry to facilitate the implementation of the government ICT program. Its major role is to support investments in ICT projects, as well as scientific and university research, development programs, international promotion and marketing of Bulgarian ICT sector. In 2004 the Ministry of Transport and Communications announced the "i-Bulgaria" Program which brings under one umbrella all of its ICT initiatives, including rural telecenters, regional software institute, ICT in education, etc. The practical results and impact of this program are yet to be seen.

Other components of the institutional framework for information society in Bulgaria include the **Communications Regulation Commission**, which is the independent telecommunications regulator. There is no specialized regulatory authority in the area of ICT, and the IT market is unregulated and thriving. Several industry associations represent the collective interests of market players (e.g. BAIT, Basscom, BINA, etc.).

The Bulgarian **National Statistical Institute** (NSI), as a part of the European statistical system, is in charge of submitting comparable statistical information to Eurostat. In addition to fulfilling the national priorities, the national statistics has to be harmonized with the EU requirements in regard to the implementation of new ICTs, becoming fully compliant with the European statistical system, and the IS priorities. Partial compliance has been achieved in the field of statistical surveys on information society development, providing data on the access and use of ICT networks and services.

2. Legal and Regulatory Framework

The major legal and regulatory framework for information society development in Bulgaria is already largely in place. Particularly, a number of laws and strategy papers have been adopted recently, which include:

- **Law on Access to Public Information** was adopted in July 2000. It defines the term "public information" and declares the principle of free and unlimited access to such information. The Law also specifies the procedures for obtaining public information and the authorities responsible for its provision;

- **Law on copyright and neighboring rights**;

- **Law on electronic documents and electronic signature** was adopted in March, 2001, and has been effective since October, 2001. The implementation of the e-signature law marked considerable progress in 2003 with the registration of the first two certification service providers for universal electronic signature (the only type of electronic signatures applicable in the public domain). The existence of such providers allows for the use of electronic signatures not only in the private sector, but also in relations involving governmental and municipal authorities. Further steps in this respect were made at the end of 2003, when the government set up an inter-departmental committee to draft the necessary legal framework for the use of electronic signatures in the judiciary;

- **Law on Personal Data Protection** was adopted in December, 2001, and provides a general framework for the protection of individuals with regard to the processing of personal data;

- **Law on Protection of Classified Information** was adopted in 2002. The law envisages the establishment of a modern legal framework in conformity with the NATO policy and standards, and specifies the principles and procedures for the protection of classified information, as well as the responsible specialized authorities, and their powers. It also provides for the establishment of a State Commission on Security of Information to carry out the overall organization, coordination, and control in this field;

- A **law enforcement mechanism for cyber crime and intellectual property** is of primary importance. The national legislation in these fields is

not yet fully harmonized with that of the EU.

Amendments to the **Criminal Code** were adopted in September, 2002 which incriminates computer related crime. However, instead of following the recommendations of the European Convention on Cyber Crime (signed by Bulgaria in November 2001, but still not ratified), the Parliament adopted a set of provisions that, to a certain extent, differ from the ones envisaged in the convention. At present, Bulgarian criminal law defines several major computer-related criminal offences. These include: unregulated access to computer resources; unauthorized copying or using of computer data; unauthorized addition, alteration, deletion, or destruction of computer data or programs; insertion of computer viruses in computers or computer networks; illegal dissemination of computer or system passwords; computer fraud; etc. The law specifies two types of penalties to be imposed on the perpetrators of computer crimes: fine (up to BGN 6,000 in the severest cases), and imprisonment (up to 6 years in the most severe cases). Despite some shortcomings—related primarily to the inconsistent terminology used to formulate the offences—the amendments could serve as an appropriate basis for effectively prosecuting, and punishing computer related crime in the country.

A further step towards making Bulgarian criminal law in the area of cyber crime compliant with international standards was the amendment, in 2002, of the **Code of Criminal Procedure**. Among other changes introduced to rules governing the development of criminal proceedings, the amendments envisage special provisions related to the prosecution of computer-related offences. The major new provisions concern the recognition of computer information / data recorded on a certain carrier as material evidence in criminal procedure; the immediate saving and storage of computer information data and traffic data on electronic messages communicated through a computer system upon request by the competent authorities; and the search and seizure of such data under the established judicial supervision.

Although Bulgarian criminal legislation is now considerably in line with major international standards, the newly adopted rules are not yet effectively implemented in practice. Among other measures needed to overcome the present situation, and further facilitate the enforcement of the new legislation is the improvement of professional skills of magistrates in the area of information technologies and cyber crime.

In an environment of a full liberalized market, effective since January 1, 2003, which marked the end of the Bulgarian Telecommunication Company's monopoly over fixed voice services and leased lines, a new **Telecommunications Law** was adopted (on September 23, 2003). The purposes of this law are to provide adequate conditions for the development of the telecommunications market; encourage competition, while guaranteeing the freedom and confidentiality of communications, the protection of the interests of telecommunication services users, the provision of a universal telecommunication service, the effective utilization of scarce resources, and the protection of public interests; and ensure national security and state defense. The new Telecommunications Law establishes a competitive framework for regulation of a fully liberalized telecommunications market, following the principles of transparency, non-discrimination, and proportionality.

Several important strategy documents have also been drafted in partnership with the private sector.

ICT Competitiveness Strategy was the follow up of the e-government strategy, and brought together mainly IT businesses and associations, key government representatives, and civil society members, focusing on how to raise Bulgarian ICT competitiveness on a national and global level. The strategy outlines six broad lines of action–intensive use of public-private partnerships; raising trust in the security of Internet use by businesses, citizens, and government; building the ICT infrastructure; enhancing human capital and investing in education; mobilizing wide public support; and branding and promotion for a competitive Bulgarian ICT sector.

Strategy for ICT introduction to secondary schools was developed by experts from the Bulgarian Association of Information Technologies (BAIT). The document is aimed at creating an environment and conditions to help students acquire skills to work with computers, and learn online, starting as early as 5th grade. (According to the present curriculum, the classes in informatics start at 9th grade.) It is planned that lessons in all subjects will be taught with the help of computers.

Information Society development in Bulgaria is largely influenced by the eEurope Action Plan. After the completion of the eEurope+ Action Plan, specifically designed for the candidate countries, the next step for all countries—including the new member states and candidate countries—is the adoption of the eEurope 2005 Action Plan's targets in their national programs, which have to be achieved within the timeframe of the eEurope 2005 Action Plan.

The full implementation of the eEurope 2005 Action Plan in Bulgaria will be impossible to achieve without a specialized coordination body on IS issues, which would be responsible for updating the National Program for Information Society development, and ensuring good horizontal coordination among all relevant bodies involved in IS activities.

Bulgaria faces a number of difficulties in its IS development, due to a lack of institutional capacity, good coordination, and strong political commitment. Conducting effective IS policies requires the existence of clear and high-level political support, legitimate and responsible businesses, and a reasonable level of collaboration and trust between the different sectors.

