FACTORS AND IMPACTS IN THE INFORMATION SOCIETY
A PROSPECTIVE ANALYSIS IN THE CANDIDATE COUNTRIES

REPORT ON ROMANIA

Authors:
Alexandru Caragea, Radu Gheorghiu, and Geomina Turlea

January, 2003

Technical Report EUR 21279 EN

European Commission

Joint Research Centre (DG JRC)

Institute for Prospective Technological Studies

http://www.jrc.es

Legal notice

Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use which might be made of the following information.

Technical Report EUR 21279 EN

Printed in Spain

Acknowledgements:

We are indebted to RALUCA **MIRON** (Raiffaisen Bank), for her valuable contribution to this work.

Preface

The Institute for Prospective Technological Studies (IPTS) of the Directorate General Joint Research Centre of the European Commission contracted the International Centre for Economic Growth, European Centre (ICEG EC) to act as the coordinator of a consortium of 11 research institutes to carry out this project.

The main objective of the project was to provide a series of national monographs studying the development of the Information Society (IS), including both the positive and negative impacts, in each of the candidate countries. These monographs offer an assessment of the strengths and weaknesses of each country regarding the development of IS, and a view on their possible outcomes; both strongly rooted in factual quantitative data. They provide a clear, contextualised, multi-factoral and multi-causal picture of the input factors that contribute to the success or failure of IS developments, and the relevant output parameters that support mid- and long-term impacts on economic growth, employment and other relevant aspects of the future of each country. Each monograph concludes with a set of alternative scenarios for the development of IS in that country.

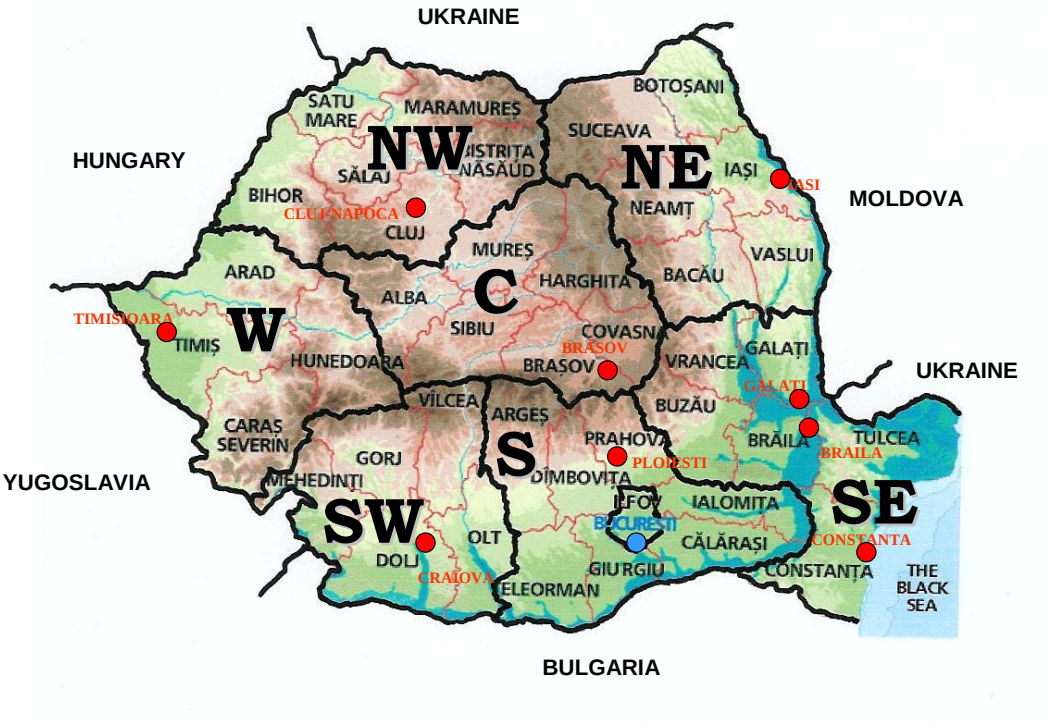
This report was carried out by Softwin Research Department, and aims to study the factors and impacts of the Information Society in Romania. The report reflects the research results, comments and opinions of the team of authors. It does not necessarily reflect the opinion of the European Commission. It is organised around 9 themes – economy, demography, government policies, industrial development and competitiveness, relevant economic activity, IST penetration rates, institutional capacity and regulatory background, education, and culture. The section on each of these themes concludes with a specific SWOT analysis. Finally, a general diagnosis is made of Romania's potential for IS developments, followed by a brief section on possible scenarios for the future and policy recommendations.

A Synthesis Report was also prepared by the Project Coordinator, the International Centre for Economic Growth, European Centre (ICEG EC), on the basis of all the country studies. This offers an integrated and prospective view on the future outlook for the Information Society in the Candidate Countries and can be found on the FISTE (Foresight in Information Society Technologies in Europe) website: http://fiste.jrc.es/

The contract was awarded by: Institute for Prospective Technological Studies (IPTS) of the Directorate General Joint Research Centre, European Commission
Contractor: International Centre for Economic Growth, European Centre (ICEG EC) – Coordinator of Consortium of 11 research institutes
Romanian member of the Consortium: SOFTWIN Research Department, Techno-Marketing Foresight Team
Contract name: Factors and Impacts in the Information Society: a Prospective Analysis in the Candidate Countries
Contract number: N 20089-2002-11 F1ED SEV HU

