

Table of contents

Executive summary

1. Assessment objectives

2. Romania – background

3. Network ACCESS

3.1. Information Infrastructure

3.1.1. General overview

3.1.2. Years 1991-1999

3.1.3. Year 2000 and plans for the future

3.2. Internet Availability

3.2.1. Market size and statistics

3.2.2. ISPs, Internet users and Internet usage

3.2.3. Internet hosts and domains

3.2.4. Internet infrastructure solutions

3.2.5. Cybercafes, telework centers and telecenters

3.2.6. Networks and level of usage

3.3. Internet Affordability

3.3.1. Dial-up

3.3.2. Cable Internet

3.3.3. Free Internet and other incentives

3.3.4. Internet services

3.4. Network Speed and Quality

3.5. Hardware and Software

3.5.1. IT market statistics

3.5.2. Hardware market

3.5.3. Software market

3.5.4. Hardware and software usage in the public sector

3.5.5. Challenges for the IT market

3.6. Service and Support

3.6.1. RomTelecom service

[3.6.2. ISP service](#)

[3.6.3. Security services](#)

[4. Networked Learning](#)

[4.1. Schools' Access to ICTs](#)

[4.1.1. General overview](#)

[4.1.2. Private initiatives](#)

[4.2. Enhancing Education with ICT](#)

[4.2.1. E-learning and distance learning](#)

[4.2.2. Educational software](#)

[4.3. Developing the ICT Workforce](#)

[4.3.1. Governmental plans in education](#)

[4.3.2. Academic training opportunities](#)

[4.3.3. Private sector training opportunities](#)

[5. Networked Society](#)

[5.1. People and Organizations Online](#)

[5.1.1. Internet usage](#)

[5.1.2. Internet users](#)

[5.1.4. Portals](#)

[5.1.5. Youth on the Internet](#)

[5.2. Locally Relevant Content](#)

[5.2.1. Business sites](#)

[5.2.2. Academic sites](#)

[5.2.3. Governmental sites](#)

[5.2.4. Libraries](#)

[5.2.5. Mass media](#)

[5.2.6. Language features](#)

[5.3. ICTs in Everyday Life](#)

[5.3.1. PC ownership](#)

[5.3.2. Payphones, mobile phones](#)

[5.3.3. Cybercafes, telework centers telecenters](#)

[5.4. ICTs in the Workplace](#)

6. Networked Economy

6.1. ICT Employment Opportunities

6.2. B2C Electronic Commerce

6.3. B2B Electronic Commerce

6.3.1. Industry trends

6.3.2. Education for the new economy

6.3.2. Import-export

6.3.3. Small and medium enterprises (SME)

6.3.4 Payment issues for B2C and B2B

6.3.5. Legislation

6.4. E-Government

7. Network Policy

7.1. Telecommunications Regulation

7.1.1. The privatization process

7.1.2. Legislation for the information society

7.2. ICT Trade Policy

7.2.1. General foreign investment climate

7.2.2. Trade policies

8. Latest developments

9. Conclusions and recommendations

10. List of abbreviations

11. References

Executive summary-

According to public communication theory, the persistence of an issue in the public attention is indicative of strong public will to solve that issue. If this correlation holds true, then Romania has the will to connect to the networked world, as the pros and cons on information and communication technologies (ICT) issues has captured public attention through TV shows and debates in the academia, media and politics. Since 1990, when Romanians changed from a communist to a democratic government, the ICT issues are the ones that developed the most and the fastest. Although Romania lags behind other developing countries in other economic areas, it has remained relatively abreast of IT (information technology) development, emulating better global trend of development in this arena. Because IT development outstrips that of most other economic sectors business analysts believe that it promises to become an engine of growth for the Romanian economy.

IT Growth: opportunities for future

The majority of indicators for urban ICT growth reveal a series of success stories. For example, in 1999 RomTelecom, the partly-privatized telephony operator, had a waiting list of 0.92 million people. The waiting time was only 3.9 years for installation, compared with 14.4 years in early nineties. In the same year, this sector experienced its greatest spurt in economic growth, with an increase in business subscription of 14%, accounting for 10% of the subscriber base growth.

The cable television industry, liberalized in 1992, is another success. From 1996 to 1999, turnover increased tenfold, from 10 mil US\$ to 100 mil US\$. According to a poll in 1999, 3.45 out of 6.9 million homes with a TV set were connected to a cable television network, creating a subscription level of around 50.3%. These figures place the Romanian cable market at sixth place in Europe, after Germany, Belgium, Holland, Switzerland, Sweden, Poland, and before countries like France, Great Britain, Denmark or the Czech Republic.

The 1996 boom in mobile telephony has echoed the success of the cable industry. By the end of 1998, the yearly growth rate for mobile telephony was around 400% and since 1996 the number of subscribers to the GSM mobile network grew from about 50,000 to 1,350,000 at the end of 1999. This impressive growth continued in 1999 with a final 110% increase in the subscriber base.

The internet market had a similar development pattern. Its 1996 growth compensated for all market “inactivity” in the previous years. From January 1996 to February 1997 there was a 500% increase in the number of host sites, while the number of Romanian servers connected to the Internet increased ten-fold from 1996 to 1998. Since then, the growth curve for Internet usage in Romania has emulated, and even exceeded that of worldwide usage. Despite the unimpressive number of users and companies, the Romanian Internet growth has bound ahead at a 6.5% rate of increase compared with a worldwide growth rate of only 1.86%. This growth rate is among the largest in Europe, and shows no sign of a slowing down.

In what regards the ICT policy, until recently Romania lacked any legislation for electronic commerce, private information protection, secure data transfer and e-signatures. However, after 10 years of tergiversations, a parliamentary commission for ICT legislation and a brand new Ministry for Information and Communication Technologies were established, and laws for e-business were adopted within a year. Currently, other important pieces of law are on their way to being adopted.

One of the biggest opportunities for the ICT sector is the deregulation of the telecommunications industry slated for 2003. This move promises to compensate the opportunities for market growth - like the ongoing global decline of information and communication technologies prices - that the Romanian IT market has missed until now. Most telecom analysts believe a dynamic competition will start after 2002; its signs are already present on the market, in the thousands of miles in alternative networks built by private companies or the former national state-owned companies, and now privatized. The government is also showing a keen interest in stimulating the open market process,

having affirmed its position in two recently publicized strategies regarding the communications and information technologies.

Difficulties

Despite the encouraging developments, ICT policy reform is impeded by the unpredictable and inconsistent nature of Romania's legal and regulatory framework. The current climate of poor law enforcement, soft stances on piracy and the changeability of tax laws discourages foreign investment and presents one of the major challenges for the fledgling Ministry of ICT.

Another challenge that Romanians face is the ICT urban-rural divide. Although the urban elite is catching up with the developed world, 45% of the population lives in rural areas, where ICT development is lagging behind. Some 2,000 remote villages (which represent 15% of the total number of villages) still lack basic fixed line connectivity. Moreover, their ability to access these services is hampered not only by the lack of infrastructure, but also by their economic poverty. These problems are part of a wider web of deprivation that includes a lack of transportation facilities, and education. For the third of the total population that live in poverty, e-commerce or e-government may be of no relevance. Thus, in order to become ready for the Networked World, the Romanian government must balance resource allocation to providing basic facilities to its rural poor, while encouraging the urban elite to continue its efforts to catch up with the developed world.

Overall, Romania is trying hard to upgrade the ICT its and to catch up with the developed countries of the Networked World. The quick evolution of mobile telephony, the good start of e-business and the quality ICT workforce offer much encouragement. Nevertheless, major challenges, like the struggling economy, the lack of proper legislation and law enforcement will be a barrier to the Internet development in the future years. No matter what the criteria, most of the research done in the last couple of years would assert that Romania is a "sprinter" in adopting new technologies, but still has a good way to go before being ready for the Networked World.

1. Assessment objectives

The methodology used for this report¹ aims at evaluating the ICT resources in Romania and offers a for creating a strategic approach to ICT planning.

- The Readiness for the Networked World is defined as the degree to which a community is prepared to participate in the digital global community. This is established by assessing a community's relative advancement in the areas that are most critical for adoption of ICT and the most important applications of ICTs. The guide examines 19 different categories of indicators, ranking each by levels of advancement in Stages One through Four².

Within this framework, we must call attention to a number of caveats. Firstly, this report is limited by a substantial lack of data, especially in the national education system or the private system, where the presence of ICT has never been evaluated or the data has not been made public. Such information inavailability is an expected and presently unavoidable consequence of the fledgling nature and rapid growth of the Romanian Internet Market. Secondly and more generally, measuring the unit of analysis can present challenges for the researcher. For example, in the assessment of the “relevant local Internet content”, without using more qualitative research tools like focus groups or local interviews, it is difficult to identify with exactitude the local needs in terms of Internet usage.

Finally, the report we present below is meant to illustrate how such a Readiness assessment can be conducted. It is meant to serve as work tool and an informative document, not a substitute for local evaluations. It is the task of local communities to

¹ *Readiness for the Networked World, A Guide for Developing Countries*, www.readinessguide.org

² Please see *Annex 1* for a description of the indicators and basic questions.

customize this methodology in order to identify their specific needs and formulate relevant, strategic policies to promote their country's readiness for the networked world³.

2. Romania – background

Romania country profile⁴

Romania is located in southeastern Europe, bordering the Black Sea, north of the Balkan Peninsula, in the Lower Danube basin. It is neighbored by Ukraine, the Republic of Moldova, Bulgaria, Yugoslavia, and Hungary. It is a medium-size country in terms of area (237,500 sq km - about the size of Oregon state) and is the 12th largest country in Europe).

Figure 1 - Map of Romania⁵

³ This report was made possible with the support of the Ron Brown program sponsored by the International Research & Exchanges Board (IREX), Cristian Chicus and Thomas Cooper.

⁴ Profile information selected from CIA- The World Factbook 2000 Romania:
<http://www.odci.gov/cia/publications/factbook/geos/ro.html>

⁵ http://www.aaustria.go.ro/romania_map.htm



There are 22,788,993 inhabitants in Romania and 9 million living outside of Romania⁶. Life expectancy is 66.5 years for men and 73.2 years for women. Romanians constitute the main ethnic group (89.5%), while Hungarians represent 7.1% of the total population, Roma 1.8%, Germans 0.5%, and Ukrainians 0.3%. As for the practiced religions, the majority of the population is Orthodox (70%). Only 6% are Roman Catholic (of which 3% are Uniate), and 6% Protestant.

Literacy is relatively high: 97% of the total population can read, and out of them 97% are men and 95% are women.

Politics

Following the parliamentary and presidential elections in November 2000, the Party of Social Democracy (PDSR) took the lead. Its leader, Ion Iliescu has been elected to a third term of service. (Magda, maybe it's better politically not to make political judgements about the communist past of Iliescu? We will turn the government against us, because they are relatively leftist) For the next four years mandate he plans to combat extreme

⁶ According to 7 January 1992 census returns

poverty, revive the economy, rebuild the state and win Romania membership in both the European Union and NATO.⁷ Romania's bid for accession to the began after 1990. In December 1999 the European Union officially invited Romania to start working for accession in the second wave⁸.

Economy

After the collapse of the Soviet Bloc in 1989-91, Romania was left with an obsolete infrastructure base and a pattern of industrial capacity wholly unsuited to its needs. In February 1997, Romania embarked on a program of comprehensive macroeconomic stabilization and structural reform. The restructuring program includes the liquidating of large energy-intensive industries and major agricultural and financial sector reforms.

However, implementation has been difficult. In August 2000, Romania reached an agreement with the International Monetary Fund (IMF) for a US\$ 547 million loan, but release of the second tranche was postponed in October because of unresolved private sector lending requirements and differences over budgetary spending. Bucharest avoided defaulting on mid-year lump-sum debt payments, but had to significantly draw down reserves to do so; reserves rebounded to an estimated US\$ 1.5 billion by yearend 1999.

Standard & Poor's changed the outlook on Romania's ratings to stable from negative⁹. Although Romania's economy is poised for growth of about 3.9% in 2001 and 3.7% in 2002¹⁰, owing to an export recovery, inflation has not been brought under control. The government's inflation target changed from an optimistic 27% to 40%, in 2000¹¹.

Other macroeconomic data are presented below:

Table 1 – Statistics (inUS\$)

GDP (US\$ bn)	35.4
GDP per head (US\$)	1,577
GDP per head (US\$ at PPP)	4,306

⁷ CNN, <http://www3.cnn.com/2000/WORLD/europe/11/26/romania.election.02/>

⁸ Catherine Lovatt, *Romania's Road to Reform*, May 2000, Central Europe Review at <http://www.ce-review.org>

⁹ Standard&Poor's, *Romania's Outlook Changed*, at <http://www.standardandpoors.com/ratings/>

¹⁰ Country Report Romania. EIU, The Economist Intelligence Unit, June 2001, at www.eiu.com

¹¹ *Business Outlook: Romania*, Economist Intelligence Unit (EIU), 23 October 2000, <http://www.eiu.com/>

Consumer price inflation (av; %)	45.7
Current-account balance (US\$ bn)	-1.5
Exports of goods fob (US\$ bn)	10.2
Imports of goods fob (US\$ bn)	11.9
External debt (US\$ bn)	9.8
Debt-service ratio, paid (%)	19.6

Source: EIU, CountryData

Population below poverty line

Last year 41.2% of the population lived beyond the poverty rate¹². A 25% poverty rate target had been intended, but it appears now that this level might be reached only within 5-6 years. 80% of the families with more than 3 children are living below the poverty rate¹³.

Internet development

IT sector growth outstrips that of all other sectors of the economy¹⁴. Still, compared with other central and eastern European countries Romania lags behind. While per capita IT expenses were US\$ 8 in Romania, they were US\$ 94 in Hungary, and US\$ 141 in the Czech Republic (1998).

Commercial Internet was available since 1995, but the market developed slowly due to infrastructure problems and a generally weak economy. The economic environment is expected to remain an obstacle to development of the Internet market in the years to come as investment in expensive computer systems is impractical for the vast majority of individuals and businesses.

Due to the weakening of the economy in the past three years, the continuous global decline of computer prices didn't bring the expected opportunities for IT market growth. Although the Economist Intelligence Unit (EIU)¹⁵ anticipates an economic recovery for the medium term, this will not help the Internet service providers (ISPs) with problems

¹² *Statisticile indica o crestere a saracie*", Curentul, www.curentul.ro, August 2000 (Romanian)

¹³ The poverty rate is reached when less than 60% of the prime necessity needs of a family are not covered.

¹⁴ BINARY'2000 – Romania's Silicon Valley for three days, The Financial Newspaper, Oct 2000. An English translation can be found at http://www.romania-gateway.ro/news/ViewDoc.asp?Document_ID=434

¹⁵ *Telecoms and Wireless Eastern Europe/CIS*, EIU, 23 Apr. 1999

like the network access. These issues are likely to persist at least as long as 2003 when RomTelecom's monopoly expires¹⁶, allowing room for the private sector to offer alternative telecommunication solutions. Several companies have already built alternative networks, most prominently the cable television industry and GSM mobile networks.

¹⁶ As it will be presented in more detail later in the paper, RomTelecom has a monopoly until the end of 2002, at which point all statutory restrictions on entry into voice telephony will be lifted and Romania will open its market to foreign telecommunications companies, according to its commitments in the World Trade Organization Telecommunications Agreement. This consequently affects small and medium ISP, who don't have the capital to build their own networks but also pay a too high price for using Romtelecom's network.

3. Network ACCESS

3.1. Information Infrastructure - Stage 3

3.1.1. General overview

Modernization of the telecommunication infrastructure was initiated in 1991, when RomTelecom, the incumbent state-owned operator, devised a 15-year telecommunications development plan. The plan articulated specific objectives such as: a) increase telephony penetration rate from 11% to 30%; b) develop the microwave network and support radio link solutions; c) improve basic services provided to the rural areas, and encourage the development of value-added services¹⁷.

In 1999 teledensity reached 16%¹⁸, while in the rural areas it was as low as 4%-5%.¹⁹ Some 2,000 villages²⁰ have no telephone service at all. This is of particular significance as 45% of the population of Romania lives in the rural areas and provision of basic telephony services to rural areas should be a priority item for RomTelecom.²¹

According to the ITU²², in 1997 there were 22,481 payphones in the country, of which 6,950 were card operated²³. By the end of 1999 the total number of payphones in operation was 34,831 (31,894 of which were operated by cards), representing 91.6 % of public phones in Romania²⁴.

The average waiting time for a telephone line was 14.4 years in the early nineties. The situation improved over the following ten years. In 1999 the waiting list was 0.92 million people and the waiting time was only 3.9 years for installation. In 2000, RomTelecom

¹⁷ Roda Tinis, *Telecommunications and information technology*, CEEBInet Market Research, Central and Eastern Europe Business Information Center, <http://www.mac.doc.gov/eebic/countryr/romania/research/telroma.htm>

¹⁸ Jasmine Killen, *Romania: The Commercial and Regulatory Environment*, ITU April 2, 1999

¹⁹ Jasmine Killen, *idem*

²⁰ In Romania there are 13,000 villages

²¹ Dan Jianu, *Impacts of National Information Technology Environments on Business*, American University, 1999, <http://www.american.edu/academic.depts/ksb/mogit/country.html>

²² International Telecommunications Union

²³ Jasmine Killen, *idem*

²⁴ RomTelecom Annual Report 1999, www.romtelecom.ro

connected 196,000 new subscribers, while the waiting list grew by 30%, which indicates that the market has a higher potential than RomTelecom's current capabilities.²⁵

From an economic perspective the largest growth took place in 1999 when business subscriber growth was 14% accounting for 10% of the subscriber base.²⁶

Significant private investment, Romanian and foreign, contributed to the development of the data transmission, mobile communications, radio/TV broadcasting, and value-added services. At the beginning of 1998, the private sector included:

- 2 operators of data transmission networks
- 2 GSM operators
- 24 trunked radio operators
- 12 paging operators
- 162 local radio stations
- 72 local TV stations
- 5 radio broadcasters via satellite
- 4 TV broadcasters via satellite
- 9 VSAT (Very Small Terminal Aperture) operators
- more than 400 CATV (cable television) operators
- 8 suppliers of data transmission services via CATV²⁷.

The number of operators and suppliers of data services is increasingly higher and continues to grow.

3.1.2. Years 1991-1999

Fixed networks

The initial phase of modernizing the telecommunications infrastructure took place in 1992, when a 7.5-km fiber optic loop was installed in Bucharest²⁸. The EBRD (European Bank for Reconstruction and Development) financed RomTelecom's plans for building the first 1,800-km national digital overlay network (DON). The effort was designed to

²⁵ Nicolae Oaca, Entering a period of potential, Eastern Europe – Romania, Oct 1999, <http://www.telecoms-mag.com/issues/199910/tci/romania.html>

²⁶ Dan Jianu, idem

²⁷ Roda Tinis, *Telecommunications and information technology*, CEEBInet Market Research

²⁸ Dan Jianu, idem

accommodate the increased volume of telephone and data traffic at the national and international levels.

The period between 1995 and 1998 was the busiest in terms of modernization programs. RomTelecom contracted various foreign companies like Ericsson, Siemens and Lucent Technologies for several network projects all over the country, especially in the rural areas. The projects were designed to build ISDN support²⁹ and SDH³⁰ networks. RomTelecom undertook the testing of its first SDH transmission system during 1995. The high-bit rate transmission is now arranged in an optical ring that can transmit bit rates of up to 622 Mbps, equivalent to 9,600 simultaneous telephone conversations³¹.

Of a planned total of 10,000 km cable, 7,000 km was in place by 1998.

WLL systems

To increase teledensity in rural areas and in populated urban environments, RomTelecom expanded its digital wireless local loop (WLL) systems. Of the approximately 500,000 lines/year to be installed, about one third was expected to use WLL systems. Between 1995 and 1997 RomTelecom undertook several pilot projects in WLL systems. These included³²:

Table 2 – WLL system projects

Type of project and date	Location	Customer base
DECT (TDMA) ³³ pilot project - 1997	Snagov area (35 km from Bucharest)	1,400 subscribers
CDMA ³⁴ pilot project	Arad (west of Romania)	1,000 subscribers ³⁵

²⁹ integrated services digital network

³⁰ Synchronous Digital Hierarchy

³¹ Roda Tinis, *idem*

³² W. Crawford, *Wireless Communications Equipment*, CEEBInet, 1997, <http://www.mac.doc.gov/eebic/countryr/romania/research/telecomm.htm>

³³ Digital Enhanced Cordless Telecommunications, respectively Time Division Multiple Access

³⁴ Code Division Multiple Access

³⁵ The Economic Bulletin of the Romanian Embassy in US, July-August 1988, <http://www.roembus.org/romanian/afaceri/bull07.html>. Also see W. Crawford, *idem*.

TDMA ³⁶ + PMP ³⁷ project - 1997	Iasi (north east of Romania)	2,096 subscribers
Proximity fixed wireless access - 1998	Constanta (southeastern Romania) ³⁸	-
CDMA WLL system (10,000-line radio access network) - 1999	Buzau County (central eastern Romania)	-

International networks

RomTelecom is an active partner in several international telecommunications networks:

- KAFOS (Black Sea Fiber Optic System) - was inaugurated in 1997. It is a network linking Romania, Bulgaria, Turkey, and Moldova. Rom Telecom owns 17.9% of this partnership, offering access to other regional networks.
- ITUR (Italy-Turkey-Ukraine-Russia Submarine Fiber Optic Cable System) connects Italy, Turkey, the Ukraine and, Russia. Rom Telecom participates with a 1.9% share.
- BALTICA (PRO BALTICA FORUM) is an alternative network extending towards the Baltic area. Rom Telecom participates with a 1.9% share.
- In 1997 Rom Telecom supplied the connection between Romania and Bulgaria for the TEL project³⁹ connecting eastern and Western Europe over a 14,000-km fiber optic bridge.
- TAE (fiber-optic Trans-Asia-Europe system) network linking Europe with Asia⁴⁰.