BOX 3: E-Registration Reform in Bulgaria: The Role of Civil Society

A concept paper for reforming the Bulgarian registration system was drafted by the Center for the Study of Democracy (www.csd.bg), a leading Bulgarian think-tank, in early 2001. This was followed by the set-up of a Registration Reform Task Force, consisting of prominent Bulgarian lawyers experienced in the area of civil and commercial law. The Task Force carried out a comprehensive research on the status of official registers in Bulgaria, and best practices implemented in other countries, and, in early 2003, prepared a report on *Opportunities for Establishment of Central Register of Legal Persons and Electronic Registries Center in Bulgaria*. The report reflects the recommendations and suggestions made in the process of its preparation by Bulgarian and foreign experts, government institutions, non-governmental organizations, and the business community. It outlines the following objectives of the reform: establishment of administrative procedures of registration; centralization of existing registers; and transformation of existing paper-based registration systems into electronic ones. The document also provides a complete set of proposals for reform, together with a plan for its implementation, and a model organizational structure of the Electronic Registries Center.

Recent developments: two governmental decisions on registration reform

In the spring of 2004 the Council of Minister adopted two important decisions that clearly demonstrate the government's will to actively engage with the reform of the registration system in the country.

On March 11, 2004, the Council of Ministers adopted a decision for approving the Plan for Implementation of the E-Government Strategy (Decision on point 37 from the sitting of the Council of Ministers of March 11, 2004, included in the Record of Proceedings No.10 of March 11, 2004). Based on a proposal by CSD, the plan incorporated a separate section on reforming the registration system in Bulgaria, describing the main stages of the process, the responsible government institutions, and the respective deadlines for their implementation. The plan envisages the following stages:

- **Stage 1: Establishment of Central Register of Not-for-Profit Legal Persons** with the Ministry of Justice (time frame: January–May 2004; responsible institution: Ministry of Justice; activities: amendments to the Law on Not-for-Profit Legal Persons, adoption of secondary legislation governing the organization and activities of the register, and setting up the register on the basis of the existing Central Register for Public Benefit Not-for-Profit Legal Persons);
- **Stage 2: Establishment of Central Commercial Register** (time frame: May 2004–May 2005; responsible institution: Ministry of Justice; activities: amendments to the Commercial Law and the Civil Procedure Code, and setting up the Central Commercial Register);
- **Stage 3: Establishment of Central Register of Legal Persons** (time frame: May–October 2005; responsible institution: Ministry of Justice; activities: merging the Central Register of Not-for-Profit Legal Persons and the Central Commercial Register into a Central Register of Legal Persons);
- **Stage 4: Establishment of Electronic Registries Center** (time frame: long-term, starting October 2005; responsible institutions: Ministry of Justice, or another ministry under which the Center will be set up; activities: adoption of a Law on the Electronic Registries Center and the respective secondary legislation, and setting up the Electronic Registries Center).

The stages as listed in the Plan for Implementation of the E-Government Strategy follow the steps proposed by the CSD Registration Reform Task Force in its report *Opportunities for Establishment of Central Register of Legal Persons and Electronic Registries Center in Bulgaria*.

On April 22, 2004, the Council of Ministers adopted Decision No. 332/30.04.2004 for setting up a Working Expert Group for Developing a Strategy to Establish a Central Electronic Register of Legal Persons, and of an Electronic Registries Center of the Republic of Bulgaria. The Working Group is chaired by the Minister of Justice, and includes representatives of the Ministry of Justice, Ministry of Regional Development, Ministry of Economy, Ministry of Finance, Ministry of Agriculture and Forestry, Ministry of Transport and Communications, the team of the Minister of State Administration, Supreme Judicial Council, the administration of the Council of Ministers, and the Center for the Study of Democracy. The setting up of this working group is the first step towards implementing the stage-by-stage plan, envisaged in the governmental decision of March 11, 2004. Building upon this plan, the Strategy to be elaborated by the working group should describe in detail the individual steps to be undertaken, especially in view of developing the necessary legislative changes.

In July 2004 the working group prepared a first draft of the Strategy describing the need of reforming the system of official registries in the country, the objectives to be achieved, and the steps to be taken thereof. According to this draft document, the reform should start by building up a Central Register of Legal Persons—a centralized electronic register, incorporating several integrated registers. This register will serve as the basis for the development of an Electronic Registries Center, which will initially include the Central Register of Legal Persons and the Central Pledges Register, while, in the long run, it will encompass other central registers as well (e.g. tax register, register of motor vehicles, central property register, etc.) The draft strategy also recommends the activities and deadlines, formulated in the Plan for Implementation of the E-Government Strategy in relation to the registration system reform, to be reconsidered and adjusted in order to fully correspond to the stages outlined in the strategy

The process of drafting the necessary legislation starts with the approval of the strategy by the Council of Ministers in September 2004.

3. e-Government Infrastructure

For a number of years the Bulgarian government has been working on the computerization and networking of government offices, and the deployment of a backbone network for internal communication among central government ministries, regional governments, and municipalities. The backbone of the system is provided by the National Public Administration Network (NAMDA)[35] that is comprised of 27 regional networks based in the regional cities. They have around 600 nodes in buildings where public institutions are located. The largest networks are those in Sofia, 115 buildings; Plovdiv, 39 buildings; Rousse, 35 buildings; and Varna, 29 buildings. Seven hundred kilometers of fiber optic cable have been installed between the cities of Sofia, Pazardjik, and Plovdiv. NAMDA connects 910 buildings of central government institutions and their branches.

Other large communication networks are also operated by the Ministry of Finance, Ministry of the Interior, Ministry of Defense, and the National Statistical Institute.

The government infrastructure is not yet integrated, which presents a major barrier to the effective provision of e-government services. It currently runs on X.25, ATM, VoIP, and others net works. If the public procurement procedure does not start by end of 2004, the integration project would be delayed even beyond 2005. In parallel to the physical integration of the networks, it will be necessary to synchronize and integrate the various databases and knowledge banks which exist at different ministries and government agencies. This would lay the foundation for providing effective one-stop-shop e-services to citizens and businesses. Both processes require effective horizontal coordination, and horizontal accountability, which are not yet fully in place.

The Internet connectivity of public administration offices varies from 80 to100% in regional administrations, 70 to 80% in central government agencies, and less than 20% in local government administrations, according to the e-government strategy.

Civil servants are generally supportive of the development of e-government. This positive attitude is an important precondition for the implementation of the complex and comprehensive reforms that are needed. According to a study conducted by the National Center for the Study of Public Opinion at the National Assembly[36], 58.3% of public administration employees believe the development of e-government would be very useful to their work, but see a problem in the low penetration of ICT tools. Less than two thirds (63.1%) of civil servants have access to e-mail functionalities provided through their internal administrative systems. From the total number of employees, less than half (46.3%) use systems for electronic document exchange. This percentage rises to 68.9% in departments where such systems are already operational. The computer literacy of civil servants is higher, compared to the general population—about 70% use Internet, against 18.7% among the population.

