

Romania: IED Assessment

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Management Summary

This Assessment has been undertaken at the request of the Information Technology (IT) Task Force located in Bucharest, Romania in an effort to examine potential opportunities for the United State Agency for International Development (USAID) engagement in the Information and Communications Technologies (ICTs) arena. This request, and the Internet for Economic Development (IED) Assessment itself, represents an initial action that follows up on the recent inclusion of the country of Romania into the White House's IED Initiative.

The IED Assessment has been built around five key areas: 1) *Pipes*—an examination of the current state of telecommunications infrastructure within Romania; 2) *Public Sector*—an examination of the Government of Romania's (GOR) position and status with respect to ICTs, with specific focus on *Policy*, 3) *Private Sector*—an examination of the current state of the private sector with regard to providing and leveraging of ICTs, with focus on opportunities, 4) *People*—with a focus on the supporting educational systems within the country, and 5) *Programs*—which focuses on identifying opportunities for leveraging ICTs within the current development portfolio of the USAID/Romania Mission.

The IED Assessment has concluded that Romania is poised to significantly benefit from future deployment of ICTs in the government and private sectors, and that the emerging ICT sector itself holds substantial promise for even further expansion into the global marketplace. At present, however, there are several constraints that limit Romania's broader leveraging of ICTs in support of its economic development. These are primarily in the areas of telecommunications access (limited availability and high cost) and legal restraints that keep a monopoly telephony provider in place for the next two years and does not support leveraging the Internet for E-commerce/E-Business applications. Yet another area of concern is the current loss of students graduating from Polytechnic Universities and leaving for higher-paying jobs in Western Europe, the United States (U.S.), and Canada. This will likely only increase in the near-term as the Internet explodes in Western Europe relative to that of Romania. This continued, and perhaps expanding, loss is increasingly including the core professors and researchers who are also migrating to the private sector for higher-paying jobs (both out of country and in Romania). This could well undermine the future strength of Romania's current national asset—its Polytechnic education system.

The Assessment identifies opportunities where targeted efforts can be undertaken that would expand access to the Internet into rural areas, advance a more pro-ICT legal structure, strengthen the ICT sector by the Government of Romania, and support the development of the ICT sector within Romania by encouraging linkages between U.S. and Romanian high-tech firms. In addition there is the possibility to grow local demand for ICTs in the non-ICT business sector by increasing the awareness and education of local business owners and managers.

A series of recommendations are put forward to the IT Task Force for consideration. These are reflected in more detail as a separate appendix, Appendix H.

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Abbreviations and Acronyms

ADT	Admission/Discharge/Transfer (hospital system)
AED	Academy for Educational Development
ANCI	National Agency of Communications and Informatics
ANRE	National Regulatory Agency for Energy
ANEIR	National Association of Romanian Exporters and Importers
ARIES	Romanian Association for Electronics and Software Industries
ASEBUSS	Institute for Business and Public Administration
ASYCUDA	Automated System for Customs Data (UNCTAD)
ATM	Asynchronous Transport Mode
B2B	Business to Business (electronic commerce)
B2C	Business to Consumer (electronic commerce)
BI	Business Incubator
BLS	Bureau of Labor Statistics (U.S. Department of Commerce)
BTA	Basic Telecommunications Agreement (WTO)
CAG	Civil Action Group
CAGR	Compound Annual Growth Rate
CIC	Community Information Center
CIS	Commonwealth of Independent States
CMM	Capability Maturity Model (Software Engineering Institute)
CPCE	Foreign Trade Promotion Centre S.A. (ANEIR)
DBMS	Data Base Management System
DOC	U.S. Department of Commerce
DOT	Digital Opportunity Task Force
EBRD	European Bank for Reconstruction and Development
EDA	U.S. Department of Commerce's Economic Development Administration
EDI	Electronic Data Interchange
EF	Eurasia Foundation
EIT	Economies in Transition

EU	European Union
EU/TACIS	European Union/Technical Assistance to CIS
FSU	Former Soviet Union
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GNP	Gross National Product
GOR	Government of Romania
GPS	Global Positioning Systems
GSM	Global System for Mobile Communications
GTE	General Telephone and Electronics
GTZ	Gesellschaft für Technische Zusammenarbeit
IAS	International Accounting Standards
IBTCI	International Business and Technical Consultants, Inc.
ICI	National Institute for Research and Development in Informatics
ICT	Information and Communications Technologies
IDC	International Data Corporation
IED	Internet for Economic Development
IEEE	Institute for Electronics and Electircal Engineers
IESC	International Executive Service Corps
IFC	International Finance Corporation (WB)
IMF	International Monetary Fund
IPO	Initial Public Offering
IPR	Intellectual Property Rights
ISDN	Integrated Services Digital Network
ISO	International Standards Organization (e.g., ISO 9000)
ISP	Internet Service Provider
IT	Information Technology
ITA	Information Technology Agreement (WTO)
ITAA	Information Technology Association of America
IT&C	Information Technology and Communications
ITG	Information Technology Group at Center for International Development at Harvard University

ITU	International Telecommunications Union (UN)
JICA	Japan International Cooperation Agency
Km	Kilometers
LAN	Local Area Network
Mbps	Mega bytes per second
MHz	Mega (million) Hertz (cycles/second)
MOF	Ministry of Finance
NARD	National Agency for Regional Development
NCUA	National Credit Union Administration
NTCA	National Telephone Cooperative Association
NGO	Non-Government Organization
NIS	New Independent States
OSCE	Organization for Security and Cooperation of Europe
OSIM	State Office for the Protection of Inventions and Marks
OTE	Organismos Tilepikoinonion Ellados
PAROS	Paros Informatique SSII (France)
PHC	Primary Health Care
PWC	PricewaterhouseCoopers
RATDC	Romanian Trade Development Center
RNC	Romanian National Communications
ROL	Romanian LEI
SME	Small and Medium Enterprise
SO	Strategic Objective (USAID)
TRIPS	Trade Related Intellectual Property System (WTO)
UNCTAD	United Nations Commission on Trade and Development
UNDP	United Nations Development Program
U.S.	United States
USAID	U.S. Agency for International Development
USDA	U.S. Department of Agriculture
USDOC	U.S. Department of Commerce
USG	U.S. Government
VSAT	Very Small Aperture Terminal

WB World Bank
WIPO World Intellectual Property Organization
WTO World Trade Organization

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I. Background

During the past several years USAID has increased its focus on leveraging Information and Communications Technologies (ICTs) within its development activities. During the last two years one thread of this focus has been in the form of the White House-sponsored Internet for Economic Development (IED) Initiative. While the IED Initiative initially included only 10 countries, additional countries have recently been added, with 20 countries currently included in the Initiative. At the request of the IT Task Force, Romania was added to this list of IED Initiative countries in the summer/fall of 2000.

USAID's focus on placing increased attention on leveraging ICTs for international development was recently reinforced at the G-8 Summit that took place in July 2000 at Okinawa, Japan. While the Summit addressed several issues, the issue of the growing "digital divide" resulted in the development of an Okinawa Charter on Global Information Society. This Charter launched a Digital Opportunity Task Force (DOT Force) as a first step toward the goal of achieving digital access and education for all by the year 2010. A brief summary of this Charter and the global call to action is reflected as Appendix A.

In large part, this increased global focus is predicated on the growing awareness of the impact that ICTs have had on the U.S. economy over this past decade. This impact has been captured and documented in a series of annual reports prepared by the U.S. Department of Commerce in its June 2000 report, "Digital Economy 2000." A brief summary of this report is reflected as Appendix B.

In summary, the IED Assessment activities consist of combining ICT-related efforts already undertaken by the USAID/Romania Mission with recent ICT-related information and studies carried out by others, and verifying and expanding the knowledge base by targeted interviews with both public and private organizations/individuals. The template used for this exercise primarily serves as a framework to pull the information together and to assist in the analysis and in communication of the findings. This template focuses on five discrete areas:

- 1) **Pipes**, the telecommunications infrastructure
- 2) **Public Sector**, including policy
- 3) **Private Sector**, including ICT and non-ICT sectors
- 4) **People**, focusing on education
- 5) **Programs**, sponsored by USAID

In addition to relying on this framework, two other ICT-related assessment approaches have been taken into account:

- 1) a recently published readiness assessment covering several countries recently issued by McConnell International¹ (in which Romania was included); and
- 2) a Readiness for the Networked World approach recently put forth by the Information Technology Group (ITG) at the Center for International Development at Harvard University.²

Appendix C reflects additional information regarding both of these Readiness tools, including a preliminary assessment based on the ITG Readiness Guide.

Based on this IED Assessment, the IT Task Force prepared a preliminary set of recommendations for inclusion into this final version. In several areas the obstacles for progress and requirements needed to move Romania forward in key areas are beyond the scope of engagement for the activities represented by the IT Task Force members. However, these have been identified and are discussed in order to present the broad picture as well as to identify existing limitations to progress imposed by these obstacles. Potentially, the IT Task Force can work with the GOR and perhaps other multilateral and/or bilateral agencies in order to generate movement on key issues.

¹ <http://www.mcconnellinternational.com>

² <http://www.readinessguide.org>

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II. Pipes

One of the underlying components increasingly recognized as critical to development is the telecommunications infrastructure. In recent years this has become even more critical as globalization expands and increasingly relies on ICTs as a fundamental component of this global expansion (e.g., E-commerce, E-business).

This section of the IED Assessment examines the in-country telecommunications environment from several perspectives and levels, including:

- 1) brief overview of the telecommunications market in Romania
- 2) products/services provided by RomTelecom, the monopoly provider of basic telephony services in Romania
- 3) mobile services in Romania
- 4) data services in Romania—including local Internet Service Providers (ISPs) and data communication alternatives in Romania
- 5) examination of comparative data sets based on 1998 data from the International Telecommunications Union (ITU)

Summary/Analysis

The telecommunications situation in Romania can be described with three dominant themes: 1) a monopoly provider for basic telecommunication services (RomTelecom) that will remain a monopoly until the end of 2002; 2) a rapidly expanding mobile telephony market currently dominated by two firms (MobilRom and Mobifon) with a third entity just entering the market (CosmoRom); and 3) a relatively open data/Internet environment with a significant number of ISPs operating in the market, multiple options for securing local and international Internet access, but also a currently constricted market due to RomTelecom's practice of charging pulse-rate based local use fees on its local loop.

Overall teledensity in Romania is relatively low (17:100) with a wide disparity between urban and rural areas. Internet access is also relatively low (estimated at between 150,000-300,000 for a population of 23,000,000) due in part to the high costs of PCs (US\$ 600 – US\$ 700) and charges for Internet use relative to the average gross national product (GNP) per capita (approximately US\$ 1,544 for 1998). However there are

Findings

- **RomTelecom has monopoly for basic Telecom through 2002**
- **Low overall teledensity in Romania of 17:100**
- **Wide disparity between urban/rural areas with unserved and underserved rural areas**
- **Competition and rapid growth of mobile wireless (with approximately 2 million subscribers)**
- **Competition in data/networking with some cable being used for high-speed access**
- **Very active ISP sub-sector**
- **Constrained use of Internet due to high pulse-based use fees of local loop (provided by RomTelecom)**
- **Growing number of Cybercafes in urban areas, some, but fewer, in rural areas**

considerable dynamics taking place with regards to upgrading and expanding the basic telecommunications infrastructure, including wireless capabilities, that will provide a solid base for future expansion. With the elimination of the telephone monopoly beginning January 2003, the telecommunications environment will become even more dynamic. As Romania's extremely high literacy rate and high quality of technical/engineering educational facilities equips its citizens to leverage these ICT capabilities, the potential for growth once access becomes more affordable and accessible is significant.

The current pulse-rate based pricing by RomTelecom substantially limits access to the Internet. Where many individuals can perhaps afford the ISP fees (between US\$ 10 – 25 per month), most simply cannot afford the RomTelecom connect fees which can cost 3 to 4 times as much depending on actual use. Technical solutions can be put into place that would eliminate these pulse-rate based fees for data/Internet services, and with the limited number of PCs and Internet accounts in Romania, the expanded use would not reflect a substantial reduction in revenue for RomTelecom. It appears this option has been discussed within RomTelecom and even between RomTelecom and private ISPs, but to date no action has been taken. If the Government of Romania wants to create a social end of an interconnected society, then it can create a regulatory environment that changes the telecommunications infrastructure either by absorbing some of the initial costs or by requiring private communications companies to examine alternate revenue streams. Pressure by the US government and others may well have an impact on moving RomTelecom forward in implementing a solution that would have a direct and immediate impact on substantially increasing Internet usage within Romania. While it may be impossible to quantify all the positive contributions this would have, it is clear it would yield benefits across a wide spectrum of social and economic sectors.

Perhaps one of the most significant issues to be addressed in the *Pipes* arena is ultimately that of expanding access to the rural areas where approximately 45 percent of Romania's people live. At present there are two to three thousand cities and villages where there is not even a single telephone let alone access to the Internet. This limited access is a major urban and rural issue as the need for additional build out and affordable rates are key ingredients to expanding Romania's future links with the emerging global economy.

Romanian Telecommunications Environment

The Romanian telecommunications environment can best be characterized as being at the initial phase of market liberalization, with some level of competition in place for mobile telephony and data services, but with basic telecommunications still provided by a single monopoly provider, RomTelecom. RomTelecom has been privatized in recent years with 35 percent equity owned by Organismos Tilepikoinonion Ellados (OTE)—a move taking place as recently as November 1998. Two mobile telephony firms entered the Romanian market in 1997 (Mobifon and MobilRom)—joining a firm already operating with limited market presence (TeleMobile). RomTelecom is currently entering the mobile market.

With regard to data communications, the market is relatively open with RomTelecom having been prohibited from participating in this market since 1992 as it has 49 percent ownership of the local Global One operations in Romania. There is a relatively free market for

data communications, to include leveraging the existing cable TV networks, establishing a Very Small Aperture Terminal (VSAT), leasing lines from RomTelecom for international linkages, establishing wireless distribution systems, and laying fiber and copper lines.

The following provides a more focused discussion of the major players and current dynamics.

RomTelecom

RomTelecom is the sole provider of wire-based telephony services in Romania. RomTelecom had previously been wholly owned and operated by the Government of Romania as a state-owned monopoly. This shift took place as recently as February of 1999, when RomTelecom was privatized with the selling of a 35 percent equity share to OTE taking effect. OTE paid US\$ 675 million for the acquisition of its 35 percent ownership. While owning just 35 percent, OTE obtained 51 percent voting rights to RomTelecom, and also an option to purchase an additional 15 percent equity—bringing their total equity position to 51 percent. OTE is 65 percent owned by the country of Greece (down from 75 percent in late 1998).

Recently RomTelecom has made commitments to invest US\$ 500 million in 2000 and US\$ 2.7 billion in infrastructure between 1999 and 2003. This investment has been taking place primarily in updating and expanding its backbone infrastructure. As reflected in their 1999 Annual Report, the following were put forth as their 1999 Performance Highlights during their first year of operations:

Main Events

- On 15 January 1999, RomTelecom established CosmoRom, a subsidiary to provide mobile telephony services using the 1,800 MHz frequency band.
- Following the privatization process, on 17 February 1999, a new managerial team was appointed. The team is composed of specialists from OTE, GTE, and RomTelecom having restructuring RomTelecom as their main task.
- On 8 October 1999, RomTelecom and Siemens affiliates from Greece and Romania, and Intracom of Greece signed a US\$ 324.0 million contract for 2.0 million digital lines in five years ending 2004; 1.150 million lines for Intracom and 0.850 million lines for Siemens, out of which 0.550 million lines will be installed in 2000.
- On 5 November 1999, RomTelecom and Alcatel NSR signed a US\$ 122.0 million contract for installing 0.650 million digital lines in five years, ending in 2004, out of which 0.150 million lines will be installed in 2000.

Quality Factors

- 740,000 waiting list in 1999 compared to 920,000 in 1998.
- 3.57 years average waiting time for a main telephone line in 1999 and 3.94 years in 1998.
- 105 average confirmed complaints per 100 main lines per year in 1999 compared to 130 in 1998.

- 49.2 average confirmed faults per 100 main lines per year in 1999 compared to 68.7 in 1998.
- 34.8 hours average for fault clearing in 1999 compared to 47.7 hours in 1998.
- 0.72 seconds – average waiting time for dial tone in 1999 compared to 1.02 seconds in 1998.

Key areas of focus for RomTelecom include reducing the staff from its current 45,000 to a planned 30,000 by the end of 2003; improving the teledensity; lowering the waiting list; improving the quality of service; and introducing new services such as ISDN and voice mail.

In addition to basic telephony services, the RomTelecom Group is a majority shareholder in CosmoRom, a new mobile telephony firm which began operations in mid-2000, and CableVision of Romania, with operations in five cities: Bucharest, Giurgiu, Sf. Gheorghe, Slobozia, and Targoviste. CableVision has 35,000 subscribers and their focus here is primarily to become more active in the data communications market that leverages their fiber networks.

RomTelecom also has minority interests in Global One Communications Romania SA, and TeleMobile. However, it was recently announced that Global One and RomTelecom are canceling their joint venture. With TeleMobile, RomTelecom has reduced their ownership from nearly 80 percent to 3.01 percent, placing its mobile efforts into the new CosmoRom startup. It is also interesting to note that one of the key partners, GTE is also pulling out of its relationship with RomTelecom, an announcement made while this IED Assessment was underway.

<p><u>Statistics as of December 1999</u></p> <ul style="list-style-type: none"> • 4.424 million lines total switching, an increase of 0.347 million compared to 1998.254 million digital lines, an increase of 0.52 million compared to 1998.74 million main telephone lines (subscriber and public phones) of which 0.146 million were connected in 1999.85 million digital main telephone lines (subscribers and public phones) of which 0.381 million were connected in 1999.347 million residential subscribers, of which 0.118 million were connected in 1999.34,841 payphones, of which 31,894 are card operated. 12,854 kilometers of optical fiber were installed. 93.5% of main telephone lines are connected to automatic
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It is clear that RomTelecom's strategy is not simply to expand its basic telephony services in reach, scope (added services), and quality, but also to enter additional markets (e.g., mobile and data/Internet). This is no doubt partly due to the fact that their monopoly on basic telephony services runs only through 31 December 2002—at which time the Romanian market will be opened for competition in basic telephony services.