Alternative networks

Former state agencies, now transformed into National Companies, play a particular role in the development of Romanian infrastructure, as they are expected to enter in the competition for data transmission after 2002. Some of them obtained credit from

³⁶ Digital Enhanced Cordless Telecommunications, respectively Time Division Multiple Access

³⁷ point multipoint

³⁸ Nortel Networks Inc., News, March 1998, <http://www.nortelnetworks.com/corporate/pressroom/>

³⁹ ICE-TEL project: Interworking Public Key Certification Infrastructure for Europe

⁴⁰ Jasmine Killen, *idem*

international institutions in order to develop their own infrastructure for data transmission:

a) National Company of Railways (SNCFR)

SNCFR developed its own telecommunications network, entering in the hierarchy of operators with their own infrastructure. In 1999 SNCFR started to implement a fiber optic based infrastructure, a digital transmissions network (with some SDH network elements), and an ISDN⁴¹ telephony network. By the end of the year, SNCFR had 2,000 km of optic fiber; now they are in the process of expanding it by some 4,000 km (20 mono-mode fiber optics with 5 rings)⁴².

In August 1999, the Romanian National Railroad Society signed a new contract with Siemens (US\$ 12.3 mil), to build an internal communication structure that will also provide alternative communication services. The company plans to start to offer data transmission services on their own infrastructure to the Government, large companies and operators (GSM operators, TV Cable companies, RomTelecom).⁴³

b) CONEL SA (Electrical National Company)

As part of economic reform measures passed in 1990, the energy sector was reorganized and CONEL SA is the main successor of the basic activities of RENEL

At the beginning of this year CONEL announced its intention to enter the telecommunications market as a RomTelecom competitor in 2003. Furthermore, CONEL plans to invest in a 170 million US\$ project to develop a telecommunication network. CONEL intends to install a 5,600-km optic fiber telephone and data network between major cities.⁴⁴

c) The National Radio-Communications Company (SNR)

⁴¹ Integrated Services Digital Network

⁴² *Alternative Networks, Romania Update Memo*, 2000, ISPO-DG Information Society of the European Commission, ESIS II project, <http://www.eu-esis.org/esis2alt/ROalt5.htm>

⁴³ *Alternative Networks, Romania Update Memo*, idem

⁴⁴ *Alternative Networks, Romania Update Memo*, idem

The radio-communication sector has a large geographic coverage and offers a solid infrastructure in its alternative networks:⁴⁵

The National Radio-Communications Company operates the Romanian radio-communication network as well as the largest Romanian satellite ground station⁴⁶. The old networks containing obsolete radio-transmitters used for national radio and television program broadcasting and telephone links, have in the recent years been upgraded to new sub-networks using state of the art technology and equipment.

Anticipating the complete privatization of the telecommunication market, the National Radio-Communications Company embarked on projects in order to rank second behind RomTelecom. One of these projects is the SDH national digital radio-transmitters network, a complex network with a bandwidth of 622 Mbps. Built in a period of one and a half-years as part of an US\$ 11 million contract with the German Company Bosch Telecom. The network is based on four backbones (organized in a star topology with Bucharest at the center). In addition, it provides links with major networks from Europe (based on ETSI⁴⁷) and North America (SONET networks, based on ANSI⁴⁸).

Almost one half of the population of Romania now has access to the SDH's network services. The SDH network was installed with the help of 180 Romanian engineers, who built 8.1 Km of wave-guides, covering 1500 km and linking 43 cities.

The national digital radio-transmitters network represents the platform for the broadcasting of national radio and television programs as well as for new services like:

- Internet access
- National data and video networks
- Telephony network for governmental and financial institutions, universities etc.
- Digital broadcasting of national radio and television programs
- Real-time banking operations
- Videoconferences

⁴⁵ The information is selected from *Alternative Networks, Romania Update Memo*, idem

⁴⁶ The company owns the biggest satellite dish in Romania - 32 meters in diameter, located in Cheia, a resort in the Carpathians mountains

⁴⁷ European Telecommunication Standard Institute Standards

- Tele-universities

SNR is also drawing plans for the first Romanian telecommunications satellite. SNR and Israeli's Spacecom are expected to be the only partners in a US\$ 200 mil project to acquire a satellite.⁴⁹ It is believed that SNR will take up to 25 per cent of the satellite's capacity, Israel utilizing the remainder. The satellite will have a lifespan of 12 years, with 24 channels for TV, telephone and Internet use, and will have a range between London, eastern Ukraine, Stockholm, and Greece. The launch date is anticipated to be in mid-2002 by an Ariane rocket from Guyana in South America.

d) Public Administration

The Romanian Public Function Ministry and the National Agency for Communications and Informatics (ANCI) intend to develop a data-voice network (for two years for 50 million US\$) for public administration.⁵⁰ This network will link all public administration institutions in Bucharest to others all over the country⁵¹.

Cable TV

Cable television (CATV), put in place by RomTelecom, was liberalized in 1992. Turnover increased tenfold, from US\$ 10 mil in 1996 to US\$ 100 mil in 1999.⁵² This industry constitutes, in many experts' opinion a great success for the private sector, though not comparable to that of mobile telephony.

More than 20% of the networks have a bandwidth of minimum 450MHz, and 5% of these are already over 720MHz.⁵³ Still, only approximately 10% of the networks are bi-directional, allowing for data transmissions. According to a study by IMAS (Institute for Marketing and Polls) in 1999, out of 6.9 million homes with a TV set, 3.45 million were connected to a cable television network, creating a subscription level of around 50.3%. These figures place the Romanian cable market at sixth place in Europe, after Germany,

⁴⁸ American National Standard Institute standards

⁴⁹ Tim Johnson, *Deep space time*, Bucharest Business Weekly, January 2000, www.bbww.ro

⁵⁰ *Alternative Networks, Romania Update Memo*, idem

⁵¹ It will permit the government to use data and voice transmissions for about 10 years without modifying anything in the network topology.

⁵² Nicolae Oaca, idem

Belgium, Holland, Switzerland, Sweden, Poland, and before countries like France, Great Britain, Denmark or the Czech Republic⁵⁴.

The CATV industry in 1999 consisted of more than 100 small operators, according to Pyramid Research.⁵⁵ However, year 2000 statistics show a much higher number of 500 operators. The difference in statistics may stem from the fact that numerous operators don't register in order to avoid paying taxes, due to very unclear tax and regulatory provisions for this industry⁵⁶.

The local private industry, injecting 80% of Romanian capital (US\$ 100 million), succeeded to create this booming industry. The cost of usage, including installation fees and a monthly subscription, helped create this attractive market. With an average of 3US\$ for a 24-26 channel package, the Romanian CATV offer is very attractive in the European region (France – US\$ 30, Germany - US\$ 18, Poland - US\$ 11, Hungary - US\$ 7)⁵⁷.

Market saturation is about to take place, with 10 companies having 70% market share. In Bucharest, for example, there were around 20 companies in the early 90's; now there are eight.. Services offered include 20-30 television channels, data transmission and Internet access. CATV operators also intend to provide telephony in line with the market liberalization, and the competition in the larger cities is pushing services into rural areas. The main competitors in the sector are:⁵⁸

Table 3 – CATV market leaders

Company	No of subscribers	Info

⁵³ *Alternative Networks*, idem

⁵⁴ IMAS cited in *Alternative Networks, Romania Update Memo*, idem

⁵⁵ *Case studies in Information Infrastructure Indicators*, 1990-2000, InfoDev, 1999. The case studies are prepared by Pyramid Research.

⁵⁶ *Alternative Networks, Romania Update Memo*, idem

⁵⁷ *Alternative Networks*, idem

⁵⁸ Nicolae Oaca, idem

Romania Cable Systems (RCS)	450,000	Bucharest-based company with 50 licenses. Has recently acquired a Hungarian cable company with 50,000 subscribers.
Astral Group	400,000	by the end of last year its CATV services included Astral TV with 140,000 subscribers, Storm TV with 90,000 subscribers, TV CABLU with 85,000 subscribers and DELTA STAR TV with 45,000 subscribers
TERRA SAT	150,000	operates mainly in large cities in the southern part of Romania
Analog	65,000	
Seltron	75,000	

Two recent deals reshaped the Romanian cable TV landscape - Analog merged with Seltron,⁵⁹ and United Global Communications (UPC) announced a joint venture with the owners of the merged company. UPC is ready to consolidate its market position with new acquisitions and modernized networks, in order to enter the liberalized telecom market providing TV channels, Internet access and voice services. Possible acquisition targets for UPC would include RCS, the largest cable service provider, or Astral group⁶⁰.

Coverage of the cable network was expected to rise to around 90% by year 2000⁶¹. Still, the market growth did not reach these expectations. On one hand, the problems that CATV operators encounter are determined by infrastructure. Around 97% of the network is air built and therefore the networks are vulnerable, due to both unauthorized human intervention and bad weather. Also, the lack of dialogue between many local administrations and of cooperation in providing regulations for reliable and well-protected lines postpones the realization of the potential existing in the CATV industry⁶². On the other hand, although the cable networks have experienced rapid growth, the

⁵⁹ Nicolae Oaca, idem

⁶⁰ Nicolae Oaca, idem

⁶¹ Inside Cable and Telecoms Europe report, *Romania*, 1999, at http://www.inside-cable.co.uk/c_roma.htm

⁶² *Alternative Networks*, idem

companies are achieving very low revenues per customer. Operators bitterly complain about the high level of taxes they pay, about video piracy and also about the lack of political action or will to fully liberalize the telecommunications market.

Wireless telephony

In Romania the mobile telecommunications era started in 1991, with an analog system called NMT-450 (Nordic Mobile Telecommunications). In 1998 the first two GSM-900 networks were installed and in 2000 the DCS-1800 network was implemented.

a) NMT-450 Network

The NMT-450 mobile telecommunications operator, a joint venture between RomTelecom and Telefonica Spain, started the first Romanian mobile communications network in 1991. In 1997 this network had about 18,500 customers⁶³. In 1997 Telefonica Romania changed its name to Telemobil and its shareholders became RDT Holding (Regional Transportation District - 95%), RomTelecom (2.5%), and National Radio-Communications Company (2.5%). In 1999 the company introduced LEMS⁶⁴ technology, and launched a new brand name, SunTel, against the newly introduced GSM system. By the end of 1999 SunTel had less than 20,000 subscribers, well below the planned 50,000. The network covers at the present only five main cities: Bucharest, Brasov, Constanta, Timisoara and Cluj. This is also less than planned.⁶⁵

b) GSM-900 Networks

The GSM mobile network boomed in Romania in 1996-1997, when two consortia earned a 10-year GSM-900 license: MobiFon and MobilRom⁶⁶. By the end of 1998, the yearly

⁶³ *Alternative Networks, Romania Update Memo*, idem

⁶⁴ Low Emission Mobile System

⁶⁵ There is heresay that it will change its network technology to CDMA

⁶⁶ Cf. *Alternative Networks, Romania Update Memo*, idem: these two consortia include some of the major telecommunications operators in the world:

MobiFon: Telesystem International Wireless Inc. Canada - 60%, AirTouch Europe (an AirTouch Communications USA Division), Logic Telecom, Ana Electronic, ISAF SA, Romanian Mail Company and Romanian Investment Fund.

growth rate was around 400%⁶⁷. Since 1996, there has been a large increase in the number of subscribers to the GSM mobile network with the number of customers growing from about 50,000 in late 1996 to 1,350,000 at the end of 1999.⁶⁸ In 1999, mobile telephony recorded a 110% increase in the subscriber base with a penetration rate of 6%⁶⁹. More than 70% of the Romanian territory was covered in 1999 by mobile phone networks⁷⁰:

Table 4 – Connex and Dialog

Company	Coverage	No of subscribers
MobiFon (Dialog)	73% of Romania's surface, 225 cities, 11,800 km of roads and 90% of population	800,000
MobilRom (Connex)	72% of Romania's surface, 258 cities, 12,500 km of roads and 92% of population	800,000

Connex

In June 1999 MobiFon (brand-named Connex), was the first Romanian GSM company that was awarded a license for the Internet Service provision and launched "Xnet" as a part of a first full communication solution that belongs to a digital mobile telephony company in Romania. With Xnet, MobiFon extended the possibility to connect to the Internet through all existing options: GSM access for about 750,000 mobile telephony users, fixed RomTelecom lines access (both regular phone and leased lines) for general

MobilRom: France Telecom Mobiles International - 51%, Media Pro Group - 30%, Computerland - 10%, Tomen Telecom Project Romania and Alcatel Network Systems Romania (an Alcatel France Division).

Since late 1999 the new structure of shareholders is: France Telecom Group - 67%, American Investment Group and Societe Generale - 14.28%, MMR Group (Media Pro, MBL Computers and Radcom) – 9.52%, Tomen Company Japan – 5.1%, Alcatel NV – 2.86%.

⁶⁷ www.dialog.ro

⁶⁸ *Alternative Networks*, idem. Also see *MobilRom*, www.alo-gsm.ro.

⁶⁹ Nicolae Oaca, idem

⁷⁰ EIU, *Resources and infrastructure: Transport and communications*, 25 February 2000. Also *Alternative Networks, Romania Update Memo*, idem

public/small offices, and advanced wireless radio connections for large companies and institutions⁷¹.

Xnet is present in Bucharest and nine other counties⁷² (Prahova, Brasov, Cluj, Timis, Dolj, Iasi, Bacau, Galati, Constanta). Access to the International Internet backbone is provided through Xnet's own satellite connection backed up by terrestrial high-speed lines (fiber optic). The services include e-mail, web site and FTP (File Transfer Protocol) site hosting, Internet domain and subdomain registration and hosting, web page design, customized Intranet design, electronic commerce, etc.

Dialog

MobilRom developed and operated an interface that offers e-mail and Internet access only for mobile phone users, using other Internet Service Provider's (ISP) services ("Dialog E-mail" and "Dialog WAP⁷³"). Since March 2000, MobilRom has been evaluating offers to become a full ISP.

c) DCS-1800 Network⁷⁴

In December 1998 RomTelecom acquired one of the two DCS-1800 licenses and introduced a new mobile communications operator, CosmoRom (100% owned by RomTelecom/OTE – The Hellenic Telecommunications Organizations S.A.).⁷⁵ Starting in March 2000 with an investment of US\$ 60 million, CosmoRom⁷⁶ plans to bring on-board another US\$ 500 million for building a network covering Bucharest and 6 other counties. It also aims to achieve national coverage by the end-2001.

Recently CosmoRom acquired WAP data-transfer system, which allows for Internet browsing via a mobile phone, taking data transfer speeds on GSM up to 9.6 kbps per second. Voice mail, intelligent network services and Internet access are part of the package RomTelecom planned to offer to its subscribers in 2000⁷⁷. About 40,000 full-

⁷¹ Cf. Connex, www.connex.ro

⁷² Romania has 41 counties

⁷³ Wireless Applications Protocol

⁷⁴ *digital cellular system*

⁷⁵ Luli Popescu, *Romania Telecom To Launch Cellular*, CommunicationsWeek Intl, Dec 1999, www.totaltele.com

⁷⁶ www.cosmorom.ro

⁷⁷ Adrian Dascalu, *RomTelecom to invest in teledensity*, 15 September 2000, www.totaltele.com

time Internet users are expected to subscribe to this new service; however, up to the date this report was written, this offer has not yet been launched.

The National Agency for Communications and Informatics (ANCI), the main telecommunication regulator until 2001, announced on June 2000 that ANCI intends to sell the second DCS-1800 license for US\$ 25 million. This license would be operational starting on January 1st 2003, when the RomTelecom/CosmoRom monopoly on the 1800 MHz frequency will expire⁷⁸.

*Trunking and paging*⁷⁹

Radiotel, Mobilcom, Rokura, Uniaxis, Radcom, ADISAM are the main trunking operators in Romania⁸⁰. Paging services were offered in 1998 by 12 operators.

Satellite

Since 1992 the satellite communications market was fully liberalized and many private companies (most of them foreign joint-ventures) appeared on this market as satellite operators with wide territorial coverage. Satellite networks used in Romania include: Intelsat (two earth stations, at Cheia, operated by the National Radiocommunications Company - SNR), Eutelsat (one earth station, at Cheia, operated by SNR, and one station, in Bucharest, operated by RomTelecom), Orion Network Systems (Orion 1 satellite), and Telenor⁸¹.

The satellite communications are operated by one public institution, RNC (National Computer Network for Research) and ten private operators (Digicom, Eastern Space Systems, Logic Telecom, Global Communications Services, MediaSat, Sumitcom Rokura, etc.)⁸²

⁷⁸ *Alternative Networks, Romania Update Memo*, idem

⁷⁹ Telecommunications, CEEBICnet, at <http://www.mac.doc.gov/eebic/COUNTRYR/ROMANIA/RESEARCH/TELROMA.HTM>

⁸⁰ Hilde Corbu, Eugen Preotu, *Romania – Communications infrastructure*, Telecom ON-line, IDG Romania 1997, <http://www.kappa.ro/idgro/telecom/tc97-4-4.html> (Romanian)

⁸¹ Roda Tinis, *Telecommunications and Information Technology*, CEEBICnet Market Research, May 1998, <http://www.mac.doc.gov/eebic/COUNTRYR/ROMANIA/RESEARCH/TELROMA.HTM>

⁸² *Alternative Networks, Romania Update Memo*, idem

Most of the private satellite operators offer data communications services for the general public and companies (including for other Internet Service Providers) such as Internet access using regular phone lines, leased lines, fiber optic connections, wireless radio systems (like Wave LAN⁸³) and VSAT technology connections.

Many of these private companies offer high-performance data communications services (LAN to LAN Ethernet and Token Ring connections, X25 networks, Frame-Relay, SDLC⁸⁴-based networks), digital TV point-to-multipoint broadcasts services and special services like Euteltracs (satellite tracking and mobile communications for ships and trucks). There are a few companies that offer worldwide integrated services using the support of other international telecommunications companies: British Telecom/Concert, Loral Orion.

All of the data communication providers are interconnected by a terrestrial high-speed line in a backbone named BUHIX, maintained by the National Computer Network for Research (RNC) and National Institute for Research and Development in Informatics. The facility links all the major Internet service providers in Romania⁸⁵.

Both public and private companies intend to expand their network capacity, deploy new technologies such as Frame-Relay, and expand data transmissions services as soon as a new legal framework comes into place⁸⁶.

One of Israel's top IT companies, Allot Communications, entered the Romanian mid-end ISP and LAN equipment market after signing a contract in September 2000 with its sole local distributor, Industrial Computer Group⁸⁷. A large number of ISPs is already interested in buying Allot's broadband devices for online data and voice exchange. Roknet, Softnet, Lantec, Logic Telekom, Connex, RBS, DigiCom, ICI, RoEduNet, FX, DNT and Mediasat will follow a one-year trial Internet service program with Allot

⁸³ Local area network

⁸⁴ SDLC is synchronous data link control

⁸⁵ Major ISPs are: like RNC, KAPPANet, RoEduNet, FX, DNT, MediaSat, ITCNet, Canad Systems, Global One Communications, LOGICnet, Eastern Space Systems, Rokura, MediaSat, StarNets, MobilRom, DigiCom, etc

⁸⁶ *Alternative Networks, Romania Update Memo*, idem

⁸⁷ B. Tudorache, Israelis top wireless market, Bucharest Business Week, 18 September 2000, at www.bbww.ro

hardware devices. The company intends to enter the wireless radio voice services market in 2003, when RomTelecom's monopoly on phone transmissions ends.

National Radio-Communications Company

The National Radio-Communications Company uses the satellite earth station for data communications, TV broadcasts, and international phone communications (used by RomTelecom). The company developed a national backbone using fiber optic cables with Points-of-Presence (POP) in the main cities of the country. The main structure of this network is interconnected with the RomTelecom backbone and with other mobile communications operators: MobiFon, MobilRom, Telefonica Romania and with other major networks crossing Romania (like RoEduNet, administered by the Ministry of Education). This backbone provides complete data communication solutions such as ISDN, X.25, Frame-Relay, ATM⁸⁸ and B-ISDN⁸⁹, both for public institutions (Internal Affairs Ministry, Public Ministry etc.) and for private companies.

3.1.3. Year 2000 and plans for the future⁹⁰:

RomTelecom allocated US\$ 500 million for investment in 2000 and 2001, in order to increase the telephone density to 23 percent and the digitalization rate to 69.4 percent by 2003⁹¹. Other plans in 2000 included the connection to the network of isolated and economically underprivileged towns and the replacement of the obsolete technology with new equipment. The network is now 90.5% automated, with electronic Pentaconta switches still comprising the majority of switching capacity⁹². Following the connection of 520,000 digital lines installed in 1999, RomTelecom planned to connect 700,000 lines in 2000.

Some of the plans from 2000 to 2005 include the following:

⁸⁸ asynchronous transmission mode

⁸⁹ "bearer" ISDN

⁹⁰ Telecommunications, CEEBICnet, idem

⁹¹ Adrian Dascalu, *RomTelecom to invest in teledensity*, 15 September 2000, www.totaltele.com and *Regulatory Developments Romania*, ESIS II, 2000, <http://www.eu-esis.org/esis2reg/ROreg6.htm>

⁹² 1999 RomTelecom Annual report, at www.romtelecom.ro

- By 2004 the company plans to install 2.54 million new lines and replace existing analog lines in order to reach a 70% digitalization by 2003⁹³.
- In 2002, according to the CEO⁹⁴ of RomTelecom, there should be no waiting list.
- The Romanian Government represented (in 2000) by the National Agency for Communications and Informatics signed an agreement with the government of the Republic of Korea⁹⁵ for an infrastructure development project. The government credit, established at US\$ 30 million, will contribute to the modernization of rural telephony in two counties: Alba and Buzau.
- RomTelecom plans to offer ISDN services soon⁹⁶, using the already existing switching system and related transmission paths. ISDN is not yet very popular in Romania, but it is hoped that it will develop in the future⁹⁷.
- Alcatel will supply RomTelecom with telecommunications equipment worth US\$ 39 million which will be installed in the network of the national phone operator within the next three years⁹⁸. The Alcatel systems will offer services in the near future through optical fiber and copper cables to provide Internet connections at an enhanced speed, as well as multimedia applications, high-quality vocal phoning, and digital video services. The first Alcatel systems will be introduced in Bucharest at the beginning of the year 2001. They will also be implemented in the rest of Romania's main cities.
- A second international digital switch, located in the city of Brasov, will be installed in order to ease congestion on the existing switch located in Bucharest and expand the capacity of RomTelecom's international connectivity.
- Until 2003 the company plans to invest US\$ 2.7 billion⁹⁹ in order to increase digitalization of main lines.