An assessment of the existing ICT environment of the public administration[37], covering 20 central administrations, 28 regional administrations, and 16 courts, counted more than 20,000 computers and 931 servers. About 88% of this hardware was in operation in the central administration. The subsequent analysis concluded that, while the central government (ministries and some affiliated agencies) was relatively well-equipped, the available ICT equipment in regional authorities and courts was largely insufficient. There are significant gaps and incompatibilities that need to be addressed.

35 National ATM network of the public administration
36 Problems of the Administrative Reform, 2002
37 Conducted by the ICT Directorate of the Council of Ministers in February 2003 on the basis of questionnaires completed by the IT departments of respective ministries, regional authorities and a small number of courts.

4. e-Government Services

The number of websites of public institutions has shown considerable growth over the last few years. In 1997, there were only two sites, while this number increased to more than 120 in 2001. Currently, almost all public institutions have Internet sites. In addition, there are several sites of regional administrations, and around 50% of the municipalities. Still, many of these sites contain mainly static information, and are not regularly updated. Several websites provide for online downloading of forms, i.e. tax forms.

In 2002 slightly over half of government ministries provided feedback possibilities through email or web-forms, while in 2004, this option is provided by practically all the ministries. In 2002 only about three to five regional administrations (15%), and around 15-25 municipalities (7-8% of all) had feedback features integration on their websites, and this number grew to 42 municipalities—about a third of those having websites—in 2004. Sofia Municipality is a big exception at the municipal level, providing, for example, an online tracking service for citizens' requests. Sofia was ranked 36 among a total of 100 capitals worldwide[38].

Only 4.3% of the population currently visits public administration websites. The general population tends to be less interested in e-administration than firms. Firms visit government websites more often due to their interest in public procurement–around 6% of the companies use various e-government services. This phenomenon could be explained by the lack of adequate and attractive services for citizens, and the immediate cost savings (or other types of value added) for businesses that e-services can provide. E-government development is still largely supply-driven, and not demand-driven. This is true for even the best case, Sofia Municipality. It is ranked 10th according to services offered, and 51st by usability (cited rankings). Most investments and e-pilots are designed to address constrains that the administration itself faces, or perceives as most hindering development (their work). Some of the services offered on government websites include:

- General Tax Directorate (downloading tax forms online, public registers for VAT, register of companies with unserviced debts to the budget);
- Bulstat (National Company Registry);
- Public procurement registry at the Council of Ministers;
- Registry of small public procurement at the SME Agency;
- A public database with all public information for listed companies,
- A public registry of NGOs performing in public benefit;
- A registry to check electoral lists.

Yet, the direction of flow in most cases is from the government to citizens. Large tax-payers[39] can also submit their tax-documents online. An interesting case is provided by the Varna District Court which offers the opportunity to obtain all relevant information concerning a case movement through the court's website, or via SMS.

According to the "Progress Report on E-Government Development in Bulgaria,"[40] drafted by the Coordination Center for Information, Communication and Management Technologies, the advance of the Bulgarian government in the electronic delivery of 20 indicative services can be assessed as 39.42%. This figure represents the aggregated information on the relative delivery of services, and the calculation is done using a methodology developed by the Dutch government, and published on the site of the *e*Europe initiative (E-Government section[41]).

The most developed e-government services are: address registration, social and health insurance data, reports to police, and notifications and job search in the employment agencies. More e-government services are being developed in 2004, which include: online submission of income tax and value added tax return forms, customs claims, and fully operational e-procurement system for small-scale (up to 10,000 BGN) public procurement at the

The overall electronic delivery of administrative services to businesses and citizens reveals the following results[42]:

TABLE 19: Advancement in the Electronic Delivery of 20 Priority Services

For citizens	43.86%
For businesses	34.04%
For businesses and citizens	39.42%

Source: CCICMT, August 2003

38 Digital Governance at Municipalities World-Wide, 2003

39 According to Order No 1 About the Order and Conditions for Tax Registration from 12.01.2000, changed in 13.12.2002 and in force from 1.01.2003, "large taxpayers" are firms with a) revenues exceeding 10 million BGN, b) paid or due for reimbursement taxes and duties of over 2 million BGN for last year, c) licensed for bank operations in the country or abroad; insurance companies and pension funds. Currently the large taxpayers are around 400.

40 http://www.ccit.government.bg//common/documents/RetriveDocument.aspx?DocID=56&LanguageID=2

41 http://europa.eu.int/information_society/eeurope/action_plan/egov/index_en.htm

42 Calculations are based on the best performing public service, part of a corresponding indicative EC service. In this case, the coefficient computed does not account for the full set of public services included in an indicative EC service and can be considered as a maximum value, and not as a mean weighted value.

5. Summary and Conclusions

Ministry of Finance. More detailed information on the status of major e-government services is provided in Appendix 1: *Delivery level of 20 priority e-government services*.

Recently, the Bulgarian public administration has been concerned with implementing as many of the e-government services as possible, and has focused less on the quality of these services. Once the services are online, it is expected that more efforts should be invested into customizing the services according to the specific needs of customers, including people with special needs and disabilities.

The future development of these services requires a common web-based platform. This platform should define common standards and unified business processes that will ensure a high-level of interoperability and scalability of the information systems within the public administration, regional administrations, and courts.

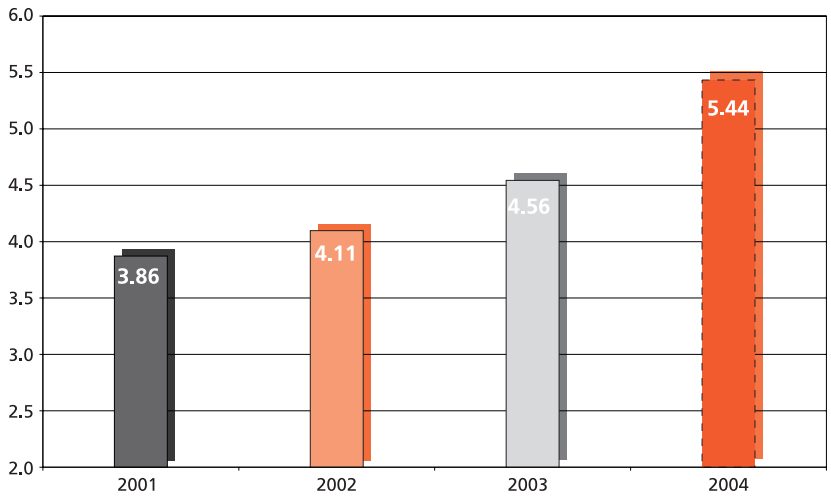
The overall adoption of e-government in Bulgaria can be assessed as relatively modest, but if certain conditions are put in place—such as good horizontal coordination, adequate training of civil servants, commitment to a common vision, etc.—it is quite possible to achieve a large part of the ambitious e-government program.

The strategic framework for e-government needs to be implemented into practical operational plans, and adequate financial resources should be allocated to this purpose. In order to raise the general understanding of the e-government development processes, the quality of e-government services should be enhanced to meet the real needs of citizens and businesses.

Special measures should be implemented in order to improve the accessibility of these services, including for people with special needs and disabilities.