Mobile Telephony

<p>In just 3 years the two mobile firms have grown their combined subscriber base to over 2.0 million—compared to RomTelecom's current 3.74 million subscriber base for main telephone lines.</p>
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The mobile telecommunications market has been open for entry since 1997. Currently there are four operators providing

mobile telephony in Romania—the two largest ones having entered the market in 1997. These are Mobifon GSM that operates under the name ConnexGSM, and MobilRom GSM which markets under the name, Dialog. The third provider of mobile services is TeleMobile which provides limited services using the 450 MHz frequency band in a few selected cities. CosmoRom, a subsidiary of RomTelecom has just initiated its mobile services with little likely penetration into the market at this time.

The mobile market has exploded in Romania with an estimated 2.0 million subscribers at present—with MobilRom having a slightly higher number of subscribers than Mobifon. This total number of mobile subscribers is approximately 50 percent of the total number of land lines currently being provided by RomTelecom. As of September 2000, both Mobifon and MobilRom were in the process of preparing for their Initial Public Offering (IPO)—with MobilRom’s scheduled to take place at the end of November 2000.³ This is being handled by Morgan Stanley. In preparation for its IPO, Mobifon has become part of the U.S. based ClearWave holding company of Fort Collins, Colorado. This push to secure additional capital is most likely an effort to gain funds to expand their build out as well as to position themselves to better compete with the new CosmoRom entrant from RomTelecom.

Data/Internet Services

The situation in Romania, with regards to the Internet, is considerably different than in many transitioning and developing countries. The data/Internet market is not only open for competition, but the incumbent has been prevented from participating in this market—and only able to do so through a joint venture with Global One. This has allowed for the use of cable, VSATs, private networks, leased lines, etc. to be established and used to provide bandwidth to the customers.

There is one area, however, where RomTelecom, the current monopoly provider, maintains the commanding position that severely limits Internet use within Romania: distribution. While RomTelecom does have price differentiation based on time of day, the current pricing scheme is such that local calls rely on a pulse-based approach where actual use is on a per-minute basis. This virtually eliminates household use by the average Romanian due to high connect costs. RomTelecom has discussed and even established some plans for establishing a pool of numbers for use by ISPs that are not metered, yet to date this has been more discussion than reality. The high costs limit Romania’s ability to expand Internet usage and links with the global environment.

Internet Service Providers—At present it is estimated that there are as many as 150 ISPs within Romania, but only 10 or so with a substantial enough customer base to be sustainable in the longer term. There is

³ *MobilRom sets the tone for IPO.* Bucharest

Internet in Romania

The Internet environment in Romania, unlike basic telephony services, is open for competition with a large number of ISPs participating in the market.

- **There are an estimated 150 ISPs operating in Romania**
- **Current estimates of the number of Internet subscribers is placed between 60-70 thousand—with the number of users likely 3-4 times this amount**
- **While most access to the Internet is via dial-up, access is also achieved via leased lines, wireless, and cable TV**
- **A number of the larger ISPs have established their own international Internet access via VSATs, purchasing access from an international provider, or via fiber to a neighboring country**

considerable consolidation taking place among the smaller ISPs and with larger ISPs buying smaller companies. Part of this consolidation is due to the fact that the base of Internet subscribers, while growing, is such that the potential profits for providing Internet services is being realized mostly by RomTelecom—because of the high costs for local loop dial-up. Obtaining financing to expand their businesses continues to be a major obstacle, and is one of the reasons for the consolidation that is taking place.

The area of most concern to the ISPs at present is the lack of the legislation needed to support shifting to E-commerce. Most ISPs consider this the most promising source of future revenue—the value-added services that come from developing and supporting content on the Internet (not providing access). This expansion is linked closely with the ability to move into buying and selling of goods and services over the Internet—an activity not currently possible (see Section III of this report for an assessment of this issue).

Collectively the ISPs estimate that there are approximately 60-70 thousand Internet accounts in Romania, and around 10 thousand registered domains (with a much smaller number actually in use). They also estimate that only 2.7 percent of businesses have PCs and around 1.0 percent of households have PCs.

One of the current dynamics taking place within the ISP community is the linking of ISPs via a common backbone in an effort to share costs. This approach is being used to not only link the ISPs, but also to support major customers such as banks, business, and even the U.S. Embassy located in Bucharest.

Internet Access Options—While basic telephony services within Romania are only provided by RomTelecom, access to data/Internet services are very open (with the exception of the reliance on the local loop provided by RomTelecom), and options are increasingly becoming available. These options include:

- RomTelecom, where a leased line can be used to secure the physical access, but access to the Internet is obtained from Global One or some other Internet access provider.
- Access via cable TV companies. At present it is estimated that cable TV is available in approximately 3.0 million homes in Romania. This plant is being upgraded by several operators (there are approximately 70 cable TV operators in Romania) such that it can provide two-way Internet services. The significant advantage here is that there is no pulse-based pricing on actual use, and the system provides high-speed access. In addition, the upgraded cable TV plant can be used to establish high-speed links between ISPs and businesses, etc. Increasingly some of the cable TV operators are laying fiber optics and looking to enter this market (including CableVision, in which RomTelecom has a 95.67 ownership share).
- Services from the National Radiocommunications Company.
- In some instances, firms have laid their own fiber/copper to/from their facilities. This can be used to actually bring in data/Internet access from a neighboring country as is being done by at least one ISP who acquires connectivity from Hungary.

- Several operators have put in VSATs to secure international data/Internet access in order to meet their own needs and to resell to other ISPs and larger business accounts. The Government of Romania appears reasonably liberal in licensing VSATs in order to secure international data/Internet access.
- Local wireless/microwave can be used to establish connectivity. Apparently there some locations that are relying on the IEEE 802.11b standard which is essentially wireless Ethernet capable of connecting 11 Mbps networks and at lower speeds, up to 25-35 km distance.

Cyber Cafes/Community Information Centers—One of the obvious solutions for accommodating the relatively high price of buying a PC (US\$ 600 to US\$ 700), and the high cost of Internet access (due to pulse-based pricing by RomTelecom), is the use of shared-access facilities such as Cyber Cafes and Community Information Centers (CICs). These are already beginning to appear in urban areas with pricing being between US\$ 0.50 and US\$ 1.00 per hour. These facilities vary considerably as to the number of PCs available and the quality of the Internet line, but as a rule the speeds are considerably faster than dial-up and are much less expensive to use. Several of these were visited and used as part of this IED Assessment, and in most cases the usage was very high, but the quality of the Internet connection varied from day to day.

Clearly shared access Internet facilities will be the most promising way to support the expansion of Internet access in both urban and rural settings for the foreseeable future. In rural settings this will also likely need to include access to telephony services since the teledensity of the rural areas is so low and costly to build out. Ideally these could be set up such that they are community-based and used to deliver a range of ICT-provided services to those living in the local community. For such an effort to have a broad-based impact on Romania, a concerted effort would need to be undertaken in lieu of the small one-off type of Cyber Cafes that are currently being implemented in urban areas. Ideas for such efforts are reflected in a recent study undertaken by the National Telephone Cooperative Association (NTCA).⁴

ITU Telecommunications Information

Each year the ITU publishes a World Telecommunications Development Report.⁵ Its most recent report issued on 10 October 1999, included an expanded set of data that for the first time included data on mobile cellular. In addition, it reflects indicators of basic and international telecommunications, television, and Internet usage. While during the course of this Assessment there was reason to suspect the accuracy of this data, it must be recognized that the information is based on 1998 data. In the rapidly changing telecommunications environment (e.g., growth in some subsectors can be in excess of 100% CAGR [Compound Annual Growth Rate]), current data may be significantly different than what is reflected in this report.

⁴ **Role of the Private Sector in Sustainability of Community Information Centers.** National Telephone Cooperative Association. June 2000

⁵ World Telecommunications Development Report—1999. Mobile and World Telecommunications Indicators. ITU. Geneva, Switzerland. 10 October 1999.

The ITU data is based on the stated 1998 population for Romania of 22,470,000. As defined in the ITU report, Romania is considered a “Low-Medium Income” country; Low-Medium Income is defined as those countries with a Gross National Product (GNP) per capita as being between US\$ 786 and US\$ 3,125. The ITU reflects the annual per capita GDP for Romania at US\$ 1,544. It should be noted that ITU obtains this data either from the IMF or the World Bank and that some growth has taken place since 1998.

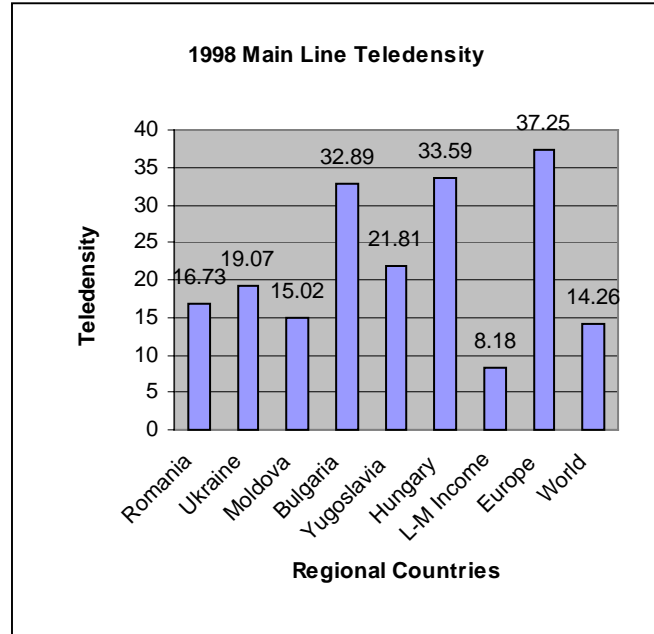
A series of tables with data extracted from the ITU report is reflected as Appendix C. For this analysis, Romania data was compared to that of neighboring countries (Ukraine, Moldova, Bulgaria, Yugoslavia, and Hungary), as well as those countries with which it has a historical and/or current economic tie (Italy, Germany, France, Turkey, and Russia). In addition, average data is reflected for Low-Medium Income countries as well as Europe, the U.S., and the world. This comparative data is included to provide a regional, income-based, and global comparison of the situation in Romania.

The following provides key summary observations resulting from reviewing and analyzing these sets of data. For actual data from which this was prepared, refer to Appendix D.

Basic Telephony Infrastructure

The telephone infrastructure in Romania compares very close to the average for Lower-Middle Income countries (with regards to income and teledensity and growth).

- Its teledensity of 16.73, while higher than the average for Lower-Middle Income countries, is lower than that of its neighboring countries with the exception of Moldova—a Low Income country.
- The 16.73 teledensity represents a total number of land lines of 3.8 million—which places telephones in 46.8 percent of the households in Romania.
- With regard to faults/100 lines the infrastructure in Romania appears nearly twice as high as the average.
- While the ITU data does not reflect an urban/rural mix for Romania, other sources have indicated that the rural teledensity is on the order of around 3 per 100, with between 2,000 to 3,000 rural communities without any telephone service at all.⁶
- This urban/rural disparity is significant when compared to other countries in the region, but especially when one takes into account that approximately 45 percent of the Romanian population lives outside of the large urban centers.
- Discussion with RomTelecom indicates a renewed focus on improving access to the rural areas and recently they have announced a goal of reaching a teledensity of 23.2 by the year 2003.⁷



Waiting List

The waiting list for telephone lines in Romania is higher than the average for Lower-Middle Income countries as well as its neighboring countries.

- As of 1998, 74.4 percent of the demand is satisfied.
- In addition, whereas there is an overall trend of neighboring countries in lowering this waiting list, in Romania it has grown between 1995 and 1998 such that in 1998 the waiting time is placed at 4 years—compared to 1 year for the Lower-Middle Income countries reflected in the ITU report.

⁶ Daniel Jianu. *Information Technology Landscape in Romania*. MOGIT/American University. December 1999. <http://www.american.edu/carmel/dj2877a/page2.html>.

⁷ *RomTelecom Charts Expansion Course*. The Business Review. 18-24 September 2000. Page 1.

- Discussions with RomTelecom indicate that the current wait time is currently 3 ½ years, and that this represents 500,000 lines. However, they also acknowledge that these numbers are soft as frequently when capacity is brought on-line by their expansion efforts, the demand does not materialize.

Basic Telephone Tariffs

The ITU data reflects that as of 1998 the connection costs and monthly subscriptions for residential customers were considerably under the average for Lower-Middle Income countries by a considerable amount. This is also the case for business customers though less significantly. While business connection costs are lower than in neighboring countries, the monthly subscription fees are typically higher.

The percent of GDP per capita is 1.2 percent in Romania compared to an average of Lower-Middle Income countries of 3.8 percent. This suggests the potential that the then-current (1998) rate structure may have been set too low relative to covering costs, and especially if the upgrading and expansion of the telephone system is being financed out of revenues. However, there have been tariff adjustments since 1998 that may well have brought this more into parity with the average and neighboring countries.

Cellular – Subscribers and Tariffs

The 1998 data from the ITU reflects the initial two years from the introduction of mobile telephony in Romania.

- Two major GSM mobile operators (Mobifon marketing under the name ConnexGSM and MobilRom marketing under the name Dialog) began operations in 1997, with the 1995-1998 data showing rapid expansion in the mobile market.
- In 1998 the mobile market comprised 14.5 percent of the total telecommunications market in Romania which is a significant percentage considering the short time that this has been available. This is likely due in part to the 4-year backlog for landlines, by nature of wireless the build out can be rapid, and the fact that there are a growing number of transnational companies operating in Romania where the international GSM roaming capabilities offers an important value-added capability.
- Current data places the number of mobile licenses at nearly 2.0 million—shared nearly equally between the two large operators. This continued growth from the 1998 ITU data reflects an even greater percent of Romania’s telephony being satisfied via wireless mobile technologies.
- In late 1999 RomTelecom announced entry into this mobile market under the name CosmoRom, the introduction of the service likely to take place in mid-2000.

International Traffic

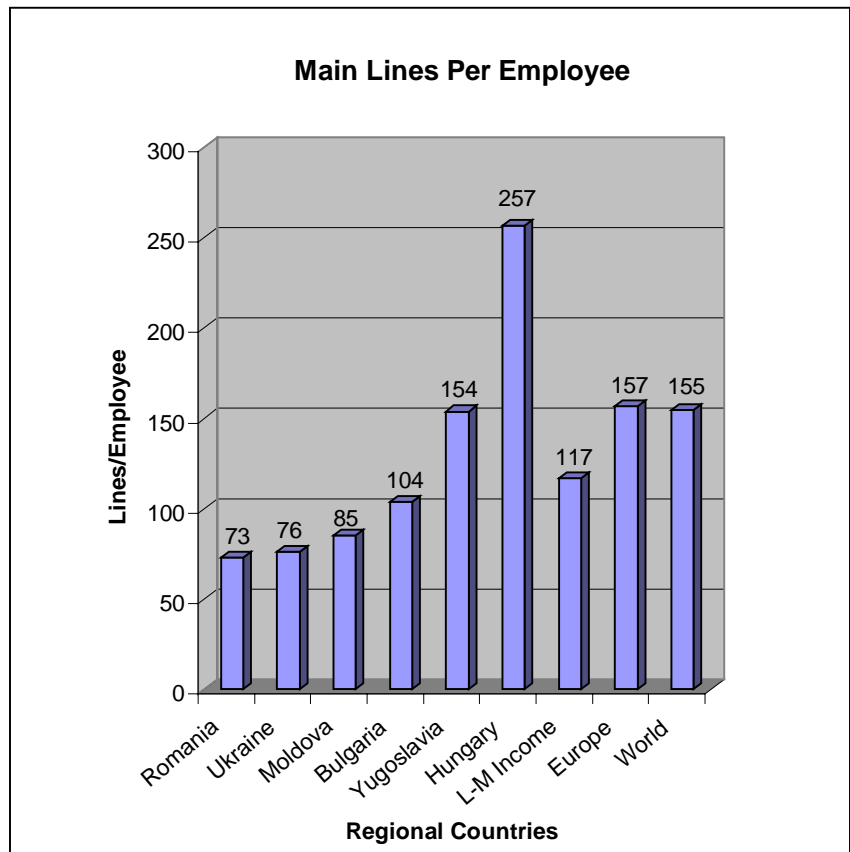
Between 1995 and 1998, the ITU data shows a significant growth rate in Romania’s international telephone traffic (on a percent CAGR basis)—over twice the average for Lower-Middle Income countries. This growth is also considerably higher than its neighboring countries and even higher than the European countries—same as the United States. However, this

expansion needs to be tempered by the fact that the base is relatively low when compared to neighboring countries and when viewed from a minutes per subscriber basis (29.4 minutes compared to an average for Lower-Middle Income countries average of 38.3 minutes).

Telecommunications Staff

Between 1995 and 1998, the ITU data reflects a lowering of telecommunications staff by a CAGR of -1.9 percent.

- Discussions with RomTelecom reflect they presently have around 45,000 employees (compared to 51,700 reflected in the ITU data for 1998).
- On average RomTelecom is reducing its workforce by approximately 4,000 per year and doing such in a way that does not create employee hardship.
- However, in spite of this continuing reduction, the income per employee for RomTelecom is considerably lower than that of its neighboring countries and the average for Lower-Middle Income countries.
- Assuming the current trend continues, this situation will steadily improve over the years, but has a long way to go.
- Current efforts by RomTelecom to enter the cellular and data transport markets are being done via new companies such that current labor/employment restrictions do not impede making the necessary changes needed to compete in a fast-moving and dynamic marketplace.



Telecommunications Revenue and Investments

Revenues viewed from both a per main line and per employee basis, are well below the average for Lower-Middle Income countries, but within the range of its neighboring countries. This may well account for a potential low rationale for rapidly expanding the current number of

lines. It may also be a function of the relatively high fault rate of the current telephony system with dropped calls, etc.

The low revenue per employee figures simply reflect that RomTelecom has too many employees—a situation under correction. The numbers for investments are also blower than the average for Lower-Middle Income countries on both a per line and percent revenue basis. This would indicate that expansion is being funded largely out of current revenues with forecasts of further revenue growth which actually may not be supported by the low per line revenue data.

Information Technology – Internet and PCs

Two key numbers with respect to ICTs appear on the ITU Statistics table (Appendix D):

- 1) Number of Internet Users: 150,000, and
- 2) Number of PCs: 230,000.

This is typically a high-growth sector and these figures are based on 1998 data, however, estimates obtained as part of this Assessment reflect that the current number of Internet users are roughly the same. The number of PCs range from 250,000 to 700,000, with less than 200,000 located in residences and the rest in businesses and the government. The number of Internet hosts and hosts per 10,000 are extremely high; as a rule these numbers are soft due the practice of registering names but not putting these into service. Clearly the number of Internet users and the number of PCs are primarily restricted due to costs—costs of pulse-based pricing on Internet access and the cost of PCs relative to the average GDP level in Romania.