TABLE OF CONTENTS

COUNTRY PROFILE
- ROMANIA –



Geographical Location	
Location	SE-Central Europe (at the latitude of 45° parallel north and longitude 25° east line), on the lower Danube
Boundaries	Total: 3149.9 km, of which: NE and E: Republic of Moldova (681.3 km); N and E: Ukraine (649.4 km); SE: Black Sea (193.5 km); S: Bulgaria (631.3 km); SW: Yugoslavian Federation (546.0 km); W: Hungary (448.0 km)
Area	238 391 sq. km (12th in Europe and 81st in the world)
Administrative organisation	
Capital	Bucharest
Development Regions	8 (NUTS-2): North-East, South-East, South, South-West, West, North-West, Center, Bucharest
Counties	41 (NUTS-3) + the Capital
Towns and cities (excl. the capital)	265 towns (NUTS-5), from which 96 municipalities
Communes and villages	2 686 communes with 13 092 villages
Population and labour force (2002)	
Total population	21 698 181 persons (2002 Census), from which: - Romanians: 89.5% - Hungarians: 6.6%
Romanians living outside the country	9.9 million
Population density	91 inh./sq.km
Life expectancy	70.5 years
Urban population	11 434 941 persons, from which 41% live in the 10 major cities: Bucharest (1 921 751 inhab.);Iasi (348 705 inhab.);Constanta (336 309 inhab.);Cluj-Napoca (331 992 inhab.);Timisoara (328 263 inhab.);Galati (325 057 inhab.);Craiova (311 326 inhab.);Brasov (307 046 inhab.);Ploiesti (248 339 inhab.);Braila (230 687 inhab.)
Iliteracy rate (as of population 15+)	3%
Labour market participation rate	56% (of population over 15 years)
Unemployment rate (ILO)	8.4%
Macroeconomic data (2002)	
GDP / capita (PPS)	24.4% of EU-15
Inflation rate	22.5%
Net lending of the general government	2.2% of GDP
Current account deficit	-3.4% of GDP
European integration process (1 May 2004)	
Year of signing the Association Agreement	1993
Year of starting accession negotiations	2000 (February, 15th)
Number of negotiation chapters opened	30
Number of negotiation chapters provisionally closed	22
Expected year of EU accession	2007

A. NATIONAL AND REGIONAL ECONOMY

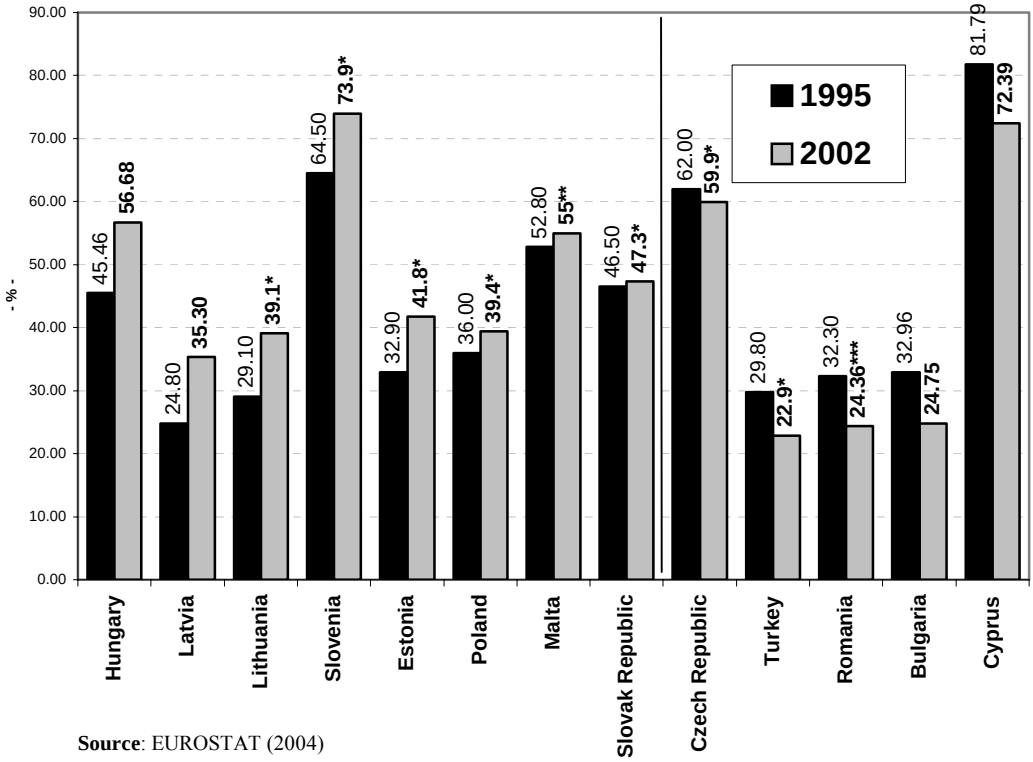
A.1. Economic growth

A.1.1. The growth pattern

Romania is the second largest country in the region, after Poland, in terms of size, population and market, holding a significant potential for becoming an important regional player. However, with a population of around 6% and an area of over 7% of the EU-15 one, Romania produces, in PPS terms, only the equivalent of less than 1.5% of the EU-15 GDP[1].

For 2002, according to EURSTAT estimates, the Romanian GDP per capita level, expressed in comparable PPS terms, is situated at 24.36% of the EU average, which positions Romania in the group of countries diverging from the EU average and behind most of its competitors in joining the EU (see graph A1).

Graph A1.: Relative position of candidate countries in terms of GDP per capita in PPP terms (average UE = 100%) in 1995 and 2002



Source: EUROSTAT (2004)

Notes: Data are ranked according to the size of convergence/ divergence (% of EU average gained /lost over the analized period)

* - forecasts; **- data for 1999 (most recent data available); ***- data from NIS (2003a)

The growth maintained in 2003 the same high rate as in 2002 (4.9%), again among the highest in Eastern Europe. As a consequence, Romanian GDP/inhabitants reached at the end of 2003, 27% of the EU average in PPS terms.

[1] Source: Authors calculations based on official National Institute for Statistics (NIS) and European Statistical Office (EURSTAT) data.

The main particular feature of the growth dynamics of Romanian economy during the last decade is the occurrence of the two-phased transitional recessions, in 1990-1992 and 1997-1998 (see graph A2.). They were reflecting the gradualist approach and the stop-and-go policies, with periods of acceleration of reforms alternating with periods of stagnation or even trend reversals.