Information and communication technologies within different administrations should be harmonized, and adequate and uniform standards should to be applied.

FIGURE 54: E-GOVERNMENT TREND



Source: ARC Fund (2004 is a forecast)

LIST OF ACRONYMS AND ABBREVIATIONS

ACP	Academic Challenge Program
ARC Fund	Applied Research and Communications Foundation
ARCADE	Architecture for Reusable Courseware Authoring and Delivery
ATM	Asynchronous Transfer Mode
AUBG	American University in Bulgaria
BAIT	Bulgarian Association of Information Technologies
BGN	Bulgarian Lev (currency code)
BTC Ltd.	Bulgarian Telecommunications Company
CAD/CAM	Computer-Aided Design/Computer Aided Manufacturing
CaTV	Cable Television
CCICMT	Coordination Center for Information, Communication and Management Technologies
CCIS	Coordination Council on the Information Society
CCNA	Cisco Certified Networking Associate
CCs	Candidate Countries for EU membership
CD	Compact Disk
CCNA	Cisco Certified Network Associate
CRC	Commission for Regulation of Communications
CSS	Cascading Style Sheet
CSS	Course Support Systems
DEMAND	Design, implementation and management of distance education
DK/NA	Don't Know/Not Available
DNS	Domain Name Server
DVB	Digital Video Broadcast
DVD	Digital Video Disc
ECDL	European Computer Driving License
ERP	Enterprise Resource Planning
ETSI	European Telecommunications Standards Organization
EU	European Union
FDI	Foreign Direct Investment
FR	Frame Relay
FWA	Fixed Wireless Access
GHz	Giga Hertz
GPS/GRPS	Global Positioning System/General Radio Packet System
GSM	Global System for Mobile communications
HI-FI	High Fidelity
HTML	Hyper Text Markup Language
ICT	Information and Communication Technology
IIPA	International Intellectual Property Association
IIS	Integrated Information Systems
IS	Information Society
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
IT	Information Technologies
ITU	International Telecommunications Union
LAN	Local Area Network
MacOS	Macintosh Operating System

MAN	Metropolitan Area Network
MCDBA	Microsoft certificates Database Administrator
MCSA	Microsoft certificates System Administrator
MCSD	Microsoft certificates for Solution Developer
MCSE	Microsoft certificates System Engineer
MCT	Microsoft certificates Trainer
MES	Ministry of Education and Science
MHz	Megahertz (million Hertz)
MOS	Microsoft Office Specialist
MTC	Ministry of Transport and Communications
N	Number (of respondents)
NAMDA	National Network Of The Public Administration
NASDAQ	National Association of Securities Dealers Automated Quotation (system)
NATO	North Atlantic Treaty Organization
NGO	Non-Government Organization
NSI	National Statistical Institute
OS	Operating System
PC	Personal Computer
PeU	University of Plovdiv e-learning system
PHP	Hypertext Preprocessor (server-side scripting language)
PIAP	Public Internet Access Point
PIRLS	Progress in International Reading Literacy Study
POS	Point-Of-Sale
PSTN	Public Switched Telecommunications Network
RAM	Random Accessed Memory
SME	Small and Medium Enterprise
SMS	Short Message
SOHO	Small Office and Home Office
TLD	Top-Level Domain
UCC	University Computing Center
UML	Unified Modeling Language
UNDP	United Nations Development Programme
USD	United States Dollar
VAT	Value Added Tax
VoIP	Voice over Internet Protocol
VPN	Virtual Private Networks
VSAT	Very Small Aperture Terminal
VSR	Voice Storage and Retrieval
WWW	World Wide Web
y-o-y	Year on Year

APPENDIX I:
Delivery Levels of the 20 Priority E-Government Services

Name	Institution	Current stage of supply	Maximal possible stage of supply	Service
Administration to Citizens Services				
1. Income tax: declarations, notifications.	General Tax Directorate	One-way interaction	Transaction	Distribution of information; downloading of forms; tips on filling out forms; FAQ; phone numbers for complaints; signals; and opinions http://www.taxadmin.government.bg/dek_for_ud/udostov.htm
2. Job search in the employment agencies	Employment Agency	Two-way interaction	Two-way interaction	Distribution of information for services offered by the EA; "Job Market"—interactive service for offers and search—job positions; FAQ; feedback option. http://www.nsz.government.bg/
3. Social Insurance				
Information on health insurance status	National Social Security Institute	Information	Transaction	Information on health insurance status for citizens http://healthinsurance.nssi.bg/report_healthhtm.asp
Information about Social Security Contributions	National Social Security Institute	Information	Transaction	Provides detailed information about social security contributions using Digital Signature identification. http://egateway.government.bg
Supplements for children	Ministry of Labor and Social Policy	Information	Transaction	Information about the terms and procedures for receiving the supplement; contact info; FAQ http://www.mlsp.government.bg/bg/public/deca.htm
Children benefits	National Social Security Institute	Information	Transaction	Information about the terms; form download http://www.noi.bg/children/index.htm
Social insurance and benefits for the unemployed	Social Dare Department (Municipality of Sofia)	One-way interaction	Transaction	Distribution of information for the service; form download; completed templates; contact info http://sgr.hit.bg/bzr.html
Scholarships	Ministry of Education and Science	Information	Transaction	Information for the requirements and procedures for scholarships for students, PhD candidates; information for openings http://www.minedu.government.bg/konkursi/konkursi_short.html
4. Personal documents				
ID cards, passports	Ministry of Interior	Information	Two-way interaction	Information for the terms and procedures for issuance of documents; FAQ http://www.pasporti.mvr.bg/
Driving licenses	Vehicle Control	Information	Two-way interaction	Information for the terms and procedures for issuance of driving licenses http://www.kat.mvr.bg/
5. Vehicle registration	Vehicle Control	Information	Transaction	Information for the required documents and fees for registration and change in registration of vehicles http://www.kat.mvr.bg/
6. Filing of building permits	Directorate National Building Control, Ministry of Regional Development and Public Works	One-way interaction	Transaction	Information for the required documents for getting a building permit and use; download of scanned forms http://www.dnsk.mrrb.government.bg/default.asp?r=11
7. Reports to police, notifications (e.g. for burglaries etc.)	Ministry of Interior	Interaction	Two-way interaction	Filing of notification with the police – online form http://www.dnsp.mvr.bg/php/touchmail/form.php