⁹³ RomTelecom Annual Report, 1999, p 3, www.RomTelecom.ro

⁹⁴ Chief Executive Officer

⁹⁵ The agreement was signed on the 11th of October 2000. For more details, see <http://info.cni.ro/comunicatepresadiacr.htm>, (Romanian).

⁹⁶ RomTelecom's Annual Report 1999

⁹⁷ *Basic Factors and indicators*, ESIS II, 2001, <http://www.eu-esis.org/esis2basic/RObasic7.htm>

⁹⁸ Romanian Daily, through Mediafax, 1999, <http://www.romanian-daily.ro/MENU/RED504.html>

⁹⁹ ESIS extension – Romania – Regulatory Developments, 2000, <http://www.eu-esis.org/esis2reg/ROreg3.htm>

- The expansion of COSMOrom coverage. The plans for the development of the mobile telephony services include national coverage before 2002¹⁰⁰.
- Expansion with Internet services. RomTelecom left its partnership with Global One and intends to establish a new company aiming to become a national ISP¹⁰¹

3.2. Internet Availability – stage 3

3.2.1. Market size and statistics

Commercial Internet has been available in Romania since 1995, but only in 1998 did it become functionally suitable for business use. This was due to a) a lack of critical mass: b) not enough service providers, c) lack of host site providers, and d) not enough interesting sites. Starting with 1996, the growth curve for Internet usage in Romania emulated that of worldwide usage, and it even exceeded it. For example, from January 1996 to February 1997 there was a 500% increase in the number of host sites (servers hosting domains) in Romania.¹⁰² The number of Romanian servers connected to the Internet increased ten-fold from 1996 to 1998 and Internet growth (the 6.5% increase mentioned below) bounded ahead at a 6.5% rate of increase compared with the worldwide growth rate of 1.86 percent¹⁰³. Despite the unimpressive number of users and companies, the speed of growth over the past couple of years seems to be among the largest in Europe, and as yet there is no sign of a slowdown.

3.2.2. ISPs, Internet users and Internet usage

There has recently been a boom in the ISP market, and in 1999 there were around 200 ISPs¹⁰⁴ and 70,000 Internet users¹⁰⁵. According to a more recent EIU (Economist Intelligence Unit) estimate, by the end of the first quarter 2000 there were close to 900,000 Internet users in Romania, of which 95% were business users, the rest being

¹⁰⁰ ESIS extension, idem

¹⁰¹ According to RomTelecom's Chief Executive Officer, Vassilios Tsakoniatis, RomTelecom Annual Report 1999

¹⁰² Michael Kamrath, Romanian Business Guide, *Internet*, 1999, <http://www.neweuropepromotions.com/romanian/communication3.html>

¹⁰³ According to Vlad Tepelea, the head of RomTelecom, in Michael Kamrath, idem

¹⁰⁴ Basic facts and indicators, ESIS, January 2001, at <http://europa.eu.int/ISPO/esis/default.htm>

¹⁰⁵ Nicolae Oaca, idem

home users. An ESIS report dated January 2001 mentions 713,000 users¹⁰⁶. This represents an increase of 80% compared to the beginning of year 2000. In contrast, there were only about 50,000 Internet users at the end of 1997.¹⁰⁷ Some analysts predict a market growth rate of 45% in 2001, and 35% in 2002¹⁰⁸.

At the outset, it was believed that most Internet users in Romania were those with high income and education, but recent market studies changed this perception¹⁰⁹. Although students and professionals predominate among Internet users, average-educated persons have started to comprise an important segment (10%) of the market. Yet most of the users are young, well-educated male (75%) graduates, living in urban areas and/or having above average revenues¹¹⁰. In addition, this research also indicates that Romanians access the Internet from the office (53%) and from school (28%). According to another report, only 7.4% of users are managers or entrepreneurs, 44.7% of Internet users in Romania are students or in school, while another 27.2% have finished their university studies¹¹¹. Women make up a mere third of the users. The 18-34 year old age group represents 45% of users, while those over 45 represent just 5%.

3.2.3. Internet hosts and domains

In 2000 Romania had around 36,000 Internet hosts (servers hosting domains). Compared with 1999, the growth was lower, emulating the regional growth (between 10 to 64%). Croatia has a rate of growth of 53%, the Czech Republic 41%, Bulgaria 64%. This could simply be a period of normalization, following the impressive rates of up to 200%, recorded between 1996-1999.¹¹²

¹⁰⁶ <http://europa.eu.int/ISPO/esis/default.htm>

¹⁰⁷ EIU 1st quarter 2000 statistics, at <http://www.ukbiz.ro/source.php3?owner=1>

¹⁰⁸ Mohsen Khali, Director, Global Information and Communications Technology Dept, the World Bank Group, presentation in May 24, 2000

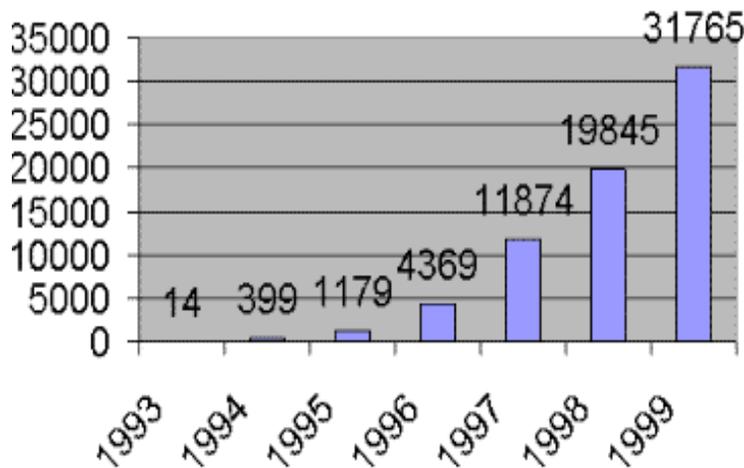
¹⁰⁹ McCann Erickson and Ogilvy & Mather's, in Bucharest Business Week, 4 February 2000

¹¹⁰ McCann Erickson and Ogilvy & Mather's, idem

¹¹¹ *School Kids and Students Make Up Almost Half of Romania's Internet Users*, January 2001, Stockaccess.com, at <http://www.stockaccess.com/news/news010126-7.html>

¹¹² *Internet infrastructure development in transition economies*, United Nations, Economic and Social Council, Economic Commission for Europe, 2000, <http://www.unece.org/trade/tips/docs/ctied4/ct018.pdf>, p. 14

Figure 2 – Hostcount for Romania



Source: Romanian National R&D Computer Network

Market players

EUNet was the first ISP in Romania in 1992, followed by Open Society Foundation-Romania around the same year¹¹³. The development of the ISP market was slow, due to high prices as well as a complicated licensing process for network access practiced by RomTelecom. Since last year, the provision of internet services requires authorization from the recently established Ministry of Communications and Information Technologies¹¹⁴.

Consolidation started to shape the ISP market since 1999. Several highly visible mergers and acquisitions (M&A) suggested that the process is set to continue and some analysts expect that in Bucharest, out of the 30-40 ISPs of significant size, only a handful will remain in the game in a matter of years¹¹⁵. Among the bigger mergers are those of corporations such as the Romanian Post Privatization Fund, Euroweb International Corp, and Sumitkom Rokura.

¹¹³ Internet Censorship Project, a project of the Open Society Institute's Internet Program, <http://www.soros.org/censorship/balkans/romania.html>

¹¹⁴ The Ministry also regulates e-commerce, the usage of e-signature, the transmission of data and the activity of the ISPs. A Romanian version of the government decree to establish MCTI can be found at <http://www.mcti.ro/legislatie/invigoare.html>.

¹¹⁵ *Romanian ISP Sector at a Glance*, StockAccess.com Outlook, November 2000, <http://www.stockaccess.com/outlook.html>. The article contains detailed information about M&A activities.

The most important M&A deals are within the cable TV-ISP area. The key factor behind this trend is the upcoming liberalization of the Romanian telecommunications market. New companies such as Astral Kappa (which are able to provide a number of value-added services, such as cable TV, Internet and advanced data network services along with traditional telephony), can occupy a strong, competitive position.

Table 5 - Leading Romanian ISPs

Subscribers (Q1 2000)	Subscribers	Established	Revenues 1999 (US\$)	Revenues 1998 (US\$)	Dial-up Lines
PC-Net	21,000	1993	No data available (nd)	n.d	500
Dynamic Networks Technologies	8,725	1997	1,673,453	960,358	420
Romania Data Systems	256	1997	1,320,612	321,268	n.d.
Digicom	900	1996	997,500	246,000	100
Global One Comm.	10,000	1994	1,000,000	n.d.	1,000
Euroweb Romania	8,500	1998	900,000	600,000	230
FX Internet	9,000	1997	800,000	450,000	450
Ines Internet	n.d.	1995	906,000	375,000	100
KPN Qwest	n.d.	1993	600,000	550,000	n.d.
Kappa	3,000	1993	n.d.	n.d.	n.d.

There are some companies, like Romania Data Systems, that focus on large corporate customers and consequently have a very low number of subscribers. Most local analysts agree that creating a less numerous but more reliable (corporate) customer base builds up turnover, but in the long run the stronger ISPs will be those that choose to focus on

building large networks serving residential customers. Additional market observation shows that in all recent takeovers, the targets were ISPs with a large customer base, regardless of their turnover¹¹⁶.

New entries to the market have changed the ISP market landscape. As mentioned earlier in the report, in 1999 CONNEX launched Xnet, a complete Internet Service Provider, offering its own servers, network, and satellite connection to the International Internet backbone¹¹⁷. X-Net is the first complete Internet Service Provider belonging to a digital mobile telephony company in Romania. Its services are based on both RomTelecom infrastructure (for dial-up) and its own infrastructure. Now it is focusing on expanding its services based on wireless infrastructure¹¹⁸.

Internet: Connex

The package offered by Connex allows for access to a wide range of applications such as message management (voice messaging, e-mail, chat), personal assistant (organizer, agenda), general news (news, weather, tourism, proprietary information), banking services (account information, interest rates, exchange rates), commercial services (stock transactions, shopping), traffic and travel information (train and airlines' timetables, holiday destinations), and entertainment¹¹⁹.

Connex subscribers can benefit from unlimited access to Internet through Xnet without having to pay for a dial-up monthly fee. There is still a charge for telephony, with packages matching different types of demands: 0.10 \$/min (peak hours) and 0.07\$/min (off peak time).

For those who do not want to invest in a PC and a modem, Connex has an alternative offer, Xmail¹²⁰, an e-mail service on the mobile phone.

Dialog, the second mobile phone operator, is also evaluating offers to become a full Internet service provider. Dialog currently provides an interface for the Internet using

¹¹⁶ *Romanian ISP Sector at a Glance*, StockAccess.com Outlook, idem

¹¹⁷ X-Net Press release, at http://www.xnet.ro/english/pages/press/may_12_1999.html

¹¹⁸ www.connex.ro

¹¹⁹ Press release, Connex, at <http://www.connex.ro/eng/services/vas/wap.html>

mobile phones¹²¹. It is also considering moving into voice over IP in 2003, when RomTelecom's monopoly will come to an end¹²².

3.2.4. Internet infrastructure solutions

In terms of network solutions it seems that the Internet market has two major business trends:

- Some of the large ISPs count on wide geographical deployment and spend their resources on expansion based on RomTelecom infrastructure, (like PC-Net, FX-Internet or KPNQwest (the former EUNET¹²³).
- Some ISPs have built and invested in their own infrastructure focusing on a smaller geographical area, like the cable TV companies. RDS (Romanian Data Systems), for example, inaugurated the first 1,000 kilometers of a 4,000 km fiber optic network under a 40mil US\$ project. By 2003 the company intends to offer services such as voice, data transmission, and Internet to smaller cities and villages.¹²⁴

The non-commercial, academic ISP - RoEduNet (Romanian Education Network) - linked 6 major university centers via leased lines and has international connectivity by satellite at 2Mb¹²⁵.

Some ISPs intend to offer services like the Virtual Private Network, which seems to be attractive in terms of costs/investments for companies that don't want to build their own infrastructure.

CATV

Romsat, a wholly owned subsidiary of Metromedia International Telecommunications, started in 1998 to offer Internet access over its own CATV network in 1998¹²⁶. In order

¹²⁰FAQ Connex, at <http://www.connex.ro/eng/connect/faq/faq7.html>

¹²¹ Steven Wright, *Dialog dials up ISP project*, Bucharest Business Week, March 2000, at www.bbww.ro

¹²² Steven Wright, *idem*

¹²³ For more details, see http://www.romania.eu.net/media_events/press_releases/25April00/

¹²⁴ Claudia Covaci, *RDS to install fiber optic*, Bucharest Business Week, Dec 2000, www.bbww.ro

to be able to offer Internet services, Romsat upgraded its cable plant from 350 MHz to 860 MHz in several areas of the capital city. The residential monthly fee was US\$ 95 for Internet access and usage, and US\$ 125 and US\$ 500 for businesses for using 64 kbps and 1 mbps speed transmission.

*VSAT*¹²⁷

Only a small group of ISPs use VSAT and offer such services to very large enterprises such as banks and Government. Most of the data communication providers are interconnected through a terrestrial high-speed line in the BUHIX¹²⁸ backbone maintained by RNC¹²⁹ and National Institute for Research and Development in Informatics. ISPs like RNC, KAPPANet, RoEduNet, FX, or DNT, are linked in this manner¹³⁰.

3.2.5. Cybercafes, telework centers and telecenters

The difference between the number of computers and Internet users¹³¹ can be explained by the booming business of Internet cafes since 1999, particularly in Bucharest, as in 1998 there were 540,000 Internet users and 480,000 personal computers. Yet, the latest statistics show an equalizing trend in the relationship between Internet users and number of computers. In December 2000 an ESIS report counted 713,000 personal computers and 690,000 Internet users. An alternative explanation could account for this trend, and this is not Internet cafes as much as computer penetration at the workplace. It is now believed that the majority of Internet users surf at work.¹³²

¹²⁵ *Bridging the Digital Divide: Internet Access in Central and Eastern Europe*, Romania, January 2001, <http://www.cdt.org/international/ceeaccess/countrydetail.shtml#romania>

¹²⁶ *Telecoms & Wireless Eastern Europe/CIS: Romanian CATV Company Launches Internet Services*, EIU, 26 August 1998

¹²⁷ VSAT - Very Small Terminal Aperture

¹²⁸ BUHIX - Bucharest Internet Exchange

¹²⁹ RNC/NRC – National Computer Network for Research

¹³⁰ *Alternative Networks*, idem

¹³¹ according to ESIS: <http://europa.eu.int/ISPO/esis/default.htm>

¹³² *Romanian ISP Sector at a Glance*, Nov 2000, at <http://www.stockaccess.com/outlook.html>

There are no available statistics for the exact number of cybercafes in Romania. Some .com companies (such as cybercafes.com) estimate that there are 50 cybercafes in Romania. The actual number is supposedly much higher (in the hundreds) because of the many small ISP providers that do not declare their activity in order to avoid paying taxes.

Public Internet access is becoming widely available at hotels and travel agents' offices of major cities in Romania: Timisoara, Bucharest, Craiova, Iasi, Mangalia (on the Black Sea coast), Sibiu, Sighisoara, Gheorgheni in Transylvania, and Sighetu Marmatiei (in Maramures). The online access cost ranges from less than US\$ 1 to US\$ 3 per hour.

In 1999 the first telework center, WESTERN IQ – Romanian Telework Informations (WIQ), opened in Bucharest and failed shortly after its start¹³³. In 1999 WIQ estimated that telework centers could be used by around 0.5% to 1% of the workforce, and that over the next five years the figure could rise to over 3%¹³⁴. In its first stage, the center had 5 telework workposts, which offered Internet access, web hosting, and other specific services needed for work at distance. WIQ charged relatively high fees for the services offered, which may explain why it disappeared from the market: Word processing per page was US\$ 0.51, data conversion US\$ 0.26, Internet website access US\$ 1.04/ page browsed, at a time when the regular Internet access in any cybercafe was less than a dollar/hour.

An important player in the telework's newly born market is the *Romanian Telework Society* (RTS), part of the Association of the Engineers from Romania, which aims to promote the teleworker's interests¹³⁵.

¹³³ Literature suggests a slight difference between telework centers and telecenters. The main definition of telework is “use of computers and telecommunications to change the accepted geography of work”, focusing mainly on work at distance. Telecenters are defined as centers established in rural areas, where communities are offered access to telecommunication resources. The differences seem to lie in the prices charged (most of the times in urban areas, telework centers are basically for profit companies, while telecenters are mainly organized within assistance programs, charging small fees, if any. Telecenters are also called telecottages.

¹³⁴ WIQ Telework Center, at <http://www.crie.ro/telework/html/webtwce1.html>

¹³⁵ at <http://www.teleactivities.org/srt/index.htm>

Two local NGOs are currently developing telecenter projects: The Center for Rural Assistance (CREST) and the Resource Center for Nongovernmental Organizations (CREST).

CREST – the Resource Center for Nongovernmental Organizations¹³⁶ offers various types of services that could help to the establishment and functioning of a telecenter :

- training of personnel for the telecenter in organizational management, proposal writing, project management, partnership management, community development and IT,
- disseminating information about existing opportunities for social-economic and cultural development,
- technical assistance,
- endowment of the telecenter with technical equipment using a free loan contract.

The selection of the beneficiary communities is coordinated through a transparent application process, which is also stimulating competition.

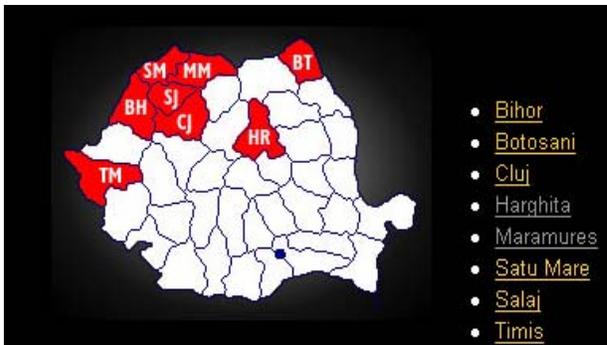
One of the achievements CREST mentions in the Annual Report for FY00 is the Initiation and support for establishing of the Telecottage Association in Romania.

CAR is offering similar services, operating mainly in Timis county.

As a result of the partnership between CA and CREST currently there are 25 telecenters in the north and north-west counties in Romania, as they can be seen highlighted in red on the map below.

Figure 3 – Telecenters in counties in NW Romania

¹³⁶ <http://www.crest.ro/gbhtml/gbindex.htm>



What is unique about the two organizations is the way they build and use partnerships towards increasing their effectiveness. Not only do they cooperate together in the newly born telecenter “industry”, but they also try to attract other partners, local and international.

Trying to attract young people in telecenter projects, CAR is currently partnering with Service Civil International in organizing summer camps. This way students have the opportunity to work on the restoration of telecenter buildings and also find out by experience what is a telecenter and how does it contribute to developing rural communities¹³⁷. Another resource is the US-based Peace Corps program, or other international organizations working with telecenters in Hungary, Great Britain, and Yugoslavia.

ITU (International Telecommunications Union) is also studying the feasibility of Multipurpose Community Telecenters (MCT) projects¹³⁸, as part of a larger program to support telecenters all over the world. The purpose of the program is to establish experimental telecenters in rural areas and learn about their problems and potential benefits. In the second, the *Implementation of Alternative Models for the Development of Rural Telecommunications* program is trying The aim of this program is to increase the

¹³⁷ information presented at http://www.sci-ivs.org/workcamp01/romania_sci.htm

¹³⁸ Royal D. Colle and Raul Roman, *Communication centers and developing nations*, 1999, Media for development and Democracy, at <http://www.devmedia.org/documents/Banga.htm>

development of telecommunications in isolated areas¹³⁹ with support coming through a PHARE grant¹⁴⁰.

3.2.6. Networks and level of usage

For the time being, Romanian resources are deployed in three academic networks¹⁴¹ network, two or three Internet service providers (mainly for non-governmental organizations), and dozens of Commercial Internet service providers (Kappa Net, ROMPAC, KPNQwest, DIGICOM, LOGICnet, StarNets, PCnet, RoLink and DIGINET, etc). The networks are growing very rapidly at the moment. For example, the reported number of hosts connected to RoEduNet was 6500, and the number of web sites changed in a few years from a couple dozen to several thousand (8,205 servers in January 1997 compared to 20 in October 1993)¹⁴².

RoEduNet

More than 100 universities, education and research institutes, public institutions, library sites are connected to RoEduNet¹⁴³.

The RoEduNet backbone consists of links between the NSP (Network Service Provider) nodes in 6 major cities: Bucharest, Iasi, Tirgu Mures, Cluj, Timisoara and Craiova¹⁴⁴. There are two types of links, between the backbone nodes (2Mbps) and between RoEduNet NSP nodes and RoEduNet POPs in each county capital city (256 kbps). The Internet connection is provided at the Bucharest node, using VSAT, to Taide Network and Loral Orion. Internet access capacity is 1.5/0.5 mbps and 4/1 mbps respectively. All NSP nodes are able to connect to the Internet users via dialup, leased asynchronous lines, and leased digital (64 kbps) lines. Also, based on local resources, users can be connected over Ethernet, cable (CATV), wireless, or fiber optic.

¹³⁹ *Implementation of Alternative Models for the Development of Rural Telecommunications*, PHARE, 1998, <http://www.phare-pcu.bg/project/1995/zz9506-03-04.html>

¹⁴⁰ Originally constituted as an assistance program for Hungary and Poland (Phare is the acronym of "Poland and Hungary: Action for the Restructuring of the Economy"), PHARE became one of the largest assistance program of EU, focused on supporting the processes of economic transition and institutional reform in the partner countries in South and Eastern Europe.

¹⁴¹ Namely Romanian Education Network (RoEduNet), the Romanian R&D Network (RNC) and FOS (Foundation for an Open Society)

¹⁴² <http://www.uttgm.ro/~dradoiu/ic/jalo/jalo.html>

¹⁴³ <http://www.roedu.net/nodes.html>

¹⁴⁴ The Official RoEduNet website, at <http://www.roedu.net/topology.html>

RNC

The Romanian National Research and Development Network (RNC) is a national project established and coordinated by the National Agency for Science, Technology and Innovation. It allows communication between its own nodes as well as access to other networks, like the Internet and EARN (European Academic and Research Network). It already has 94 institutions connected through leased lines, over 250 research institutions connected by dial-up, about 8000-10000 users, a total international traffic 300 Gb/month, and a total international and national traffic of 500 Gb/month¹⁴⁵.