The recession in the first years (1990-1992) – a shock of 25% of the GDP – was a typical early transitional recession. The inflation soared to a peak of 295.5% in 1992, mainly as an effect of the first stages of administrative price liberalisation during 1991[2]. However, unemployment remained relatively low[3], the adjustment to the shock being absorbed mostly into an important decline in real wages, which dropped to 60% of its 1990 value by the end of 1994. The partial price liberalisation was a component of the gradualist programme. The overall programme succeeded to smooth the economic decline, and turn it into a growth pattern during 1993-1996, but the macroeconomic stability was lacking sustainability in absence of a better coordination with structural reforms (OECD (1998), OECD (2003a), IMF (2001), Bratu (1998), Croitoru, Lucian (2003), a.o.).

As a consequence, the budget deficit rose[4] and foreign reserves declined[5]. Major stakeholders such as the managers of state-owned companies and trade unions in the large state enterprises and the state bureaucracy have successfully opposed structural reforms. More than that, lax monetary policy, easy financing for state enterprises, subsidies granted for social protection created a framework of soft budget constraints[6].

A new government came into power in late 1996. Beginning with 1997, implementation of a "shock therapy" program was attempted, with the central objective of accelerating the structural reforms. The so-called "100 Laws" package had four main objectives (OECD (1998): restructuring of the inefficient sector of the economy (represented mostly by raw materials and public utilities, energy sectors, but also in the heavy industry) accelerating the privatisation programme, reforming the agricultural sector and promoting the foreign investment. The main policies used for achieving the stated goals were: adoption of new, more market oriented legislation, a second wave of price liberalisation[7], reduction of subsidies and tight monetary policy. The reforms proved painful – a decline of over 12% in GDP followed in 1997-1999. This was the cumulative result of the unfavourable international

[2] During 1991 the number of products with regulated prices decreased from 170 to 98. Among the prices that were not liberalised in 1991 are basic foodstuff, housing and energy.

[3] With a maximum of 10.9% in 1994

[4] With the peak of budget deficit in 1993 (-4.7% of GDP, the highest level during the transition period)

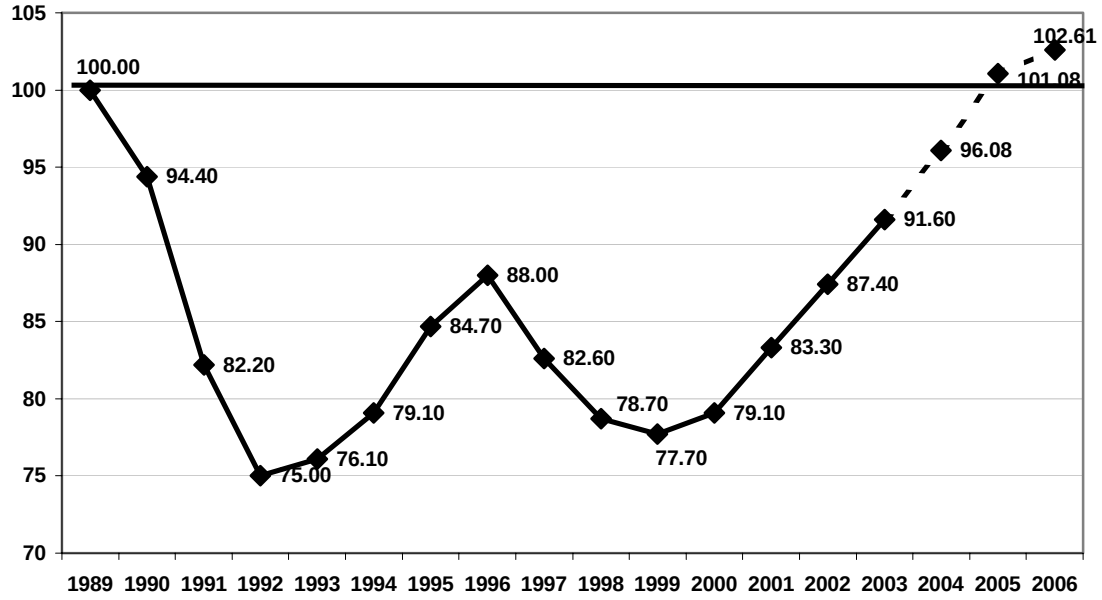
[5] Reserve assets of the National Bank of Romania (NBR) declined from +1843 mil. USD in 1990 to -618 mil. USD in 1994 and –414 mil. USD in 1996 (NBR ((2003)).

[6] For an in-depth analysis of sources and effects of soft budget constraints in Romania see Dăianu (1999), Dobrescu (1999), Dobrescu (2003), Țurlea (1998), Iancu (1997), OECD (1998), OECD (2002), IMF (2001), Croitoru (2003) a.o.

[7] IMF (2001) shows that estimates on the degree in which prices were controlled until 1997 vary according to the methodology used. Essentially, although many of the consumer prices were liberalised up to 1994, they were distorted by the subsidies, especially for the agricultural goods, and by the controlled prices of the raw and basic material prices. In some cases, controls were reintroduced. IMF estimates that at the end of 1996 as much as 40% of the consumer basket was still subject to direct or indirect control. The same source appreciates that after the liberalisation in 1997, the share of administrated prices in the consumption basket dropped to 14%.
Budina *et al.* (2001), estimates that after the liberalisation of prices in 1997 the share of administered prices in the consumption basket halved, from 33.2% to 16.1%.

conditions[8] and of the lack of coordination in implementation of different components of the program[9]. Nevertheless, the policies pursued in the period 1997-2000 set the primary and irreversible conditions for successful structural reforms, whose benefits started to be seen in the after-2000 evolutions.

Graph A2.: Romanian GDP growth pattern, actual and forecasted (1989=100)



Source: NIS (2004a), Romanian Government (2003a)

In 2000 Romania was beginning to pull out of the recession. This was based on a more coherent mix of basic policies: a prudent fiscal policy, a tight monetary policy with a managed float exchange rate, a more strict control of wage growth, and some progress in structural reforms. Thus, the patterns of more sustained growth started showing in 2001 and 2002: the 22.5% inflation in 2002 was the lowest since 1989, the budget deficit was brought down to 2.7% of GDP in 2002 (below the initial target of 3%), and the external position improved in 2002, although during 2003 the situation worsened again. Public debt is below 30% of the GDP[10] and foreign reserves rose to USD 6 billion, the highest level in the post-communist period. The NATO accession and the roadmap for European integration are incentives for further change and contributors to improving the perception of Romanian economy on international markets[11], potentially leading to growth in FDI, needed to finance the modernisation of the economy.