Network Growth

There is no ITU data for Romania with regards to growth in new telephone lines, new mobile subscribers, and new Internet hosts between 1997 and 1998, however some general impressions about more recent growth has been obtained that indicates network expansion in recent years.

Telephone Lines—RomTelecom is under obligation to expand its service to rural areas and is undertaking an expansion program. However, its primary investments to date have been in upgrading its infrastructure, including laying optical fiber and installing new digital switching. These are essential core components that are prerequisites to expanding distribution. Discussions with RomTelecom indicate that they are expanding at a rate of approximately 450,000 lines/year, with two thirds being new lines and one third being replacement lines.

Mobile Subscribers—Nearly all of the mobile telephone expansion has taken place between 1997 and 1998 as the current operators did not enter the market until 1997. Growth since 1998 has been significant as reflected earlier.

Internet Hosts—As the popularity of the Internet has grown, there was also rapid growth of Internet hosts in the 1995-1998 numbers. Due to the relatively high cost of pulse-based telephony pricing, and the alternative Internet access via this cable infrastructure, the importance

of the number of cable TV subscribers in Romania could be critical to expanding Internet. In 1998 the number is placed at 2.680 million.

Year 2000 Projections – Main Lines and Cellular

The ITU reflects projected growth for the period of 1998 (for which they report hard data) to the year 2000, for landlines and cellular. With regards to land lines, discussions with RomTelecom indicate that the actual growth rate is in line with these projections. Their own Annual Report for 1999 reflects 3.74 million main lines and 1.85 million digital main lines in place at the end of 1999 (total of 5.59 million). Expansion during 1999 was reported as being 0.146 million main lines and 0.381 million for digital main lines (growth totaling 0.527 million). These figures would reflect a higher-than-actual teledensity as they must take into account a replacement factor for new lines (amounting to one third of new installs). The ITU projections of 4.992 million for the year 2000 seem reasonable.

The rapid growth rate of mobile in the last couple years has already surpassed the ITU estimates for the year 2000—with the current on-the-ground estimate being approximately 2.0 million subscribers in Romania, with RomTelecom, via its CosmoRom subsidiary just now entering the local market.

Romania: IED Assessment

III. Public Sector

A second critical component included in this IED Assessment was that of the GOR's position relative to ICTs. Specifically this focused on two key areas:

- 1) the GOR's policy and legal framework on the areas that directly and indirectly impact the expanded use of ICTs within Romania (specifically with regards to telecommunications and e-commerce); and
- 2) the GOR's actual use of ICTs to automate and streamline key Ministries and functions/activities that they carry out.

Summary/Analysis

The Government of Romania has apparently had some level of understanding that ICTs are important for several years as it has created a variety of national plans, policy documents, strategies, established commissions, etc. However, it appears that these efforts have had only marginal value in creating a consistent government-led vision that attempts to leverage the contributions of the ICT sector within Romania. While the GOR has taken steps to liberalize the local telecommunications sector, it retains 65 percent ownership of RomTelecom and has granted them a monopoly license until 1 January 2003. Other parts of the telecommunications sector such as mobile wireless and data/Internet have been liberalized such that competition is taking place within the marketplace. The resultant rapid expansion and competitive pricing in these areas are tempered by continued slower build out and higher pricing than would be realized if competition took place for basic telephony services. The current situation is especially critical with regards to slowing Internet use within Romania.

Findings

- **History of national ICT-related plans but not translated into sustainable actions**
- **Weak and confusing GOR telecommunications regulatory and management institutions**
- **Little progress to date in GOR attempts at E-commerce and E-business legislation**
- **High tax rate impedes investments and growth of ICT sector (with other businesses)**
- **Limited success to date with attempts at high-tech parks**
- **Reasonable adoption of ICTs in GOR**
- **Need for ICT awareness and management training**

In recent years attempts have been made to develop legislation that would also address a number of e-commerce and e-business related issues in an effort to free up carrying out commercial transactions. These include electronic signature, illegal and harmful content, consumer protection, fraud, and privacy. However, the draft legislation appears to lack broad support and therefore is not passed through Parliament and put into practice. The result is slower realization of the potential benefits brought about by Romania entering into the increasingly digital global economy.

Interestingly, the public sector has been especially successful in building a high quality education system that graduates world-class high-tech students. This is successful to the point that ICT-related businesses from other

countries have recognized the valuable human resources graduating from these public Polytechnic Universities and hire many of them into jobs located outside of the country. Yet the GOR has not seen the value in providing tax/investment incentives that would leverage this ICT investment in people (e.g., education) such that the country would gain economically by building/strengthening the local ICT business sector. It is a lost opportunity for a country that has much to offer and needs the contribution of all its citizens.

Throughout the GOR, various ministries are beginning to leverage ICTs and move onto the Internet via posting various information for access by its citizens and those outside the country. This does not appear to be any priority or coordinated effort, but based on individual initiatives.

Public Policy

The following provides a brief synopsis of public policies that have an impact on the use and expansion of ICTs within Romania.

Telecommunications

Since 1989 Romanian telecommunications and post systems have been restructured. In 1991, the operational functions of the unitary telecommunications system were separated. RomTelecom was set up as autonomous. The main activities of RomTelecom include the administration, development, and operation of the telephone-telegraph services for domestic and foreign end-users, meeting the requirements of the public, social, and defense interests. RomTelecom includes 41 telecommunication departments, organized according to the administrative-territorial structure of Romania. In 1998 the regime was privatized through foreign investment.

The strategy of telecommunications development was drawn up as a priority field of the country's macroeconomic infrastructure. Based on the survey undertaken by the consultancy company Dofrecom France, a long-term development program with strategic objectives was devised to include: the use of top world technology; expansion and improvement of the quality of services. Part of the program has already been accomplished through the commissioning of local and international digital transit telephone exchanges. These have been built over 10,000 kilometers of main communication lines through optic fiber cables.

Regarding international telephone connections, the actions taken in 1993 led to the extension of direct telephone connections with 38 countries. Digital lines were developed in cooperation with the USA and Canada. In 1993 Home Country Direct Services were established providing any telephone set with automatic access to international exchanges. The first partners with which this convention was concluded were AT&T and Sprint International from USA, and Telecom from Canada.

In 1997 GSM system mobile telephony, in the 900 MHz band, came to cover the whole country. The best known private companies boasting national coverage are the Romanian Canadian Mobifon, which supplies Connex GSM services, and the Romanian French MobilRom,

which supplies dialog GSM services. Two mobile phone licenses for the 1,800 MHz band have also been granted as of 1999.

Romania Telecom Networks Services is a joint stock company licensed to exploit the public network of data transmissions through Rompac packages shift. The company is licensed by the Ministry of Communications to supply E-mail and Electronic Data Interchange (EDI) services. The main activity of the company is the development, exploitation, and marketing of the public network of data transmissions. Rompac is part of France Telecom Transpac Europe network.

At the present time, the Romanian Post is a regie autonom, part of the communications system. Its major function is the administration, development and marketing of post services in the public field, and cooperation with similar institutions abroad. The Romanian Post espouses the outlook of the European Commission regarding the new unitary market of post services in the Green Book. This implies the practice of the same tariff in the whole community and granting of the same categories of services.

Intellectual Property Rights

Romania is a signatory of international conventions concerning intellectual property rights and has enacted domestic legislation that protects these rights. The European Association Agreement also includes specific provisions, which reaffirm the country's commitment to internationally agreed rules in this field.

Romania has also concluded a number of bilateral conventions designed to protect industrial property. Signatory countries include Belgium, Great Britain, Italy, and United States. The State Office for the Protection of Inventions and Marks (OSIM) reviews patent and trademark applications, issues patents, and registers trademarks.

Trademarks

Since 1920 Romania has adhered to the 1883 Paris Convention for the Protection of Intellectual Property; joined the 1894 Madrid Agreement relating to the International Registration of Trademarks; and complied de facto with classifications adopted by Nice and Vienna Agreements ratified at the beginning of 1999. The current trademark legislation provides for a level of protection similar to the international one with respect to the basic aspects of the procedures regarding the granting of trademarks and the protection of the exclusive right of use.

Certain trademark registration conditions are expressly set out by the law. In order to have the rights ensured against third parties, the natural or legal person shall file an application drawn up in Romania. The application for trademark registration is examined by OSIM with regard to the form and contents as set out by the law. Following ascertaining the fulfillment of such conditions, and if there are no objections filed within the legal term, the trademark will be registered with OSIM. The applicant will be issued a registration certificate.

According to the provisions in force, trademark registrations are valid for 10 years from date of application, and renewable for similar periods. The first applicant is entitled to registration. The period for contesting a trademark is 3 months.

The trademark registration gives its holder the exclusive right over such trademark for the registered products and services. The holder of the trademark may request the competent court to forbid third party use of such trademark in their business activity without its consent. In the event of non-compliance, the holder has the right to request compensation for damages.

Patents

As a party of the 1883 Paris Convention for the Protection of Industrial Property, Romania has subscribed to all of its amendments. Foreign inventors are therefore entitled to the same treatment as Romanian citizens.

Patent law, Law No. 64/1991 modified by Law No. 146/1997 and Law No. 255/1998, was adopted to broaden and clarify the basis on which a patent is granted. The patent validity period has been extended to 20 years. Accessory patents are valid for the period of the original patent, but for no less than 10 years.

In order to benefit from the rights provided by the law with respect to an invention, a patent certificate issued by OSIM is necessary. The patent application will be filed with OSIM or by an authorized representative with headquarters or residence in Romania. OSIM's decision regarding a patent may be challenged within 3 months from notification by any interested party.

Copyright

Romania is a member of the Bern Convention on Copyrights. The copyright law has been in force since 1956, with periodic amendments to royalty regulations. After 1990, an improved copyright law (Law No. 8/1996 modified by Law No. 146/1997) was enacted, which covers direct and indirect rights related to a larger range of creative works.

According to the law, the object of copyright includes the original works of intellectual creation in the literary, artistic, or scientific field, regardless of the creation methods or form of expression. Romanian law establishes the conditions for acknowledging and granting the copyright of a literary, artistic, or scientific work, as well as any other works concerning intellectual creation. Copyright is assigned to the author and involves moral and patrimonial rights.

The law provides that copyright protection begins from the moment the work is created and lasts as long as the author lives. Generally, upon the author's death, the right to his works passes to his heirs for an additional period of 70 years. The lifetime of software protection guarantee is 50 years after the death of the last co-author. Works of art are granted protection for a period of 25 years after the creation of the work.

The copyright holder may entirely or partially transfer its rights with the conditions of stipulating in such agreement the patrimonial rights, which are conveyed, the exploitation way, duration and extension of such transfer, and the revenues to be received. The author's moral rights cannot be transferred.

By Government Decision No. 60/1997 the Romanian Copyright Office has been established, the sole authority in Romania empowered to supervise and control the application of the copyright legislation.

Industrial Models and Drawings

The protection of industrial models and drawings in Romania is regulated by the Law No. 129/1992.

The new aspect of a product can be registered as an industrial drawing or model providing that it has utility function and meets the following conditions:

- It has not been made public in Romania or abroad for the same class of products.
- The object to which the drawing or model applies may be duplicated whenever deemed necessary.

Industrial drawings or models which destination or aspect are contrary to public order or good morals are not granted any protection. In order to have these rights ensured against third parties, the author will file an application with OSIM, personally or through a Romanian representative. The industrial drawing or model registration certificate entitles its holder to prohibit any third party from the unauthorized duplication, manufacture, marketing, use, or import of a product incorporating the industrial drawing or model.

The decisions regarding the application for an industrial drawing or model registration may be challenged within 3 months from their notification and are to be examined by the Re-examination Commission within the OSIM.

Integrated Circuit Designs

The Law No. 16/1995 modified by Government Ordinance No. 41/1998 protects the original designs, which are the results of their creators' intellectual effort.

The application for integrated circuit designs protection will be examined by OSIM, which will register the design in the National Register of Designs. At the same time, OSIM will publish the registration and will release a design registration certificate to the entitled person, within 3 months from the official date of the application. The validity term of a design is 10 years from the official date of design registration.

Legal Framework

- Patent Law No. 64/1991.
- Law No. 133/1994 regarding the ratification of TRIPS Agreement.
- Law No. 84/1998 on trademarks and geographical indications.
- Law No. 8/1996 regarding copyrights and related rights.
- Government Decision No. 60/1997 regarding the establishment of the Romanian Copyright Office.
- Law No. 129/1992 regarding the protection of industrial models and drawings.
- Law No. 16/1995 on the protection of integrated circuit designs.
- Law No. 255/1998 on the protection of various types of plants.
- Government Ordinance No. 41/1998 on taxes in the field of intellectual property protection and their use.

A significant number of GOR Ministries are considerably aware of the development of e-commerce related legislation. Issues regarding privacy and digital signature have all surfaced and draft legislation has been prepared to address the issues. Despite several attempts, however, these have not been able to get past Parliament. At this point it is not likely that privacy and digital signature issues will get immediate attention. However the U.S. could possibly play a supporting role to get legislation prepared and passed through building awareness/education on the part of key GOR officials and legislators.

ICT Use in the GOR

As part of this IED Assessment, discussions were held with several key Ministries within the Government of Romania. These included the Ministry of Finance, the Prime Minister's office, the Ministry of Industry and Commerce, the Polytechnic Institute of Bucharest, the Ministry of Education, the National Agency for Regional Development, the National Agency for Employment and Vocational Training, the National Bank of Romania, the National Agency of Communications and Informatics, the General Department of Customs, and the National Institute for Research and Development in Informatics. While these interviews did not result in a comprehensive understanding of their use of ICTs, the following provides some reflection of the Government of Romania's current use of ICT.

In summary, there is an increasing reliance on ICTs for internal use within a growing number of GOR Ministries. This use includes not only office automation, but in some cases the establishment of sophisticated databases for collecting, analyzing, and reporting. In addition, a growing number of Ministries and Agencies are beginning to place information on the Internet—recognizing that the actual access is somewhat limited by those living within Romania. While clearly there is a direction being set for the telecommunications sector within Romania (primarily by the National Agency of Communications and Informatics), there is no evidence that there is a

strategic plan for ICT within the government itself. In addition, it is equally clear that there is a real lack of ICT-related training taking place within the GOR Ministries, especially with respect to training mid-level and higher-ranking managers on the benefits of ICTs for operating efficiencies and effectiveness.

The following provides a quick overview on selected applications of ICTs by various ministries:

Ministry of Finance—The Ministry of Finance (MOF) has been actively engaged in the reliance on ICTs since the early 1990s, with the income tax system being the largest application of technology. This was developed in-house and relies on Oracle DBMS. In 1997-1998 a large investment in infrastructure was made that resulted in procurement of a number of servers, PCs, networking, as well as provision of training, and technical assistance. The automation under this project automated MOF in 350 locations around Romania. Presently 450 locations around Romania are linked via telecommunications for at least E-mail, but typically also for more sophisticated applications such as income taxes.

Other functions automated within the MOF is customs which relies on the Automated System for Customs Data (ASYCUDA). This system has been developed in cooperation with UNCTAD and is used in approximately 70 countries.

The MOF relies heavily on Lotus Notes/Domino for many of its automation needs, including document management. An effort is currently underway to upgrade the telecommunications infrastructure between its locations with Asynchronous Transport Mode (ATM) which will deliver at 2 Mbps speed.

The MOF has a history of IT training—primarily end-user as well as for special software applications (e.g., new income tax system). Most of this training is accomplished by outside ICT firms engaged in the software acquisition/development.

The MOF is very supportive of expanding the use of automation for e-commerce/e-business through pilots. They acknowledge the current lack of legislation to address key issues. They are working with a key senator and the Ministry of Industry and Commerce to introduce legislation to address the electronic signature issue (including setting up a certification authority), as well as establishing a technology park to support the ICT sector. While they have supported the President's "e-Romania" initiative, this needs additional support before it will be successful.

While the MOF is not currently supporting e-business, it has a considerable amount of data being collected and processed by its internal systems; an increasing amount of

The MOF sees the following as critical for growth of the ICT sector in Romania:

- A nationwide strategy and action plan;
- Legislation addressing key e-business issues;
- Lowering of telecommunications costs;
- Lowering of taxes on ICT firms;
- Improve investment environment for ICT firms; and
- Improved salary for government workers needing to support the GOR pieces of e-business

which is being placed on the Internet for broad access. Their Web site is <http://www.ctif.mfinante.ro>.

Ministry of Industry and Commerce—The Ministry of Industry and Commerce is a key player with respect to advancing the area of ICTs—especially with regards to e-commerce/e-business. The Ministry has established an Institute of Management and Informatics with several large projects having been completed. These include the development of a USAID-supported privatization registry and a national finance brokerage system that seeks to resolve unpaid bills by canceling debts based on linking up firms engaged in the supply/value chain. This system alone will have resolved approximately US\$ 1 billion in unpaid bills by the end of 2000. The system is browser-based and relies on Oracle and Compaq Alpha systems.

Areas where the Ministry of Industry and Commerce has concerns or sees opportunities for making progress are as follows:

- Legislative framework to enable e-business in Romania
- Improve existing databases and expand the availability of information on the Internet;
- Improve business to business cooperation—specifically between the U.S. and Romania in the high-tech arena for increasing sourcing and exports from Romania;
- Extend Internet access to smaller cities
- Establish an IED/Romania Task Force to pull together USAID, the ANCI, donors, the private sector associations, etc., to address these integrated issues collectively;
- Work with the software associations to develop a Web site to promote their sector globally;
- Establish a Government of Romania Web site through which Romanian citizens and off-shore businesses and individuals can access key information, and carry out transactions such as applying for and obtaining licenses, obtaining assistance and consulting, carrying out discussions/debates on legal initiatives, exploring business opportunities, obtaining economic data, and carrying out e-procurement; and
- A technology park, not only for software but hardware as well, is needed and is an area of significant benefit to Romania.

National Agency for Regional Development (NARD)—The NARD is a new government body, legislatively established in 1998 and put into place in 1999. The Agency absorbs the previous Romanian Development Agency and the National Agency for Small and Medium Enterprises. Staffing for NARD started with 60 people and at present is comprised of 200 employees. Its presentation here is pertains to its role in the development of Romania with regards to leveraging ICTs.