FOS

The Foundation for an Open Society has achieved an Internet access national network, providing free access to selected Romanian high schools.

3.3. Internet Affordability – Stage 2

RomTelecom prices are one of the main barriers to the development of the Internet market. It happens quite frequently that a dial-up subscriber pays more for the telephone bill than for the ISP service. Some estimates show that for every dollar paid to the Internet provider, RomTelecom receives three dollars¹⁴⁶. Another significant barrier is low penetration of computers and the fact that many computers are not equipped with modems. The cost of a computer, with prices starting from US\$ 1000, is too high and makes it a luxury good. Compared in a labor hours, in 1999 the cost of a PC was 64 hours for EU, and 970 hours in Romania¹⁴⁷.

Most Romanians access the Internet at work or cybercafes, in order to get affordable access. As described in the *Internet availability* section, the ISP Internet access rates are relatively affordable for most of the large urban population of Romania.

¹⁴⁵ The official site of Romanian National Research and Development Network (RNC), at <http://www.rnc.ro/new/trncprez.shtml>

¹⁴⁶ This could be one of the reasons why RomTelecom doesn't rush to enter the ISP market, some providers speculate (<http://www.eu-esis.org/esis2reg/ROreg3.htm>)

¹⁴⁷ Vasile Baltac, *Romania as an IT-nation*, presentation at <http://www.atitc.org.ro/files/Microsoft%20PowerPoint%20-%20Seminar%20Suedia.pdf>

3.3.1. Dial-up

Dial-up connection on fixed telephone lines seems to be the most popular option, since it is the least expensive. There are two components of the cost for dial-up Internet access: RomTelecom's charge and the ISP's charge.

In order to get a new line the user pays around US\$ 5 for the monthly subscription, and a connection fee (US\$ 22 to 45).¹⁴⁸

A comparison of older prices and new prices of RomTelecom is tabulated below. A new wave of price changes took place as recently as December 2000, when RomTelecom decided to drop the prices for dial-up access by 50% without, however, making any change in price for the night interval (between 10 PM and 7 AM).

Table 6 – Old and new prices at RomTelecom¹⁴⁹

<i>Year</i>	<i>7:00 AM – 6:00 PM US\$/min</i>	<i>6:00 PM – 10:00 PM US\$/min</i>	<i>10:00 PM – 7:00 AM US\$/min</i>
1999 ¹⁵⁰	0.02	0.014	0.002
2001 ¹⁵¹	0.03 (7:00 AM – 4:00 PM)	0.02 (4:00 PM – 10:00 PM)	0.002

The new prices may have no impact on the majority of people who browse the web at night. However, they may attract new Internet users (businesses, NGOs and public institutions) or stimulate Internet usage at home. A larger number of daytime customers could possibly lead to an increase in returns for Internet Service Providers from advertising.

¹⁴⁸ The new tariffs from January 2001, at http://www.romtelecom.ro/PDF/Tarife_jan2001.pdf (Romanian)

¹⁴⁹ The prices showed in the table are tabulated without calculating inflation or depreciation

¹⁵⁰ *Romania*, Internet Censorship Project, Open Society Institute's Internet Program, at <http://www.soros.org/censorship/balkans/romania.html>

¹⁵¹ Press Release RomTelecom, at <http://www.romtelecom.ro/internet/comunicat.htm>; also Romanian Development Gateway News, at http://www.romania-gateway.ro/news/ViewDoc.asp?Document_Id=1118

Due to competition, ISP tariffs have decreased to almost half, that is around US\$ 0.6/hour. Despite cheaper prices for off-peak time, ISPs are claiming RomTelecom's high prices are the cause for the slow development of the Romanian Internet market.

Therefore, an average Internet user using the Internet for 20 hours/month might pay between US\$ 12-30/month for dial-up, which is around 20-30% of the average wage in Romania¹⁵². For wireless dial-up, the price comes to approximately US\$ 0,7 – 0.10/min, depending on the time of use (peak, off-peak). Both prices include the telephone call.

4.3.2. Leased lines

The cost of a leased line depends on the type and speed of network. The installation fee, ranging in general between US\$ 300 and 400 (depending on the type of network), has to be added to the monthly subscription fee. The selected prices below illustrate years 1999 and 2000¹⁵³. Some of the companies offer free installation or network access.

Table 3 – Internet costs

Types/speeds	Price US\$/month	Additional fees (selective)
Leased lines		
64 kbps fixed lines	260 – 300	Installation fee: 300 - 400
64 kbps wireless	160 – 200	Network access fee: 50 Installation fee: 300 - 400
64 Kbps ADSL (Asymmetric Digital Subscriber Line)	900 – 1000	Network fee: 200 - 300
33 Kbps ADSL	290	Network fee: 200 - 300
128 Kbps ADSL VPN (Virtual Private Network)	90	

¹⁵² Romanian Daily, at <http://www.romanian-daily.ro/MENU/RED504.html>

¹⁵³ Data for price analysis were collected from 6 major Romanian ISPs.

There is also a difference between the prices charged in the capital city and the rest of the country. In Bucharest prices are higher, while in regions like Transylvania or Moldavia the user pays almost 20% less for the same services.

3.3.2. Cable Internet

Unlike the situation in more developed markets, the high prices of cable modems and personal computers leave CATV Internet service within the price range of small and medium-sized businesses, but beyond the price range of the average consumer, the market for which most of the CATV access lines were installed. However, because of increasing global demand for cable modems, prices are falling, and they may reach affordable levels for the end consumer market.

3.3.3. Free Internet and other incentives

Some of the ISPs are providing free Internet services, leaving the user to pay only for the phone connection for example, *EasyNet* and *X-Net*, two packages offered by different companies. The cost for *EasyNet*, a package including 20 hours¹⁵⁴ of Internet access, is around US\$ 40 . Among the services offered by *X-Net*, the connection price varies from US\$ 1 to US\$ 30, depending on variables like length of the RomTelecom cable, time spent on the Internet, etc. In addition there is an installation fee ranging between 100 and 140US\$¹⁵⁵.

Most of the providers offer special packages in order to reach different market segments with various income levels and Internet access needs. *Connex*, for example, integrates in the wireless dial-up access a wide range of applications such as message management, personal assistant, general, banking services, commercial services, traffic and travel information, or entertainment. Also, for those who need to have e-mail but don't want to invest in a computer there is the *Xmail* package, a service that gives the user the possibility to send and receive e-mail messages using a mobile phone.

Other incentives to use the Internet access services include promotional price packages that either offer a time bonus or eliminate the network connection fee.

¹⁵⁴ Easy Net.com prices, at <http://www.easynet.ro/faq.html#>

¹⁵⁵ www.xnet.ro

Some offers include alternative payment solutions such as prepaid cards: PC-Net, Kappa, and Digicom. The table below illustrates the prepaid solution proposed by PC-Net.

Table 7 – Prepaid solutions for Internet access

Time (hours)	Price US\$
5	2
10	4
20	8
50	16
100	30

The card provides a certain degree of freedom to the user. He/she can create the Internet account on his/her own, extend usage at any time, change the password, and administer his/her account directly from the ISP provider's website.

3.3.4. Internet services

The providers offer a range of services relating to Internet access. These include Internet connectivity, the provision of applications to end-users, design, consulting and training services¹⁵⁶, as well as system services such as IP¹⁵⁷ registration, DNS¹⁵⁸, and routing.

With some identifiable exceptions, there is generally an open market in the provision of such services. On the supply side, there is freedom to enter the market, to compete for business, and to charge for services in order to stay in business. In this context, it is an acceptable practice for Internet service providers to charge for services such as domain

¹⁵⁶ The consulting services include most of the times setting up the computer to be "Internet ready", or for installing and configuring additional software. Prices vary from company to company – from US\$ 10/hour to US\$ 30, or 8 US\$/H for consulting on the phone.

¹⁵⁷ Internet Protocol

¹⁵⁸ domain name system

registration, routing services, packet forwarding and IP services. On the demand side though, the general plurality of service providers means that the customer has a choice.

The prices vary depending on the server space, time, speed, type of network used and the ISP price policy.

Table 8 - Internet services (illustration)

Services	US\$
Domain name hosting	10 - 130/year
Website hosting	10-50/month
E-mail	25
Consulting	10 – 30
Advertisement	90 – 150

3.4. Network Speed and Quality - Stage 2-3

The communication and data network infrastructure in Romania is already well developed, and among the main service providers in this area there are RomTelecom, ROMPAC, LOGICnet, and the Academic data network. The network speed and quality depend mostly on the type of access, infrastructure used, and price.

Table 9 – Internet speeds for Internet access

	Type of connection	Speed	ISP (selection)
<i>Dial-up</i>	Fixed lines	33 kbps – 128 kbps	<i>RomTelecom</i>
	Wireless	9600 baud ¹⁵⁹	<i>Connex</i>
<i>Leased lines</i>	Fiber optic	<i>Ethernet: 10 mbps</i> <i>Fast Ethernet: 100 mbps</i> <i>ATM: 155 mbps</i>	<i>Kappa</i>

¹⁵⁹ Baud was the prevalent measure for data transmission speed until replaced by a more accurate term, bits per second. One baud is one electronic state change per second.

	Fixed lines	64 kbps – 265 kbps	<i>RomTelecom,</i> <i>Connex</i>
	Wireless	64 kbps – 2 mbps	<i>Connex</i>
	Cable	4 mbps, 10 mbps	<i>Kappa</i>

The local telecommunications infrastructure supports most of the data services, depending on the local ISP. Most of the time the small ISPs rely mainly on RomTelecom's infrastructure. The quality of their services is therefore highly dependent on the quality of RomTelecom services.

RomTelecom's development program (digitalization, extension of the infrastructure) had a positive impact on the voice quality of the domestic calls in the few last years. Only approximately 50 faults per 100 mainlines were reported in 1999, compared to around 70¹⁶⁰ in 1998. An increasing digitalization process of fixed lines as well as the extension of the existing infrastructure significantly improved the accessibility of Internet activities. Still, the long waiting list (estimated at 0.74 mil in 1999) and the waiting time for new line allocation (up to three years), together with the high costs for dial-up, are impediments to the growth of the Internet users market.

Wireless access solutions are alternatives that offer higher quality services to those who own a mobile telephone. The bandwidth is wide, offering multiples of 64 Kbps to 2mbps. This makes it ideal for transmitting and receiving large amounts of data. Wireless access solutions are seen as a more reliable network alternative. In 1999 the mobile telephone market had a 110 per cent increase in its subscriber base to 1.36 mil subscribers, and a penetration rate of 6%.¹⁶¹

The availability of high speed is not a problem for accessing the Internet, but the price for it is high and makes it less affordable for the large majority of Internet users. The latest technologies were recently introduced to the market, enabling customers to use most

¹⁶⁰ 1999 Annual Report RomTelecom, at www.romtelecom.ro

¹⁶¹ Nicolae Oaca, idem

types of the connections available in the West: ADSL – ATM (leased line + optic fiber), wireless, radio, VSAT, etc. New generation services, such as Virtual Private Networks, or Voice over IP are also offered. The high speed allows users to make fast transfers, to have immediate access to the websites, and to easily listen and watch real time radio or video.

3.5. Hardware and Software – Stage 2

Hardware and software products are available, but at high prices. The purchase of expensive computer systems (from US\$ 1,000 up) is impractical for the vast majority of individuals and businesses. There are local IT hardware and software sales points, especially in the urban areas, where the IT software/hardware retail and wholesale market exist and are competitive. Outside the city it is less likely to find sales points for computer components.

3.5.1. IT market statistics

The basic ICT indicators show a real technological divide between Romania and the more developed European countries. Per capita information technology and telecommunications spending is US\$ 25, compared with US\$ 567 in Greece¹⁶². The estimated number of PCs per 100 inhabitants is around 2, compared with 12 in Croatia, or with the 11 in the Czech Republic¹⁶³. The low purchasing power is determined mostly by the slow economy and a decreasing GDP. Despite the drop in computer prices in the European market in the last years, the economic crises in Romania have made the purchase of expensive computer systems impractical for the vast majority of individuals and businesses in the country¹⁶⁴.

In 1999, the IT market for Romania was assessed at US\$ 227.14 mil according to the following structure¹⁶⁵:

¹⁶² Vasile Baltac, *South Eastern Europe: Digital Divide or Digital Opportunity?*, 2000, at <http://www.atic.org.ro/ist2000>

¹⁶³ *Telecom and Informatics*, World Indicators, ITU 2000

iIn the European Union a PC is equivalent to 64 average labor hours, while in Romania it equals 970 labor hours. Source: Vasile Baltac, idem

¹⁶⁵ Information Society Status Matrix, Romania, CEEC 2000, at <http://www.systec.be/jhlc/rom01.htm>

1. *Equipment*: Multi-user systems 18.1%, Single-user systems 52.4%, Data communication equipment 4.8%.

2. *Software and services*: Software packages 13.2%, Services 11.5%,

According to other sources¹⁶⁶, the Romanian IT market was assessed as follows:

Table 10 – Value of the Romanian IT market

	1999	2000
Equipment	350 mil. \$	400 mil. \$
Software and services	120 mil. \$	143 mil. \$

The Romanian software and information services market is expected to outgrow the equipment market in the years to come. A similar pattern of growth can be noticed in the labor force sector. In 1999, 15,000 employees worked in the software and information services sector, and this number increased to almost 17,600 in 2000¹⁶⁷. The number of Romanian IT specialists seem to increase continuously, as a result of market development, despite the high mobility of the trained human resources (around 40% emigrate yearly).

3.5.2. Hardware market

More than 50% of the PC market belongs to domestic PC manufacturers. The 1999 turnover of these companies was US\$ 240 million and the 2000 estimated figure is US\$ 400 million¹⁶⁸.

Table 11 – Summary of IT indicators in Romania

IT&C Spending (1998)	450 million US\$
ICT spending/GDP (1998)	0,5%

¹⁶⁶ Pierre Audoin Conseil, *L'Industrie Roumaine du Logiciel et des Services Informatiques &endash; situation actuelle et perspectives 1998-2000*, 1999, at <http://193.149.47.36/fra/pdf/roumanie.pdf>

¹⁶⁷ CEEC report, idem

¹⁶⁸ Mugur Isarescu, Prime Minister of Romania, in a presentation at the World Bank Group, in May 24, 2000: *Romania on the Cutting Edge of Information Technology*

Rate of growth PCs (1998/1999)	30,3%
PC consumption per year	~ 75,000 units
PC networked	25%

Source: Vasile Baltac,, South Eastern Europe: Digital Divide or Digital Opportunity¹⁶⁹

It is expected that the local production companies will soon tap into the market controlled by the representative offices of international hardware vendors. Their advantage is usually the price, the knowledge of the market and the maintenance and consulting services they could offer. A study remarked that up to 54% of PC sales went through indirect channels (dealer/resellers and value added resellers), 27% from the vendor, while distributors sold only 12% to end-users¹⁷⁰.

In 1996, the PC usage trend showed that government organizations in the process of institutional reform were the larges portion of the consumer base. This, however, is not necessarily reflective of widespread governmental IT usage as most of these programs had IT-specific components. In the near future, it is expected that businesses will become the biggest computer consumers, having already represented 54% of total PC purchases in 1998.

Table 12 - Levels of usage

% of total PC sold – 1996 ¹⁷¹	% of total PC sold - 1998 ¹⁷²	End users ¹⁷³
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¹⁶⁹ at <http://www.atc.org.ro/ist2000>

¹⁷⁰ *Romania: Computer Networking Hardware/Software*, 1998, CEEBICnet, at <http://www.mac.doc.gov/eebic/COUNTRYR/ROMANIA/RESEARCH/rocomputer.HTM>

¹⁷¹ *Romania: Computer Networking Hardware/Software*, idem

¹⁷² *Romania - An overview of the IT Market. 1998-2003*, , at http://www.majorcompanies.ro/art_template.cfm?template=idgz.htm

¹⁷³ Some of the end users in Romania are: the Romanian Government, the Romanian Presidency, the Romanian Parliament, Ministry of Defense, Ministry of Finances, Ministry of Research and Technologies,

25.70%	17.6%	Governmental organizations
22.70%	n.a.	Finance/banks
15%	17.6%	Offices with less than 10 employees
14.80%	12.6% - 17.8%	Small and medium companies (11-499 employees),
13.30%	8.9%	Individuals
7.50%	6%	Big companies (more than 500 employees)
1%	7.5%	Education

Most of the foreign capital used in direct investment was directed towards local importers of equipment, components and parts that received exclusive rights to distribute brand names on the market (like S&T - Hewlett-Packard, Total Technologies - Packard-Bell, RBS - IBM, RomSys - Sun Microsystems)¹⁷⁴. Some companies like Digital Equipment and Intergraph opened representative offices subordinated to their EU headquarters. In 1996, Oracle and IBM opened offices in Romania. In 1997, Hewlett-Packard opened a representative office as well. Several other companies used foreign capital to increase the quality and quantity of their computer components in local assembly production lines, and for the development of computer networking systems.

3.5.3. The software market

At present there are over 1200 registered software companies which produced a turnover of US\$ 90 million in 1999 and an estimated US\$ 150 million in 2000. According to the

National Commission of Statistics, National Bank of Romania, National Authority for Railroads, National Authority for Electricity, etc.

¹⁷⁴ Romania: Computer Networking Hardware/Software, CEEBICnet, idem

National Commission for Statistics, the software industry experienced 65% growth in exports over the last year.

The Romanian software market is supplied by both Romanian and foreign producers. Around 75% of the foreign software industry in Romania is controlled by U.S. companies. Yet a large majority of the foreign software is customized in the local language.

In addition to the medium-sized software firms, Romania has a very large number of one- and two-person software firms with low turnover. These are often set up by IT professionals who left one of the research and development (R&D) firms or by recent IT graduates¹⁷⁵. Their work ranges from tailor-made software to customer support, in the small but growing market of smaller enterprises and home users. They also customize existing software packages for the same market: building databases and spreadsheets, using application programming languages like Visual Basic, adding a Romanian interface to imported software packages or simply translating them.

The Romanian language interface as well as the specific requirements of the Romanian legal, business and governmental practices, provide a 'natural protection' for the local software industry in a way that does not apply in hardware - Western packages cannot be directly transferred to work in most Romanian settings. Furthermore, the comparatively low cost of locally produced software provides the domestic IT market with an additional advantage. These low costs are possible partly because of low local software wages and partly because some firms are willing to accept a 'loss leader' position or to cross-subsidize from state-funded/state-related projects.

Software applications

Much of the software in Romania is imported and localized by Romanian companies to the needs of the market. Some examples include: SQL (Structured Query Language),

¹⁷⁵ Mihaiela Grundey & Richard Heeks, *Romania's Hardware and Software Industry: Building IT Policy and Capabilities in a Transitional Economy*, 1998, at <http://www.man.ac.uk/idpm/diwpf2.htm>

Access, Oracle, Lotus Notes, Informix, IBM DB2, Tamino, Adabas and Polyhedra, AutoCAD, PaintShopPro, Adobe Photoshop, Adobe Premier, software applications for using the following networking/communication protocols: TCP/IP, HTTP, FTP, IPX/SPX, Novell IPX, NetBEUI, DLC, VINES, POP3, SMTP, software products that are developed for OS platforms: Ms-DOS, Win3.x, Win85/98, Win2000, WinNT, WinCE, Unix, Linux, MacOS 7.x and OS-2.

The following are some of the current local software products on the Romanian market:

Table 13 –Software packages in Romania

Types of Software	Notes
<i>Capital 3</i> - integrated system for business management	Unisoft Romania
- SIBANK - Integrated Retail Banking System (Oracle-based integrated wholesale and retail banking system, supporting all bank operations)	Romsys
<i>ERP</i> based programs - enterprise resource planning	Scala Business Solutions Romania, Romsys
<i>SEMM</i> - electronic labor exchange software	National Agency for Employment and Vocational Training – end user
<i>eDoc</i> - secure system aimed to allow development, traffic and administration of internal documents within an organization	SoftNet
<i>eBank</i> - secure way to perform remote banking operations	SoftNet
<i>JApS</i> - Java Application Server – WWW applications in Java.	Genesys Software Romania
<i>GESY-PRO</i> – integrated accounting system	Genesys Software Romania

SIPER - Human Resources Management System (Data Repository and DSS for Human Resources of the Romanian MoD. Assists in managing and tracking the entire career path of a soldier, etc)	Romsys
DISPEC(Medical Call-Center System) Real-time dispatching and monitoring system for medical emergency services. Also applicable to other emergency services, such as police and fire departments	Romsys
SIDD - Automotive e-Commerce System (for Renault): Web-based, interactive, distributed support system for commercial operations in the automotive industry	

New laws and changes to the tax legislation on hardware and software for Y2K compliance created new market demands. For example, the Emergency Ordinance no. 28/1999 required all companies with a turnover above 6,000 US\$ to have a machine for printing receipts and a tally for the company records¹⁷⁶. In addition, a copy of the information was to be provided to the public finance department. Failure to comply would result in fines of up to 6,000 US\$. Following the publication of this ordinance, the 'Capital 3' software was in high demand.

Canadian software and expertise worth around 1.7 million US\$ is developing an electronic labor exchange for Romania that automatically matches work opportunities to a database of job seekers¹⁷⁷. SEMM will begin in ten counties (Arges, Bihor, Brasov, Bucuresti, Buzau, Cluj, Constanta, Hunedoara, Neamt, Vilcea) this summer.