[8] Asian and Russian crises

[9] For instance, the tight monetary policy pursued in conditions of severe under-capitalisation of (mostly unrestructured) companies, and the associated credit crunch, on a market where the exit mechanisms (including the bankruptcy legislation) were not fully set or implemented, generated increasing arrears (reaching the equivalent of over 40% of the GDP by the end of 1999, according to official estimates) and ever higher informal economy, leading finally to an increase in the financial indiscipline.

[10] At the end of 2002, the government debt calculated according to the EU methodology is 22.7% of the GDP, out of which 7.1% represent domestic debt (information from the Ministry of Public Finance for the Pre-Accession Economic Programme)

[11] Following the economic and political progress registered by Romania and the invitation to join NATO in November 2002, the major agencies (Fitch, Standard and Poors and Moody's Investors Service) upgraded their

Several overwhelming challenges are still ahead for the Romanian government (EC (2003), OECD (2002), Romanian Government (2003a), a.o.): the urge for decisive fight against corruption[12], the need to simplify taxation and reduce the administrative burden[13], especially in what concerns the entry-exit mechanisms[14], the need to support the modernization of the economy, a more effective dissemination of the growth effects along all the layers of the society[15], the need to restructure and privatise public utilities, introduce effective wage control in the state sector[16], stimulate enterprise creation and development, and associated creation of more stable and better jobs, and, last but not least, to limit the volatility of legislative and institutional changes that contribute substantially to the high business risk perception on the Romanian markets[17]. Under the assumption of an adequate response of the macroeconomic policy mix to the above-mentioned challenges (Romanian Government (2003a), Dobrescu (2003)), official estimates point towards a rather sustained rate of growth in the next four years (at an average rate of 5.2%).

A.1.2. Regional disparities in growth

According to NUTS-2 classification, Romania is divided into 8 development regions: Bucharest, Southeast, South, Northeast, Northwest, West, Southwest and Centre. In terms of GDP per capita, the regional dispersion[18] increased from 1996 to 2000 (latest data available at regional level) by 2.2 times. In 2000, the gap between the leader (Bucharest region) and the laggard (North-East region) was 3:1. During 1996-2000, no change in relative positioning of the regions (according to the GDP/inhabitant), was observed.

EURSTAT (2003a) reveals that the poorest region in the countries included in the analysis (EU-15 and candidate countries) is the Romanian North-East region with only 16% of the EU-average in terms of GDP per capita. Ten out of the 56 regions in the candidate countries are below the threshold of 25% of EU average, of which 6 are in Romania. A seventh

rating for Romania during 2003 – this was the expected outcome of a higher credibility of Romania as investment destination (see a.o. Sadeanu *et al.* (2002))

[12] Corruption was indicated as a major problem by all the relevant bodies: EU, International Monetary Fund, World Bank, NATO. Transparency International (http://wwwtransparency.org) ranks Romania according to the Corruption Perception Index on the position 79 out of 102 countries surveyed worldwide, after Russia (74) and far behind other candidate countries (of which Slovak Republic has the lowest score, 55). Romania set in 2002 a National Anti-corruption Prosecutors' Office, which nevertheless was accused of concentrating mostly on petty corruption. In 2003 new legislation on transparency and fight against corruption was introduced.

[13] There are 200 taxes and fees in Romania, although only 36 make up to 95% of the tax burden (OBG (2003)).

[14] After 2002 an Action Plan on improving the business environment was put in place, with visible results – the creation of Sole Office, the introduction of self-registration and self-certification, the new bankruptcy law. However, there are still important barriers and problems as the inefficiency of juridical system, or various organizational problems e.g. those related with the decision to move the Sole Office (SO) from the Trade Registry to the Ministry of Justice.

[15] According to World Bank estimates, only between 1989 and 1998 the poverty increased 6 folds. In 2002, the share of poor was estimated at 29% of the population (World Bank (2002), National Anti-Poverty Commission, (2002)), with 11.8% living in extreme poverty (National Anti-Poverty Commission (2002)). Although anti-poverty policies are put in place, various institutions as the Romanian Academic Society or Crisis Prevention Commission criticize them as chaotic, incompatible with World Bank framework, and leaving room for red tape.

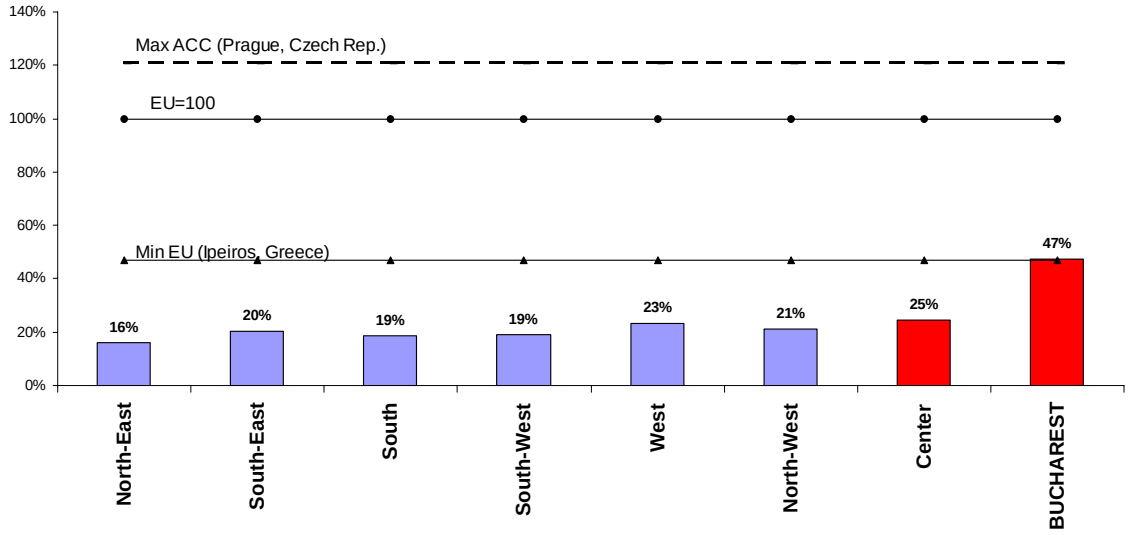
[16] The wage gap between public and average wages was estimated by the OECD, Economic Assessment, Romania, 2002 as the ratio between public sector wages and national average wages at 1.44, while the state sector produce the most or arrears and losses.