The Agency has five themes:

- Regional Development
- Defavorized Areas (areas in decline)
- Privatization and Post-Privatization (State Ownership Fund)
- Promotion and Foreign Investment
- National Policy for Small and Medium Size Enterprises

The NARD patterns its activities after the EU model, and in fact was established in part to manage EU development funds, which is the primary source of its funding. In addition to EU funds, the Government of Romania provides 25 percent of the Agency's funding. Current funding from the National Fund for Development amounts to 25 million Euros.

**The six targeted areas
for attention by the NARD are:**

- **Infrastructure;**
- **Human Resource Development;**
- **Small and Medium sized Enterprises;**
- **Tourism;**
- **Local private sector development; and**
- **Technology Transfer**

At this time the NARD is not undertaking any Technology Transfer activities, instead they are relying on the public sector and the National Agency for Science and Technology for activities in this arena. However, the Agency is working on the recently passed law on industrial parks. Their effort is on establishing "norms" by which the actual implementation of the legislation will be carried out. This document will establish the

how, where, and when of the implementation and is scheduled to be finalized during the later part of September/early October.

Discussions with NARD indicated the following areas of current and possible engagement/activity:

- Expansion of the NARD Web site (<http://www.anrd.ro>);
- Close coordination with the World Bank's Gateway project;
- Create a capacity to receive and manage funds from the EU;
- Development of an Intranet to link regional offices and development of regional Web sites for local information;
- Improvement of production.

The current plan for NARD is posted on their Internet Web site. This plan will be updated in May 2001 and every year thereafter.

National Agency for Employment and Vocational Training—The National Agency for Employment and Vocational Training is one of two current, and one soon-to-be-established, social protection agencies. The other current Agency is the National House of Pensions, and the one to be established in the near term is the National House for Social Assistance (e.g., welfare).

The National Agency for Employment and Vocational Training is currently undergoing a major effort to place ICTs in each of their 261 locations; 41 of which are in the country capital cities. These centers will be linked by a network and used not only to support their internal work processes, but also to extend the delivery of, and access to, information and services via direct access to their clients. This will be via a small number of PCs located at each of their offices for free access to those seeking training, job opportunities, etc. Vocational training is offered by the Agency at 6 different locations around Romania for long-term vocational training, but for shorter term training, this is done at each of the centers.

The immediate need surfacing here is that of establishing a training center for the Agency personnel. While the hardware/software is being, along with some initial training on basic word processing and the systems being built to support the Agency's activities provided (by the World Bank and National Agency for Rural Development), the need for ongoing training in ICTs has not been addressed. The notion of a central facility with 12 to 15 PC local area networks (LANs) to support such a capacity to meet their own needs, and possibly those of their sister social protection agencies, appears to warrant some additional examination. The potential linkage between public access being afforded their clients, and the element of rural access centers may also be an area to examine should USAID decide to pursue such a pilot activity.

National Agency of Communications and Informatics (ANCI)—The ANCI is an independent Agency that is primarily responsible for overseeing the Romanian's national direction/strategy for ICTs. It is currently responsible for overseeing most of the telecommunications-related activities, though it shares this with other agencies such as the Inspectorate for Communications, etc. The ANCI has been responsible for developing a "Strategical Orientations" framework for guiding future direction concerning the ICT development in Romania. A complete reproduction of the materials provided during our discussion with ANCI is reflected as Appendix E.

It is clear in discussions with ANCI that they are in a state of transition, and while the World Bank has provided some financial support in the form of a US\$ 30 million loan, there is an opportunity for the USG to provide valuable and potentially critical support during these next few years—when the telecommunications environment within Romania is further liberalized.

**ANCI "Strategical Orientations"
Framework Objectives:**

- 1. The Restructuring and Institutional reform—to be made by the separation of the activities connected to elaboration of the policies and strategies in the IT sector, from the activity making the control in the same field;**
- 2. The reduction of the differences between Romania and the developed countries from the European Union and the whole world;**
- 3. Development of applications and services based on convergence of the IT&C into a single media;**
- 4. Human resources improvements; and**
- 5. Development of the national IT&C industry.**

National Institute for Research and Development in Informatics (ICI)—The Central Institute for Informatics was established in 1970 in an effort to assume the role of an advanced research center in the IT field. In operations for 30 years, the center has been active in

undertaking advanced research and development and innovation in the Applied Informatics field.⁸ The areas of expertise that have developed over the years includes the following: knowledge engineering; computational linguistics; database systems; computer networking; software engineering; quality assurance for IT; business process reengineering; decision support systems; computer graphics; computer integrated manufacturing; mathematical modeling, simulation, and optimization; multimedia; and GIS. ICI consists of approximately 200 researchers, with a total staffing of approximately 800. This is considerably less than even a few years ago due to a lack of funding and the ability to pay competitive wages for researchers. As a result many have left to join the private sector and more are likely to leave in the future unless additional funding sources can be found.

The ICI works closely with the Polytechnic Universities and supports a Romanian National Communications (RNC) network that links the universities in six cities in order to support their research activities. This is currently a 2 Mbps network in need of upgrading due to heavy traffic and slower-than-desirable performance.

The ICI is closely linked with a number of international organizations, and in recent years, especially with the European Union. They are currently working on parallel computing systems with funding being supplied by the World Bank. Some 50 other projects are being supported by the European banking community. These projects include creating mathematical models for e-commerce, specifically in the area of oil refineries.

One of the primary issues facing the ICI is similar to that of the Polytechnic Universities: maintaining and hiring professors/researchers. Funding is limited and wages are largely restricted due to public policy. While some of their research has the potential value for commercialization, this is not being strongly pursued due to a weak linkage with U.S. and Western European high-tech firms. Such a linkage could be of significant value in both key areas: funding and moving the fruit of their fundamental research activities toward products with commercial value.

⁸ ICI Activity Report 1999.

It is the private sector that must generate the business activity that establishes and maintains economic growth and improves the living standards of the citizens. This third area of assessment focuses on two key areas relative to leveraging ICTs in Romania: 1) determining the strength and potential of the ICT-related sector itself relative to supporting the domestic and international markets, and 2) the reliance on ICTs by local non-ICT businesses in an effort to improve the effectiveness and efficiencies of their operations and where appropriate, to potentially become more competitive in the global marketplace.

Summary/Analysis

Since gaining independence in 1998, the ICT sector in Romania has grown considerably by shifting from a dominance in hardware to that of software. While still small (considered to be but 0.5% of the GDP), it is growing and gaining a global reputation. This is due in large part to the high quality of government Polytechnic institutions that produce high-caliber graduates in the ICT arena (with as many as 30% of the graduates finding high-tech jobs off-shore).

It is currently estimated that there are 2,000 software firms in Romania alone, with revenue spread evenly from the domestic and global markets. In addition to hiring Romanians for jobs in the U.S., increasingly there are U.S. firms establishing partnerships and programs in

Findings

- **Established ICT sector in Romania with over 2,000 firms.**
- **Viable ISP sub-sector with some consolidation and investments taking place.**
- **Some US-Romania business relationships being established, but mostly US and European hiring Polytechnic graduates.**
- **Transnational businesses operating in Romania feeding local ICT market with demand. Non-ICT Romanian business sector not fully aware of value of ICTs, e-commerce/e-business.**

Romania in an effort to capitalize on the local strength. Oracle, Cisco, IBM, Compaq, Motorola, and others are increasing their presence in Romania as this sector matures into a global player.

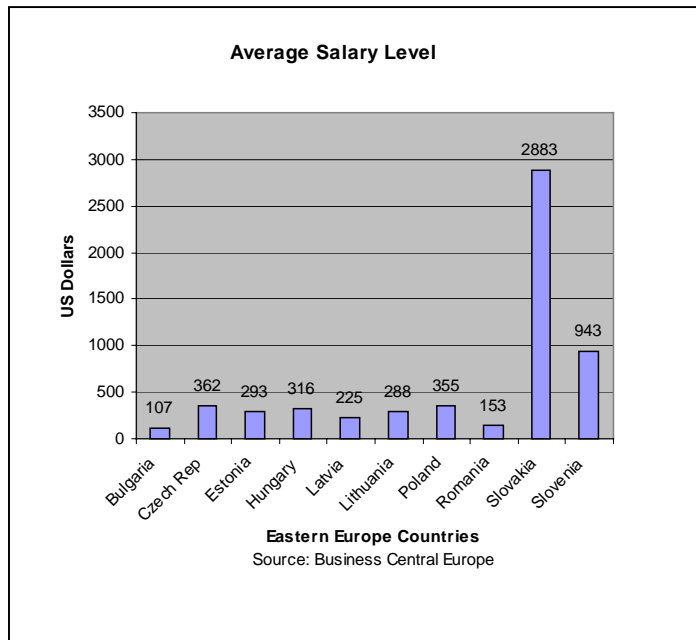
However, the ICT sector in Romania has not optimized its expansion into the global market. In the domestic market the growth is limited by the lack of demand because businesses do not understand its value; there is a lack of available finance to support expansion; a lack of a national strategy; and burdensome tax rates. As a result of these hindrances,

the potential for this ICT market is much greater than what is now being realized. This can change if the demand for ICTs in the local market expand and the awareness and business linkages on the global market increase and mature.

General Overview ⁹

After 1989, aiming at the transition to a market economy, Romania is confronted with a complex, yet difficult and painful process, having social consequences that must be taken into account.

The Gross Domestic Product in 1998 estimated at 338,670 billion ROL (Romanian LEI),



in current prices, was, in real terms, about 7.3% lower than in 1997. This tendency resulted mostly from a decrease of the gross value added in industry (-10.5%) and constructions (-11.5%). These two sectors contributed about 36.9% to its creation. In agriculture, unfavorable trends caused by lower vegetable and animal production have determined a lower gross value added by 8.5%.

In 1998 the Gross Domestic Product (GDP) by main categories was: industry (31.7%), agriculture (16.0%), services (37.8%). The structure of the GDP by aggregates of expenditures in the same year was: total final

consumption (90.8%), gross fixed capital formation (18.1%), net export (-8.5%), and variation in stock (-0.4%). The private sector share in GDP rose from 58.1% in 1997 to 58.4% in 1998.

ICT Assessment Focus

The specific focus of this IED Assessment relative to the private sector is on the ICT-related sector itself, the use of ICTs in the private sector, and the potential for further leveraging ICTs for bringing about economic growth.

ICT Sector

During the course of the IED Assessment, a number of meetings were held with ICT-related business associations (hardware and software), a number of ISPs, as well as with individual ICT companies. This sector is very dynamic in Romania. A recent publication by the Romanian Association for Electronics and Software Industries (ARIES) in preparation for an upcoming Binary 2000 Software Fair, presents the following overview of the sector.¹⁰

⁹ *Romania Your Business Partner – 1999/2000 Edition*. ANEIR – Foreign Trade Promotion Centre S.A.

¹⁰ *Romanian Software Directory 2000*. Romanian Association for Electronics and Software Industries. September 2000.

“...Soon after 1990 Romania connected to the new technologies and the Western hardware and software companies began to operate in Romania. The position of the old state companies was quickly taken by the private ones. This sector being the only domain in Romania of almost 100% private initiative.

In the early 1990s, most businesses that operated in Romania’s high-tech industry focused on hardware. Because of Romania’s well-educated workforce, many companies began to specialize in software.

Because of Romania’s comparative advantage of highly skilled and low labor costs in the software sector, many Western companies have taken an interest in either investing or setting up partnerships with Romania software companies. Given the proliferation of the Internet and the World Wide Web, software companies can rapidly develop and export their services with little capital investment.

The majority of Romania’s engineers graduated from technical institutes in Bucharest, Cluj, Iasi, and Timisoara. Bucharest accounts for 70% of Romania’s technical resources while Bucharest combined with the main university centers accounts for 90% of Romania’s technical resources. Although these percentages have remained stable throughout the 1990s, towns such as Sibiu, Galati, Brasov, Tg. Mures, Baia Mare, and Craiova turned up a number of competitive companies.

In accordance with the data given by the Government, in Romania almost 2,000 companies work in this domain (Information and Communication) disposing of 100,000 specialists and, every year, about 8,000 new graduates are prepared. As after some statistics published by the prestigious French magazine – 01 Informatique in September 13, 1996, Didier Genau being the author, Romania has 25,000 specialists in informatics with high education, in comparison to 200,000 from India (a country with the same level of development) and 50,000 from Russia. This means 109 specialists of high educational level for 100,000 inhabitants in Romania in comparison with only 24 in India.

The value of human resources can also be proved by the fact that the University’s team situation on the 4th place before all the American Universities at the last edition of the AMC university competition. In the last years telecommunications and Internet knew a large development, the companies which act on the Romanian market offering almost all the available world services”

The ARIES report characterizes the informatics services sector by the number of employees, indicating that 76 percent of the firms have less than 10 employees; 14 percent of the firms have between 10 and 50 employees; 8 percent of the firms have between 50 and 100 employees, and 2 percent of the firms have over 100 employees.

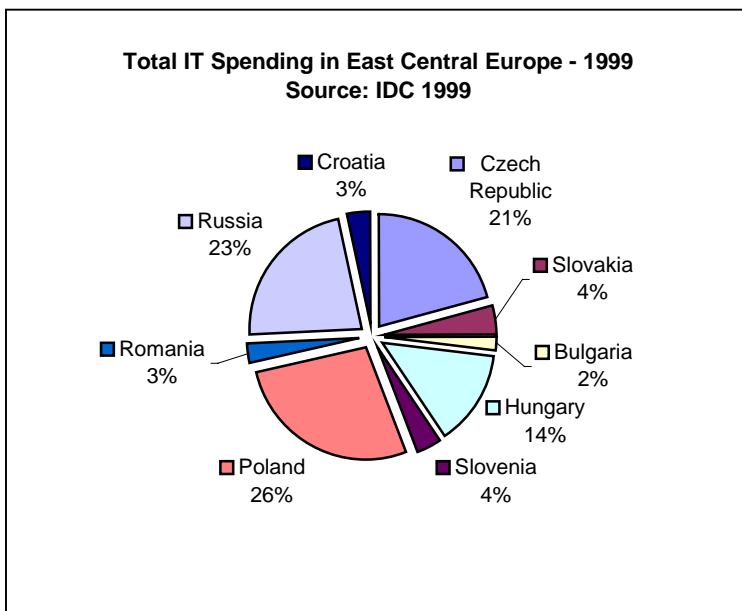
Discussions with both the software and hardware business associations add the following elements to the above:

- Due to the lack of effective marketing, the Romanian products are not nearly as successful with regards to export as they have potential for becoming;
- The U.S. and Western Europe are simply not aware of the high-quality of products and development capabilities of the software sector in Romania;
- There is a lack of U.S.-Romanian business networks to provide professional, quality, and ongoing promotion into the U.S. market—as well as the European markets;
- At present there are several software business associations in Romania, with discussions taking place among them to form a collective Federation to help promote the sector nationally as well as globally;
- Romania is just now beginning to enter the e-business arena, but there is the lack of credit cards, and legislation, as well as a general commercial divide with Western Europe;
- There are approximately 500,000 debit cards in Romania, with cash remaining the common form of payment—even with the 30 to 40 ‘business to consumer’ (B2C) e-commerce sites in Romania, payment is made upon delivery (in lieu of an Internet-based payment/debit);
- The IT sector is calculated to comprise approximately 0.5% of the Romanian GDP (compared to approximately 8% in the U.S.);
- The high tax burden is an issue for the ICT sector and is described such that if an employee is paid 1,000 dollars a month, the company in fact has to pay an additional 1,700 in taxes of various kinds;
- There is a lot of support for a technology park that was recently approved by Parliament, but as yet not fully implemented;
- At this time the market for software developed in Romania is split evenly—approximately 50% domestic and 50% for export;
- Where the state and private technical universities produce excellent graduates, there is a general position that the students do not have adequate access to ICTs as part of their studies, and that there is the need for stronger focus on project management within the curriculum;
- In spite of the fact that there have been various national plans developed in the past, there is the need for strong leadership by the Government of Romania in adding focus on the ICT sector—such that it would establish a national vision, promote the establishment of required e-business related legal reform, promote technology parks, and support the ICT sector by increasing business linkages with key countries such as the U.S.;
- There is a general lack of capital in Romania to support the expansion of existing businesses as well as new start-ups—even where business plans are prepared and the revenue stream is very attractive, obtaining investors/funding is virtually impossible.

A report produced by the International Data Corporation (IDC) in late November 1999 gives a comprehensive view of the IT market for PCs, servers, and printers, in Romania, with

comparisons to neighboring countries, as well as forecasts.¹¹ Some of the key figures included in this report include the following:

- In 1998, vendor shipments of PCs in Romania totaled 74,550 units totaling a value of US\$ 92.89 million;
- The forecasts for growth through 2003 reflects PC shipments of approximately 120,000 units by 2003 with a total value of approximately US\$ 135.0 million;
- Overall IT spending in Romania during 1998 was placed at US\$ 203.17 million, in 1999 it was US\$ 227.14 million;
- IDC forecasts this overall IT spending will grow to approximately US\$ 375.0 million by the year 2003;
- When viewed in the context of the total IT spending in East Central Europe (including the Czech Republic, Hungary, Poland, Russia, Slovakia, Romania, Bulgaria, Slovenia, and Croatia), the following surfaces:



- For 1998 the total IT spending for these countries totaled US\$ 8.29 billion, of which Romania had only 2.4 percent of the total;
- For 1999, the total IT spending for these countries totaled US\$ 8.43 billion, of which Romania had a slight increase of 2.7 percent
- In both in 1998 and 1999, Romania as a percent of the total was at the bottom on a percent basis—followed only by Bulgaria.

A recent article appearing in the IN Review magazine paints a brief history and current situation of the ISP market in Romania.¹² The article states that in general Romania got off to a slow start relative to Hungary and Poland, with the current number of users placed at between 600,000 and 1,000,000. It estimates that the number of PCs in households is approximately 200,000. While this is a relatively small number considering a population of over 22 million, the Romanian market is the European country with one of the fastest growth rates for the last two years. Estimated revenues from Internet-related businesses and services are placed at US\$ 10 million—compared to between US\$ 100-200 million in Poland, Hungary, and the Czech Republic. At present there are a number of high-quality ISPs operating in Bucharest (perhaps as

¹¹ *Romania – An overview of the IT Market, 1998-2003*. Nicholas Kaufmann, IDC ECE & MMEEA. International Data Corporation. 26 November 1999.

¹² *“Dawn of a New Era.”* Bogdan Marchidanu. IN Review-Romania’s Magazine for Business. September 2000/Volume 5, Number 7. Pages 20-24.

many as 30 total) with some ISPs showing a growth rate in new subscribers in the area of 400-500 per month. The ISP sector is beginning to see some consolidation take place with new investment starting to materialize in this market. To some degree it appears these investments are looking forward to the time (1 January 2003) when RomTelecom loses its monopoly for telephony, and others are anticipated to enter the market—lowering access rates which at present undoubtedly restrict growth.