Name	Institution	Current stage of supply	Maximal possible stage of supply	Service
8. Public Libraries	**National library "St. Cyril and Methodii," Library "Dora Gabe" – City of Dobrich**	Two-way interaction	Two-way interaction	Distribution of information and database search http://nationallibrary.bg/catalog.htm http://www.libdgabe.dobrich.net/index.htm
9. Civil acts (birth, marriage etc.)	**Municipalities**	Information	Two-way interaction	Information for the required documents, fees and deadlines. Some municipalities allow download of forms http://bulgaria.domino.bg/
10. High School and Academic Diplomas	**Ministry of Education and Science**	Information	Transaction	Online check of the enrolment results for the 7th grade of the Secondary School http://www.minedu.government.bg/klasirane/klasirane.asp
11. Changes in the Address registration	**"General Directorate on Civil Registration and Administrative services" Ministry of Regional Development and Public Works**	Two-way interaction	Two-way interaction	Change of address registration using electronic signature identification: http://egatway.government.bg Information for the required documents, fees, and deadlines of the services provided by the municipalities. http://bulgaria.domino.bg/
12. Health care related services	**National Health Care Fund** **Ministry of Health**	Information	Transaction	Dissemination of information on the rights of patients http://www.nhif.bg/bg/patient1.phtml
***Administration to Businesses* Services**				
1. Social insurance of the employed Data on the social and health insurance of the employed people	**National Social Security Institute**	Two-way interaction	Transaction	Submission of information about social insurance contributions of employees using electronic signature identification: http://egateway.government.bg Publishing information and contact info; System for collection of data related to professional and universal pension funds; distribution of software for companies in order to gather the information in declarations 1, 3, 4; download of forms; registration of labor contracts online; check for professional and universal pension funds http://www.noi.bg/index_first.html http://nssi.orbitel.bg/ppf/
2. Corporate taxes: declaration, notification	**General Tax Directorate**	One-way interaction	Transaction	Information distribution; download of forms http://www.taxadmin.government.bg/faq/faq.htm
3. VAT: declaration, notification	**General Tax Directorate**	Information	Transaction	Public registry of companies for purposes of VAT. Each company can be searched in the registry by its name (whole or partial), by its ID number (Bulstat), or its tax number. A WAP version has been released http://www.taxadmin.government.bg/registri/registri.htm
4. Registration of new company	**"Information Services" Ltd.**	Information	Transaction	National Information System DELPHI provides actual information about the legal status of companies. http://egateway.government.bg

Name	Institution	Current stage of supply	Maximal possible stage of supply	Service
Registration of sole trader	**Agency for Small and Medium Enterprises**	One-way interaction	Transaction	Information for the procedure, fees, and offices for filing and receiving documents; downloads of forms http://www.asme.bg/bg/proc/et/default.htm
Launch of a commercial entity	**Department "State Administration," Council of Ministers**	One-way interaction	Transaction	Information and forms for licensing and registration regimes in the Registry of Administrative Structures http://www1.government.bg/ras
	Agency for Small and Medium Enterprises	Information	Transaction	Information for the required documents http://www.asme.bg/bg/proc/tradesite.htm
5. Sending data to the National Statistical Institute	**National Statistical Institute**	Information	Two-way interaction	General information http://www.nsi.bg/statistika/Statistics.htm
6. Customs Declarations	**Customs Agency**	Information	Transaction	Uniform electronic format and guidelines for its proper completion for submission in electronic form of customs manifests and Uniform Administrative Documents (custom declarations) http://www.minfin.bg/bg/act/index.php?docid=499&lang=1&catid=225&depth=1
7. Permits related to environmental regulations	**Ministry of Environment and Waters**	Information	Transaction	Information on licensing regimes http://www.moew.government.bg/index1.html
8. Public procurement	**Council of**	Information	Transaction	Public Procurement Registry
	Ministers			http://www1.government.bg/rop/
	Agency for	Information	Transaction	Small Order Public Procurement Registry
	Small and			http://www.asme.bg/bg/mop/default.asp
	Medium			
	Enterprises			

Source: Updated Table from "Progress Report on E-Government Development in Bulgaria", CCICMT, August 2003

APPENDIX II:
E-Bulgaria (E-Readiness) Assessment Model and Methodology for Quantitative Assessment

The **definition** of e-readiness used in the current assessment is mostly based on that developed by Center for International Development at Harvard University, which defines the "e-ready" society as:

> *one that has the necessary physical infrastructure (high bandwidth, reliability, and affordable prices), has integrated current ICTs throughout businesses (e-commerce, local ICT sector), communities (local content, organizations online, ICTs used in every-day life, ICTs taught in schools), and the government (e-government).*

The structure of the e-Bulgaria Assessment focuses on five categories of e-readiness: **access**, **society**, **education** and **economy,** and **e-policy/e-government**. A detailed qualitative assessment in each category is followed by quantitative measures (indices).

Similarities to the CID matrix can be summarized in two main objectives:

First, both the e-Bulgaria assessment model (BAM), and the Network Readiness Index (NRI) divide the total e-readiness measurement in subdirectories, corresponding to different aspects of ICT's proliferation. They make a distinction between factors that determine the usability of the Network (the Enabling Factors, as called in NRI), and variables that reflect the extent of Network Use or Network Access, in BAM.

Second, both indexes are constructed using overlapping indicators, which provides an overall complexity of these measurements, and also allows a partial comparison between Micro-Indexes.

The e-Bulgaria Assessment Model contains a series of indices that summarize the most important indicators affecting the level of development of ICT (e-readiness) in different sectors of society. The model measures five main categories:

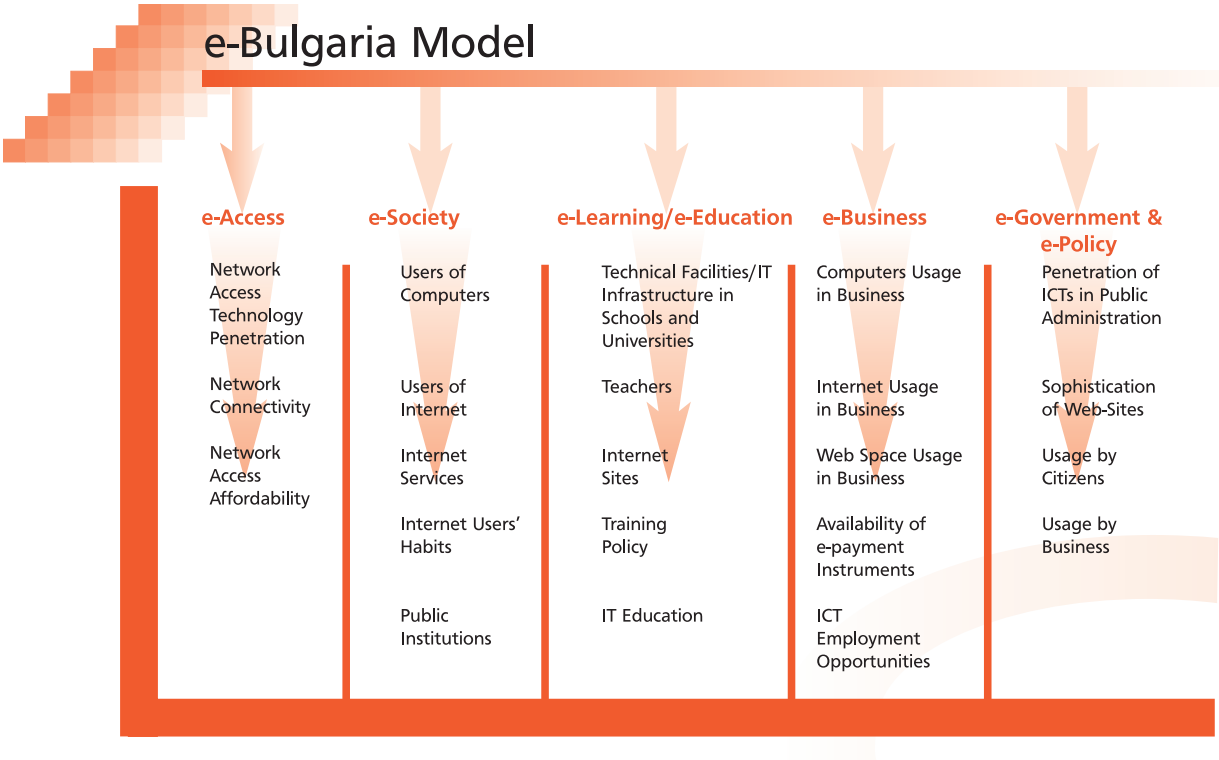
1. Network access/e-access
2. E-learning/e-education
3. E-society
4. E-business
5. E-policy/e-government