[17] For instance, the legislation on commercial companies was modified 23 times since its introduction in 1990, the VAT legal framework also 23 times since 1992, the privatisation legislation no less than 51 times since 1995 (Bogdan (2003))

[18] Measured as standard deviation from the mean value

Romanian region, Centre, is at the 25% of the EU GDP/capita, while Bucharest is barely reaching 47.2%[19], slightly above the EU-15 poorest region, Ipeiros in Greece (see graph A3.).

Graph A3: Relative position of Romanian regions in terms of GDP per capita in 2000 (average EU-15=100)



Source: Authors' calculations based on EURSTAT (2003a)

The main reason that lie, in our opinion, behind the growing regional disparities in Romania[20], we find *the previous model of forced industrial development*, based on monoindustrial regions, usually small-medium towns[21], with not enough mass for achieving urbanisation effects, falling therefore into economic depression after the collapse of the underlying industry. Some of these regions are declared by the Romanian legislation as "disadvantaged" and enjoy various financial and fiscal incentives to attract investment[22]. 200 localities are included in governmental programs addressing disadvantaged areas[23] (see Table A1.).

Table A1.: Number of disadvantaged areas per development region

North-East	South-East	South	South-West	West	North-West	Center	Bucharest	Total
3	4	4	3	7	9	5	0	35

Source: MDP (2002)

[19] Following the high growth in 2001 and 2002 the Bucharest region probably reached by 2002 a value over the threshold of 50 % of the EU average (estimation based on trend extrapolation).

[20] See also MDP (2001)

[21] More than half (59.2%) of Romania's 265 towns are small, having less than 20,000 inhabitants. The population living in these communities represents slightly over 7% of total population, but together with rural population, it covers 52% of Romanian citizens living mostly out of agriculture, handcraft activities, or public services, with only marginal presence of industrial or services activities. Only 24 cities have more than 100000 inhabitants and it is here where most of the industrial activity is concentrated (MDP (2001)).

[22] Government Emergency Ordinance no. 24/1998 on Disadvantaged Zones, amended by Government Emergency Ordinance no. 75/2000, establish the criteria for declaring a particular Area as disadvantaged, the period for granting the status and the incentives for investment. As now, there are 35 disadvantaged zones in Romania, but the facilities granted have been limited recently and there is a probability that the legislation will be abrogated during 2004.

[23] Around 8% of the total number of towns and communes in Romania

Nevertheless, the regional disparities in Romania remain rather low. Estimated by the standard deviation of the GDP per capita in PPS terms, the inter-regional disparities in Romania, represented 35.7% of the EU average in 2000 and 51% of the candidate countries (ACC) average[24] for the same year. An increase in the regional disparities might be expected, as the market forces actually tend to reshape the regional profiles.

Pro-active regional policies meant to prevent growing disparities have to strike the balance between answering the development needs of local communities and allowing the reshaping and re-alignment of industrial networks. European structural funds might represent an important tool in achieving this goal. However, according to the European Commission's "Regular Report on Romania's progress towards accession", 2003, Romania has to register significant further progress in preparing the implementation of Structural Funds for insure their efficiency, both in terms of clarification of institutional structure (including at local/regional level) and of enhancing the quality of development plans and prioritisation of investment programs.

A.2. Sources of economic growth

A.2.1. The supply side of growth

The evolution of the supply side was constantly under the influence of both structural policies and reforms, and of market forces. While the opening of trade has exposed the Romanian industry to international competition, the privatisation and market-oriented reforms achieved only partially their goal of insuring modernization of the production capacities. This resulted in a shrinking of supply. Although the private sector contributed with more than 50% to the GDP creation since 1996, it was only in 2002 that the private sector became preponderant in the structure of social capital of Romanian companies. This points to the role of the private sector mostly in agriculture and small services based on self-employment. The development of the private sector in the corporate sector was inhibited by several factors and policies (Dobrescu (2003)):

- existence of many chronically under-performing enterprises, sustained by the state through implicit or explicit subsidisation, mainly in order to avoid social unrest or the collapse of a regional node;
- under-use or even complete blockage of other capacities, although potentially profitable, due to delays in privatisation and numerous patrimony litigations;
- under-capitalization of a large part of the viable segment of the economy due to the difficult (until 2002) access to credits; very limited measures to support start-ups;
- relatively high burden of taxation; widespread corruption.

During 2001-2002 all these bottlenecks started to be effectively addressed, and the results became visible. The explicit subsidies were reduced and the financial discipline was strengthened. Therefore, the stock of arrears decreased compared with 2000[25]. The continuation of in-depth reform of the banking sector after the bank scandals in the late 90s

[24] The ACC average does not include Malta, for which data is not provided by the EURstat study

[25] Reaching 37% of the gross domestic product at the end 2002 compared to a stock of 40.67% of the GDP in 2000 (Romanian Government (2003a))

lead to a substantial increase in the share of credit of private sector[26]. A lower level of taxation for labour reduced the tax burden for companies and facilities for micro-enterprises were introduced, including a more favourable tax system and guaranties for credits. These trends and measures have impacted both on the growth itself, but also on the changes in structure of the value added.

The share of major sectors in total VA (in nominal terms) shows an impressive shift favouring the growth of services in total GDP on the supply-side especially since 1997. This was achieved at the relative expense of mainly industry, but also agriculture.