¹⁷⁶ Steven Wright, *Cash register law rings up IT sector benefits*, Bucharest Business Week, 4 October 1999, at www.bbw.ro

3.5.4. Hardware and software usage in the public sector

Most of the rehabilitation and restructuring projects currently going on in Romania (addressing such concerns as transportation, energy, health, banking, and custom and financed by international financial organizations) have an IT component. A short list of IT projects includes¹⁷⁸:

- ⇒ Ministry of Finance – Customs Office + Global Taxation System
- ⇒ Ministry of Interior – ID & Car registration + Border Police + Metropolitan Police C31 Systems
- ⇒ Ministry of Health – Central Administration and Neamt County
- ⇒ Information systems (IS) of major banks with branches all over the country
- ⇒ Educational and research networks
- ⇒ Ministry of labor – National Employment System
- ⇒ B2B (Business to Business) Portals

Company profile

Romsys¹⁷⁹ was founded in 1993 as a 100% private Romanian company, and provides advanced information technology solutions in Romania, used primarily in banking, health care and government sectors. Romsys develops and implements advanced information and communications systems solutions, on a variety of hardware, software and networking platforms: Unix, NT, Oracle, Java, Lucent, Cisco, etc

The company sold to the Ministry of Defense software that generates pre-formatted and custom QSP status reports for all major acquisition programs (the SURA product, DSS for Military Procurement). Another package sold to the Ministry, Data Repository and DSS for Human Resources, can assist in managing and tracking the entire career path of a soldier (the SIPER Human Resources Management System).

The Ministry of Education bought from the same company, through a Phare grant, the *PHARE-HER* Integrated Financial Management System for Romanian Higher Education Institutions. The functions of this soft in budgeting and financial management of budgets,

¹⁷⁷ Steven Wright, *Canada brings e-jobs*, Bucharest Business Week, 26 June 2000, at www.bbww.ro

¹⁷⁸ Vasile Baltac, *South Eastern Europe: Digital Divide or Digital Opportunity*, idem

as well as in financial management of research contracts, financial accounting or payroll make easier the administrative load of the administrative work.

3.5.5. Challenges for the IT market

Romania has been a haven for software pirates for years. Until the enactment of its 1996 Copyright Law, the Romanian legal system offered little protection for software developers. Furthermore, penalties for counterfeiting were small. Thus, for a long period of time, pirating prospered as foreign and software manufacturers remained outside of the Romanian market. An earlier BSA study was mentioning that in 1995 software manufacturers suffered over US\$ 20 million loss in retail revenue from the Romanian market due to piracy. IN 1998 the situation was not better. The Business Software Alliance, an association of the most important producers of software in the world (Microsoft, Novell, etc.), estimated that in 1998 roughly 93% of software used in Romania was pirated¹⁸⁰ ..

In a bid to curb audio-video piracy, the Government passed an ordinance which imposes tighter regulations on imports and their distribution. Under the new regulations, illegal copies of audio-visual or CD materials are confiscated and violators of copyright laws are subject to fines ranging between 400 and US\$ 10,000.¹⁸¹ Other laws, offer partial protection of intellectual property rights. These include the laws regarding patents (L64/1991), taxes for patent requests (L120/1992) and protection of industrial patterns and layouts (L129/1992).

Although the copyright law provides a satisfactory legal framework, the lack of monetary support for enforcement mechanisms has prevented effective protection from becoming fully realized. For example, the Copyright Office, which controls and enforces property laws at a national level, should perform a multitude of raids against software pirates; in fact, due to budget constraints, just one person performs raids in the name of the agency. As a result, the software producers and other companies offering IT-related

¹⁷⁹ at www.romsys.ro

¹⁸⁰ Steven Wright, *idem*

¹⁸¹ Bucharest Business Week, January 2000, at www.bbww.ro

services resort to protection by non-copyright laws such as the trademark, design, and competition laws¹⁸².

The continued presence of the black market poses the biggest threat to the foreign companies who have offices in Romania. In 2000, Microsoft declared its unwillingness to decrease prices for its products, admitting that it couldn't beat the black market anyway¹⁸³. During the summer of 2000 one of the company's partners offered a 70% discount, but this had no effect on the market demand.

3.6. Service and Support – Stage 3

3.6.1. RomTelecom service

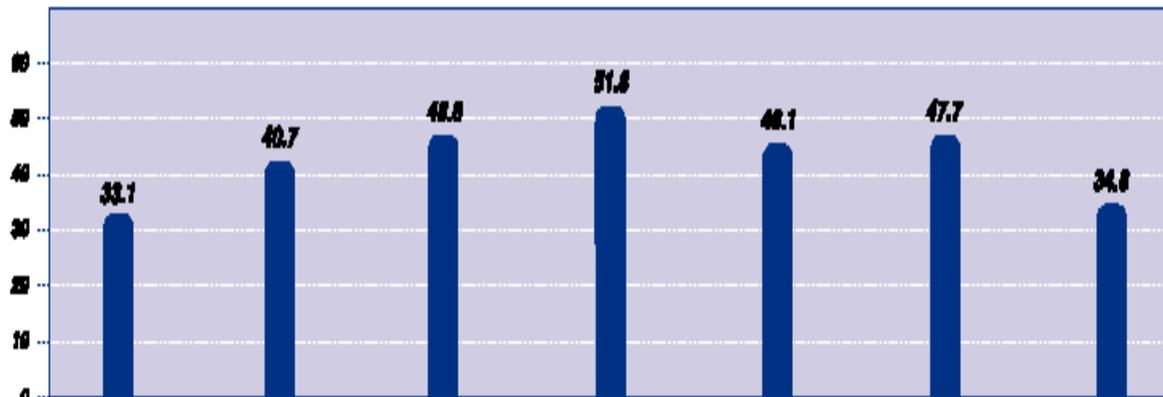
The average waiting time for a telephone line in the early nineties was 14.4 years. The situation improved in the following ten years, largely due to the liberalization program, which brought in new funds to invest in improving the telephone network and services. In 1999 the waiting list was 0.92 million people and the waiting time was reduced to 3.9 years. In 2000, RomTelecom connected 196,000 new subscribers, while the waiting list increased by approximately 63,000, showing that the market has a higher potential than RomTelecom's current capabilities¹⁸⁴. Due to the improvement of the network as well as the digitalization program, RomTelecom has experienced a slight decrease in the number of faults and complaints.

The promptness of replies to faults and complaints depends on location. In rural areas, where the teledensity is low, RomTelecom service is poor – it can take weeks for the company workers to relocate and repair the damage. Furthermore, the basic infrastructure for installing new lines is lacking in these areas. At the moment there are around 2,000 villages without telephone lines.

¹⁸² *Regulatory developments, Romania, ESIS, at idem*

¹⁸³ *Microsoft does not sell cheap, IT NEWS, Bucharest Busienss Week, 9 October 2000, at www.bbw.ro*

Figure 4 - Fault clearing time (in hours) RomTelecom



Source: RomTelecom Annual Report 1999

Among the problems still encountered when using RomTelecom's services is the dialing process itself. When trying to dial, the user might hear sometimes a busy signal or a recorded voice before ending. That means that either the number doesn't exist or the telephone doesn't dial correctly, so s/he has to dial several times and not get discouraged if the wrong person answers the first call. Some of the recorded messages - like the message saying that the number is busy - are only in Romanian. In addition, because of the poor customer service, asking the information service/phone directory for an unknown Romanian number can be a challenge sometimes. Many of the operators do not speak foreign languages or do not have the patience to listen for a long time. The operator often provides one number at a time, so the user must call again to get others. Phone numbers change frequently in Romania due to the never-ending transformation of the phone systems and the operators often offer old out of date numbers. Phone bills are not itemized unless there is a special request. At the same time, it is common in Romania to find calls on one's bill that were never actually made.

It is easy to find payphones in downtown Bucharest or in the center of any Romanian city/town. Public phones can also be found in metro and railway stations. Most of them accept only phone cards, which can be purchased at the post offices. It is more difficult to find a phone that works properly in the districts far from the center where old machines

¹⁸⁴ Nicolae Oaca, idem

only accept coins. International calls are possible from the public phones that accept cards, where the length of the call is limited by the value of the card.

3.6.2. ISP service

The quality of Internet connectivity for dial-up access to ISP's depends on RomTelecom's services. However, some of the Internet service providers take it upon themselves to clear faults on fixed lines. In terms of Internet services customer support is usually fast and efficient. The network problems are usually solved in a few hours or during the same day.

Users who have an e-mail account, website or domain name with an ISP, have the freedom to modify their account information either online or by getting in touch with the administrator. Some ISPs offer online facilities and technical support programs that are easy to use, simple and fast. A user can:

- inspect the current financial status of the account
- check the amount of money available in a financial account
- view the remaining number of days before credit expires,
- inspect all payments made toward the ISP, with details
- change passwords
- inspect the usage records on a monthly basis for the dial-up account (the days and times the user connected, the amount of time did spent connected, the amount of data transferred and cost of each connection, the average speed of connection, IP address assigned, etc) or the leased line account ;

This type of website is often password protected. If the user's browser is not java script-enabled there is an alternative solution for administering the account (downloading a more recent version from the secure FTP Server).

3.6.3. Security services

The technological framework needed to ensure security of transactions is in place in Romania. A Secure Server Survey undertaken in 1999 by Netcraft¹⁸⁵ identified 21 sites

¹⁸⁵ Internet Infrastructure Development in transition economies, the Economic Commission for Europe, 2000, idem

with valid third-party certificates in Romania. However, the legislation to enforce encryption or electronic commerce is still on the agenda of the parliamentarians. The economic mechanisms requiring the use of encryption, electronic commerce, or security systems have been developed on a de facto basis.

the

Table 14 – Secure sites in Romania

March 1999 (sites)	June 1999	September 1999	December 1999
12	20	19	21

ISPs have integrated network solutions that ensure the security of transactions. These services typically include authentication of the originator and privacy for the data. They can also provide a signed receipt from the recipient. Most of the ISPs provide secure Internet connection services, and some of them offer security consulting to other ISPs and turn-key solutions for Internet based businesses.

ISPs and users can also receive assessment services. Some companies offer online tools for comprehensive network vulnerability assessment and up-to-date security verification. These tools, together with the regular technical support, rank potential risks and recommend repairs for eliminating network weaknesses.

4. Networked Learning – Stage 3

Background on the Romanian education system

Despite the fact that the state's budget allocations for education have increased, the real substantial value has not sufficiently increased due to the continuous decrease of the Gross Domestic Product (around 5% since 1999). Some of the educational programs implemented so far in Romania have received special funding which has improved the situation in certain schools to some extent. However, for the large part of educational institutions, things that are now common in other countries, such as school lunches, transportation to and from school, modern equipment in laboratories, modern sanitary installations and ergonomic conditions of study (heating, light, dental wards), are mere aspirations.

The literacy rate stands at 98%¹⁸⁶, but the average number of school years of the adult population is 8.4, a figure low by European standards. At the same time, there is less focus on post-graduate studies, a significant indicator in evaluating the quality of the educational system.

The main education statistics in 1996 are shown in Table 15¹⁸⁷:

Table 15

Pupils/Students (thsd).		
Primary Schools	Secondary Schools	Universities
2,557	946	504

The national educational system includes both private and public schools. Privatization of the state educational institutions is forbidden by law. Education is structured as follows:

- pre-school education
- general compulsory education:

¹⁸⁶ CIA World Factbook 2000 – Romania, at <http://www.odci.gov/cia/publications/factbook/geos/ro.html#People>

- primary
- secondary (low secondary)
- secondary (high)
 - high school
 - vocational
 - apprentice schools
- post-high school
- higher education:
 - short duration
 - long duration
 - post-graduate

Public vs. private education

Although private investment is encouraged in other sectors, the government and the people hold a reserved position towards private education. The proportion of students in private education is less than 0.2% in kindergarten, primary, junior, and high schools, 5% in the vocational education, and 25% in higher education¹⁸⁸. Private institutions are only allowed to operate on a non-profit basis. Prospects for expansion at all levels except high school are inhibited because of difficulties in financing, regulatory barriers, or the general preference for public schools. Interestingly enough, despite the general public's skepticism of private schools, demand is very high at the higher education level. In 1999 the number of public institutions was 57, compared to 54 private universities and colleges, and of the total number of enrolled students, 68% of them attended courses at a public university and only 31% at a private school¹⁸⁹.

4.1. Schools' Access to ICTs – Stage 2-3

¹⁸⁷ Romania Factbook 2000, at www.factbook.net

¹⁸⁸ *Investment opportunities in private education in Romania*, EdInvest 2000, the World Bank, at <http://www.worldbank.org/edinvest/Romania.pdf>

¹⁸⁹ *Statistical Information on Higher Education in Central and Eastern Europe*, Romania, 2000, UNESCO-CEPES, at http://www.cepes.ro/information_services/statistics.htm

4.1.1. General overview

There is a significant number of primary and high schools that establish computer-literacy as a significant educational objective. These institutions do not only organize information technology classes for pupils with high aptitudes in this field, but also hold classes for beginners. The lower age limit for these classes is 8 years old, concomitant with the completion of first grade. There is no centralized report at the national level regarding the number of schools organizing clubs or classes introducing pupils to computer skills. The schools that benefit from having computer equipment organize computer classes for the secondary level within the *technological* component of the curriculum. The schedule of this program was established according to the availability of computer equipment and specialized teaching personnel in each school. Because of the insufficiency of teaching equipment and qualified staff (both for teaching and maintenance of equipment), the education system in this field is still in its early stages of development.

Most of the funding for equipping the schools and universities with computers comes from the Ministry. For example, an ordinance published in 2000 allocated US\$ 1,8 to the procurement of the necessary IT equipment in high schools¹⁹⁰. At the higher education level there are more sources of funding, due to the existence of several institutional reform programs supported by international organizations.

The technology landscape in education has improved significantly due to the presence of two major public networks connecting most of the public universities in Romania: RNC and RoEduNet. RNC's aim is to provide modern and efficient services for the exchange of scientific and technical information between Romanian scientists and their colleagues all over the world. The first university to connect to a European network, during the early stages of RNC was the Polytechnic University of Bucharest, which had connected via dial-up links using simple protocols such as terminal emulation or UUCP (UNIX-to-UNIX Copy Protocol). Currently, there are around 50 academic institutions (research centers and universities) which are linked to RNC¹⁹¹. The RNC-provided services are:

¹⁹⁰ The text of the ordinance, in Romanian, can be found at <http://www.edu.ro/om4375.htm>

¹⁹¹ National Computer Network for Research, official website, at <http://www.rnc.ro/new/tlinked.shtml>

- exchanging electronic mail and files;
- computer conferencing;
- interactive messages;
- remote login;
- access to databases;
- access to public domain and shareware software;
- access to network information services (archie, Gopher, WAIS, WWW).

More than 100 universities, educational and research institutes, public institutions, and library sites are connected to the second major public network, RoEduNet (the Romanian Education Network)¹⁹². Unlike RNC, RoEduNet offers free connection. RoEduNet was created in 1993 and got connectivity with international data networks and services. It was conceived as an open structure, offering free access to the academic, scientific and cultural nonprofit institutions. In August 1993, the first institution (the University of Bucharest) was connected, forming the nucleus of the academic data communication infrastructure.

The RoEduNet backbone consists of links between the NSP nodes in 6 major cities: Bucharest, Iasi, Tirgu Mures, Cluj, Timisoara and Craiova¹⁹³. There are two types of links: between the backbone nodes (2mbps) and between RoEduNet NSP nodes (backbone nodes) and RoEduNet POPs in each county capital city (256kbps). The Internet connection is provided at the Bucharest node, using VSAT, to Taide Network and Loral Orion. Internet access capacity is 1.5/0.5 mbps and 4/1 mbps respectively. All NSP nodes are able to connect the Internet users via dial-up, leased asynchronous lines and leased digital (64 kbps) lines.

4.1.2. Private initiatives

There are also private initiatives to provide funding for computers in schools. Procter & Gamble (P&G), for example, provided approximately 800 computers to 160 schools in

¹⁹² Romanian Education Network, at <http://www.roedu.net/nodes.html>

¹⁹³ Romanian Education Network, at <http://www.roedu.net/topology.html>

Romania during 2000. Each school received a computer laboratory, equipped with five IBM computers connected to the Internet. In addition, P&G offered these schools a one-year free Internet subscription along with networking equipment. To achieve this, P&G formed a partnership with IBM, Xnet, the Ministry of National Education, Pro TV and the 'Save the Children' foundation.

Under this initiative, schools competed to get computer labs. Selection was based on the promise of proposals stating the way in which the computer lab would be used to maximize the impact on students' education and development. In their projects, schools proposed to use computers to teach students basic and advanced computer skills and to facilitate the education and communication process. Additionally, some schools planned to use their computers to help the community, such as in training the students' parents or using the labs to offer multimedia services for some low fees.¹⁹⁴

In another venture, CISCO Networking in partnership with the Ministry of Education, opened a private IT school - the "Cisco Networking Academy" project. The main aim of the school is to stimulate the development of specific computer/IT abilities. A 280-hour curriculum is set up in this area, at the end of which students receive an internationally acknowledged diploma. The fees for the courses go up to US\$ 300¹⁹⁵. The company offers a 75% discount in school fees to the best students.

4.2. Enhancing Education with ICT – Stage 2-3

Enhancing education with information and communication technologies is a priority the Ministry of Education re-stated in 1998 and 1999¹⁹⁶. However, regardless of governmental stipulations regarding ICT training for teachers in schools, universities and high schools, Romania has a long way to go before training its teachers and students. ICT-profile faculties do exist, but mainly at the university level (including polytechnics),

¹⁹⁴ *Industry Program Connects 160 Schools to the Internet in Romania*, World Information Technology and Services Alliances, March 2000, <http://www.witsa.org/news/00mar.htm>

¹⁹⁵ The presentation of the program can be found at www.ub.ro/cisco/program.html (Romanian)

¹⁹⁶ (In Romanian), Decree no 641 in 1998 regarding the usage of computers in schools, high schools and universities, at <http://www.edu.ro/om3641.htm>

and especially in the urban areas: Bucharest, Cluj, Timisoara, Iasi, Brasov, Craiova, Pitesti.

Due to several funding programs there are schools with hundreds of users at the moment, but generally access is only provided for some students in secondary schools, beginning at the ninth or tenth grade level. Very often e-mail access is limited to students sending short messages, and file downloading is not allowed, for fear of viruses or damages produced by ignorance.

At the university level, except in the technical universities and a few “rich” universities (like the Academy for Economic Studies), the student rarely has the opportunity to type his/her papers on a computer, or, for that matter, to use various applications (like Excel, Power Point, SAS) for coursework. Often times, when there are labs in schools, they are reserved for IT classes. A large majority of the labs are locked if they are not used for IT related classes. There also is still a tendency for the teaching staff to restrict access to students, unless a supervisor or professor is present. Sometimes the reason for this is that the student may break or damage the computers, and very often the professors are responsible for maintaining the labs.

There also is a substantial need for the production of Romanian user manuals and computer textbooks, because in a rapidly developing field such as ICT, knowledge is strongly dependent on specific technical jargon. There are many local publishers involved in the translation of important textbooks and dictionaries¹⁹⁷ (like The Handbook for Dummies series on TEORA publisher, HTML, Java programming, a catalog of 1,000 web sites on ALL publisher, the Hacker Jargon translation at ProMedia Plus, etc).

4.2.1. E-learning and distance learning (DE)

Several distance learning and e-learning projects have been undertaken in Romania. Since 1997, through Socrates, Tempus and PHARE programs, together with the Ministry of Education, many DE Centers exist in the important universities, within Erasmus-

¹⁹⁷. Cf. Mihai Jalobeanu, *Internet education in Romania: a key study*, 1998, idem

Socrates European-funded projects. One of the most active is the Center for Multimedia and Distance Education from the Technical University of Cluj.

DE programs in Romania:

- CODECS and The Open University¹⁹⁸
- The Academy for Economic Studies¹⁹⁹
- The Cluj-Napoca Open and Distance Education Study Center²⁰⁰.
- The Faculty of Journalism and Mass Communication Studies from University of Bucharest²⁰¹
- The School of Communication and Public Relations "David Ogilvy", Bucharest.²⁰²
The school also offers to its students free e-mail and chat.
- The Romanian Group of Research & Actions in Rromani Linguistics in cooperation with the Ministry of National Education, started a program of distance learning for Rromani language²⁰³.
- The US Embassy in Romania and 3Com announced in 2000 the Internet Teaching Project. The program supports a partnership between Romanian and American professors from University of Maryland, and consists of courses on Unix and Shell taught by Romanian professors for American and Romanian students.
- International Correspondence Institute²⁰⁴
- Pedagogica on-line – project aiming to offer a systematic view of the distance education field
- Bucharest university, the Department for Distance Education²⁰⁵
- The virtual Schools of the Young Mathematician²⁰⁶
- The School of Architecture and Urban Planning²⁰⁷

¹⁹⁸ <http://www.codecs.ro/profil.html> (Romanian)

¹⁹⁹ <http://www.ase.ro/aseweb/default.htm>

²⁰⁰ <http://icar.utcluj.ro/en/dis/conodesc.gif>

²⁰¹ http://www.fjsc.ro/idd_en.html

²⁰² <http://www.comunicare.snspa.ro/cursorionline.htm>

²⁰³ <http://www.edu.ro/ccoresp.htm>

²⁰⁴ <http://www.iicc.ro/english.htm>

²⁰⁵ <http://www.en.credis.ro/Presentation/>

²⁰⁶ <http://math.ournet.md/>

²⁰⁷ <http://www.iaim.ro/distanta.htm>

4.2.2. Educational software

Although major IT companies offer or sell to the software needed for equipping IT laboratories to universities and schools educational software is only now starting to be in demand by the local market, due to the general lack of presence of IT in the Romanian educational system.

Smaller Romanian companies staffed with as little as 2-3 persons, have created educational software especially for high schools, such as a tool designed for learning epidemiology and biostatistics, or *Mathematics on PC 1.0*, designed to help high school students improve their math scores. The administrative staff of schools is another group for which IT specialists design special programs like *Admission and Baccalaureate in high schools and vocational schools*²⁰⁸.

Most educational packages offer foreign language courses: French, English, German, Japanese, Spanish, etc, as well as meta-language courses: business English, super success for the TOEFL test (Test of English as a Foreign Language), etc.

GIS is another imported and customized software, having had a successful penetration in the educational software market within an Erasmus program for higher education funded by European Union. . The GIS programs can be downloaded by the students directly from the server.

4.3. Developing the ICT Workforce – Stage 3

Out of the total number of graduates per year, which amounts to about 60,000, approximately 10% are trained in IT²⁰⁹. More precisely, from the 36 technical universities that exist in Romania more than 5,000 computer science majors graduate every year. In

²⁰⁸ Syracuse Language Romania, at <http://www.language.multinet.ro/produse.html>

²⁰⁹ *Perspective report on the development of information and communications in Romania*, National Agency for Communications and Informatics, 1999, at <http://www.esis2.imt.ro/documente/Icts-str.htm#I> .
Brief historical review

terms of software graduates, Romania has a density higher than the US, five times higher than Russia, and seven times higher than India²¹⁰.