Non-ICT Sector

This IED Assessment focused specifically on the ICT sector within Romania. As part of the assessment activities some key elements emerged that provide a general business context:

- There are 600,000 business enterprises in Romania, many being very small/micro enterprises with but a few employees;
- Romanian labor force is well skilled, particularly in engineering;
- Number of employees as of 31 December 1998 is placed at 5,024,800;
- While the leveraging of ICTs in the business sector is growing, it is very low at this point in time due to a general lack of awareness by the business managers; and
- There is a real need with regards not only to building awareness, but to improve the level of knowledge/skills in all aspects of ICT by the mid-level and higher-level managers working in Romanian firms.

In 1998 the structure of the Gross Domestic Product (GDP) by main category of resources was:	
• Industry	31.7 percent
• Agriculture	16.0 percent
• Services	37.8 percent

Discussions with several ICT-related firms indicate that at present most demand for ICT products and services come from multi-national firms doing business in Romania. These businesses have a full understanding of the leveraging capabilities of ICTs, and as a result, seek out local firms from which they can buy hardware, software, and services. Local firms appear to be much slower in coming to an understanding of the leveraging capabilities of ICTs and therefore are hesitant to make the investment—even when they have the financial resources to do so. It requires a lot of marketing and sales support to change the current mindset of business owners and managers to make the initial plunge into ICTs. This is an area where some broad-focused awareness/training seminars for the Romanian business community at large could potentially have an impact on expanding demand for the local ICT market.

Ultimately it is the people that are the primary core to any culture/country and the resources for bringing about socio-economic change. Whereas the public sector can set strategy and policy, and the private sector pulls together the needed financial resources, people provide the human capacities/capabilities to move forward. This section explores the people of Romania from an education perspective; specifically from an ICT-related education perspective. Where there is growing evidence that ICTs can bring about significant change—both as a sector itself and as leveraged by other businesses—the ultimate change agent is the nation’s citizens. There are many models of success, which a country can emulate, and one of the models is Ireland. Ireland used about a third of EU infusion money to develop education and human resources that in turn developed the knowledge industries like IT.¹³ And here we examine the nation’s school systems that are critical to supporting the countries potential for increased engagement in ICTs.

Summary/Analysis

The public environment of Romania has many positive attributes that can accentuate the ICT sector, but there are distracters that need to be addressed so that the current short-term successes are maintained. Information technology can be turned into products, services, business process reengineering, and procedural innovations. Currently, the majority of specialists are being deployed into the services portion of IT. Romania still has to shrink the time gap in its organizational approach to incorporating current developments in the global market place to local conditions. Nicholas Negroponte, in his book "Being Digital" remarked: “Nations today are the wrong size. They are not small enough to be local and they are not large enough to be global.”¹⁴ Romania must cultivate both the international and local market to increase its human capacity beyond the mere provisioning of IT services as a subset of international firms. It must pay more attention to leveraging the human side of structural capital by rewarding knowledge trainers and workers, bringing in experts to interact with current associations, and working to create a national Romanian ICT brand whose message is focused and simple. Efforts to physically ‘wire’ the schools need to be predicated on how the message on the wire will supplement the curricula. Romania faces a serious issue of how it can provide an acceptable financial environment for the IT teachers who train and instruct the young generation; otherwise this cadre of professors will continue to decline as members seek more remunerative compensation elsewhere.

Findings

- **Polytechnic Universities effective at feeding the workforce with ICT skills/knowledge**
- **30+% Polytechnic graduates hired into jobs outside of Romania (US, Canada, Europe)**
- **Loss of graduates likely to grow with Western Europe’s accelerating Internet growth**
- **Losing professors from Polytechnics and research institutions, and increasingly harder to hire into these positions**
- **Weak commercialization of research being conducted within Romania**
- **Students and businesses weak on ICT project and management-related**

¹³ Business Central Europe, September 2000, p. 19.

¹⁴ Nicholas Negroponte, *Being Digital*, New York: Alfred A. Knopf, 1995, p. 238.

Education and training is needed to grow ICT specialists who can then promote economic growth within a country, but another reason to promote the use of ICTS is that of growing democratic values within a society. Communication technologies, in general, have served to strengthen civil society. The Internet, as a medium, overcomes the communicative barriers of time and space, and its openness promotes increasing levels of democracy. Democracy requires a greater communication requirement among government, civil society, and the people. "The countries that made a great leap into democracy recently might be expected to slip back somewhat unless or until their communication capabilities come on par with the communication needs that are associated with their new levels of democracy."¹⁵ Greater and cheaper access needs to be provided to all segments of Romanian society so that their interconnectivity increases their sense of participation in the public discourse. Pilots like rural telecottages can be introduced to weave the Web into the social fabric.

General Overview ¹⁶

As of 1 July 1998, the **population** of Romania was placed at 22,500,000. According to the census returns of 7 January 1992, Romania's population structure by nationality is: Romanians 89.4%; Hungarians 7.1%; Germans 0.5%; Ukrainians 0.3%; Jews 0.04%; others 2.66%. About 8 million Romanians live outside the country's boundaries. Urban population: 55%.

The Romanian **labor force** is well skilled, particularly in engineering. Number of employees (31 December 1998): 5,024,800. Unemployed: 1,025,056. Retired persons (total 1998): 5,702,000 - of whom 4,020,000 (exclusive of farmers) through the state social security system.

Education has a long and rich tradition in Romania. It is to be noted that before 1990 the literacy rate was close to 100 percent. At present, education is undergoing a radical restructuring and adaptation to the new realities. The first private educational establishments were set up in 1990 after more than 40 years of full state ownership.

The system of state education comprises pre-school education (for children aged 3 to 6), primary school (grades I-IV), secondary school (grades V-VIII), high school (grades IX-XII); grades I-VIII are compulsory. Vocational and foremen's schools have 1-2 years and higher education 4-6 years.

In the school year 1997/1998 school attendance was 595,611 persons (the school year 1998/1999 is closed after the autumn exams session). The number of teaching staff was around 312,000. The number of public university students was 278,000 and of private universities 130,000 in 1998/1999.

¹⁵ Christopher R. Kedzie, *The Third Waves*, in *Borders in Cyberspace*, Brian Kain and Charles Nesson, eds, Cambridge, Massachusetts: The MIT Press, 1998, p. 125.

¹⁶ *Romania Your Business Partner – 1999/2000 Edition*. ANEIR – Foreign Trade Promotion Centre S.A.

ICT-Related Education

The educational system within Romania has a long history of engineering and technical training, with a substantial amount of emphasis in recent years being placed on ICTs. The government-run Polytechnic Institutes are considered by many to be one of the richest of Romania's assets. As such, students graduating from these institutions are in high demand both within Romania as well as by off-shore companies.

About 5,000 ICT professionals emerge into the workforce annually; this number being 60 percent more per capita when compared to the United States.

The following reflects some of the major discussions emerging out of several interviews in the area of education in Romania:

Ministry of Education—The Ministry recognizes the fundamental importance of education in securing the economic well being of the nation. Information technology is being used to amplify the education process through such methods as distance learning, computer-based instruction, and establishing virtual libraries through collaboration with international education resource centers. The Ministry is engaged in attempting to bring a public sector awareness of the need to create a salary differentiation for teaching competencies of information technology instructors as well as examining other ways to add incentives to maintain retention of qualified staff.

With regards to the level of personal computers currently in the pre-university school systems, the Data Services Department provided the following information:

- Within the 18,000 pre-university education units of different levels, there are 24,877 computers. Most of these computers are in Bucharest – 2,886, followed by Cluj, Timis, Mures, and Iasi. The districts with a less number of computers are in Giurgiu, Ilfov, and Ialomita counties.
- The computers are concentrated in a relatively small number of education units – 3,000. Only in Bucharest, the percentage of the scholastic units which have at least a computer is bigger than 50%; at the opposite pole, in Giurgiu county, only 3% of education units have computers.
- Comparatively to the education level, the majority computers are in high schools and scholastic groups.
- According to the number of pupils, the situation shows that at the national level, one computer comes to 222 pupils, while in high schools and scholastic groups, one computer comes to 50 pupils.
- At high school and scholastic group level, the best report – number of pupils per computer is registered in Mures, Harghita, Sibiu, Satu Mare, Cluj, and the weakest report being registered in Botosani, Ialomita, Dimbovita, and Olt counties.
- In the last years, the computers endowment was done at local and district level. The last important action at national level was the P&G 2000 Program initiated at the end of 1999.
- Now, the Ministry of Education, through the Data Services Department, has become a complex program within the Communication – Data System Technology in education, in

accordance with the European Council Program and the National Strategy of Romania economic development on medium term.

Polytechnic Institute of Bucharest—The Polytechnics are one of the major national institutions devoted to creating a skilled workforce in information technology. Many of the enrolled students are employed in IT firms as they pursue their studies and upon completion of their studies find immediate placement with a local or foreign firm. The Polytechnic Institute is part of the RoEdunet network which is an ostensible network of 53 universities. There are computer laboratories for hands-on learning, but much of the equipment and software is old and outdated; this allows for theoretical exercise but current applications must be cross walked elsewhere.

Institute for Business and Public Administration (ASEBUSS)—ASEBUSS is a private management school where instruction is delivered by Romanian professors as well as American professors on resident weeks. The Institute is accredited by the Ministry of Education and it has graduated 300 executives since its founding in 1993. Current American management practices are incorporated in the curriculum, and the Institute has become aware of the need to introduce the concepts of information technology to non-IT managers. Sustained digital access to international libraries and distance learning would alleviate the issues of contemporaneity in the Institute's continuous introduction of contemporary management practices.

Other Educational Sources—The growth of private schools in Romania reflects the need of the cultural milieu to allow its citizenry access to higher education. Some of the schools are in the process of becoming accredited by the Ministry of Education. For the moment, public institutions are providing the majority of quality education in technology.

Combined, and with discussions with both the software and hardware business associations where the educational topic emerged, the following reflect some of the key elements with regards to ICT-related education in Romania:

- The Polytechnic schools have been very aggressive with regards to adjusting their curriculum to stay current with the newer technologies;
- Due to low wages, there is a growing issue with regards to keeping quality professors in the teaching profession—at times this is partially offset by funds from research grants that are used to supplement basic teaching wages;
- The electronic infrastructure supporting education needs to be shored up through investment in current hardware, software, communications, and back office systems;
- Project management of ICT needs to be emphasized so that skilled managers, not just technologists, are available who can produce products and create an environment that has proven experienced people;
- The benefit of ICTs need to be introduced to those students who are going to work in either business or government so they improve customer satisfaction, cost savings, link the public and government, and present a competitive advantage;

Approximately 30 percent of the Polytechnic graduates leave Romania for jobs in the U.S., Canada, Germany, and France.

- Legal and social implications of the rapid growth of international technology need to be addressed in academic-sounding sessions so that future and current leaders can address the public choices that connect policy and technology.

The prior four sections address Pipes, Public and Private sectors, and People. This section focuses on the USAID pProgram element of the ICT equation. Specifically, this focuses on USAID development activities that are ICT related or have incorporated significant ICT components and ICT-related education.

Summary/Analysis

The USAID program element has had minimal involvement in ICT over the past several years. There has been ICT used in some of the projects, such as in the energy sector, but there have been few 'free-standing' ICT projects. It does not mean that the Strategic Objective (SO) Team Leaders are not savvy in this area. On the contrary, the group and individual discussions elicited a number of suggestions in areas that could be benefited by the use of ICTs in their programs.

The energy sector is currently using the Internet for business to business in ordering and distributing commodities. However, the Internet and even traditional IT is not used very much in Romanian business and government, including the energy sector. The SO Team Leader suggested that a program of awareness needs to be done to show the how ICTs can be leveraged for greater efficiencies.

The financial sector, the traditional bastion of the 'accounting machines', is largely not automated. The country's payment systems in the National Bank of Romania and the Ministry of Finance are on paper. There is a desire on the part of the SO Team leader to increase the use of ICTs in the financial sector in order to accrue the benefits that are enjoyed in even lesser developed economies.

In those areas such as health and child welfare the lack of even minimal automated accounting and database systems is preventing improvements in health care and child placement. Romania spends far less than many developing nations on health care, with little invested in ICTs in the health sector. The SO Team leaders working in this sector recognized the need for ICT in this area and expressed a keen interest in seeing more attention and money be paid to using ICTs in improving the delivery of services in this sector.

Findings

- **Some limited use of ICTs within USAID/Romania's current development portfolio**
- **Some opportunities to examine targeted expanded use that could be of value**
- **Opportunities to leverage newer project management software to improve project management disciplines within development partners and GOR Ministries/Agencies**

The use of IT in the public sector is confined to a few 'islands of excellence.' There are some departments, which, despite low pay and high attrition, have managed to automate some, but not most, of their processes. Much of the automation seems to have occurred prior to the exodus of the trained IT professionals from the country. Lack of finance is another factor that

has slowed down the growth of ICTs in the public sector. An even greater factor could be the fear that ICTs will displace workers and cause even greater unemployment. Only 3 million Romanians are employed in the private sector. The rest are unemployed, agricultural, or to a great extent, employed by the government. Training in the use of IT is confined to just a few Ministries. A few members of Parliament have computers, and it is suspected that many of those are not being used due to lack of training or an unwillingness to spend the time to learn.

The lack of ICTs in the Romanian private sector, excluding even financial and energy, is less than minimal. There are dis-incentives in the Romanian business processes that bring about the lack of desire to automate. Automation would limit the 'gray economy' to a very large extent. But even this unaccounted business aside, the laws of Romania make it more costly to automate. For instance, documents are required to be stamped at both ends of the transaction in order for it to be legal. Such counter-productive laws allow very little interest in automation. With that is lost the benefits of automation enjoyed in other countries.

The SO Team leader working in Agribusiness was very interested in the use of ICTs for Romanian agriculture. The ideal would be to develop an American model of large efficient corporate farms, producing low-cost surpluses. The use of the Internet would not only help farmers to learn about new farming methods and for price discovery, but the use of Internet could also improve the education of the young and help them find non-agricultural jobs in the growing tech-based economy.

The SO Team Leader for Cross Cutting Initiatives offered that government policies need to be changed in order to take advantage of the ICTs. In many cases these policies run counter to the improvement of the use of ICTs.

USAID/Romania Program

For purposes of this IED Assessment, the Mission's Strategic Objectives were briefly examined from the perspective, "Can ICTs be leveraged to enhance the effectiveness and efficiencies of the Mission's current activities?" This review took into account the current level of ICT deployment as obtained through discussions with the SO Team Leaders.

<p>A review of the USAID/Romania Congressional Presentation for FY 2000 reflects the following Strategic Objectives</p> <p>SO 1.3 Accelerated Development and Growth of Private Enterprises</p> <p>SO 1.4 Development of a Competitive, Market-Oriented Financial Sector</p> <p>SO 1.5 A More Economically Sustainable and Environmentally Sound Energy Sector</p> <p>SO 1.6 Increased Management Capacity to Promote Sustainable Economic Growth</p> <p>SO 2.1 Increased, Better-Informed Citizens' Participation in Political and Economic Decision-Making</p> <p>SO 2.3 More Effective, Responsive, and Accountable Local Governments</p> <p>SO 3.2 Improved Welfare of Women and Children</p>

In reviewing the Mission's program, there are several broad areas where ICT-related activities reflected in the prior Sections III and IV intersect with the Mission's development portfolio. Clearly there is the need for continued legislative reforms associated with e-commerce and e-government as part of expanding the economic growth within Romania. In addition, there is the opportunity to assist in the area of transparency with increased reliance on

providing expanded information and government services via the Internet. Within the private sector itself there is the potential expansion of the ICT sector—specifically for expanding production and development of software for both meeting domestic needs as well as for export.

SO 1.3 Accelerated Development and Growth of Private Enterprises—The use of ICTs in this sector has been minimal, yet the potential is greatest for Romania. The persons working in this area are very optimistic and inventive about how to apply and integrate ICTs.

In the area of agribusiness, several suggestions were made that not only applied to the improvement of farming itself, but also for the improvement of the farmers' lives. Approximately 45 percent of the Romanian population lives in rural areas. Nearly 40 percent of the population supports themselves on farms. It is an aging population with little access to telephones, television, and running water.

The Internet can be used to help the rural youth to learn the culture and bring them into the greater society, as is being done in Hungary. Those who choose to remain on the farms can use the Internet as agricultural extension services, using it to learn new farming methods, and receive weather and 'price discovery' information. It could be used to supplement education and provide the same research tools as those available to children in the cities. The use of small, portable Internet/telephony modules are available and would improve the lives of rural Romanians immediately. Non-U.S. foreign aid is available to bring Internet equipment and services into the rural areas.

A new initiative has begun in USAID/Bucharest that would create a technology-based business platform that provides expertise for the development of mutually beneficial trade relationships between Romanian and U.S. businesses. The Romanian Trade Development Center (RATDC) will provide business and targeted information technology advisory services to the information technology community in order to develop business relationships. The RATDC has, as its primary focus, the sourcing, screening, evaluation, and training of Romanian information technology companies and personnel for entry into the IT marketplace in the greater Washington, DC region and the USA in general.

George Mason University will provide the overall project management, training of project staff, and delivery of USA business development services to the Romanian IT companies that are selected for USA market entry via its 'Incubator America!' facility in Arlington, Virginia. James Madison University will provide in-country project management support and coordination.

SO 1.4 Development of a Competitive, Market-Oriented Financial Sector—This SO's major accomplishments have revolved around quelling the bank crisis, liquidating state banks, and introducing fiscal mechanisms to rationalize the budget and ease pressure on the banking system. Additional bank privatization is anticipated to occur by the end of 2000.

There is currently no automated payment system in Romania. It is paper-based. There is a pilot system running in the National Bank of Romania and there are plans to move this system out to the member banks. It appears that the banking sector may be getting ready to experience a

move into the automation era. Montran, an American company successful in the area of banking software and consulting, has established a Bucharest office.

Banking supervision is not as automated as it should be. An automated off-site banking supervision software system, modeled on those of the American banking supervision agencies, Federal Deposit Insurance Corporation (FDIC) and the National Credit Union Administration (NCUA), is now available from USAID. This software approach will accrue immediate benefits to the Romanian banking community, as it did decades ago in U.S. banks and credit unions.