This is a rather positive development, but it should be remembered that the structural change after 1997 is attributable to a large extent to the realignment of the relative prices following the massive price liberalization in 1997 and the emergence of the Balassa-Samuelson effects. In real terms, both the share of industrial production and of services in total value added recorded only a modest growth (see Table A2.). The contribution to GDP growth after 2000 was supported mainly by the manufacturing industry and selected services (post and telecommunications, financial and real estate, governmental services), as it will be detailed further in Chapter C.

The situation in the agricultural sector reflects the main structural imbalance of the Romanian economy. While employing over 33% of the labour force in 2002, agriculture contributes with less than 13% to the creation of nominal value added. This is explained on the one hand by the retro-migration[27] of industrial labour, towards subsistence agriculture, as a specific form of hidden unemployment. On the other hand, the lack of modern equipment and irrigation systems, and the fragmentation of agricultural land[28] prevent the emergence of a modern, cost effective agriculture[29].

Table A2.: Supply side of growth

- nominal prices	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Agriculture	21.3%	21.2%	20.4%	19.4%	16.0%	14.9%	12.4%	14.7%	12.6%
Industry	39.2%	35.6%	35.5%	33.5%	29.6%	28.2%	30.9%	31.5%	32.5%
Construction	6.8%	6.7%	6.7%	5.6%	5.6%	5.7%	5.5%	5.5%	5.6%
Public services	9.2%	9.2%	9.0%	7.1%	9.8%	9.0%	10.1%	10.1%	10.1%
Other services, from which	23.5%	27.4%	28.4%	34.4%	39.0%	42.2%	41.2%	38.1%	39.2%
- trade	7.4%	9.4%	9.8%	9.8%	12.3%	12.7%	11.9%	12.1%	12.3%
- 1994 prices	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Agriculture	21.3%	20.8%	19.1%	20.3%	19.4%	20.3%	16.8%	18.7%	17.0%
Industry	39.2%	38.8%	39.4%	38.9%	38.9%	40.6%	42.9%	41.8%	42.6%
Construction	6.8%	7.0%	6.8%	5.8%	6.0%	6.0%	5.9%	6.2%	6.3%
Public services	9.2%	8.4%	9.1%	9.0%	10.5%	9.2%	8.9%	8.3%	8.2%
Other services, from which	23.5%	25.0%	25.6%	26.0%	22.8%	23.9%	25.5%	25.0%	25.8%
- trade	7.4%	8.2%	8.4%	8.1%	9.2%	9.7%	9.7%	9.8%	10.2%

Source: Authors' calculations based on data in NIS (2004a) and NIS (2004b)

[26] Lending to the private sector increased during 2002 against previous year by 51.9% in nominal terms, as compared with 12.9% growth in lending to the state sector; credits to the private sector represented at the end of 2002 80.7% of the total lending (OBG (2003)).

[27] Migration of the labour force from cities to countryside, from industry and services to agriculture

[28] Individually-owned farms account for over 68% of the total agricultural land, while cost efficient farms (associations) only for 10% (OBG (2003)). It is only during 2000 that Romanian legislation allowed the previously nationalised farmland and forests to be returned to their former owners up to 50 ha of farmland and respectively 10 ha of forests.

[29] Romanian agricultural production is still strongly dependent on weather conditions, which explains the fluctuations in its growth.

According to the Romanian Pre-Accession Economic Programme 2003, the trends identified after 2000 in the supply are likely to continue, although no significant change is expected in the structure of the output at the aggregate level (see Table A3.).

Table A3.: Projected structure of Gross Value Added in real (1994) prices

	2003	2004	2005	2006
Agriculture	15.8%	15.7%	15.6%	15.3%
Industry	42.8%	42.7%	42.7%	42.7%
Construction	6.5%	6.6%	6.8%	6.9%
Services	34.2%	34.2%	34.3%	34.3%

Source: Authors' calculation based on data in Romanian Government (2003a)

A.2.2. The demand side of growth

As expected, the private consumption showed, up to 1999, an obvious tendency of increasing its share in GDP, as the rest of the GDP components are the first to adjust to the economic recession. Although the private consumption remained an important contributor to growth, its absolute share declined during the years of growth after 2000, in favour of governmental consumption and investment, but also inventory change (see Table A4.).

The gross investment's share in GDP stood at low levels. With the exception of the first years of growth (1994-1996) and 1997[30], the share of gross fixed capital formation remained below 20% of GDP up to 2002.

Table A4.: Demand side of growth – share of demand side components to GDP

- % -	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Final consumption	**79.2**	**75.9**	**77**	**76**	**77.3**	**81.3**	**82.5**	**86.4**	**90.3**	**88.8**	**85.9**	**86.2**	**82.6**	**83.2**
Households consumption	65.9	60.8	62.7	63.7	63.5	67.6	69.4	74.1	83.2	83.1	79	79.9	**76**	**76.7**
Governmental consumption	13.3	15.1	14.3	12.3	13.8	13.7	13.1	12.3	7.1	5.7	6.9	6.3	**6.6**	**6.6**
Capital formation	**30.3**	**28**	**31.4**	**28.9**	**24.8**	**24.3**	**25.9**	**20.7**	**17.8**	**16.1**	**19.7**	**21.9**	**23.1**	**24.6**
Gross fixed capital formation	19.8	14.4	19.2	17.9	20.3	21.4	23	21.2	18.2	17.7	18.9	19	**21.1**	**22.5**
Inventory change	10.5	13.6	12.2	11	4.5	2.9	2.9	-0.5	-0.4	-1.6	0.8	2.9	**2**	**2.1**
Net export	**-9.5**	**-3.9**	**-8.4**	**-5**	**-2.1**	**-5.6**	**-8.4**	**-7.1**	**-8**	**-4.8**	**-5.7**	**-8.1**	**-5.8**	**-7.9**
GDP	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Authors' calculations based on NIS (2004a) and NIS (2004b)

The evolution of public consumption was counterbalancing the investment evolution. The descending trend after 1997 reflects the austerity program implemented in the administration and budgetary sphere ever since. The significant share that inventory change (stock building) has had in GDP, starting with 1990 until 1994, might be seen as one of the most important

[30] The growth in 1997 is due to the huge inflow of foreign capital brought in by the promise of the in-depth reforms after 1997

proofs of the lack of restructuring in some of the sectors of the Romanian economy, justifying once again the non-sustainable pattern of growth for the respective years. Ciupagea (2001) show that the high level of stock building is reflecting the disfunctionality of markets or the inefficiency of supply in meeting the demand, which if not addressed, might prove non-sustainable in the medium term.