There are approximately 200,000 specialized engineers employed in vertical industries. In the software industry there are about 15,000 broadly skilled, multilingual software professionals.

According to the analysis of the Romanian Minister of Finance, the software industry recorded a 25% increase in the number of employees from 1997 to 1998. There is practically no unemployment in this field.

Still, despite the high potential of work opportunities for the ICT workforce, economic reasons compel a large number of IT specialists to leave the country seeking better paid jobs in Western Europe and the US. Some IT market leaders warn that if this trend continues Romania might have no specialists left in two years²¹¹. It is estimated that more than 40% of the graduates in information technology leave Romania every year.

It is generally admitted that developing countries and those on the verge of joining the EU might lose the economic advantages created by the Internet because they are losing their IT specialists. Moreover there is no indication that developing countries have discovered a successful strategy to prevent network specialists from leaving. Some specialists say that one solution would not only be to promote an academic system that qualifies more specialists every year but also to help SMEs (small and medium enterprises) grow, as the Internet represents their largest opportunity for development and SMEs would be able absorb a significant IT labor force.

The Ministry of National Education is committed to the introduction of ICT in the learning process. An excerpt from the strategy proposed for the next years follows below:

Information technology in education:

²¹⁰ *Romania: The "Next India" For US Software Partnerships*, Ambassador Jim Rosapapepe, Letter from Bucharest, fall 2000, at <http://uscorner.kappa.ro/fall2000/page2/page2.html>

- IT curricula to be implemented in schools and high-schools;
- Computer centers to be set up in high schools with budget and local partnership funds;
- RoEduNet to be extended to schools and high-schools;
- An information network for university administration to be headquartered in Iasi
- All communications in the administrative network of the Ministry of National Education to be carried out through the Internet by electronic-mail;
- Schools, high schools, and universities to be provided with electronic equipment from local and internal resources
- International programs and budget allocations to be extended
- Domestic production of educational software to be expanded.

4.3.1. Governmental plans in education

A decree made in 1998 by the Ministry of National Education ²¹² includes provisions regarding special training for teachers and professors to use ICT in schools, universities and high schools. A wide range of ICT curricula for both under- and post-graduate training is used in major public and private universities (mostly polytechnics) in the main urban areas. The integration of ICT in the learning process included the introduction of ICT exams for admission to higher education schools. This became a requirement as a result of policies delineated in 1999. Average computer skills are likely to become a pre-condition for admission to university.

4.3.2. Academic training opportunities

Technical schools (such as the Institute of Polytechnics²¹³) offer a good opportunity for training in ICT, but mainly at the university level. Institutions of higher education have somewhat better resources and are more focused on IT. There are three main types²¹⁴:

²¹¹ Bogdan Tudorache, *Education at the heart of development*, Bucharest Business Week, Feb 2001, at <http://www.bbw.ro>

²¹² Romanian Education Network, at <http://www.edu.ro/om3641.htm>

²¹³ Polytechnic University Timisoara web page, Electronics and Telecommunications Faculty, at <http://www.ee.utt.ro/index.html>

²¹⁴ Mihaiela Grundey & Richard Heeks, *idem*

- *Polytechnic Institutes*: provide hardware-related skills and cover areas such as electronics, computer science and automation
- *University Institutes of Economic Science*: provide software-related skills for applied work and cover areas such as cybernetics or informatics
- *University Institutes of Mathematics*: provide software-related skills for an academic or research career and cover areas such as mathematics or informatics

4.3.3. Private sector training opportunities

Partially due to the constraints on IT resources in education, training companies in IT had the chance to mushroom in the last ten years. Some companies established private schools, like Cisco Systems, which started an IT education program called Cisco Networking Academy.

There are two main types of training companies: those that focus on training almost exclusively, and those which use training as a way of making ends meet when their other activities (often software development or selling foreign software packages) fail to do so. IT training courses are in high demand, particularly among those who graduate from a school or university, because they increase the chances of getting a job. Parents are therefore willing to pay the high fees in the hopes that it will give their child an advantage in the competitive labor market.

Usually IT training offerings are typically PC-oriented and cover package skills (especially use of MS Office) and programming courses (e.g. FoxPro and Turbo Pascal). They also provide related courses in management topics such as MIS (management of information systems) and systems analysis and design.

All the courses come with some form of certificate or accreditation at the end, and all are well attended, despite the cost. Course charges can range from US\$ 60 for a two-week, four-hours-per-day MS Office course to US\$ 150 for a three-week management program. Still, as is common in cases of high demand and inadequate regulation, most of the

companies that mushroomed in the last seven years face one or more of the following problems²¹⁵:

- *inappropriate basic content*: teaching computing theory rather than practical hands-on skills
- *inappropriate skills content*: teaching skills that are outdated, not in sufficient demand, or too complex to be used in the workplace
- *inappropriate technique*: teaching by 'chalk and talk' or rote learning rather than through practice
- *inadequate resources*: having far less than one PC per student when trying to teach hands-on skills

The result is a poor return on the training investment. These training companies may help in the spread of IT *usage* skills, but only a few are making any real contribution to the development of IT *production* capabilities in Romania.

The main focus of ICT human resource development has been initial IT education. Continuing professional development has been more limited. The growth of training in foreign language skills and greater freedom of travel have made it easier for Romanian IT workers to keep up-to-date with global technical developments; so too, has the increasing availability of Internet links, allowing IT staff to connect to special interest groups globally and electronic lists on relevant technical subjects.

Magazines such as PC World, Computer World, Telecommunications, Network World, PC Record, and Computer Aided Design are available in edited versions written in Romanian; these are widely read. The Romanian edition of PC World, for example, has a circulation of around 15,000.

IT workers pick up a significant proportion of their technological capability 'on the job'²¹⁶. However, formal training courses also have a role to play and there has been a fairly predictable hierarchy in the provision of such courses:

²¹⁵ Mihaiela Grundey & Richard Heeks, *idem*

- Private sector firms linked with foreign partners, such as multinational subsidiaries, have typically been most likely to send their IT staff abroad for training
- Government institutions are next in line, though far less likely to provide training overseas
- Large enterprises will provide limited training to IT staff; perhaps one or two days per year. Some firms prefer to hire a new person with the right skills than to train an existing employee
- Small and medium enterprises tend to provide no formal training, and expect either to hire qualified staff or for staff to train themselves

'Hire rather than train' strategies are possible these days thanks to the combination of greater access to training and/or training materials and the deregulation of the labor market, which created much greater labor mobility and fewer obligations of the employer to the employee. Where once employees stayed with the same enterprise for life, employees nowadays changes jobs more regularly, and part-time and temporary employment are both common.

5. Networked Society

Statistics

According to an Internet research center based in Bucharest, there currently are 600,000 users in Romania²¹⁷. Internet account penetration, according to Pyramid Advisory Service, was estimated at 0.25 per 100 inhabitants in 1999, compared with 1.25 in Hungary and 1.99 in Poland²¹⁸. The number of Internet users is expected to grow, due to the significant increase in competition that has led to aggressive pricing and to a diversity of solutions, such as prepaid Internet cards (launched in 1998).

²¹⁶ Mihaiela Grundey & Richard Heeks, *idem*

²¹⁷ Emma McClune, *Market Strategies: RomTelecom drops Global One in Net drive*, 8 May 2000, CommunicationsWeek Intl, www.totaltele.com

²¹⁸ *Resources and infrastructure: Transport and communications*, Romania country profile, Feb 2000, Economist Intelligence Unit, www.eiu.org

Literacy levels are as high as 98%²¹⁹, but the average number of school years of the adult population is 8.4, a low figure by European standards. The Sixth Central and Eastern Eurobarometer, an annual poll undertaken by the European Union, revealed that 78% of Romanians could not speak a foreign language (conversational level)²²⁰. Only younger generations, and especially Internet literate generations, have relatively good English language skills.

5.1. People and Organizations Online – Stage 3

5.1.1. Internet usage

Internet is mainly used for finding/posting information, communication, and downloading software. The key factor seems to be the need for communication. E-mail and communication services (chat, for example) seem to be widely popular. Recent research shows that Romanians access the Internet mainly at the office (53%) or from school (28 %)²²¹.

Some of the websites are updated regularly, especially the news sites. Yet the vast majority are static and rarely updated. Only around 3 websites out of 10 seem to carry updated information relevant to various user groups²²². A certain degree of competition in building interactive and updated websites was stimulated by the launch of the Romanian website *Top100.com* , which offers the users the opportunity to vote for the website they consider useful. This has encouraged a large part of the organizations present in the Romanian virtual environment to change their Internet website projects, in the sense of making them simpler, more user-friendly, and more practical. This change in strategy has also significantly increased the interactivity and design quality of the websites.

The use of the Internet for the business sector revolves around its marketing needs. Internet until recently was used only for displaying information about products or

²¹⁹ CIA World Factbook, idem

²²⁰ Joseph Slowinski, SOCRATES invades Europe, Education Policy Analysis Archives, Volume 6 Number 9, April 1998, at <http://olam.ed.asu.edu/epaa/v6n9.html>

²²¹ According to McCann Erickson and Ogilvy & Mather's. Source: Corina Mica, Online advertising gains a foothold in market, February 2000, Bucharest Business Week, at www.bbww.ro

services, new product developments, schedules, or information for finding new clients and/or suppliers (usually called brochureware). E-mail is also used by businesses to formulate agreements with American and/or European firms. On a national level, however, the fax and telephone are still the preferred medium given the low penetration level of computers and Internet users in Romania. The business community is still likely to be the first to adapt to new technological advancements, such as videoconferencing, IP telephony, and Intranets.

5.1.2. Internet users

As in most of the emerging markets, the profile of the first people to use the Internet in Romania were those with high income and education. However, the situation was slightly changed in 1999. Market analyses²²³ show that Internet users have become more diversified recently, with an increase in, for example, the number of mid-educated users. The research profiled 300,000 Internet users in Romania in 1999 with the following characteristics: 75% male, high income, aged 18-34, graduates, living in urban areas²²⁴. Women count not more than 30% of the market.

5.1.3. Advertisement on-line

Two advertising agencies studied the emerging Internet businesses in Romania and tried to discover Internet users and their receptivity to on-line advertising²²⁵. Regardless of low penetration of users, the Internet seems viable for selected upmarket audiences. For expensive products such as cars, financial services, electronics or computers, the Internet is viewed as an attractive way to obtain a link with potential customers.

Regarding advertising strategies, websites and online banner ads are treated as organic extensions of a company's traditional advertising campaign (newspaper/radio/TV), using the same concept and executed along similar lines, but tailored to the web environment.

²²² There is no official information to certify this percentage.

²²³ idem

²²⁴ McCann Erickson and Ogilvy & Mather's, idem

²²⁵ McCann Erickson and Ogilvy & Mather's, idem

The report states that the instant reaction from customers makes it possible to tailor advertising to suit the market.

5.1.4. Portals

The popular local websites, mostly built as portals, contain entertainment information and news, as well as choices for shopping online. They offer forum applications, free e-mail and chat rooms. They also include directories with resources in any issue of interest, attracting a very diverse group of users to their website²²⁶. Often times, though, they are not continuously updated, and a large part of the links to other organizations either cannot be opened or referred organizations are no longer in existence. Other features like currency converters or banking information, weather forecasts and news briefs, are typically updated daily.

The main portals at the end of 2000 were:

Table 16

Name	Internet Address
Acasa	www.acasa.ro
Bumerang	www.bumerang.ro
Click	www.click.ro
Gaseste	www.gaseste.ro
Home	www.home.ro
Portal	www.portal.ro
Romania by	www.romaniabynet.ro

²²⁶ Basic facts and indicators, ESIS, January 2001, at idem

Net	
Romania- Online	www.romania-online.ro
Turism	www.eTurism.ro
Wap_Acasa	wap.acasa.ro
WapNet	www.wapnet.ro

5.1.5. Youth on the Internet

The presence of children on the net is small and consequently Romania is not yet connected to Kidlink. Their use of the Internet through e-mail communication is limited mainly to group oriented school projects.

Since 1994, thanks to the Soros Foundation for an Open Society E-Mail program, at least 20 Romanian schools joined the International Education and Resource Network (I*EARN). A learning model is included in I*EARN through the *Learning Circles* - a method of grouping students and teachers into international teams and supporting each teacher/class group in a Circle to develop global projects around a shared theme. Such activities give students a strong motivation to learn English, enhance their computer, reading, and general communication skills²²⁷.

There are also numerous high schools with home pages developed by students²²⁸, and an informal competition makes the websites improve drastically. There are also nation-wide competitions, like the contest for designing educational software initiated by a professor in a small city in the northern part of Romania. This contest eventually gained the support of the Romanian Department of Education²²⁹ and enjoyed popularity among schools all

²²⁷ Mihai Jalobeanu, idem

²²⁸ E. Gojdu High School in Oradea, the High School in Eforie Nord, Horia Closca si Crisan High School in Alba Iulia, etc.

²²⁹ Mihai Jalobeanu, idem

over the country. The programming contest was open to teams comprised of students and one teacher from every high school in Romania.

5.2. Locally Relevant Content – Stage 2-3

At the end of 2000 there were around 8976 addresses under the Romanian country domain²³⁰. Computer and telecommunication firms were among the first to have their own Internet sites. However, with the increasing number of web page developers, other industries are also emerging. Manufacturing companies, banks, law firms, transportation companies, hotels and consulting/marketing firms are starting to have sites that display their products and services. Most of the universities and research centers are also present, and various Romanian embassies, government institutions, and chambers of commerce are starting to surface on the Internet. Furthermore, close to 100 different Romanian media institutions are now online.

5.2.1. Business sites

A 1997 survey conducted by Romania Business Economics²³¹ indicated that the number of Romanian companies on the Internet was less than 1,000 which does not even represent 1% of the total registered companies in Romania; this number is expected to increase in 2001. Despite its growth over the last couple of years, the Internet is becoming an integral part of the business community very slowly. This could be explained by the lack of complete legislation for e-business (two bills for e-signatures and e-commerce have recently been adopted by the Romanian Parliament).

5.2.2. Academic sites

Most of the academic institutions now have their own websites. Information about departments, admission procedures, academic programs, faculty, academic schedule, is available on-line. However, there is still a great deal to be done before facilities such as those already used in the West (registration for classes on-line, financial records, online

²³⁰ Basic facts and indicators, ESIS

²³¹ Andreea Dutescu, Publications, at http://www.isr.co.ro/publications/rapid_fire.htm

technical support, newsletters, disk space on the university's LAN, listservs, etc) could be integrated into the existing Internet applications.

5.2.3. Governmental sites

The governmental sites are not frequently updated, but are well furnished with background information about Romania, the structure of the cabinet or Presidency, and sometimes with news about recent political events. The sites are relatively simple and easy to browse, and the information is very often displayed only in Romanian. There is a symptomatic lack of data and statistics, but the official documents and regulations can be easily found.

5.2.4. Libraries

Most of the central libraries in the major cities do have a website. Several projects building virtual libraries have mushroomed in the last couple of years and they could impact significantly the promotion of the Romanian culture. E-book²³² is a project of Folium Publishing, which aims to publish online the most significant books of imaginative and scholarly Romanian literature. The works of some 20 authors in sociology, literature, poetry, essays, and history are already on-line in Romanian. At the moment there is a section of the library in that includes translations of these books into English and German. Similar projects are developed by Cartea.ro²³³, the Romanian Electronic Library²³⁴, the Virtual Library Amaltea²³⁵, etc.

A law virtual library was started in 1997, when Romania became involved in the Global Legal Information Network (GAIN). GAIN is an initiative being led by the U.S. Library of Congress to build a worldwide law library on the Internet²³⁶. Romania is one of 11 countries currently participating in the project in which legal documents, treaties, etc. are scanned into portable document format (PDF) and uploaded into an Oracle database.

²³² <http://folium.hypermart.net/ebooks.htm>

²³³ at <http://www.cartea.ro/english.html>

²³⁴ at <http://www.elib.ro/>

²³⁵ at <http://www.amaltea.ro/>

²³⁶ *Information technology*, US Trade and Development Agency Report, 1999, at <http://www.mac.doc.gov/eebic/COUNTRYR/ROMANIA/RESEARCH/INTERNET.HTM>

5.2.5. Mass media

Over 200 of the websites offer news from primary or secondary sources. Many newspapers offer short e-mail versions; the first Romanian electronic publication was Telegrama, an Information and Communication service, developed by the Foundation for Communication Strategies, a privatenon-profit organization located in Bucharest. Newspapers from Bucharest offer sites which are mirrors of the printed version (with color illustrations and photos or short selections of articles). The central TV channels and radio stations offer programs and advertising on the Net, as well as live broadcasts or shows.

5.2.6. Language features

Most of the websites are presented in both Romanian and English. However, a large number of web pages are not translated into English, restricting the access of non-Romanian speakers. These sites tend to carry news, articles, and the publications of various organizations, personal pages, and or government pages. Out of ten government pages, approximately five provide information in English as well as in Romanian. Romanian websites are also converted into the languages used by national minorities: Hungarian, German, Greek, Russian, etc. There are a few sites using other languages, like Spanish or Arabic, but these are mostly the pages of international students living in Romania.

Several companies have become involved in a race to produce Romanian Internet browsers to facilitate Internet access for non-English speaking Romanians²³⁷. This niche market already has two major players. The first is Edison, produced by Edison Media, which can be downloaded for free at Edison.ro. For a fee, Ediston provides translated (English to Romanian) logs of pages that have been visited. The second is SurfRo (www.surf.ro), launched in January 2001 by HipMedia. This is available for free at

²³⁷ *Race to Create Romanian Browsers*, January 2001, Stockaccess.com, at <http://www.stockaccess.com/news/news010119-4.html>

Surfro.ro. It offers an MP3 player, various full-screen views, as well as standard browsing tools.

5.3. ICTs in Everyday Life – Stage 3

5.3.1. PC ownership

PC ownership is just 2.8 per 1000 persons, according to an Internet research center based in Bucharest²³⁸. In 1999 only 700,000 new PCs were sold, almost entirely to the business sector. The Romanian personal computer market is expected to grow at an annual rate exceeding 17% over the next five years, and is expected to reach US\$ 130 mil by the end of year 2000²³⁹. Printer sales will continue to increase at an average rate of 7.6%, reaching around 340,000 installed units in 2001. Given the virtual lack of computerization before 1989, when Romanians made the change from a communist to a democratic government, the greatest demand initially came from governmental bodies, public corporations, banks, and some state-owned companies that benefitted mostly from the funding from international financial corporations like World Bank, EBRD, Phare.

5.3.2. Payphones, mobile phones

In urban areas, a large range of communication devices is consistently used. The economic difference between the rural and urban spaces is reflected in the every day use of communication devices. By the end of 1999, the total number of payphones in operation was 34,831. Public phones include:

- Multi-coin operated payphones: 539
- Mixed (coin and card) payphones: 1,293
- Card-operated payphones: 31,894

The increase from 1998 (with 18,900 card phones) consisted of mainly card-operated payphones, which grew to 31,894 units, representing 91.6 % of the total public phones²⁴⁰.

²³⁸ Emma McClune, *Market Strategies: RomTelecom drops Global One in Net drive*, 8 May 2000, CommunicationsWeek Intl, www.totaltele.com

²³⁹ Romania: Computer Networking Hardware/Software, CEEBICnet, idem

²⁴⁰ RomTelecom Annual Report 1999, www.RomTelecom.ro

The mobile phone is highly popular, in spite of the fact that it is relatively costly. The unexpected growth in the wireless market (see section *Information Infrastructure*) can be explained through the low quality service of the traditional fixed lines. In addition, the use of wireless devices became a status symbol, economically differentiating lower and higher income classes.

5.3.3. Cybercafes, telework centers telecenters

The number of Internet cafes has exploded since early 1999, particularly in Bucharest. Despite the explosion, it is believed that the increased number of internet users resulted from increased business investment in technology rather than the greater internet availability offered by the increased number of internet cafes. The fact that less than one-third of the Internet users go online from homes, while the majority surf at work²⁴¹ supports this hypothesis.

While Internet Cafes have already become a familiar presence in the big cities, it will be some time before telecenters will be fully accepted and used by the rural population. Affordable prices are important for strengthening the client base. As mentioned previously, WESTERN IQ - Romanian Telework Informations, which offered the necessary equipment and space for individual teleworkers and companies, failed because of a faulty pricing policy.

5.4. ICTs in the Workplace - Stage 3

According to a survey conducted by Romania Business-Economics²⁴², computer firms were among the first to have websites in Romania.

The Romanian business sector is keenly aware of the long term benefits generated from their online presence and use of computers. Although Internet access, e-mail, and personnel training on the use of this new technology are expensive for most

²⁴¹ *Romanian ISP Sector at a Glance*, idem

²⁴² at Internet Service Romania, www.isr..com/publications/rapid.fire.htm

companies²⁴³, more and more businesses are incorporating IT in their business strategies in order to position themselves in the market. Around 70% of the companies in Romania have computers with an average of four computers per company. The increasing number of computers reflects the desire of managers to introduce ICT into the daily work process.

Prior to 1989, only the largest state enterprises had their own IT departments. Now however, all large and some medium-sized organizations have in-house IT capacity²⁴⁴. In a few cases, this capacity will only involves in installing, troubleshooting and maintaining imported hardware and software. In a larger number of cases, however, the staff customizes packages to meet in-house needs. In other cases, software is custom-built, either because the organization cannot afford a package or because in-house needs are unique and cannot be met by ready-made packages. The bigger enterprises even keep the equipment (hardware and software) updated to the latest there is in the market.

Expensive software for internal operations is not in high demand in the local market both because of cost issues, and because of the reluctance of companies to invest in new equipment. Thus, historically, the major clients for software companies producing these expensive packages have been large multinational corporations. This trend may be changing. For example, in the past, multinationals comprised 90% of the customer base for Exact Software, one of the companies distributing ERP, an expensive financial and logistics package. Now, however, ERP's distributors are trying to tap into the SME market. Their current aim is to increase the proportion of small and medium sized clients to 30%. The executive of ERP's distributor notes that the major barrier to the growth of local demand for their software is lack of education on the potential benefits of the Internet²⁴⁵. Another software distributor, *Scala*²⁴⁶ solution is also aiming to increase the proportion of the smaller, 'tier two' (containing less than 1000 employees) companies in its consumer base as it is more profitable in the long run.