SO 1.5A More Economically Sustainable and Environmentally Sound Energy Sector—USAID has been a major participant in improving the energy sector in Romania. In the most recent past the share of electricity devolved from the state monopoly into private entities. The National Regulatory Agency for Energy (ANRE) was transformed into a sustainable regulatory body, and energy efficiency was improved. A marketing entity was created for distribution of information to the people. The electric company was divided into Generation (nuclear, hydro, and thermal), High Voltage, and Distribution.

The use of SCADA software and computer controls is being further introduced and new telecommunications are being planned to carry these control signals. The current lines are not considered adequate to carry the proposed data and voice traffic projected for the future. There is consideration to add sufficient technology and capacity to serve as a telecom backbone for future services to the public, such as cable TV, Internet, voice telephony, and business data transmission.

One of the ways to introduce ICTs into this sector would be to sponsor awareness programs that would educate the management in the use of automation in this industry.

SO 1.6 Increased Environmental Management Capacity to Promote Sustainable Economic Growth—The USAID/Bucharest Mission has made steady progress in this area over the past year. Investments in this sector are relatively small. The Mission is examining future activities to concentrate on policy and establishing an environmental fund to leverage a far greater impact on resources. There are no suggestions by the IED Assessment Team for the use of ICTs in this SO at this time.

SO 2.1 Increased, Better-Informed Citizens' Participation in Political and Economic Decision-Making—This program has taken strides in strengthening institutions and mechanisms that make Romania's democracy to function reasonably well.

There has been the introduction of ICTs in this SO. The Ministry of Justice is using Lotus software and the Ministry of Finance and the Prime Minister's office are both using Lotus for document handling. Legal information is published on the Internet in Romanian, and sometimes in English. Romanian Customs is one of the most computerized in the region.

However, the average government employee is not very computer literate. Until there is a knowledge increase among political leaders, government managers, and employees, there cannot be the easy promulgation of information in electronic form to the general public.

SO 2.3 More Effective, Responsive, and Accountable Local Governments—The Local Government SO has made excellent strides in promoting decentralization of government. This, is an area that the ICTs, particularly the Internet, can be used most effectively in promoting democratization at the local level through an informed populace and through easily replicated budget and accounting systems. ICTs applied in the business processes of local government can go far in reducing corrupt practices.

SO 3.2 Improved Welfare of Women and Children—While the U.S. spends \$4,600 per person on health care, Romania averages only \$54. Patient records are file folders with various sized pieces of paper stuffed inside. Human error can cause information to be misfiled, switched, or lost. ICTs could easily improve the health care systems in Romania through the use of automated Admission/Discharge/Transfer (ADT) systems. Although it may not be 'politic' to speak of health care and money together, nothing moves without money in the health care arena. ICTs not only provide the accounting systems necessary for tracking supplies, paying salaries, tracking medications, storing and retrieving patient information, and many other functions. ICTs help deliver the services and minimize corruption.

Romania has a very large orphan population. Many live in orphanages until they are released into the world at the age of 18, largely unprepared for it. The use of ICTs, specifically the Internet, would be of immense help in educating Romanian orphans and to prepare them for the world at large by exposing them to the same knowledge base experienced by the rest of the world.

The current child welfare tracking computer system is designed to be a local judet-run system. The judet is often where the government services are delivered most effectively. There may be compelling reasons for this approach, but there are sometimes problems with children falling out of the system. There are ways for computers to share such data between judets and prevent duplication and loss of data (children). Before the current system is condemned or sanctioned, USAID can call upon expertise to look at the legislation and the computer design to make recommendation for improvement to the processes and the benefits to be derived from such improvements.

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Appendix A – G-8 Okinawa Summit Summary

As recently as July 2000, the leaders of the world's most power nations met at the G-8 Summit in Okinawa, Japan, and as part of their agenda addressed the concerns of the global digital divide. The result was the development of the Okinawa Charter on Global Information Society, and the launching of Digital Opportunity Task Force (dubbed the "DOT Force").¹⁷ The DOT Force will mobilize resources and coordinate the efforts of governments, the private sector, foundations, multilaterals, and international institutions and others to bridge the international digital divide and create digital opportunities.

This Okinawa Charter and the DOT Force were undertaken in recognition that the developing countries are not fully participating in the information revolution. It was acknowledged that the following situation exists:

- Of the estimated 332 million people online as of March 2000, less than 1 percent (2.77 million) live in Africa (Nua Internet Survey, March 2000);
- Less than 5 percent of the computers that are connected to the Internet are in developing countries; and
- The developed world has 49.5 phone lines per 100 people, compared to 1.4 phones in low-income countries (International Telecommunications Union, 1999).

The global call to action coming out to the G-8 Summit called upon companies, foundations, and non-government organizations to help create digital opportunities for the people of developing nations to take concrete steps in five strategic areas:

- **Fostering Policy, Regulatory, and Network Readiness:** Help developing countries adopt practices, and regulatory frameworks that will encourage private sector investment but also reap the full economic, social, and cultural benefits of the widespread diffusion of the Internet, e-commerce, and other information and communications technologies;
- **Expanding Basic Connectivity to People Everywhere:** Support the expansion of community access points or other forms of shared connectivity so that the Internet and telecommunications services are within walking distance for everyone on the planet. Invest in R&D that will lead to products and services tailored to the needs of developing countries and poor communities everywhere, such as low-cost, low-power, wireless devices;
- **Building Human Capacity in Education and Training:** Increase significantly the number of people in developing nations with the technology skills and know-how needed to build, manage, and effectively use the information infrastructure of the 21st century. Equip more people in developing nations become "technologically literate" through the

¹⁷ <http://www.ecommerce.gov/ecomnews/pr0725001.html>.

appropriate use of educational technology in schools, universities, communities, and the workplace;

- Enhance Healthcare and Quality of Life Using Information Technology: Promote applications of the Internet and information technology--such as e-health, distance learning, natural resource management, and preservation of cultural heritage, that have particular relevance to improving the quality of life for the people of the developing world; and
- Create New Opportunities for Small and Medium-sized Enterprises through e-commerce and e-business: Encourage the development of micro-enterprises and small businesses that harness the power of new information and communications technologies. In all societies, develop venture financing sources that can drive innovation.

With regards to the United States, President Clinton, in partnership with corporate and non-profit leaders, announced several new steps to bring digital opportunities to developing countries.¹⁸ This included expanding the number of countries participating in the Internet for Economic Development (IED) Initiative--Romania being one of the more recent additional countries added to the list of participating in the IED Initiative. In addition, President Clinton announced several new ICT-related initiatives involving the Ex-Im Bank, the Overseas Private Investment Corporation (OPIC), as well as several additional public-private, multilateral, and foundation-sponsored activities aimed at narrowing the digital divide gap.

This IED Assessment is predicated in large part on the recognition of the very same dynamics as reflected in the G-8 Summit's "Call to Action." Further, this Assessment puts forward an integrated set of proposed activities that hold substantial promise for bringing about a catalytic change for bringing about fundamental changes within the Romanian economy.

¹⁸ <http://www.ecommerce.gov/ecomnews/pr0725002.html>.

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Appendix B – Digital Economy 2000

On 5 June 2000, the U.S. Department of Commerce (DoC) issued the third annual report on the information technology revolution and its impact on the U.S. economy, titled "Digital Economy 2000."¹⁹ This series of reports has been critical to providing a more comprehensive understanding on the direct and indirect role/impact of the ICT sector within the U.S. In introducing the report, Vice President Gore presented several key highlights from the report:

- IT accounts for half or more of the improvements in productivity since 1995. With 2.8 percent productivity growth from 1995 to 1999--double the 1.4 percent rate of 1973 to 1995. The U.S. has a new economy. Improved productivity has lowered inflation and raised real wages;
- IT is lowering inflation. Falling IT prices have directly pulled down average inflation by 0.5 percentage points a year. In addition, by raising productivity, IT is lowering inflation of other industries; and
- The IT sector is rapidly creating jobs at high wages. IT jobs average \$58,000 a year, 85 percent higher than the average for the private sector. Between 1994 and 1998, employment in IT industries expanded by 30 percent, from 4.0 million to 5.2 million jobs. IT occupations that pay the best and require the most education have been growing most rapidly.

The Secretary of Commerce, William M. Daly, writes in the Report's preface:²⁰

"What we can see clearly are expanding opportunities. To meet these opportunities, we will have to ensure a stable and conducive economic and legal environment for continuing innovation in information technology and e-commerce. We need to encourage the building of a broadband infrastructure that allows all Americans to have access to the advanced services that support the Internet, and take the steps necessary with respect to privacy, consumer protection, security, reliability, and intellectual property rights that will inspire confidence in the Internet. To realize the full potential of this digital economy, every person and every business must be able to participate fully and make their own unique contribution to its development."

The Executive Summary of the Report provides a strong message with regards to the impact on ICTs within the U.S. economy. In addition to the above highlights, these include:

- The Internet in particular is helping to level the playing field among large and small firms in business-to-business e-commerce;
- There is growing evidence that firms are moving their supply networks and sales channels online, and participating in the new online marketplaces;

¹⁹ <http://www.ecommerce.gov/ecomnews/pr060500.html>.

²⁰ <http://www.doc.gov>.

- Advances in information technologies and the spread of the Internet are also providing significant benefits to individuals;
- The vitality of the digital economy is grounded in the IT-producing industries--the firms that supply the goods and services that support IT-enabled business processes, the Internet, and e-commerce;
- Although IT industries still account for a relatively small share of the economy's total output--an estimated 8.3 percent in 2000--they contributed nearly a third of real U.S. economic growth between 1995 and 1999;
- IT industries have also been a major source of new R&D investments;
- New investments in IT are helping to generate higher rates of U.S. labor productivity growth;
- Growth in the IT workforce accelerated in the mid-1990s, with the most rapid increases coming in industries and job categories associated with the development and use of IT applications;
- Analysis of the computer and communications industries in particular suggest that the pace of technological innovation and rapidly falling prices should continue well into the future; and
- Businesses outside the IT sector almost daily announce IT-based organizational and operating changes that reflect their solid confidence in the benefit of further substantial investments in IT goods and services.

While the above reflects current dynamics taking place in the U.S. economy relative to the ICT sector and its broader impact on the economy, it also reflects the potential value of ICTs in other economies--including developing and transitioning economies. This is of specific relevance when taken in context of USAID/Romanian's programmatic Strategic Objective for FY2000, which states for SO 1.3, "Accelerated Development and Growth of Private Enterprises." Clearly, the potential leveraging capabilities of ICTs within Romania are considerable with regards to assisting USAID/Romania in meeting this objective, and in bringing about fundamental benefits to the Romanian economy and its people.

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Appendix C – Readiness of Romania

In recent months two independent initiatives have surfaced in an effort to evaluate either the “e-readiness” or “networked readiness” of a given country. These are both considered valuable tools and are included in brief here due to their contribution in rounding out the assessment of Romania.

McConnell International’s Global E-Readiness Report - August 2000

In August 2000, McConnell International issued their first E-Readiness Report.²¹ This report assessed the current E-Readiness of 42 critical national economies including Romania. The Report provides an independent public assessment of the most important economic questions of the early 21st century: “Who is poised to prosper in the networked economy.”

“E-readiness” measures the capacity of nations to participate in the digital economy. E-Readiness is the source of national economic growth in the networked century and the prerequisite for successful e-business.

The Report looks at 5 E-Readiness attributes:

- **Connectivity** – Are networks easy and affordable to access and to use?
 - Availability of wireline and wireless communication services, community access centers (free and paid), and networked computers in businesses, schools, and homes.
 - Affordability and reliability of network access, including the cost of service, downtime, and the prevalence of sharing access among individuals.
 - Reliability of electrical supply for business-critical computer operations; and the ease of importing and exporting goods and of transporting them within a country.
- **E-Leadership** – Is E-Readiness a national priority?
 - Priority given by government to promoting the development of an e-society on a national level.
 - Extent of demonstrated progress on e-government, including efforts to automate governmental processes.
 - Quality of partnerships between industry leaders and government to improve E-Readiness.
 - Level of effort to promote access for all citizens.
- **Information Security** – Can the processing and storage of networked information be trusted?
 - Strength of legal protections and progress in protecting intellectual property rights, especially software.
 - Extent of efforts to protect privacy.

²¹ <http://www.mcconnellinternational.com>.

- Strength and effectiveness of the legal framework to address and prosecute computer crimes, authorize digital signature, and enable public key infrastructures.
- **Human Capital** – Are the right people available to support e-business and to build a knowledge-based society?
 - Quality of and participation levels in the education system, with an emphasis on efforts to create and support a knowledge-based society.
 - Culture of local creativity and information sharing within the society.
 - Skills and efficiency of the workforce.
- **E-Business Climate** – How easy is it to do e-business today?
 - Existence of effective competition among communication and information services providers.
 - Transparency and predictability of regulatory implementation, openness of government, rule of law, and general business risk (political stability, financial soundness).
 - Openness to financial and personal participation by foreign investors in ICT businesses.
 - Ability of the financial system to support electronic transactions.

The E-Readiness Report uses a Red, Amber, and Blue rating system for assessing countries in each of these five areas:

- **Blue** – indicates the majority of conditions are suitable to the conduct of e-business and e-government
- **Amber** – indicates improvement needed in the conditions necessary to support e-business and e-government
- **Red** – indicates substantial improvement needed in the conditions necessary to support e-businesses and e-government

The August 2000 Global E-Readiness Summary reflects the following for Romania:	
● Connectivity	Red
● E-Leadership	Amber
● Information Security	Red
● Human Capital	Amber
● E-Business Climate	Red

For more information on the details of this Report, refer to their Web site at <http://www.mcconnellinternational.com> or Roslyn Docktor (Vice President) at doctor@mcconnellinternational.com.

Harvard’s Readiness for the Networked World: A Guide for Developing Countries

The Information Technologies Group (ITG) at the Center for International Development at Harvard University²² has not as yet evaluated individual companies, but instead has created a “Readiness for the Networked World: A Guide for Developing Countries.” As stated in the

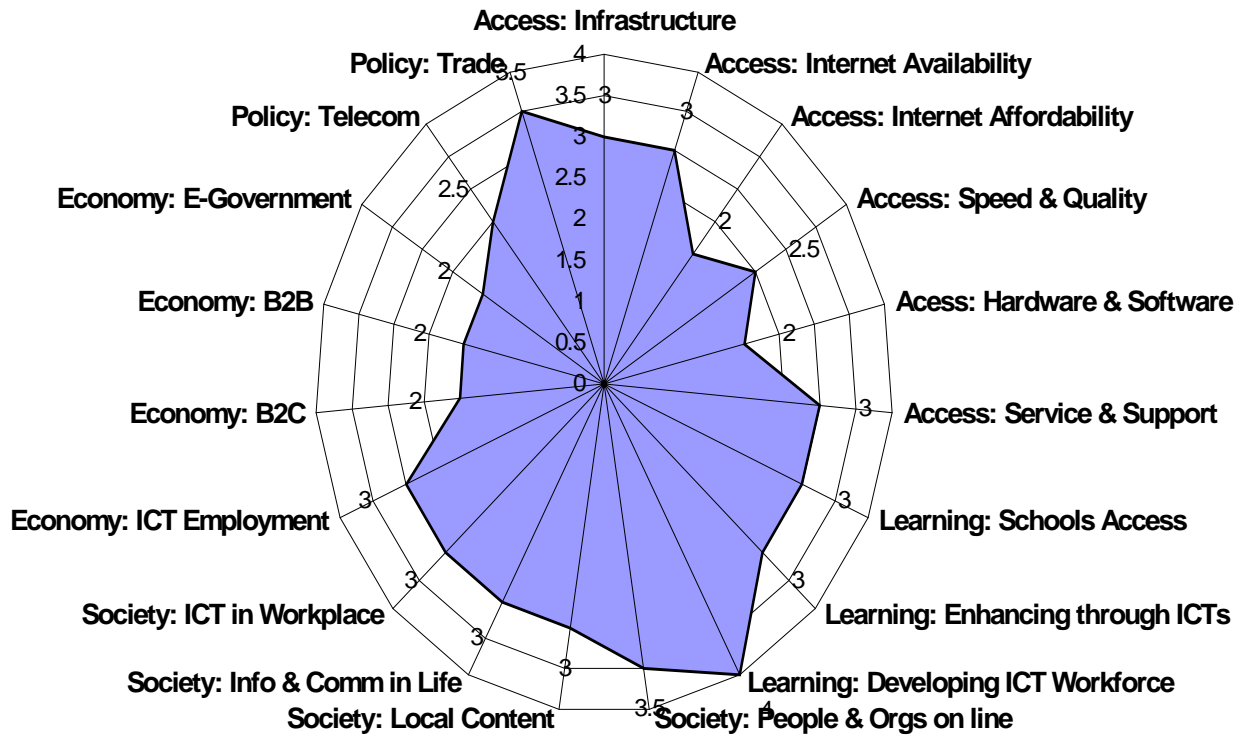
²² <http://www.readinessguide.org>.

Guide, “*This Guide is an instrument that systematically organizes the assessment of numerous factors that determine the Networked Readiness of a community in the developing world.*”

The following Assessment has been prepared relying on the published by the Information Technologies Group (ITG) at the Center for International Development at Harvard University. It is included here as part of this IED Assessment in an effort to gain familiarity with the Guide, to test its validity, and to determine its potential value in similar such efforts in the future.

The following provides a graphic representation of the values determined for each category. The following pages provide a description of each of the five groups (e.g., Access, Learning, Society, Economy, and Policy) and each category (e.g., Infrastructure, Internet Access, ...), that has been extracted from the Guide. Refer to the Readiness Guide itself for complete instructions, descriptions of each category, and the descriptions of each of the 4 stages (1-4) for the categories.

Networked Readiness: Romania



Readiness Guide: Groups and Categories Descriptions

Network Access

What are the availability, cost, and quality of ICT networks, services, and equipment?

The minimum necessary condition for Readiness is access to adequate network infrastructure. Without access to global communications networks, no community can participate in the Networked World. Access is determined by a combination of the availability and affordability of use of the network itself, as well as of the hardware and software needed for network interface. The quality and speed of the network are also important in determining how the network is used. The customer service orientation of access providers is a major factor in network application adoption and usability.

Because of the growing importance and unique character of the Internet, which provides a global platform for both data and (increasingly) voice services, the assessment of network access should be carried out in the context of Internet access, rather than access to either voice or data. The significance of the Internet will only continue to grow in terms of global trade and communications.