The model applied in the current report differs slightly from the one used in the first report developed in 2001. The E-Readiness 2001 considered e-government as part of the e-economy category, while e-Bulgaria 2004 uses two separate indicators: e-business and e-policy/e-government. Some re-calculations have been made in order to have comparative data, and minor technical omissions have been fixed.

A small discrepancy between the numbers published in the Bulgaria E-readiness Report 2001 is observed regarding Internet penetration, e.g. the figure quoted in the first report for April 2000 was 11.1%, whilst 11.0% is presented in e-Bulgaria 2004. Internet penetration for September 2000 published in the first report was 12.0%, while 11.9% is presented in the current version. This is due to the fact that different numbers are calculated by different persons, and different software packages. A difference of 0.1 percentage points could be regarded as a rounding error, i.e. caused by increase or decrease of a number to the next lowest or highest level.

An overview of the e-Bulgaria Assessment model is presented in Figure 55.

FIGURE 55: STRUCTURE OF THE E-BULGARIA ASSESSMENT MODEL



Source: ARC Fund and Vitosha Research

The method of computation of the e-Bulgaria assessment indices is elaborated below.

E-ACCESS

The goal is to assess the existing ICT and information infrastructure in Bulgaria, based on such indicators as telephone penetration, size of telecom market, market for personal computers, etc. Important sub-categories include:

- Penetration of Network Access Technologies
- Network Connectivity
- Affordability of Network Access

E-EDUCATION

The goal is to assess the ICT infrastructure in Bulgarian schools and universities, the penetration of PCs and availability of internet access, the presence of ICT in the school curricula, different initiatives (private and public) aimed at bringing ICT to schools and universities, and others. The information is structured in the following sub-categories:

- Technical facilities / ICT infrastructure in schools and universities
- Teachers and ICT technologies
- Internet sites of schools and universities
- ICT training policy
- ICT education

E-SOCIETY

The goal is to assess the diffusion of ICT, and Internet in particular, in Bulgarian society, the quality of Internet services, the number of Internet users and their "habits," the use of Internet by public institutions, etc. The information covers the following sub-categories:

- Users of computers and Internet
- Internet services
- Internet users' habits
- Public institutions and Internet

E-Business

The goal is to assess the use of the Internet and ICTs by Bulgarian businesses, the existing infrastructure and quality of Internet/IT services, the limitations in using/adopting new technologies, the access to services, various government initiatives encouraging business enterprise in the field of ICT, and others. Sub-categories include:

- Computer usage in business
- Internet usage in business
- Web space usage by business
- Availability of e-payment instruments
- ICT employment opportunities

E-Government/E-Policy

There are no sub-categories here. Instead, the direct average of the following 6 indicators is taken:

- Workplaces in government institutions having computers
- PCs in government institutions connected to the Internet
- Government institutions which have own web sites
- Population who use Internet to visit government websites
- Businesses who use Internet to visit government websites
- Level of online sophistication of government websites

The full list of e-Bulgaria indicators for each category and sub-category is presented in Appendix III.

Method of Computation of the E-Bulgaria Indexes

The e-Bulgaria indexes are a system of synthetic indicators. The main objective in constructing these indices is to reduce the multiple dimensions of the information society to a limited set of synthetic measures. The advantages of such an approach are at least the following:

- The employment of synthetic indicators is a prerequisite for establishing time series, and respectively for analyzing and assessing change;
- Synthetic indicators facilitate the public presentation of the results of the assessment, thus making analysis easier to perceive.

The method used to construct the e-Bulgaria indices involves a number of steps:

First, the value of each indicator is measured on a 4- or 5-point scale[43]

Second, a rank is assigned to each indicator value using the following procedure:

A. With 5-point scales: a rank of 1 is assigned to the first value; a rank of 3to the second value; a rank of 5 to the third value; a rank of 7 to the fourth value; and a rank of 10 to the fifth value.
B. With 4-point scales: a rank of 1 is assigned to the first value; a rank of 4 to the second; a rank of 7 to the third; and a rank of 10 to the fourth value.

The purpose of these ranks is to ensure compatibility between different scales and to present the indicator values in the range 1-10.

Third, different variables are divided in two groups, depending on their importance to Bulgaria's e-readiness assessment. The level of importance is measured on a 2-point scale ("medium" and "high") based on expert assessment. High-importance variables are weighted by 2 in the computation of the indices.

Fourth, the respective ranks (depending on the real value of a given variable) is multiplied by the importance coefficient of the variable (the weighted coefficients are as follows: "medium importance" w=1 and "high importance" w=2).

[43] The scales were created with the following approach in mind: the most developed countries were studied and their approximate level was taken as the highest possible. Then, the interval was split into five, thus giving a linear scale. Most commonly, two types of scales are used: one with top level of 100 percent (for long-time available service such as PSTN) and one with a top level of 40 percent (for newer services such as mobile phones). In some occasions, custom scales were used, mainly for high-tech issues.

Fifth, the values are aggregated in synthetic indicators in several categories. The value of each index is computed as a sum of the weighted ranks of the respective vars included in a given category / sub-category. Each index summarizes the values of several variables and is presented in a statistically normalized form, from 0 to 10. Values closer to 0 indicate a "low level" of e-readiness in the respective category / sub-category, and those closer to 10, a "high" state of e-readiness.

Table 20 illustrates the calculation of the sub-category "Access to PCs" in the "E-Society" index. The same procedure is used in calculating the values of synthetic indices in each category and sub-category. The aggregate e-Bulgaria index is computed as an average value of the indices for different categories.