²⁴³ Cited by Internet Service Romania, *idem*

²⁴⁴ Mihaiela Grundey & Richard Heeks, *idem*

²⁴⁵ Steven Wright, *Climb every mountain*, September 1999, Bucharest Business Week, at [www.bbww.ro](http://www bbw.ro)

²⁴⁶ Scala Business Solutions Romania

Most of the software launched recently on the market has been e-commerce related. However, the potential for these products is limited by the absence of e-commerce legislation. For example, Oracle launched its *E-Business suite* software which puts every aspect of a business - marketing, sales, supply chain, manufacturing, customer service, accounting, and human resources, on the Internet. However, the use of this software depends entirely on legislation protecting personal information, ensuring identity for electronic transactions, and securing payment systems.

6. Networked Economy

In 1996, from a total of 6,160,000 employed individuals, 16,225 were employed in an IT position²⁴⁷. Employment in IT comprised just over 0.2% of total employment in Romania. Work in software firms constituted roughly 13% of this figure. In 1998 the number of people working in the software industry reached 10,000 and continues to increase.

6.1. ICT Employment Opportunities – Stage 3

A well-developed market triggers employment opportunities. One useful indicator for evaluating employment opportunities in a sector is the investment rate in that sector. Applying this relationship to ICT, a comparative observation of the structure of investments by sector shows only a slight increase from 1996-1998 in investments in the telecommunications sector. In 1996 investments constituted 0.4% total investments; by 1998 they had risen to 4.04%²⁴⁸.

Although multinational companies such as Microsoft, Oracle, IBM, Hewlett-Packard, Packard-Bell, Sun Microsystems, and Computerland, are investing in IT in Romania, the foreign investment rate has remained low. In the past, this has been due to either the absence of appropriate legislation or of its enforcement. Currently, the government is adjusting its trade and investment policies

The ICT job market

The ICT job market absorbs more than 5,000 software professionals. At present, over 200,000 specialized engineers are employed in vertical industries. In the software industry there are about 15,000 broadly skilled and multilingual software professionals. According to an analysis by the Romanian Ministry of Finance the software industry recorded a 25% increase in the number of employees from 1997 to 1998.

²⁴⁷ Mihaiela Grundey & Richard Heeks, idem

Despite the growth of the ICT workforce in Romania, economic factors compel a large number of IT specialists to leave the country in order to find better-paid jobs in West European countries or in the US. It is estimated that more than 40% of graduates in information technology leave Romania every year. Some IT market leaders warn that if this trend continues there would be no specialists left in two years' time²⁴⁹. Worse yet, there also is no indication that Romania has discovered a successful strategy to prevent IT professionals from leaving. Some specialists say that one solution would be to not only promote an academic system that qualifies many specialists every year but also to help SMEs grow, as the Internet represents an excellent opportunity for small business development.

The public sector seems to have become one of the largest employers in IT due to institutional reform programs generously sponsored by international organizations. State spending on IT procurement and R&D plus state-oriented EU funding ensure the employment of several thousand IT staff²⁵⁰.

²⁴⁸ *Romanian, Trade Summary*, Foreign Trade Barriers, US Trade and Development Agency, at http://www.ustr.gov/pdf/2000_romania.pdf

²⁴⁹ Bogdan Tudorache, *idem*

²⁵⁰ Mihaiela Grundey & Richard Heeks, *idem*

6.2. B2C Electronic Commerce – Stage 2

According to an Economist Intelligence Unit 60-country survey, Romania ranks 43rd in its readiness for e-commerce and its potential for ICT integration in the e-business economy²⁵¹. With a total score of 5.2, Romania is ahead of Russia, but behind Poland, Hungary, the Czech Republic, Slovakia, and Bulgaria. The EIU's assessment for readiness was focused on internet issues that are relevant to all countries across the board. However, in the process of its investigation, the EIU discovered that, in Romania's case locally specific IT issues like ineffective legislation play a much larger role in determining the country's readiness.

The e-business market in Romania is a content provider market, rather than a functional alternative to the traditional way of completing transactions. Although there are around 8,000 registered domains, there are only a few companies that offer B2C transactions. A rough estimate shows that in Romania there are around 50 companies offering e-commerce in some form (other estimates mention around 100), but the vast majority of businesses still rely on paper transactions.

Skepticism surrounds the development of e-business in Romania. Despite of the recent adoption of one of the most vital pieces of law for e-business (the E-commerce law), the virtual transactions have a long way to go before becoming a serious alternative to the traditional business making. There are some small attempts such as virtual shops, portals and online banking services, which, as a whole, do not have an impact on the economy. One of the obstacles to consumer e-commerce development is the low number of persons with Internet access. With less than 75,000 Internet accounts (both private and business) and only 450,000 persons that have regular Internet access, Romania seems far from reaching the critical mass of potential users necessary for developing e-commerce.

In the banking system, the latest technologies have been introduced, especially in the client-bank interface, which is situated outside the traditional headquarters represented

²⁵¹ EIU, 1st quarter 2000 statistics, idem

mainly by automatic teller machines (ATMs). In 1999 Romanian banks acquired more than 400 ATMs. To date, more than 300,000 cards have been issued, of which 40,000 were MasterCard²⁵². Six Romanian banks (BCR, BRD, Banc Post, Banca Ion Tiriac, Banca Agricola and Banca Turco-Romana) are issuing payment cards. All of them issue debit cards in Lei, the Romanian currency, and in US\$. Also the American Express Card and Diner's Club are available as credit cards. Still, the alignment of the transactions to the standards defined in the western Europe and US is impeded by a complicated and tedious debit card validation process.

6.3. B2B Electronic Commerce – Stage 2

Business-to-business e-commerce seems to have a better future. Although very few companies offer their goods and services through the Internet, there are encouraging signs that new companies will adopt e-commerce in the near future. Romanian businesses would benefit from the employment of global B2B e-commerce systems which promise to enhance their ordering and procuring processes.

6.3.1. Industry trends

In spite of little Internet legislation and low Internet penetration, ‘virtual companies’ are springing up in Romania, offering new products and solutions which allow firms to manage their entire activity on the web, either in b2b or b2c activities²⁵³. For example, companies such as Oltchim and Paneuro Targu Mures implement Oracle applications, Tamisa Trading performs transactions with pharmaceuticals distribution on the web, and Omnilogic accepts orders via the Internet.

In terms of e-industries, an Arthur Andersen study which evaluated e-business efficiency using six broad categories (including web sites, sales and marketing performances, demand and processing as well as permanent technical/customer service) identified brokerage and insurance as Romania’s most and least efficient e-businesses

²⁵² *Regulatory developments, Update memo*, idem

²⁵³ Luminita Holban, *E-companies entering the market*, March 6, 200, Bucharest Business Week, www.bbw.ro

respectively²⁵⁴. Overall, considering the trends in financial online services and the implications of the new economy for the Romanian finance and banking industry, Romania is far behind other European countries.

Sibiu Stock Exchange is expecting investments to grow after launching its transactions on the Internet at www.bmfms.ro, through the Sagittarius Futures & Options Trading program²⁵⁵. US-based Eastern & Central European Electronic Bidding (eeeBid) has re-launched its bidding web site page on www.eeebid.ro. The bidding site aims to be the meeting point for sellers and buyers on the Internet, in the absence of regular e-commerce transactions. The services are free for a limited period and restrictions apply.

6.3.2. Education for the new economy

The low level of Internet penetration among small enterprises is due not only to affordability issues, but also to the lack of appreciation for the true business potential of INternet. To help resolve this, local analysts suggest that suppliers of communication services and products should focus on producing customized packages that would appeal to small businesses and that include Internet applications.²⁵⁶ For example, instead of selling bandwidth and charging their subscribers for how much information they transfer, they should offer a package of services including Internet access, web site design and, potentially, virtual shops.

6.3.2. Import-export

The emergence of B2B exchange platforms will have a positive impact on e-business in Romania. *EastEuroMarkets* executed an exclusive agreement appointing Liquidation.com to provide a surplus exchange platform creating an e-commerce marketplace for buyers and sellers of surplus assets and excess inventory in Southeastern Europe²⁵⁷. The items for sale range from unused production equipment to fast-moving consumer goods. It will also provide information about equity stakes for sale in a variety

²⁵⁴ Corina Mica, *E-conference discusses trends*, June 200, Bucharest Business Week, at www.bbw.ro

²⁵⁵ Bucharest Business Week, 3 July, 2000

²⁵⁶ Luminita Holban, *idem*

²⁵⁷ Stockaccess.com News, at www.stockaccess.com

of companies. The site will initially serve the Romanian market. Its designers ultimately plan to expand to other countries in the region. The website is an opportunity for Romanian businesses to sell their products and import on the global market. With increasing Internet connectivity in Romania, this could become a leading on-line sales and purchasing channel for large and small businesses in the country.

6.3.3. Small and medium enterprises (SME)

As part of a local SME development strategy, one of the local Internet providers, PC Net, has opened an online classifieds service especially for SMEs, trading second-hand IT products ('Bursa PC Net'). They have over 7,000 subscribers posting hundreds of messages and concluding dozens of transactions per day. Around 30 per cent of the company's subscribers are SMEs²⁵⁸. According to the general manager of PC Net, there are conditions still to be fulfilled so that e-business can take off in Romania. These include the possibility of online banking transactions, wider use of credit cards and an increased level awareness of small entrepreneurs about the advantages of the Internet.

6.3.4 Common issues for B2C and B2B: payment

There are currently two ways of buying on the Internet. The procedure for small value purchases like books, stationery, & CDs is as follows:

- the order is submitted on the web (more often the order is made by telephone)
- the company sends the package to the customer
- the customer pays when receiving the parcel at the post-office.

For products with higher value – e.g. computers, the order is submitted online and supplier is compensated via a payment order with a bank or through the post office.

One workaround solution to overcome the lack of credit cards was the issuing of Value Cards by Kappa in January 2000. These cards have the value of 10 US\$ and can be used either to buy Internet services or to buy goods of small value on the Internet.

Kappa launched an electronic system for online payments, which allows transactions to be made in real time. The only condition for full use of the services is opening of a

²⁵⁸ Luminita Holban, idem

personal account online. The firm also introduced 'street computers' that allow passers-by to connect to Internet for free. Kappa also started a project named 'Telemedicine' which makes it possible to receive a diagnosis via the Internet. Two public health institutions (Elias hospital and Polyclinic number 10) provide expertise online²⁵⁹.

The World Trade Centers' Association (WTCA) also plans to launch an electronic trade card²⁶⁰. The new system would enable commercial exchanges without the need for any written contracts or documents. The complete trade process would be done on the Internet, at a 150 US\$ flat fee per transaction.

Bank Austria Creditanstalt will launch the second Internet banking service in Romania in December 2001. Last year Banca Turco Romana launched BTRnet, the first Internet banking service in the country. Greek-owned Alpha Bank Romania also announced its intentions to introduce a similar service²⁶¹.

The National Bank of Romania (BNR) has recently launched its own website at www.bnro.ro. The site includes the main macroeconomic indicators, data regarding monetary indicators, monetary and state security markets and specialized analyses. Soon it will also include legislative measures regarding the bank, information for coin-collectors, and a presentation of its own museum. There are no plans for launching electronic banking services so far.

6.3.5. Legislation

Romanian legislators have begun to work on introducing new legislation regarding e-business. In June 2000 Varujan Pambuccian, the parliamentary representative of the National Minorities Group submitted two bills on digital signatures and e-commerce²⁶². The newly established Ministry of IT&C hastened the process and the e-signature law

²⁵⁹ according to Bucharest Business Week, Teodora Hasegan, January 24, 2000

²⁶⁰ *WTC to launch E-trade card*, IT NEWS, Bucharest Business Week, June 2000, at www.bbw.ro

²⁶¹ News, BBW, at www.bbw.ro, 16 October 2000

²⁶² A draft (in Romanian) can be found at <http://www.pcmagazine.ro>

was approved by the president in July 2001. A third bill is expected to be issued in the near future.

6.4. E-Government – Stage 2

Real e-government is not yet a reality in Romania, but initial progress has been made. Most of the governmental institutions have a website and some of them regularly use communication tools like e-mail.

The type of information that can be found on governmental websites²⁶³ varies – ranging from background information about the country (population, territorial -administrative units, economic agents), to transportation maps (traffic networks), to history, organizational structure, or legislation²⁶⁴. As part of an institutional reform program, a gradual transition towards the electronic transmission of documents between ministries/departments should be taking place in the near future.

Interaction

Internet based interaction between citizens or companies and the public sector is negligible. The Ministry of National Education, for example, has its own website serving as a resource center for students and parents. Relevant information about exams and admission procedures to public schools can be found on the web. Yet the application forms must be collected and submitted in person.

²⁶³ Mihaiela Grundey & Richard Heeks, idem

²⁶⁴ <http://domino.kappa.ro/mj/superlex.nsf>

Government entities may receive e-mails, but the communication usually takes place in a traditional manner - via telephone, fax, or direct contact. No other on-line interaction takes place between citizens and the government. However, in Bucharest a district mayor has the intention of starting an e-government project, but at this point the most users can do is download various documents. In the future, as a result of a partnership with a country portal (Romania Development Gateway), users would be able to use real electronic government applications.

E-government project

A division of the Private Sector Institutional Development Program (PIBL) of the World Bank (WB), negotiated a loan with the government for developing the Romania Gateway project, a country portal designed to develop e-government applications. The website will facilitate access to a series of directories and online resource collections. One of the goals of this project is to inform and involve the public in main development issues like pension reform, social safety nets, privatization, etc. Informational services dedicated to this program will include news, forums, transaction centers, possibilities for professional orientation, and other necessary information.



7. Network Policy – Stage 3

In 1997 the Romanian government adopted the National Strategy for the Information Society²⁶⁵, a law that sets year 2004 as the milestone year for the transformation of the country into an 'information society'.

In order to create an “e”-Romania there must first be a radical change in the legislation and regulation of the telecommunication sector. At the time the law was written and submitted to Parliament, the legislators did not know that the deregulation of voice telephony would only come into effect in 2003. It therefore seems less likely that the national strategy will realize its agenda in 2004.

The actual situation, however, is positive. Although the privatization of RomTelecom was planned for the year 2000, it already began in 1998. The partial liberalization program gave green light to private service providers to offer services such as data, paging and mobile telephony. Alternative carriers compete for private network services, leased lines, and other telecommunications services for businesses.

Partnership in policy making

An important aspect of the telecommunication policy in Romania is that it is influenced by the private sector, although not strongly enough as to furnish a favorable legislative environment for e-business. As new technologies are introduced into the Romanian market, foreign investors look for direct investment opportunities in the IT sector. One of the organizational platforms that creates a dialogue between the foreign and Romanian business sector and the government is the Association for Information Technology and Communications of Romania (ATIC), a member of WITSA (World Information Technology Software Alliance). This provides for private sector influence on government policy. ATIC is a non-governmental organization that includes the top 40

²⁶⁵ Mihaiela Grundey & Richard Heeks, *idem*

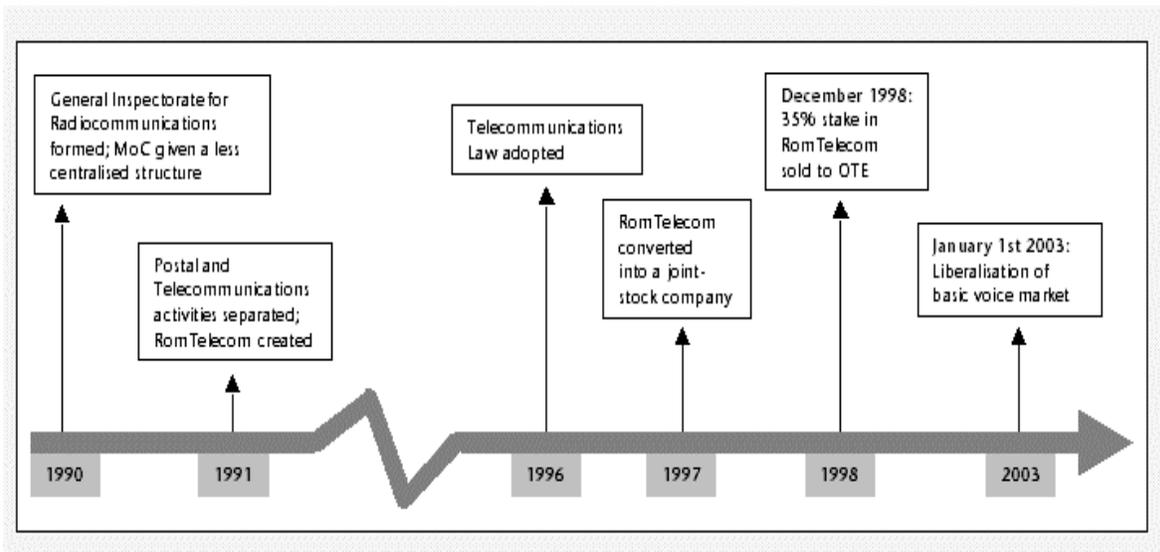
ICT companies in Romania, as well as professionals from universities and research centers.

The major objectives of ATIC are characteristic of professional associations: to represent producers and users of ICT in front of government bodies; to standardize ICT activity, to uphold the interests of producers and consumers, to assure compatibility with international standards and to monitor Romanian legislation regarding intellectual property (copyright law) and so on.

7.1. Telecommunications Regulation – Stage 3

The arduous task of restructuring national utilities and redesigning regulations to attract large-scale private investment poses unique challenges in Romania. Some of the difficulties are due to the slow economic transition to a free market that began after 1990. Others are due to the lack of experience in the formulation and implementation of the necessary regulations. Liberalization only began in Romania in 1991.

Figure 5 – Privatization and Liberalization Milestones



Source: EIU

In mid-1990 the Romanian government took the initial steps to reform and reorganize the telecommunications sector²⁶⁶. A series of regulatory changes resulted in the creation of RomTelecom (RT) as a distinct entity from the former PTT (postal and telecommunications). In 1996 a new Telecommunications Law was adopted. From 1996 to 2001 several institutional transformations were designed to simplify and better coordinate the process of privatizing telecommunications. The table below indicates the major players in the telecommunications sector and the process of institutional reform:

Table 17 - Major players in telecommunications

Date	Institution	Responsibilities
Telecom Law adopted 1996	Ministry of Communications (MOC) established	Licenses entry in telecommunications services; decides whether services will be monopolized or competitive; regulates prices.
1998	General Inspectorate for Communications (GIC) established	Independent regulator; monitors technical aspects of licensing requirements. (In 1998) advises NACI on its regulatory responsibilities, especially the technical aspects of spectrum allocation and license requirements.
1998	NACI (National Agency for Communications and Informatics) created	The primary agency for licensing in the communications sector; allocates the electromagnetic spectrum among users; awards licenses for spectrum users and all other forms of telecommunications carriers; has a role in price regulation.
1998	National wire-line carrier partially privatized. MOC abolished	MOC's equity in RomTelecom transferred to a separate state holding company. MOC's policy and regulatory functions transferred to the newly created National Agency for

²⁶⁶ *Telecommunications reform and privatization*, The World Bank, 1997, www.worldbank.org

		Communications and Informatics (NACI).
1998	Office of Competition created	Responsible for overseeing prices of all “natural monopolies”, including national companies and all of the entities with pricing rules within their licenses, like RomTelecom; enforces the provisions of RomTelecom’s license; excludes authority over interconnection and international services.
2001	Ministry for Communication and Information Technology created. NACI abolished.	Defines the restructuring policies, coordinates the privatization process in the ICT sector; is responsible for financing the main projects to make the transition of the Romanian society to an information society, promotes the development of Internet; is responsible for harmonizing the specific legislation with the provision of the European Union; authorizes licenses in the ICT sector, establishes and collects taxes for licenses.

7.1.1. The privatization process of RomTelecom

The privatization process of the state-owned telecom company started in early 1997 when the government announced the bidding process. Initially two consortia formed - KPN²⁶⁷/Telecom Italy and SBC²⁶⁸/OTE. However, after a short time both KPN and SBC withdrew from the contest and left their partners, citing the delays and uncertainties surrounding the tender. In November 1998, with only two bids entered, the government chose OTE’s offer of US\$ 675 mil for a 35% stake. RomTelecom will maintain its

²⁶⁷ KPNQwest

²⁶⁸ SBC Communications

monopoly(until the end of 2002, at which point all statutory restrictions on entry into voice telephony will be lifted and Romania will open its market to foreign telecommunications companies according to its commitments in the World Trade Organization Telecommunications Agreement²⁶⁹.

According to certain analysts, the conditions of the license granted to RomTelecom do not seem a promising indicator of the success of its privatization²⁷⁰. The investment requirement imposed on the partially privatized entity includes only general provisions that do not seem particularly demanding. Many important service details, such as call completion and service restoration speed, do not seem to be part of the license agreement.

A summary of the telecommunications liberalization status in Romania is given below:

Table 18 - Telecommunications liberalization

	Liberalization status	Comments
Voice telephony		
Local communication	monopoly	RomTelecom
Domestic, long-distance	monopoly	RomTelecom
International communication	monopoly	RomTelecom
Mobile communication		
GSM	liberalized	RomTelecom launched in 1993 a mobile telephony service based on NMT-450, but could not maintain the product on the market. During the process of privatization, RomTelecom was awarded a cellular operating license for the DCS 1800 standard. COSMORom

²⁶⁹ The official page of the Romanian Government, Telecommunications and Media, at <http://domino.kappa.ro/guvern/ehome.nsf/All/TelecomunicatiiMedia>

²⁷⁰ *Telecommunications reform and privatization*, a report of the World Bank, www.worldbank.org

		was launched in 2000. Two other GSM operators were started in 1998: Mobifon SA, and MobilRom.
Paging	liberalized	
Data transmissions (including Internet)		RomTelecom has a monopoly on telex and telegraphy. Data, value-added services, VSAT and CATV are liberalized.

7.1.2. Legislation for the information society

Although the Telecommunications Law took into account some general EU principles concerning telecommunications, the bulk of the work towards harmonization and detailed regulation is yet to be done.