- **Information Infrastructure**—For most communities in the developing world, a lack of access to voice and data services remains a significant impediment to Networked Readiness. Communications infrastructure is deployed with widely varying local and regional rates of penetration, depending on factors such as geography and/or income levels. Local network access may be provided by any one of a number of media that makes up the communications network (including twisted pair copper wires, coaxial cable, wireless local loop, satellite, and fiber optics). While in the future, mobile wireless technologies will undoubtedly provide an attractive option for data access, as will cable networks and perhaps even the electrical grid, currently most Internet access in the developing world is provided through the traditional telecommunications network.
- **Internet Availability**—Internet access is enhanced by competition among Internet Service Providers (ISPs) that operate locally. The range of services offered, number of dial-up lines (which helps determine ISP capacity) and transmission capacity all influence an ISP's usefulness. The availability of leased lines is particularly important in making the Internet available to the business community. Finally, in many communities in the developing world, public access is essential to making the Internet available to greater numbers of individuals and firms. Telecenters, Internet cafes, and community information centers assume great importance in making the Internet available to those who do not have personal access to home, school, work, or elsewhere.
- **Internet Affordability**—The prices which businesses and individual consumers pay for the Internet access are in most cases determined by a combination of fees for basic telephony and ISP services. In communities where the sum of ISP and telephony fees is prohibitively high, a disincentive to network usage exists, and access is curtailed. Pricing packages can be structured in ways that are conducive to Internet use—per minute or

hourly pricing (unlike flat rate pricing) for both Internet and telephone service can limit users' time online and therefore inhibit the use of the network for many activities such as electronic commerce (e-commerce). The provision of tiered pricing packages can improve the affordability for many subscribers by allowing them to purchase only what they need.

- **Network Speed and Quality**—The available bandwidth, both for individuals' local access and for a community's connection to the Internet backbone, determines the number of users and types of online activities the network can support. Bandwidth-intensive activities, such as large file transfers or video streaming, may be unavailable to communities with constrained access to the network. The quality of the network, including servers, also determines its usage. High numbers of mainline faults, poor connections, dropped connections, and packet loss can render any network useless or operationally sub-optimal, thus discouraging use of and investment in new technologies.
- **Hardware and Software**—A vibrant market with numerous hardware and software options can encourage more specialized usage of the network, including ICT solutions that are tailored to local needs. More widespread retail and wholesale distribution channels for both hardware and software increases opportunities to use the network within the community. The prices of hardware and software are particularly important in the developing country context, where generally low-income levels cannot support high-priced consumer items.
- **Service and Support**—A strong customer service orientation is important in determining the success of network deployment. Long waiting periods for installation and repair and a lack of support services by telephone companies and Internet providers pose major obstacles to Readiness. The quality and number of technical support professionals are essential in maintaining the network and providing service.

Networked Learning

Does the educational system integrate ICTs into its processes to improve learning? Are there technical training programs in the community that can train and prepare an ICT workforce?

Without an educated, ICT-savvy populace, no community can fully participate in the Networked World. To foster this resource, ICTs must be incorporated into the learning system. Lamentably, although the use of ICTs in education is one of the most powerful catalysts to Networked Readiness, it is an opportunity that is often squandered, misunderstood, or underestimated.

- **Schools Access to ICTs**—Schools must integrate ICT tools into their learning processes if they are to be part of the Networked World. Programs that give students access to ICTs in the classroom provide an important step to improving Readiness. A school's Readiness in terms of access can be broken down into six broad areas: number of computers, physical access to the technology, types of computers, diffusion of the network, access to and organization of electronic content, and quality and speed of connectivity in the school. In general, the diffusion of ICTs is driven by unit cost per pupil. Computers tend to be adopted first at the university level, then by the secondary school system, and finally by the primary schools.

- **Enhancing Education with ICTs**—While putting ICTs into schools is an important first step to Readiness, the technologies need to be properly harnessed to improve the learning process. Teachers must be trained to use the Internet and computers as tools for the students' benefit; this training is central to Readiness. Curricula must be redesigned to encourage the use of ICTs in the pursuit of problem solving, group learning, and research. Students should be taught from the earliest age possible to use ICTs to enhance and improve their learning experiences. Full integration of ICTs into the learning process is optimal, and collaborative, project-based learning can make up a solid pedagogical strategy for ICT-enhanced education.
- **Developing and ICT Workforce**—It is essential that there exist opportunities within the community to offer future ICT workers both first-time and continuing training in essential skills such as software programming, hardware engineering and World Wide Web design. These opportunities are fundamental to creating a sustainable ICT industry and support the integration of ICTs into the local economy.

Networked Society

To what extent are individuals using information and communications technologies at work and in their personal lives? Are there significant opportunities available for those with ICT skills?

Readiness depends upon the community's incorporation of ICTs into the fabric of its activities in order to maximize the gains of joining in the Networked World. In society-at-large, ICTs can have a profound effect upon people's professional and personal lives by providing easier access to information, more efficient ways to communicate, and powerful organizational tools. To understand how a community is using ICTs, it is important to assess not only how many members of the community have access to the technologies, but also how they are using them.

- **People and Organizations Online**—One of the hardest indicators to track is the actual number of online users. Particularly in the developing world, where multiple users share many electronic mail (e-mail) accounts and other online tools, there are few reliable indicators that accurately map how many people are online. The exponential growth in online usage also makes tracking current use difficult. This nevertheless an important indicator. As more people access the Internet regularly, and networks of users grow, there is greater demand and opportunity for online interaction, as well as better meshing with the Networked World at-large. As more organizations gain an online presence, it becomes more likely that the community will use ICTs to augment or carry out its activities and needs. One of the most important drivers of online growth is awareness—people must first know and understand what the Internet is in order to participate. Particular attention should be paid to the demographics of Internet users in the community. Particularly at lower stages in Readiness, groups such as women, the physically disabled, and racial and ethnic minorities often do not participate in the online environment. A community is more ready when there are not large discrepancies in online presence among different groups.

- **Locally Relevant Content**—Community members find the Internet medium more useful and relevant to their own lives when online content reflects their own interests and needs. Locally relevant content is a major driver of growth of Internet usage. Interactions such as chat rooms, online interest groups, special interest software, bulletin boards, listservs, and Web sites all drive the community to use ICTs more widely in their lives. English language dominance on the Internet remains a serious impediment to the world's non-English speaking communities. While the preponderance of English is waning, and other world languages are gaining, most of the world does not speak a language that is strongly represented either in software or on the World Wide Web.
- **ICTs in Everyday Life**—Communities participate more directly in the Networked World when information devices such as radios, faxes, televisions, telephones, pagers and computers are culturally accepted and widely incorporated into daily life. It is important to examine both the penetration of ICT devices into community and their applications. In communities where either income levels or the network infrastructure cannot support high levels of individual access, public shared facilities provide a needed alternative. Such venues may include telecenters, cybercafes and community information centers. Strategies for drawing people in to use these facilities is essential.
- **ICTs in the Workplace**—The more that businesses and government offices are already using ICTs, the better prepared they are to participate in the global networked economy. In order to realize important efficiency gains from ICTs, businesses and governments need to not only make technologies available to their employees, but also effectively incorporate them into their core processes.

Networked Economy

How are businesses and governments using information and communications technologies to interact with the public and with each other?

Businesses and governments that are able to effectively employ ICTs find more sophisticated and efficient ways to managing their external relationships and communications. This growing ICT usage helps form the critical mass of electronic transactions which supports a networked economy, both in terms of the network size and the demand for associated goods, services, labor, and policy reform.

- **ICT Employment Opportunities**—A thriving job market for ICT professionals provides added incentive for growth of ICT adoption, training programs and overall use of ICTs within the economy. The retention of technical workers becomes an important competitiveness issue for the community.
- **Business-to-Consumer (B2C) E-Commerce**—Online retail options enhance consumer choice and access to products. They also allow businesses to reduce costs associated with physical infrastructure and to augment their marketing outreach and public relations via a dynamic communications channel.
- **Business-to-Business (B2B) E-Commerce**—When businesses move their dealings with other businesses online, they can often communicate more easily at lower costs, hold smaller inventories, and process billings and payments more quickly, among other

advantages. Moreover, networked businesses are likely to explore new business models, including dynamic business partnerships and radical market restructuring.

- **E-Government**—Governments can take advantage of ICTs to improve connections with their constituents, including using the Internet to post information online and to offer interactive services for the public. Governments can also lead by example and become a catalyst for the networked economy by investing in ICTs for their internal use, leading to more efficient operations and the creation of a local market for ICT equipment and services. Relationships with government contractors and procurement mechanisms can be streamlined by putting them online. ICTs can make government activities more transparent to citizens and other observers.

Network Policy

To what extent does the policy environment promote to hinder the growth of ICT adoption and use?

Public policy can be a help or a hindrance to the networked economy. The favorable climate that public policy can create for Internet use and e-commerce encourages communities, organizations, and individuals to invest in and use ICTs. Important aspects of Networked Readiness dealt with elsewhere in the Guide (such as Internet availability and affordability, hardware and software availability and affordability, ICTs in school, and electronic commerce) are all influenced by public policy. For a community to become ready for the Networked World, the appropriate policy-makers must realize the implications of their decisions upon ICT adoption and use.

- **Telecommunications Regulation**—Effective regulation should promote competition, ensure affordable pricing for consumers and maximize telecommunications access in the community. Liberalization within the telecommunications sector should establish a regulatory framework that encourages multiple carriers to operate competitively. As more operators enter and compete in the marketplace, service offerings become more accessible and affordable, are deployed more rapidly and reach higher levels of quality. At the same time, regulation should encourage universal access to telecommunications services.
- **ICT Trade Policy**—ICTs become more available and affordable when there are low barriers to trade, including tariffs on ICT equipment and software, and electronically ordered or delivered goods and services

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Appendix D – 1998 ITU Statistics

Each year the International Telecommunications Union (ITU) publishes a World Telecommunications Development Report.²³ Its most recent report issued on 10 October 1999 included an expanded set of data that for the first time included data on mobile cellular. In addition, it reflects indicators on basic telecommunications, international, TV use, as well as the Internet. While during the course of this Assessment there was reason to suspect the accuracy of this data, it must also be recognized that the data is 1998 data—two years old. And in a very rapidly changing environment (e.g., growth in some subsectors can be in excess of 100% CAGR [Compound Annual Growth Rate]), current data may be significantly different than what is reflected in this Report.

However, taking these potential limitations into account, the following set of tables does reflect the most recent official data from the ITU, and data that can be used to compare the situation in Romania with that of neighboring countries. For purposes of this analysis, Romania data was compared to that of both neighboring countries (e.g., Ukraine, Moldova, Bulgaria, Yugoslavia, and Hungary), as well as those countries with which it has a historical and/or current economic ties (e.g., Italy, Germany, France, Turkey, and Russia). In addition, average data is reflected for Low-Medium Income countries as well as Europe, the U.S., and the world, in an effort to provide a regional, income-based, and global comparison of Romania.

The following tables provide more details of the situation in Romania. Following each table are key notes clarifying some of the data on the tables, as well as short comments with respect to what one may conclude from the data, regarding Romania.

²³ World Telecommunications Development Report—1999. Mobile and World Telecommunications Indicators. ITU. Geneva, Switzerland. 10 October 1999.

Telephone Infrastructure - Basic Information

Country	GDP/US\$ Per Capita	Main Lines Teledensity	Teledensity Largest Cities	Teledensity Rest	Teledensity 1995-98 %CAGR	Faults /100
Romania (L-M)	1,544	16.73	---	---	13.1	88.3
Ukraine (L-M)	974	19.07	41.80	17.82	5.8	42.5
Moldova (L)	427	15.02	29.79	11.63	4.9	79.0
Bulgaria (L-M)	1,224	32.89	37.78	30.66	2.6	5.9
Yugoslavia (L-M)	991	21.81	54.51	18.63	4.4	---
Hungary (U-M)	4,391	33.59	41.16	22.22	16.8	16.8
Germany (H)	25,625	56.68	57.17	56.66	3.4	8.7
France (H)	23,618	55.39	---	---	0.7	5.9
Italy (H)	19,913	45.07	49.78	42.82	1.3	16.2
Russia (L-M)	3,030	19.66	46.53	17.97	5.2	38.4
Turkey (U-M)	3,006	25.41	39.83	23.06	6.3	56.1
Lower-Middle Income Countries	1,191	8.18	23.29	6.57	15.2	44.7
Europe	12,129	37.25	47.98	31.45	3.9	18.0
United States	30,173	66.13	NA	NA	2.9	13.4
World	5,148	14.26	24.99	9.10	5.5	22.2

NOTE: GDP \$ are 1997

Teledensity is lines per 100 inhabitants (1998 data)

1995-98 CAGR (Compound Annual Growth Rate) based on Teledensity

Observations: The telephone infrastructure in Romania compares very close to the average for Lower-Middle Income countries (with regards to income and teledensity and growth). Its teledensity of 16.73, while higher than the average for Lower-Middle Income countries, is lower than that of its neighboring countries with the exception of Moldova—a Low Income country. The 16.73 teledensity represents a total number of land lines of 3.8 million—which places telephones in 46.8 percent of the households in Romania. With regards to faults/100 lines the infrastructure in Romania appears nearly twice as high as the average. While the ITU data does not reflect an Urban/Rural mix for Romania, other sources have indicated that the rural teledensity is on the order of around 3:100, with between 2,000-3,000 rural communities without any telephone service at all.²⁴ This urban/rural disparity is significant when compared to other countries in the region, but especially when one takes into account that approximately 45 percent of the Romanian population lives outside of the large urban centers. Discussion with RomTelecom indicate a renewed focus on improving access to the rural areas and recently they have announced a goal of reaching a teledensity of 23.2 by the year 2003.²⁵

²⁴ Daniel Jianu. *Information Technology Landscape in Romania*. MOGIT/American University. December 1999. <http://www.american.edu/carmel/dj2877a/page2.html>.

²⁵ *RomTelecom Charts Expansion Course*. The Business Review. 18-24 September 2000. Page 1.

Waiting List for Telephone Lines

Country	Waiting List for Lines		Demand		Waiting Time (years)
	1998 (000)	CAGR % 1995-1998	Total 1998 (000)	Satisfied 1998 (%)	
Romania (L-M)	1,299.0	2.7	5,076.0	74.4	4.0
Ukraine (L-M)	2,729.4	-7.2	12,427.6	78.0	5.9
Moldova (L)	167.1	-6.5	824.6	79.7	5.5
Bulgaria (L-M)	416.0	-11.9	3,158.0	86.8	7.0
Yugoslavia (L-M)	123.0	-16.1	2,442.4	95.0	1.2
Hungary (U-M)	80.3	-49.8	3,503.3	97.7	0.2
Germany (H)	---	---	46,5000.0	100.0	---
France (H)	---	---	34,000.0	100.0	---
Italy (H)	32.0	---	26,018.1	99.9	0.1
Russia (L-M)	7,120.0	-9.8	36,151.3	80.3	5.3
Turkey (U-M)	463.7	-16.1	17,423.2	97.3	0.4
Lower-Middle Income Countries	22,525.5	-4.7	198,059.9	89.4	1.0
Europe	15,520.9	-10.2	306,104.3	95.0	1.4
United States	---	---	178,800.0	100	---
World	36,076.3	-3.2	854,739.5	95.9	0.7

Observations: The waiting list for telephone lines in Romania is higher than the average for Lower-Middle Income countries as well as its neighboring countries with 74.4 percent of the demand satisfied. In addition, whereas there is an overall trend of neighboring countries in lowering this waiting list, in Romania it has grown between 1995 and 1998 such that in 1998 the waiting time is placed at 4 years—compared to 1 year for the Lower-Middle Income countries reflected in the ITU report. Discussions with RomTelecom indicate that the current wait time is 3 ½ years, and that this represents 500,000 lines. However, they also acknowledge that these numbers are soft as frequently when capacity is brought online by their expansion efforts, the demand does not materialize.

Basic Telephone Tariffs

Country	Residential (US\$)		Business (US\$)		Local Calls US\$	% GDP per Capita
	Connection	Monthly Subscription	Connection	Monthly Subscription		
Romania (L-M)	49	1.6	130	5.8	0.01	1.2
Ukraine (L-M)	68	1.7	272	2.6	0.01	2.3
Moldova (L)	60	0.2	101	2.0	0.02	1.2
Bulgaria (L-M)	68	0.6	68	3.4	---	0.6
Yugoslavia (L-M)	397	1.6	1,402	6.2	0.02	0.6
Hungary (U-M)	153	6.4	304	7.8	0.13	2.1
Germany (H)	49	12.2	49	12.2	0.12	0.7
France (H)	52	11.5	52	13.7	0.13	0.6
Italy (H)	137	9.4	137	14.6	0.10	0.6
Russia (L-M)	171	3.4	582	18.8	NA	1.4
Turkey (U-M)	48	4.4	48	4.4	0.08	1.6
Lower-Middle Income Countries	133	4.8	212	8.8	0.05	3.8
Europe	126	8.0	193	11.2	0.11	1.0
United States	44	19.9	70	41.3	0.09	0.8
World	109	6.9	155	11.1	0.09	7.5

NOTE: Cost data is 1998; per capita data is 1997

Observations: The ITU data reflects that as of 1998 the connection costs and monthly subscriptions for residential customers were considerably under the average for Lower-Middle Income countries by a considerable amount. This is also the case for Business customers—though less significant. While the Business connection costs are lower than neighboring countries, the monthly subscription fees are typically higher. The percent of GDP per capita is 1.2 percent in Romania compared to an average of Lower-Middle Income countries of 3.8 percent. This suggests the potential that the then-current (1998) rate structure may be set too low relative to covering costs, and especially if the upgrading and expansion of the telephone system is being financed out of revenues. However, there have been tariff adjustments since 1998 that may well have brought this more into parity with the average and neighboring countries.