As highlighted in the Romanian Government (2003a) the still low level of marketable domestic demand, especially in case of households, is limiting the further growth-driving potential of the current structure of GDP (see Table A5.). Self-consumption (produced and consumed out of the market) is still an important part of the final consumption (see Chapter I). Moreover, a growth in market demand tends to be covered by growing imports, worsening the trade balance. These are the main reasons for which the governmental programs are stressing out the need to stimulate primarily the investment.

Table A5.: The contribution to growth of demand-side components of GDP

- % growth against the previous year -	2000	2001	2002	2003
GDP	**2.1%**	**5.7%**	**4.9%**	**4.9%**
Households consumption	0.1%	5.1%	2.9%	5.2%
Governmental consumption	1.2%	0.1%	0.2%	0.3%
Gross fixed capital	1.0%	1.7%	1.8%	1.2%
Inventory change	2.2%	1.8%	-0.3%	-0.9%
Net export	-2.4%	-3.0%	0.3%	-0.9%

Source: Romanian Government (2003b), and authors calculations based on INS (2004b) data

During 2002, the favourable developments in the economy, and the lower interest rates have boosted the investors' confidence, reflected in an 18% growth of loans for capital investments. The official forecasts point towards strengthening of the contribution of gross fixed capital formation in GDP growth over the following years (see Table A6.). This is likely scenario given several favouring conditions:

- the main short and medium term objective of the fiscal budgetary policy (Romanian Government (2003a) are: accelerating of structural reforms, stimulating the growth of private investment and implementation of investment projects of national interest (infrastructure);
- the reform in the administrative and legal framework is to continue, improving the business environment;
- a functional banking system; increased private savings; higher availability of funds for credits;
- a better system of grants and guaranties for start-ups and SMEs;
- a higher credibility and consequently a better raking of the Romanian economy, which is expected to attract further FDI[31].

[31] Nevertheless, there are strong expectations of an orientation of investments towards portfolio investment, as a reaction to the volatility of international capital markets (Ciupagea and Ţurlea (2003)) Although portfolio investment is crucial for the functioning of domestic capital markets, it is subject of higher volatility than the direct investment.

Table A6.: Projected growth of main GDP components on uses side

- % against the previous year -	2004	2005	2006
GDP *growth* at *constant* market prices	5.6	5.2	5.1
Private consumption expenditure	4.0	4.0	3.8
Government consumption expenditure	2.0	1.0	1.5
Gross fixed capital formation	13.0	11.0	10.0
Changes in inventories and net acquisition of valuables as a % of GDP	2.0	1.8	1.7
Exports of goods and services	8.2	7.7	7.3
Imports of goods and services	8.0	7.4	6.8

Source: Romanian Government (2003a)

A.3. Labour market and productivity

A.3.1. Trends in unemployment

At first glance, the unemployment rate seems as one of the less worrying figures on Romania. The number of registered unemployed at the end of December 2002 decreased at 761 thousand, as compared with 827 thousand at the end of 2001 (NIS (2003a)). The registered unemployment rate reduced, therefore, from 8.8 per cent to 8.1 per cent. The adoption of the Law 76/2002 on the unemployment insurance system (which came into effect on March 1st 2002) introduced effective active labour market policies aiming both at stimulating the employers to hire from the unemployment pool and at new job creation. In 2002, the expenditures with active labour market policies accounted for 13.9 per cent of total expenditures of the unemployment budget, as against 2.3 per cent in 2000.

Both the registered unemployment rate[32] and the ILO unemployment rate[33] (see Table A7.) are close to average when compared with levels registered in Central European[34] or European Union countries[35].

[32] In order to receive unemployment benefits, the unemployed have to register at the Labour Offices. Up to 2002, most of those registered were entitled to benefits, irrespectively of the search behaviour, as the Labour Offices were perceived as having only limited impact on effectively reducing the mismatches on the labour market. As a rule, after the period of granting the unemployment benefit, they ceased to register. The introduction of the Law on Minimum Guarantied Income (Law 416/2001), boosted the registration of the unemployed, as this became a compulsory condition for granting the minimum guaranteed income, which, unlike the unemployment benefit, it is not restricted to a limited period. According to estimations for Romanian Government (2003a), 8.4% of the Romanian families benefited for support within this programme.

[33] Resulting from the labour surveys, according with the International Labour Office methodology

[34] ILO unemployment rate in Eastern European countries was ranging in 2002 between 3.3% in Cyprus and 5.8% in Hungary and 18.5% in Slovakia and 19.9% in Poland (NIS (2003b))

[35] The average ILO unemployment rate for the EU-15 was 7.8% in 2002 (EURSTAT (2003b))

Table A7.: Unemployment rate, 1990 – 2002 (%)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Rate of unemployment (registered unemployment- %)	3	8.4	10.4	10.9	9.5	6.6	8.9	10.4	11.8	10.5	8.8	8.4	7.2
Rate of unemployment (ILO unemployment %)	NA	NA	NA	NA	NA	6.7	6	6.3	6.8	7.1	6.6	8.4[36]	NA

Source: NIS (2004a)

Moreover, the Romanian Pre-Accession Programme estimates a decline in the ILO unemployment rates over the incoming years (Table A8.).