TABLE 20: Computation Procedures for Assessment of "Access to PC's", Sub-Category in "E-Society" Index

Number of Variable	Rank	Weight	Rank multiplied by Weight (B*C)	Result: Σ D/ Σ C
A	*B*	*C*	*D*	*E*
1	3	2	6	
2	1	2	2	
3	1	1	1	
4	1	2	2	
5	1	1	1	
		Σ = 8	*Σ = 12*	*I = 1.5*

Source: ARC Fund and Vitosha Research

TABLE 21: E-Bulgaria Index Values

	2001	2002	2003	2004
e-Bulgaria Index	**3,46**	**3,87**	**4,25**	**5,05**
E-Access	**4**	**4,68**	**5,55**	**5,93**
Network Access Technology Penetration	3,95	4,59	4,95	5,23
Network Connectivity	3,86	4,71	6,43	7,29
Network Access Affordability	4,2	4,73	5,27	5,27
E-Education	**4,27**	**4,42**	**4,47**	**5,06**
Technical facilities /IT infrastructure in schools and universities	4,6	4,6	4,6	5,4
Teachers	1	1	1	1
Internet sites	5,5	6,5	6,5	7,5
Training policy	5,88	5,63	5,88	7
IT education	4,38	4,38	4,38	4,38
E-Society	**2,29**	**2,59**	**2,59**	**3,66**
Users of computers	1,5	1,5	1,5	2,5
Users of Internet	1,44	1,44	1,44	2,11
Internet services	1	2,5	2,5	4
Internet users' habits	3,5	3,5	3,5	4,33
Public Institutions	4	4	4	5,33
E-Business	**2,86**	**3,54**	**4,11**	**5,17**
Computers usage in business	2,43	2,43	3,29	3,86
Internet usage in business	1	3	3	3
Web space usage by business	2	2	3	5
Availability of e-payment instruments	3,75	4,25	5,25	8
ICT employment opportunities	5,14	6	6	6
E-government	**3,89**	**4,11**	**4,56**	**5,44**

Source: ARC Fund

APPENDIX III:
Definitions of E-Bulgaria (E-readiness) Assessment Model, Indexes and Indicators

The e-Bulgaria (e-readiness) Assessment Model is defined as an average value of the following indexes: *Network Access, E-learning, E-society, E-business, and e-Government/e-Policy*

I. Network Access/E-Access

The Network Access Index is an average value of Network Access Technology Penetration, Network Connectivity, Network Access Affordability,

Indicator 1: Network Access Technology Penetration is defined as follows:

Network Access Technology Penetration = 9/14 hard data + 5/14 survey data

Hard Data

1. The teledensity (number of telephone lines per 100 people) *Source:* BTC Annual Report
2. The percentage of households that have a phone line installed *Source:* BTC Annual Report, NSI Data
3. Percentage of digital phone lines (56 kbps capable) as of all phone lines *Source:* BTC Annual Report
4. Percentage of ISDN phone lines (128 kbps capable) *Source:* BTC Annual Report
5. Percentage of households, which have access to cable TV *Source:* BTC Annual Report, NSI Data
6. Percentage of failures of dial-up attempts/connections because they are busy or interrupted *Source:* BAIT, BG Online
7. Failures of the attempts to reach local web sites (servers inaccessible) *Source:* BAIT, BG Online
8. Percentage of the Internet users, who have experienced security related problems (viruses, hacking etc.) *Source:* BAIT, Bulgaria Online, Vitosha Research
9. Number of domains registered under the country's TLD *Source:* Register.bg

Survey Data

10. Percentage of the population currently having access to the Internet via the cable network
11. Percentage of the population using mobile phones
12. Percentage of the households, which have at least one mobile phones
13. Percentage of the population using mobile Internet access
14. Percentage of households having computers (assuming that every computer, even if not-so-modern, is capable for Internet access)

Indicator 2: Network Connectivity is defined as follows:

Network Connectivity = average of Hard data

Hard Data

15. Total international bandwidth per capita, bps *Source:* BAIT, Bulgaria Online
16. Total national bandwidth per capita, bps *Source:* BAIT, Bulgaria Online

17. Number of users per dial-up access point *Source:* BAIT, Bulgaria Online

18. Average bandwidth of a leased line, kbps *Source:* BAIT, Bulgaria Online

Indicator 3: Network Access Affordability is defined as follows:

Network Access Affordability = 3/5 hard data + 2/5 survey data

Hard Data

19. Percentage of the average price of 1 hour of Internet access of the minimum monthly wage

20. Percentage of the average price of 1 hour of public Internet access (Internet *cafés*) of the minimal monthly wage *Source:* BAIT, NSI

21. Percentage of the average price of 1 hour local phone call of the average monthly wage

22. Average price (USD) of 1 hour Internet access through mobile service, *Source:* Mobiltel

23. Percentage of the average price of 1 hour Internet access through mobile service of the average monthly wage *Source:* Mobiltel, NSI

24. Percentage of the telecom expenses in the overall expenses for Internet (ISP price + telecom price)

Survey Data

25. Average prices (USD) of 1 hour of dial-up Internet access, *Source:* BAIT, Bulgaria Online

26. Average prices (USD) of 1 hour of public Internet access (Internet *cafés* etc), *Source:* BAIT, Bulgaria Online

27. Average price of unlimited dial-up Internet access, USD per month. *Source:* BAIT, Bulgaria Online

28. Percentage of the average price of unlimited dial-up Internet access of the average monthly wage *Source:* BAIT

II. Networked Learning/E-Education

E-Education is defined as an average value of Technical facilities /IT infrastructure in schools and universities, Teachers, Internet sites, Training policy and IT education.

Indicator 1. Technical facilities /IT infrastructure in schools and universities

Technical facilities = average of Hard data

Hard Data

1. Percentage of schools (primary and secondary) which have computer labs
2. Percentage of schools (primary and secondary) which have access to the Internet
3. Percentage of universities which have access to the Internet
4. Percentage of schools (primary and secondary) which have Intranet
5. Percentage of universities which have Intranet

Indicator 2. Teachers

Teachers = average of Hard data

Hard Data

6. Percentage of teachers using computers
7. Percentage of teachers who use Internet (at work/at home)

Indicator 3. Internet sites

Internet sites = average of Hard data

Hard Data

8. Percentage of schools, which have own Internet site
9. Percentage of universities which have own Internet site

Indicator 4. Training policy

Training policy = average of Survey data

Survey Data

10. Percentage of schools which have some computer/IT education of the curricula
11. Initiatives to integrate the Internet and IT technology in education and training policy.
12. Initiatives taken by business to increase access of schools to the Internet.
13. Cooperation between educational institutions and businesses to develop up –to-date curricula.
14. Distance education usage in the education.

Indicator 5. IT education

IT education = 3/5 Hard data + 2/5 Survey Data

Hard Data

15. Percentage of students of schools in IT specialities /% of all students
16. Percentage of students of universities in IT specialities /% of all students
17. Percentage of post-graduated students of universities in IT specialities /% of all students

Survey Data

18. Percentage of population with education in the field of IT
19. Percentage of population who have attended computer courses

III. Networked Society/E-Society

E-Society is defined as an average value of Users of computers, Users of Internet, Internet services, Internet users' habits and Public Institutions.