Cellular – Subscribers & Tariffs

Country	Subscribers 1998 (000)	95-98 %CAGR	Teledensity	Connect (US\$)	100 Min Basket	% of total subscr
Romania (L-M)	643.0	313.9	2.89	---	31.50	14.5
Ukraine (L-M)	143.0	117.0	0.28	30	35.40	1.5
Moldova (L)	7.0	693.7	0.16	---	---	1.1
Bulgaria (L-M)	127.0	82.4	1.52	---	---	4.4
Yugoslavia (L-M)	240.0	---	2.26	108	61.68	9.4
Hungary (U-M)	1,070.2	59.2	10.50	93	37.78	23.8
Germany (H)	13,925.0	55.2	16.97	28	61.91	23.0
France (H)	11,210.1	104.9	18.78	72	34.75	24.8
Italy (H)	20,489.0	73.5	35.53	---	42.85	44.1
Russia (L-M)	747.1	103.6	0.51	135	46.50	2.5
Turkey (U-M)	3,506.1	100.2	5.25	46	47.22	17.1
Lower-Middle Income Countries	35,903.8	76.3	1.54	90	39.69	15.9
Europe	104,889.7	63.4	13.15	65	40.25	26.1
United States	69,209.3	27.0	25.60	NA	25.00	27.9
World	318,892.9	52.1	5.38	86	38.15	27.5

NOTE: Subscriber data is 1998; tariff data is 1999
 100-Minute Basket is 50 minutes of peak and 50 minutes of non-peak
 use plus subscription fee, less free minutes

Observations: The 1998 data from the ITU reflects the initial two years from the introduction of mobile telephony in Romania. Two major GSM mobile operators (Mobifon marketing under the name ConnexGSM and MobilRom marketing under the name Dialog) began operations in 1997, with the 1995-1998 data showing rapid expansion in the mobile market. In 1998 the mobile market comprised 14.5 percent of the total telecommunications market in Romania—a significant percent considering the short time in which this has been available. This is likely due in part to the 4-year backlog for landlines, by nature of wireless the build out can be rapid, and the fact that there are a growing number of transnational companies operating in Romania—where the international GSM roaming capabilities offers an important value-added capability. Current data places the number of mobile licenses at nearly 2.0 million—shared nearly equal between the two large operators. This continued growth from the 1998 ITU data reflects an even greater percent of Romania’s telephony is being satisfied via wireless mobile technologies. In late 1999 RomTelecom announced entry into this mobile market under the name CosmoRom, the introduction of the service likely to take place in mid-2000.

International Telephone Traffic

Country	Minutes 1998 (000 minutes)	1995-98 %CAGR	Minutes per Inhabitant	Minutes per Subscriber	International Circuits (000) (1998)
Romania (L-M)	111.0	19.2	4.9	29.4	3.2
Ukraine (L-M)	486.8	7.4	9.5	51.7	---
Moldova (L)	53.4	-6.9	12.2	81.2	0.3
Bulgaria (L-M)	84.3	0.3	10.1	30.8	3.1
Yugoslavia (L-M)	220.0	1.3	20.7	94.9	6.7
Hungary (U-M)	238.9	-1.2	23.4	69.8	6.7
Germany (H)	4,711.0	-3.5	57.4	101.3	13.0
France (H)	3,400.0	6.1	57.0	100.0	---
Italy (H)	2,704.7	13.7	46.9	104.1	95.3
Russia (L-M)	1,038.2	5.0	7.0	35.8	13.9
Turkey (U-M)	644.1	19.9	9.7	38.0	14.8
Lower-Middle Income Countries	7,255.8	8.3	3.2	38.3	176.4
Europe	34,051.3	7.0	42.7	115.3	354.4
United States	22,811.9	19.2	85.2	132.3	146.1
World	83,714.6	9.5	14.4	100.7	816.2

NOTE: Data reflects only outgoing telephone traffic

Observations: Between 1995 and 1998, the ITU data shows significant growth rate in Romania's international telephone traffic (on a percent CAGR basis)—over twice the average for Lower-Middle Income countries. This growth is also considerably higher than its neighboring countries and even higher than the European countries—same as the United States. However, this expansion needs to be tempered by the fact that the base is relatively low when compared to neighboring countries and when viewed from a minutes per subscriber basis (29.4 minutes compared to an average for Lower-Middle Income countries average of 38.3 minutes).

Telecommunications Staff

Country	Telecom Staff		Main Lines/Employee	
	1998 (000)	CAGR % 1995-98	1998 (000)	CAGR % 1995-98
Romania (L-M)	51.7	-1.9	73	14.9
Ukraine (L-M)	128.4	2.9	76	2.4
Moldova (L)	7.8	1.0	85	4.1
Bulgaria (L-M)	26.4	0.3	104	2.0
Yugoslavia (L-M)	15.1	9.9	154	-4.6
Hungary (U-M)	13.3	-15.9	257	38.7
Germany (H)	219.7	-1.5	212	5.0
France (H)	169.1	3.7	201	-2.0
Italy (H)	92.0	-3.3	282	5.0
Russia (L-M)	444.5	0.2	65	4.9
Turkey (U-M)	72.8	-1.0	233	9.7
Lower-Middle Income Countries	1,607.0	0.4	117	16.8
Europe	1,888.6	0.1	157	4.1
United States	1,021.8	4.3	175	-0.5
World	5,433.2	0.6	155	6.2

Observations: Between 1995 and 1998, the ITU data reflects a lowering of telecommunications staff by an CAGR of -1.9 percent. Discussions with RomTelecom reflect they presently have around 45,000 employees (compared to 51,700 reflected in the ITU data for 1998). On average RomTelecom is reducing its workforce by approximately 4,000 per year and doing such in a way that does not create employee hardship. However, in spite of this continuing reduction, the income per employee for RomTelecom is considerably lower than that of its neighboring countries and the average for Lower-Middle Income countries. Assuming the current trend continues, this situation will steadily improve over the years. Current efforts to enter the cellular and data transport markets are being done via new companies such that current labor/employment restrictions do not impede making the necessary changes needed to compete in a fast-moving and dynamic marketplace.

Telecommunications Revenue and Investments

Country	Revenue 1998			Investments 1998		
	Total (M US\$)	Per Main Line	Per Employee	Total 1998 (000 US\$)	Per Main Line	% of Revenue
Romania (L-M)	549.4	145	10,632	197.5	62	35.3
Ukraine (L-M)	1,243.5	128	9,685	321.3	33	25.8
Moldova (L)	32.9	50	4,238	13.5	21	41.1
Bulgaria (L-M)	304.5	111	11,538	61.3	23	27.9
Yugoslavia (L-M)	913.7	394	60,485	112.4	52	20.8
Hungary (U-M)	1,387.7	448	76,303	507.4	164	36.6
Germany (H)	50,008.5	1,075	227,622	8,808.3	189	17.6
France (H)	27,407.1	1,274	187,074	5,724.1	170	21.3
Italy (H)	26,026.5	1,002	282,743	6,693.1	260	29.6
Russia (L-M)	3,693.0	127	8,308	1.2	---	---
Turkey (U-M)	3,412.7	201	46,849	603.7	36	17.7
Lower-Middle Income Countries	49,761.4	270	31,246	25,296.1	142	57.8
Europe	221,522.2	746	116,991	47,854.1	163	22.6
United States	246,392.0	1,378	241,135	24,218.1	135	9.8
World	772,548.2	871	133,321	175,655.0	215	24.7

Observations: Revenues viewed from both a per main line and per employee basis, are well below the average for Lower-Middle Income countries, but within the range of its neighboring countries. This may well account for a potential low rationale for rapidly expanding the current number of lines. It may also however be a function of the relatively high fault rate of the current telephony system with dropped calls, etc. The low revenue per employee figures simply reflects that RomTelecom has too many employees—a situation under correction. With regards to investments, here too the numbers are lower than the average for Lower-Middle Income countries on both a per line and percent revenue basis. This would reflect that expansion is being funded largely out of current revenues with forecasts of further revenue growth perhaps not all that promising when one takes into account the low per line revenue data.

Information Technology – Internet & PCs

Country	Internet - 1998				Estimated PCs - 1998	
	Total Hosts	Hosts per 10,000	Users (000)	Users per 10,000 pop	Total (000)	Per 100 pop
Romania (L-M)	23,508	10.46	150.0	66.74	230	1.02
Ukraine (L-M)	19,775	3.89	150.0	29.49	700	1.38
Moldova (L)	613	1.40	3.3	7.51	28	0.64
Bulgaria (L-M)	10,250	12.30	150.0	179.94	---	---
Yugoslavia (L-M)	7,712	7.25	100.0	94.03	200	1.88
Hungary (U-M)	95,931	94.12	300.0	294.35	600	5.89
Germany (H)	1,449,915	176.74	6,000.0	731.38	25,000	30.47
France (H)	511,193	85.65	2,000.0	335.10	12,400	20.78
Italy (H)	386,632	67.05	3,000.0	520.29	10,000	17.34
Russia (L-M)	182,680	12.37	1,000.0	67.71	6,000	4.06
Turkey (U-M)	48,873	7.32	450.0	67.43	1,550	2.32
Lower-Middle Income Countries	382,118	1.64	5,640.0	24.70	27,233	1.27
Europe	7,728,825	96.88	39,008.8	488.50	106,528	13.89
United States	30,489,463	1,127.68	60,000.0	2,219.16	124,000	45.36
World	43,486,022	73.43	144,801.0	250.32	337,828	6.43

Observations: Two key numbers with respect to ICTs appear on this table—number of Internet users and number of PCs. Here the numbers are 150,000 Internet users and 230,000 PCs; recognizing that is 1998 data and this is typically a high-growth sector. Current estimates obtained as part of this Assessment reflect the number of Internet users are roughly the same, with the estimate on the number of PCs ranging from 250,000-700,000; less than 200,000 being located in residences, the rest in businesses and the government. While the number of Internet hosts and hosts per 10,000 are extremely high, as a rule these numbers are soft due to the practice of registering names but not putting these into service. Clearly the number of Internet users and number of PCs is primarily restricted due to costs—costs of pulse-based pricing on Internet access and the cost of PCs relative to the average GDP level in Romania.

Network Growth

Country	New Telephone Lines		New Mobile Subsc		New Internet Hosts	
	Total (000) 1997-98	CAGR (%)	Total (000) 1997-98	CAGR (%)	Total (000) 1997-98	CAGR (%)
Romania (L-M)	---	---	---	---	---	---
Ukraine (L-M)	288.2	3.1	85.8	150.0	5.8	41.3
Moldova (L)	30.3	4.8	4.8	218.2	0.4	150.2
Bulgaria (L-M)	60.9	2.3	57.0	81.4	3.4	50.1
Yugoslavia (L-M)	137.4	6.3	153.0	175.9	2.8	57.5
Hungary (U-M)	327.7	10.6	364.4	51.6	28.0	41.3
Germany (H)	1,300.0	2.9	5,755.0	70.4	317.7	28.1
France (H)	300.0	0.9	5,392.8	92.7	156.2	44.0
Italy (H)	288.1	1.1	8,751.1	74.6	132.3	52.0
Russia (L-M)	780.8	2.8	219.7	41.7	30.1	19.7
Turkey (U-M)	1,215.5	7.7	1,896.3	117.8	13.8	39.5
Lower-Middle Income Countries	23,861.8	14.3	13,323.7	60.8	87.2	30.8
Europe	9,625.1	3.3	43,486.0	71.4	2,049.8	36.2
United States	6,347.5	3.7	13,897.0	25.1	9,865.5	47.8
World	50,558.4	6.4	103,044.0	47.9	13,354.9	44.3

Observations: Unfortunately there is no ITU data for Romania with regards to growth in new telephone lines, new mobile subscribers, and new Internet hosts between 1997 and 1998. However some general sense about more recent growth has been obtained that give an idea of network expansion in recent years. With regards to new telephone lines, RomTelecom is under obligation to expand its services to rural areas and is undertaking an expansion program. However, its primary investments to date have been in upgrading its infrastructure, including laying optical fiber and installing new digital switching. These are essential core components that are prerequisites to expanding distribution. Discussions with RomTelecom indicate that they are expanding at a rate of approximately 450,000 lines/year, with two-thirds being new lines and one-third being replacement lines. With regards to Mobile expansion, nearly all of the expansion has taken place between 1997 and 1998 as the current operators didn't enter the market until 1997. Growth since 1998 has been significant as reflected earlier. With regards to Internet hosts, here too we saw a rapid growth in the 1995-1998 numbers, with likely most of this being in the later period as the popularity of Internet has grown. And while not reflected in this table, it is important to take into account the number of cable TV subscribers in Romania. In 1998 the number is placed at 2.680 million. While typically this is not all that important, due to the relatively high cost of pulse-based telephony pricing, and the access to alternative Internet access via this cable infrastructure, the importance could be very critical to expanding Internet.

Year 2000 Projections – Main Lines and Cellular

Country	Main Telephone Lines			Cellular Mobile Subscribers		
	Total (000) 2000	Per 100 1998	Per 100 2000	Total (000) 2000	Per 100 1998	Per 100 2000
Romania (L-M)	4,992	16.73	21.71	1,200	2.86	5.22
Ukraine (L-M)	10,634	19.07	20.45	200	0.28	0.38
Moldova (L)	722	15.02	16.50	31	0.16	0.71
Bulgaria (L-M)	2,879	32.89	34.97	200	1.52	2.43
Yugoslavia (L-M)	2,517	21.81	23.46	500	2.26	4.66
Hungary (U-M)	4,755	33.59	47.02	2,000	10.50	19.78
Germany (H)	50,905	56.68	61.50	15,000	16.97	18.12
France (H)	35,212	56.97	59.68	20,000	18.78	33.90
Italy (H)	26,740	45.07	46.10	23,000	35.53	39.66
Russia (L-M)	31,865	19.66	21.24	1,500	0.51	1.00
Turkey (U-M)	19,986	25.41	29.39	5,000	5.25	7.35
Lower-Middle Income Countries	282,030	8.18	11.87	64,439	1.54	2.77
Europe	325,397	37.25	40.21	160,149	13.15	19.79
United States	193,006	66.13	69.93	100,000	25.60	36.23
World	1,007,939	14.26	16.45	491,447	5.38	8.17

Observations: The ITU reflects projected growth for the period of 1998 (for which they report hard data) to the year 2000, for landlines and cellular. With regards to land lines, discussions with RomTelecom reflects that the actual growth rate is in line with these projections. Their own Annual Report for 1999 reflect that 3.74 million main lines and 1.85 million digital main lines in place at the end of 1999 (total of 5.59 million). Expansion during 1999 was reported as being 0.146 million main lines and 0.381 million for digital main lines (growth totaling 0.527 million). These figures would reflect a higher-than-actual teledensity as they must take into account a replacement factor for new lines (amounting to one-third of new installs). The ITU projections of 4,992 million for the year 2000 seem reasonable. With regards to mobile, the rapid growth rate in the last couple years has already surpassed the ITU estimates for the year 2000—with the current on-the-ground estimate being that there are already approximately 2.0 million subscribers in Romania, with RomTelecom, via its CosmoRom subsidiary just now entering the local market.

Romania: IED Assessment

Appendix E – ANCI Strategical Orientations Concerning IT

The following represents information provided by Dr. Stelian Gutu, Director of the IT Strategic Direction, National Agency for Communications and Informatics, on 29, September 2000.

Objective no. 1: The Restructuring and Institutional Reform

The objective could be made by:

to be made by the separation of the activities connected to elaboration of the politics and strategy in the IT sector, from the activity making the control in the same field.

By *control of the IT field*, we understand to maintain the respect about the law as well as international recommendations, standards, etc.

The control could avoid the misunderstandings and should settle the disputes in different problems between persons and organizations.

- a. One independent organization, named Romanian Authority for Information Technology, should exercise the control of the IT field. A similar organization will be made in the communication field, his role being different, namely to distribute licenses and authorizations for frequencies, to control the numeration of the phone numbers, etc.
- b. A special organ the State Secretariat for Information Society should be made for elaborate the national politics and strategy in the IT sector.
- c. This structure is proposed in the “Code for development and use of the information technology” – an ensemble of laws, initiated by National Agency for Communications and Informatics, which are discussed now in the Romanian Parliament. In completion, the Code makes the rules for the very important chapters of the information technologies, for instance:
 - The personal data protection;
 - The data protection in the networks and databases;
 - The electronic document, linked to electronic signature and electronic commerce; and
 - The penalties for infringements of the law in the IT domain.

Objective no. 2: The reduction of the difference between Romania and the developed countries from the European Union the whole world

This objective will be accomplished by the following provisions:

- a. The growth of the computers and networks numbers, in parallel with the development of the telephonic posts and related to development of the new technologies in Information

Technology and Communications (IT&C) (for instance global communications using WAP – Wireless Application Protocol which brings the convenience of the Internet to mobile phones, GPRS – General Packet Radio Service which provides mobile users with data rates up to 115Kbps, circuit and packet services co-existing and Bluetooth – a low cost, low power radio technology that allows mobile phones, PCs, laptops, printers, etc., up to 10 m. to communicate without wires).

- b. The realization of the data communications network for Public Administration and for the direct use of the citizens. This action was started last year, when the American firm TeleConsult International, using a grant from USTDA, made a feasibility study about this subject (NetPAD). It was a very professional work, which proposed for Romanian administration a modern solution, a complete evaluation of resources and several administrative variants.
 - One of them, proposed a consortium which will manage the project realization and finally will transfer the whole system to Romanian specialists. Unfortunately, the actual legislation is very confused in this domain and doesn't provide for a foreign company, the right to implement such a project for Romanian administration. We hope to change this situation very soon.
 - Other solutions were discussed, for instance, a financial support from the part of international bodies, but a decision must be taken by Romanian authority.

Objective no 3: Development of applications and services based on convergence of the IT&C into a single media

This objective is based on:

- a. Acquisition of the new software for public administration, for the communication with citizens, for the exchange of information with the private sector;
- b. Implementation of the magnetic cards and smart cards in the public sector, especially in the banks; and
- c. Support for pilot projects in different domains, especially for electronic commerce, digital town, etc.

Objective no 4: Human resources improvement

This objective could be realized by:

- a. The high school programs adaptation, in order to take care of the real labor market in IT&C domain. The same thing for professional conversion in the IT sector.

Remark: The truth is that Romania prepares a great number of specialists, which are systematically used by the developed world because:

- In Romania there is a very small business market in computers and communications;
- The level of salary is much lower in Romania, than that in the developed countries; and

- USA, Germany and other countries have now a lack of specialists in the IT&C domain.

For these reasons, it is necessary a revision of strategy in education from the part of Romanian Government.

- b. A very similar situation is registered now in the research sector, which must be stronger supported by the national budget.

Objective no 5: Development of the national IT&C industry.

This objective may be realized by:

- a. Stimulation of the demand and supply of IT&C products;
- b. Quality improvement of the products and services in this domain;
- c. Help for the medium and small enterprises, in order to increase the IT&C use, reducing the duties and taxes, according the credits with small interests, etc.; and
- d. One important measure is to facilitate the development of technology parks. The Romanian Parliament adopted, very recently, a law providing a legal framework for the establishment of a technological park on the Romanian territory and introduced some advantages for the companies developing their activity inside a technological park. We hope that this law will encourage also the IT&C investment, because the companies developing their activity inside a technological park need a modern infrastructure of communications and computers.

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