- ⇒ There are no service providers for Voice over Internet services in Romania to date. One reason is that there is uncertainty over whether this technology would be construed as voice telephony.
- ⇒ There is little legislation regulating transactions (sales) conducted over the Internet. As a result, principles of general commercial law, consumer protection legislation, and private international law must apply.
- ⇒ there is no comprehensive legislation in force regarding data protection. The domain names are protected by the general principles of Romanian law relating to the protection against unfair competition.
- ⇒ There is no specific legislation in force to protect against cybersquatting. In the absence of specific legal protection, domain names may be protected by the general principles of Romanian law relating to the protection against unfair competition. The law considers any practice that constitutes a breach of honest commercial practices as unfairly competitive and applies sanctions.

At the moment the Internet legislation is one of the main issues of discussion and a priority for interest groups from both the government and IT business sector. Certain aspects of Internet use were governed by Romania's Telecommunications Law, adopted in 1996 and changed by later developments like the establishment of the Ministry of IT&C. The Law suggests that an Internet Service Provider should notify the regulating authority of its intended operations. The Telecommunications Law states that a license is required for "the provision of data services"²⁷¹, because Internet was considered data services.

The bill on digital signature has been recently adopted and the bill on e-commerce is under discussion in the Parliament. In addition, the introduction of a third bill on e-payments is expected in the near future. The new initiative on digital signatures, which is a pre-condition to the framework on e-commerce, will allow parties to conclude transactions without having to meet face-to-face or exchange written correspondence. An e-signature will be granted the same legal status as a written one. This will effectively put electronic and printed data on an equal footing and will allow electronic data to be admitted as evidence in court in the event of a dispute. According to the current project, the Ministry of Communications and Information Technologies (MCTI) should be the authority in charge of the regulation of e-signatures.

The e-commerce bill defines e-commerce and other basic concepts, such as electronic messaging or exchange of data over the Internet. It establishes who can start an e-business registered in Romania and how. It outlines taxation principles and regulates a number of other relevant issues with the aim of meeting EU recommendations. E-transactions involving software applications exempted from taxation, while any other material products, either imported or locally produced, will be subjected to generally applicable tax rules. It is supposed that the Finance Ministry will tax downloads.

²⁷¹ *E-Commerce Legislative Framework in Romania*, an Altheimer & Gray report, www.altheimer.com

7.2. ICT Trade Policy - Stage 3

Although trade barriers for ICT equipment have been reduced, they are still relatively high, because the appropriate policies are not in place. Foreign direct investments in the ICT sector are encouraged without restrictions.

7.2.1. General foreign investment climate

The Law no. 241/1998 and the Government Urgency Ordinance no. 92/1997 on the promotion of direct investments establishes the general legal framework regarding the guarantees and facilities for direct investors and investments²⁷². In principle investors in Romania enjoy the opportunity to invest in any field approved by law in addition to custom and fiscal incentives. They are also permitted to deduct advertising and publicity expenses from taxable profit and to employ foreign citizens in accordance with the legal provisions in force.

Moreover, law no. 84/1992 establishes free zones in maritime and river ports, in the Black Sea-Danube Channel, and other navigable channels. It also established free zones in territories near the borders in order to promote international trade and attract foreign capital.

7.2.2. Trade policies

The Romanian market is open and requires no special conditions for access or operation. The legislative framework for trade allows for ICT business development. By signing or becoming party to various treaties²⁷³ Romania has come to enjoy certain facilities in foreign trade, such as customs and tax reductions or even exemptions for some of its products. It was also granted most favored nation status from the United States of America.

²⁷² The official website of the Minister for Commerce and Industry, at <http://gama.imi.ro>,

²⁷³ E.g.: Association Agreement with the EU and free trade agreements with the European Free Trade Area (EFTA) countries and the Central European Free Trade Agreement (CEFTA) countries.

A potential obstacle for U.S. exporters is the preferential tariff treatment for European competitors. The free trade arrangements with the EU, EFTA²⁷⁴, and CEFTA are already triggering customs duty discrimination against some U.S. products. Partially as a result of this, and despite the Romanian government's efforts to encourage trade and foreign investment²⁷⁵, the United States registered a trade deficit of 258 million US\$ with Romania in 1999, compared to a deficit of 54 million US\$ in 1998²⁷⁶.

It is worth mentioning that there remains resistance to foreign investment in some sectors, from representatives of nationalist parties and managers of state-owned enterprises who fear that the foreign investors' purchase of state-owned companies at bargain prices will give them too much influence in the economy²⁷⁷. Another significant impediment to foreign investment in Romania is the unpredictable legal and regulatory framework.

On March 1st 1997 Romania became a signatory to the Information Technology Agreement - signed by 36 countries at the World Trade Organization. The agreement refers to the liberalization of trade of five categories of IT products: computer peripherals and parts, telecommunication products, semiconductors and equipment for the manufacture of semiconductors, data storage products and software, and scientific equipment²⁷⁸. The elimination of taxes on IT products started in 1998, from 25% and decreased to 15%. All taxes should have been completely eliminated by the end of year 2000²⁷⁹; by June 2000 no significant changes had taken place.

In conclusion, the advantages of the Romanian IT market are still counterbalanced by corruption, bureaucracy, high taxes, and a complicated legislative system²⁸⁰.

²⁷⁴ European Free Trade Area

²⁷⁵ For example Romania eliminated custom duties on more than 600 technology projects:
<http://www.mac.doc.gov/eebic/COUNTRYR/ROMANIA/RESEARCH/TELECOMM.HTM>

²⁷⁶ *Telecommunications reform and privatization*, idem

²⁷⁷ *Telecommunications reform and privatization*, idem

²⁷⁸ Romania: Computer Networking Hardware/Software, CEEBICnet, idem

²⁷⁹ *Vom incuraja proiectele de IT din zona bancara*, Piata Financiara, March 1998, at
<http://domino.kappa.ro/e-media/piata.nsf/All/HomePage>, (Romanian)

²⁸⁰ *Americanii interesati de afacerile software cu Romania*, 6 iunie 2000, IDG Computer World, at
<http://www.computerworld.ro/articol.cfm?id=254>

8. Latest developments

- ⇒ Starting with a budget of about 100,000 USDUS\$, a group of ISPs set up the Association of the National ISPs in October 2000 with the aim of influencing the process of regulating telecommunications. Among the strategic goals are: legislative initiatives towards the liberalization of the telecom market; joining similar organizations in US and Europe; the creation of an internal code regulating the local ISP market. They also intend to become a dialogue partner with RomTelecom to help implement changes demanded by the EU. The founding members are PC Net, Astral/Kappa, Fx Internet, Dynamic Network Technologies (DNT), and Romanian Data Systems (RDS). The Government set up an IT Promotion Work Group to evaluate opportunities and strategies for the industry as well as approve and coordinate projects over 100,000 EUR²⁸¹. It includes PM Adrian Nastase, Finance Minister Mihai Tanasescu, Public Administration Minister Octav Cozmanca and IT&C Minister Dan Nica. They will also approve major directions and annual budgets for IT&C projects requiring government guarantees.
- ⇒ The new Ministry for Communication and Information Technology (MCIT) was set up as a result of the last elections in 2000²⁸². The new minister, Dan Nica, planned to adopt all legislation for the IT sector (e-commerce law, the digital signature law, and the antifraud legislation related to this field) as soon as possible. Under the new set of laws, Romania will apply sanctions against fraud similarly to EU and US standards. The legislative framework will include: a law concerning electronic documents and archives, electronic notary, electronic public administration and regulation applied to banks, insurance and capital markets. Companies investing in the IT and telecommunication field will be able to obtain assets belonging to state-owned companies under the SME. This law has been

²⁸¹ IT news, *Government sets up IT Group*, Bucharest Business Week, February 2001, at www.bbww.ro

²⁸² *Romanian IT Market Will Double This Year*, Minister Says, January 2001, [stockaccess.com](http://www.stockaccess.com/news/news010112-1.html), at <http://www.stockaccess.com/news/news010112-1.html>

- recently re-enforced by the new government. Dan Nica also stated that the government would launch a series of major funding programs directed mainly at two areas - education and public administration - aimed at implementing e-government. The minister indicated that he intended to have at least one computer hooked to the Internet in each Romanian school by the end of 2002.
- ⇒ The European Union will provide Romania US\$ 7 mil in non-reimbursable grants through its PHARE program to help the country introduce a comprehensive electronic payment system by 2002²⁸³.
- ⇒ The MCIT intends to implement by the end of the year pilot projects involving the creation of E-market, web video conference and info-kiosk projects worth around 34,000 USD each²⁸⁴. The projects will be initially implemented in Bucharest and, after a trial period, they will be expanded nationwide. The minister mentioned that the info kiosk project will provide citizens with an integrated information system via touch-screen computers located at railway and metro stations, and public institutions. The web video conference is planned to reduce the costs with 75 per cent for organizing meetings, while the e-market is a portal that offers access to those who buy or sell products and services and the ministry will be the first one to test it.
- ⇒ the Ministry of Education and Research is to have a nationwide Educational Management Informational System (EMIS) by year-end, following an investment of over one million US\$²⁸⁵. The integrated system designed and implemented by Romsys, will provide educational, financial, informational and administrative management at all levels of the national educational system. The pilot project has been implemented in ten pilot schools, two in Buzau county, two in Arges county and six in Bucharest.

²⁸³ European Union May Disburse \$7mn to Set up Electronic Payment System in Romania , December 2000, Stockaccess.com, at <http://www.stockaccess.com/news/news1213-3.html>

²⁸⁴ Mugur Badarau, *Pilot projects prepare for take off*, Bucharest Business Week, July 30, 2001, at www.bbw.ro,

²⁸⁵ Mugur Badarau, *EMIS for high-tech education*, Bucharest Business Week, July 30, 2001, at www.bbw.ro

⇒ The president adopted in July 2001 the the e-signature law, which is vital for Internet transactions.

9. Conclusions and recommendations

Romania is struggling to modernize its ICT capabilities and catch up with developed countries connected to the Networked World. The quick evolution of mobile telephony and the start of e-business show positive signs of change. However, the economic environment threatens to slow down the development of Internet services in the years to come. The acquisition of computer systems proves to be costly and impractical for the vast majority of individuals and small businesses. Furthermore, unpredictability of the legal system and the general state of the economy tend to discourage foreign investors from entering the market.

This Assessment reveals patterns and peculiarities of ICT development that allow for predictions concerning Romania's e-future. General observations offer an overview of the strengths and weaknesses of the ICT sector in Romania, as well as possible risks and opportunities for policy makers.

IT should bridge, not increase the divide

There are evident benefits of "joining" the Networked World ranging from access to more information and resources to faster processing of business, research and leisure benefits. ICT reduces (or even eliminates) geographical distance and increases the volume of communication, which is fundamental to providing both social and economic opportunities. Yet technological advancements come with their challenges - access to the network is not free and the people using these resources may remain a limited elite group from the total population. Investment in equipment, computer literacy, and a sound infrastructure are some of the prerequisites for meaningful participation in the networked world.

Although the urban elite in Romania is catching with the developed world – getting more connected through Internet, mobile telephony and wireless communications - the largest part of the population is lagging behind. Some 2,000 remote villages still remain without basic fixed line connectivity. More strikingly, almost 45% of the total population lives in

rural areas. Moreover, their ability to access these services is hampered not only by the lack of infrastructure, but also by their own poverty.

Poverty, either in rural or urban areas, must be taken into consideration in evaluating what strategy would best allow the majority of the population to benefit from the advantages of the new economy. For those that live in poverty (almost half of the total population)²⁸⁶ e-commerce and e-documents may be of no relevance. Therefore, the task of getting ready for the Networked World is even more challenging in the context of a growing divide that is not only technological – both between Romania and other developed nations and within Romania itself. It is the government's task to allocate its resources, and at the moment there is the risk that this priority might be forgotten in the struggle to catch up with the developed world.

A solution for opening the rural world to new technologies would be for the government to support the construction of telecenters. Some 30 telecenters are already developing programs in Romania and the government has recently offered funding for one such program.

A balanced role of government

Coordinated participation of government in developing the IT sector is essential. In order to implement thorough institutional reform, various institutions with overlapping responsibilities were created and then abolished. The most recent addition to the government (the largest government Romania has had until now) is the Ministry of Communications and Information Technologies, which took over a large portion of ANCI's responsibilities. There must be a clear separation of activities and tasks, especially in terms of *policy making* and *implementation of policy*, in order to avoid the risk of slowing down IT development due to political interests and the inevitable complications that stem from running the whole telecommunications sector within one institution.

²⁸⁶ 41.2% of the population lived beyond the poverty rate in 2000.

In order to reduce the gap between Romania and the rest of the developed world there must be a consistent approach, which would preserve gains as a result of investment in technology and further the consolidation of the ICT market.

Another objective concerns the presence of ICT within the government itself. With a large, ill-trained staff that does not integrate computers into its daily work-life, the government is unlikely to have either an awareness of the advantages offered by ICT or an interest in supporting and consolidating e-government activities. Several types of activities (ranging from training for public servants, the transfer of the archives on the computer, promoting the activities of the government on the web) would not only help make the work in the public sector more efficient, but also bring the government as an equal partner from a technological point of view with businesses and other well technologically equipped organizations.

A more participatory presence of the private sector in policy making

The role of the private sector is also important, and more involvement is needed. The state needs to sustain the recent IT successes of the private sector by supporting it with specific legislation and effective regulation. Thanks to the private sector, the mobile communications market exploded over the past two years, and fast data transfer technologies became available. Yet, certain legislative issues of dire importance for e-business remain unresolved, leaving the Romanian IT market risky for local and foreign businesses.

Several success stories have proved that partnerships between the private sector, non-profits, and government could achieve significant results. A program that provided 800 computers to 160 schools in Romania was initiated in a large partnership²⁸⁷. The story of this case and others should be disseminated as best practice models, in order to increase the number of such programs.

²⁸⁷ P&G, IBM, Xnet, the Ministry of National Education, Pro TV and the 'Save the Children' organization were involved.

The private sector will be an alternative provider of infrastructure in 2003, when deregulation of telecommunications will be completed. At this point there is a hidden potential for the existent thousands of kilometers of fiber optics communication backbones built by power and railway companies independently of the national telephone carrier RomTelecom. It is very likely that, in terms of infrastructure, the competition will be so strong after 2003 that RomTelecom will lose subscribers for various services. To avoid significant market losses and to work for the benefit of the subscribers, RomTelecom could cooperate as of now with other infrastructure providers in using alternative solutions (subcontracting, buying network solutions) in order to increase its effectiveness in covering the rural areas.

The role of civil society

Although there are few non-profit organizations that participate directly in promoting ICT, a start has been made with the establishment of two associations that represent the interests of ISPs and the IT sector²⁸⁸. Another foundation is conducting a feasibility study for telework centers in Romania and is acting as an information resource for the Romanian public²⁸⁹. The role of civil society is especially important in two areas:

- Education (computer literacy, enhancing work with IT)
- Linking poorer areas to the networked world through telecenters and community based foundations.

Legislation

Romania has just started to adopt comprehensive e-commerce legislation. Before adopting and enforcing all necessary laws for e-business there is practically no valid protection against cybersquatting or fraud, and no liability for content published on the 'Net.

²⁸⁸ Association of the National ISPs and respectively, the Association for Information Technology and Communications of Romania (ATIC).

²⁸⁹ CONSENS, <http://www.ong.ro/ong/consens/>

Attention must be given to legislation to protect SMEs, which have yet to benefit from the Internet. However, although the adoption of the Law 133 for SMEs²⁹⁰ in 1999 represented a starting point SME development, the enforcement of the law was delayed because of several technical inconsistencies²⁹¹. This is one characteristic of the legislative process and policy making that discourages investors and small business managers. Often, several years pass after a law is adopted before it is properly implemented and enforced.

Education

Infrastructure connectivity in the education sector is already in place. RoEduNet, plans to connect 16,000 new institutions in 2002-2004; yet students' access to the network is still limited and controlled. Also, more plans for updating the curricula to international IT standards have been written, but it is difficult to determine what stage they are in. Through a PHARE program the ministry of education intends to introduce an integrated financial management system for the education system in order to help set up and control the annual budget. Still, it takes time to turn the plans into actual programs.

Although the literacy rate is high (97%), the average person has completed only 8,4 years of schooling, a relevant statistic for the correlation with IT development. In order to be competitive, a labor force must be able to apply new technologies in the workplace, improve language and interpersonal skills. Despite the high quality of the school education, Romania lags behind in building a competitive labor force.

Greater determination to improve the presence of IT in education can be done not only through creating a better environment for technical universities in Romania, but also by focusing on non-ICT educational institutions. Investment in virtual libraries, online databases, Internet access, and computer laboratories for the use of students would mean

²⁹⁰ The law pertains to the boosting of private entrepreneurs for the setting up and development of SMEs. It creates a favorable framework for setting up SMEs and offers several fiscal and banking facilities in the cases where the entire capital is private.

²⁹¹ L. Holban, New Funds for SMEs, 1999, Bucharest Business Week, at www.bb.w.ro

a real integration of ICT tools in the learning process. ICT reform in education also involves the improvement of software literacy. It would be possible to take advantage of the two main existing academic networks in order to modernize the universities' campuses all over the country by introducing campus cards, ATM machines, and "lockers" (free space on the servers of the universities). So far, the network facilities are offered only to research and professors' groups. Most of the students in non-technical universities do not have access to the Internet and are not trained to use it. A large part of them don't have basic computer skills (such as MS Office).

Industry Focus

While the western economies are relying heavily on the service industry, in Romania an obsolete manufacturing industry is still bearing the burden of Romania's productivity. The two industries have different implications in terms of labor force. For a high-tech, competitive, service-based economy there is a highly skilled labor force that receives high wages/salaries. In addition this type of economy has a customer-related culture. In manufacturing industries there is high demand for basic skills; wages are low, and there is little need to develop communication skills. Romania excels in developing the latter, and this will most likely have a negative impact on the development of the ICT sector.

ICT Mentality

Tangentially touched by the issue of education is the mentality in eastern European countries like Romania. For most of the population IT and digital integration are important only in a distant future. Basic immediate needs demand the attention of the majority of population. It is not clear to people living in remote villages how technology and the Internet can help to improve their lives. This is partially due to a general absence of the community involvement in and support of the policy making process. Having the support of the population is vital especially in the context of policies that create an economic divide. Education campaigns should be incorporated alongside the policies that aim to promote Internet use and IT business start-ups, in order to explain how can information and communication technologies improve day to day life.

10. List of abbreviations

ADLS - Asymmetric Digital Subscriber Line

ANCI - National Agency for Communications and Informatics

ANSI - American National Standard Institute

ATM - automated teller machine

B – ISDN – „bearer” ISDN

B2C – Business to Client Commerce

B2B – Business-to-Business Commerce

BALTICA - PRO BALTICA FORUM

BNR – National Bank of Romania

BUHIX - Bucharest Internet Exchange

CATV - Cable Television

CCs – Commercial companies

CDMA – Code Division Multiple Access

CONEL – Electrical National Company

DE – distance education

DECT - Digital Enhanced Cordless Telecommunications

DCS-1800 - Digital Cellular System

DON – Digital Overlay Network

DNT – Dynamic Network Technologies Romania

DNS - domain name system

EARN – European Academic and Research Network

EBRD - The European Bank for Reconstruction and Development

ETSI - European Telecommunication Standard Institute

EFTA - European Free Trade Area

EIU – Economist Intelligence Unit

e-Doc – electronic document

e-bank – electronic banking
e-government – electronic government
e-commerce – electronic commerce
ERP – Enterprise resource planning

FOS – Foundation for an Open Society
FTP- File Transfer Protocol

GAIN – Global Legal information Network
GDP – Gross Domestic Product
GIC – General Inspectorate for Communications
GIS - Geographical Information Systems
GSM - Global System for Mobile Communications

HR – Human Resources
HSCD – High Speed Circuit Switched Data
HTTP - Hypertext Transfer Protocol
IMAS - Institute for Marketing and Polls
IMF – International Monetary Fund
IP –Internet Protocol
IPX - Internetwork Packet Exchange
IS - Information System
IS – Information Society
ISP – Internet Service Provider
ISDN - Integrated Services Digital Network
ITUR - Italy-Turkey-Ukraine-Russia Submarine Fiber Optic Cable System
ITU – International Telecommunications Unit
IT – Information technology

JapS – Java Applications Server

KAFOS - Black Sea Fiber Optic System

KPN - KPNQwest

LAN - local area network

LEMS – Low Emissions Mobile System

M&A – mergers and acquisitions

MCT – Multipurpose Community Centers

MIS - Mnagement of Information Sstems

MOC -Ministry of Communications

NATO – North Atlantic Treaty Organization

NMT – Nordic Mobile Telecommunications

NSP – Network Service Provider

OTE - Hellenic Telecommunications Organization

PC – personal computer

PDF – portable document format

PDSR – Party of Social Democracy

PIBL – Private Sector Institutional Development Program

PMP – point multipoint

PMP - Point multipoint

PoP - Points-of-Presence

PSTN – Public Switched Telephone Network

PTT – postal and telecommunications

RAs – Regis Autonomous

RCS - Romania Cable Systems

RENEL – Regis Autonomous for Electricity

RDS – Romania Data Systems

RNC/NRC – National Computer Network for Research

RoEduNet – Romanian Education Network

RTD - Regional Transportation District

RTS – Romanian Telework Society

R&D – Research and Development

SBC – SBC Communications

SEMM – electronic labor exchange software

SQL - Structured Query Language

SDH - Synchronous Digital Hierarchy

SDLC - Synchronous Data Link Control

SME – Small and medium enterprises

SNCFR – National Company of Railways

SNR – National Radio-Communications Company

SONET - Synchronous Optical Network standard

TAE - fiber-optic Trans-Asia-Europe (TAE) system

TEL – ICE-TEL project: Interworking Public Key Certification Infrastructure for Europe

TCP/IP - Transmission Control Protocol/Internet Protocol

TDMA - time division multiple access

TIMMS – Third International Mathematics and Science Study

TOEFL – Test of English as a Foreign Language

UMTS - Universal Mobile Telecommunications System

US – United States

UUCP - UNIX-to-UNIX Copy Protocol

VSAT - Very Small Terminal Aperture

VPN - Virtual Private Network

WAP - Wireless Applications Protocol

Wave LAN - Wireless LAN

WB – the World Bank

WIQ – Western IQ – Romanian Telework Information

WLL - Wireless Local Loop

WTCA – World Trade Centers' Association

WWW – World Wide Web

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