Indicator 1. Users of computers

Users of computers = average of Survey data

Survey Data

1. Percentage of total population who has access to computers
2. Percentage of total population using computers at home
3. Percentage of total population using computers at school or university
4. Percentage of total population using computers at work
5. Percentage of total population using computers at public places (libraries, Internet *cafés*)

Indicator 2. Users of Internet

Users of Internet = average of Survey data

Survey Data

6. Percentage of total population using the Internet
7. Percentage of total population using Internet at home
8. Percentage of total population using Internet at schools and universities
9. Percentage of total population using Internet at work
10. Percentage of total population using Internet at public places (libraries, Internet *cafés*)
11. Percentage of population who use e-mail at least once per week

Indicator 3. Internet services

Internet services = average of Survey data

Survey Data

12. Percentage of population who use most often Internet sites in Bulgarian language
13. Percentage of population who use online services
14. Average Internet usage, hours per capita monthly

Indicator 4. Internet users' habits

Internet users' habits = average of Survey data

Survey Data

15. Percentage of population who use Internet more than 1 hour per day (only for users who use Internet every day)
16. Percentage of population who have used Internet up to 1 year
17. Percentage of population who use Internet for news
18. Percentage of population who use Internet for shopping
19. Percentage of the population who have access to computers but cannot afford Internet access
20. Percentage of the population who has access to computers but cannot use Internet due to technological and/or computer literacy reasons

Indicator 5. Public Institutions

Public Institutions = average of Survey data

Survey Data

21. Percentage of national media which have Internet sites
22. Percentage of hospitals and clinics which have own Internet sites
23. Percentage of public institutions (libraries, museums, etc) which have own Internet sites

IV. E-Business

The E-business index is defined as an average value of: *Computers usage in business*, *Internet usage in business*, *Internet usage in business*, *Web space usage by business*, *Availability of e-payment instruments*, *ICT employment opportunities*.

Indicator 1: Computers usage in business

Computers usage in business = average of Survey data

Survey Data

1. Percentage of companies using computers
2. Percentage of workplaces having computers
3. Use of computers in business.
4. Percentage of companies having Intranet

Indicator 2: Internet usage in business

Internet usage in business = average of Survey data

Survey Data

5. Percentage of companies having Internet access
6. Percentage of staff having Internet access
7. Main use of Internet in business.

Indicator 3: Web space usage by business

Web space usage by business = average of Survey data

Survey Data

8. The intensity of web space usage by business
9. Percentage of the companies having their own web site

Indicator 4: Availability of e-payment instruments

Availability of e-payment instruments = 1/3 Hard data + 2/3 Survey data

Hard Data

10. Percentage of the population using debit/credit cards Source: Borica

Survey Data

11. Is the technology infrastructure of commercial financial institutions capable of supporting online authorization and settlement of e-commerce transactions?
12. Do financial institutions issue credit cards to consumers?

Indicator 5: ICT employment opportunities

ICT employment opportunities = average of Survey data

13. Percentage of jobs, which require ICT skills
14. Salaries, which get IT workers on average Source: IDG
15. Salaries, which get specialized IT workers (programmers, developers) on average
16. Ratio Spending on ICT/GDP per capita Source: IDC

V. E-Government

E-government = 3/6 Hard Data + 3/6 Survey data

Hard Data

1. Percentage of workplaces in government institutions having computers
2. Percentage of PCs in government institutions which are connected to the Internet
3. Percentage of government institutions which have own web sites

Survey data

4. Percentage of population who use the Internet to visit government websites
5. Percentage of businesses who use the Internet to visit government websites
6. What best describes the level of online sophistication of government website?

SOURCES OF INFORMATION

The following sources of data and information have been used in performing the e-Bulgaria assessment:

Institutional sources:

- Bulgarian Association for Information Technologies (BAIT)
- Coordination Center for Information, Communication, and Management Technologies at Council of Ministers
- Ministry of Economy
- Ministry of Education and Science
- Ministry of Transport and Communications
- National Statistical Institute (NSI)
- RIPE

Companies:

- Alpha Research
- BBSS Gallup
- Borica
- BTC Net
- Bulgaria Online
- Cosmo Bulgaria
- GfK
- IBM
- IDG Bulgaria and IDC
- Mobikom
- Mobiltel
- Orbitel
- Register.BG
- Vitosha Research

Documents:

- IBM 3rd and 4th Monitoring reports of EU CCs (2003 and 2004)
- Annual Reports of Bulgarian Telecommunications Company (BTC)
- Annual Reports of Mobikom
- Annual Reports of Mobiltel
- CRC Annual Report, 2002
- European Survey of Information Society
- eEurope+ Progress Report, February 2004
- 1st Report on Monitoring of EU CCs (July 2002), PWC Consulting
- Special 301 Report, International Intellectual Property Alliance (IIPA), 2004
- SIBIS Pocket book 2002/03
- The 2004 e-Readiness Rankings, EIU and IBM Institute for Business Value

ABOUT ARC FUND

Since its establishment in 1991, ARC Fund has been an active stakeholder in the process of information society development in Bulgaria. It has been engaged in a series of policy and advocacy initiatives, public-private partnerships, awareness and public outreach campaigns, policy analyses, and implementation of pilot e-projects. Throughout the years ARC Fund has been a strong advocate for reforms in the regulatory framework of telecommunications and information society by drafting legislation and organizing high-level forums, expert workshops, and international conferences. It has published a number of books, analytical reports, educational brochures, and newsletters on some of the most topical issues of Bulgarian information society policies. ARC Fund was among the pioneering Internet service and content providers in the country in the mid-1990's, and it currently maintains a broad portfolio of public service portals, such as www.online.bg, www.infosociety.bg, www.bgrazvitie.net, www.innovation.bg, www.southeasteurope.org and others.

ARC Fund operates the ***e-Bulgaria Information Society Promotion Office (ISPO),*** a public-private partnership with the Ministry of Transport and Communications, serving as a one-stop-shop provider of IST knowledge and information to citizens, businesses and public administration. It also serves as secretariat to the Bulgaria Development Gateway (www.bgrazvitie.net)–a country node of the global Development Gateway initiative launched by the World Bank (www.developmentgateway.org).

As a key component of its information society related activities, ARC Fund regularly monitors and analyzes the penetration and usage of new information and communication technologies, and their impact on Bulgarian society. This monitoring exercise is carried out in partnership with the Vitosha Research agency (www.vitosha-research.com), and by an inter-disciplinary IT Group, which involves several experts in sociology, economics, business administration, software engineering, mass media, and law. The IT Group's main analytical product is the "*e*-Bulgaria" report, which is published for the second time since 2002.

ARC Fund also specializes in the area of **Innovation and Technology Transfer** where its activities are focused on developing the national innovation system on three levels: (i) at **sectoral level,** providing support to companies and clusters through technology brokering, counseling and international technology transfers; (ii) at **meso-level**, assisting the development of regional innovation strategies, institutions and networks; and (iii) at **macro-level**, applying foresight methodologies to shape future national innovation policies. ARC Fund creates and shares innovation knowledge through a number of off- and online publications, and tools. It is piloting a comprehensive annual innovation index, *Innovation.bg*— a review of the country innovation system's assets and policy challenges.

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