Table A8.: Forecasted unemployment rates

- % -	2004	2005	2006
Registered unemployment rate	7.8	7.6	7.4
ILO unemployment rate	7.6	7.1	6.8

Source: Romanian Government (2003) and Ministry of Development and Prognosis (MDP) estimations for budgetary projections

Some specific features lie behind this low figure, leading to the conclusion that the hidden unemployment, in various forms is, instead, very high. Among these we mention:

- **Labour participation rates are small** even when compared with other candidate countries, and far from Lisbon targets implying a significant share of inactive labour[37] (see Table A9.):

Table A9.: Activity rates in selected candidate countries (active population as percentage in population over 15 years) in 2002:

Bulgaria	Cyprus	Czech Republic	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Slovenia	Slovakia
49.4	61.9	59.8	57.9	49.1	61.8	57.9	55.4	56	57.5	60.2

Source: NIS (2003b)

- The share of **unpaid family workers** in the structure of employment (see Table A10.) is significant and increasing since 1996. The unpaid family workers are neither active on the labour market, nor flexible. They do not negotiate wages. The distribution by gender and area shows that most of the unpaid family workers are women (70%) and are located in the rural area (88%)[38]. More than that, according to the NIS - Labour Force Survey for 2002, 98.9% of the unpaid family workers and 88% of the self-employees work as farmers. Having in view the level of poverty in the rural areas and the labour added phenomenon[39], it is safe to assume that unpaid work and self-employment in agriculture is, at least for a part of the agricultural employment, an alternative to wage-earner situation, and not a utility-enhancing choice.

[36] Due to changes in methodology, data for 2002 is not comparable with the rest of the time series
[37] Moreover, the activity rates are significantly lower in the urban areas (see table A15)
[38] Data for 2002 (NIS - Labour Force Survey)
[39] The increasing share of employment in the agriculture, producing a similar level of output

Table A10.: Structure of employment, by professional status, gender and area (2002)

	Employee (%)	Employer (%)	Self-employment (%)	Unpaid Family Worker (%)	Member of a cooperative (%)	Total (%)
Male	62.99%	2.00%	26.62%	8.14%	0.25%	100%
Female	60.14%	0.85%	15.37%	23.37%	0.26%	100%
Urban	91.46%	2.27%	5.17%	1.05%	0.05%	100%
Rural	32.05%	0.69%	37.77%	29.03%	0.46%	100%
Total	61.69%	1.48%	21.50%	15.07%	0.26%	100%

Source: Authors' aggregation based on NIS - Labour Force Survey (2002) data

The unemployment rate among young persons (15-25) is declining (see Table A11.), in the same time with the participation rate for the same group (see Table A15.). This can be partially explained by the increase of enrolment rates in higher education.

Table A11.: Rates of unemployment, by age groups (%)

	1996	1997	1998	1999	2000	2001	2002[40]
15-24	20.2	18	18.3	18.8	18.6	17.5	21.6
25-34	7.1	6.6	6.8	7.5	7.8	7.2	8.7
35-49	4.4	4.1	4.9	5.7	6.3	5.9	6.9
50 and over	1.1	1	1.0	1.3	1.6	1.5	3.5

Source: NIS - Labour Force Surveys, various issues

The rate of unemployment is the highest for the younger age (15-24 years), but not outside the similar data in the candidate countries (see Table A12.).

Table A12.: Unemployment rate for the 15-25 years age group, 2002, %

Bulgaria	Cyprus	Czech Republic	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Slovenia	Slovakia
36.5	7.7	16.0	17.6	12.6	20.8	23.0	43.9	21.7	16.7	36.1

Source: NIS (2003b)

On the other hand, the high activity rates and low unemployment for the older workers is explained by the involvement of this age group into agricultural activities, associated with the rural areas (Table A15.).

The unemployment rate for highly educated persons is below that for other categories (see Table A13). However, the pattern seems to change, as the unemployment rates increase for the highly educated and decrease for the lower educated. The low unemployment rate for the lower educated labour is explained by the fact that 93% of the labour with primary school and below are employed in agriculture. The increasing unemployment rate for the higher educated labour force draws the attention on the risk of accentuating the under-utilisation of labour.

[40] Due to changes in methodology, data for 2002 is not comparable with the rest of the time series

Table A13.: Unemployment rates by educational level (%)

	1996	1997	1998	1999	2000	2001	2002[41]
Higher education	2.41	2.66	2.60	3.12	3.60	3.96	4.65
Post high school	2.91	3.22	3.75	4.19	5.62	4.71	5.13
High school	8.40	7.73	8.49	9.27	9.71	8.80	9.71
Primary school and below	6.20	5.11	4.95	5.05	4.87	4.57	4.60

Source: Authors calculations' based on data from NIS - Labour Force Surveys, various issues

At regional level, disparities exist in the rate of registered unemployment (see Table A14.), as well as an expected correlation with the level of GDP per capita (see section A6.). Nevertheless, the size of regional disparity[42] declined by 2001 at 66% of its value in 1994.

Table A14.: Distribution of registered unemployment at regional level

	1994	1995	1996	1997	1998	1999	2000	2001	2002
TOTAL	**10.9**	**9.5**	**6.6**	**8.9**	**10.4**	**11.8**	**10.5**	**8.8**	**8.4**
NORTH-EAST	16.4	13.7	10.0	12.2	13.9	14.9	13.2	10.6	10.8
South-East	11.9	10.6	5.3	9.4	11.7	13.2	11.4	9.8	10
South	9.9	9.0	5.4	8.0	10.1	11.8	10.4	8.9	9.2
South-West	11.0	9.9	5.7	10.8	10.9	11.7	11.6	10.4	9.4
WEST	9.2	7.5	8.6	8.3	10.6	12.6	10.4	9.5	6.6
North-West	10.1	8.6	7.6	8.1	8.8	10.0	8.5	6.8	6.8
Center	10.0	9.1	7.7	8.7	10.2	11.0	10.3	8.6	9
Bucharest	5.7	5.1	4.7	5.4	4.4	6.9	5.8	4.7	3.3

Source: NIS (2003c) and NIS (2004a)

A.3.2. Changes in labour supply

The participation rate[43] has a descending trend, from almost 65% in 1996 and 1997 to 62.2% in 2001 (see Table A15.). According to the new methodology implemented in 2002 in the labour force surveys, the participation rate in Romania is as low as 56%[44].

[41] Due to changes in methodology, data for 2002 is not comparable with the rest of the time series

[42] Measured using the standard deviation of registered unemployment rates

43 The participation (activity) rate is defined as the share of labour supply, or active population (employed + unemployed) in total population over 15 years

[44] The main methodological difference that affects the participation and employment rates regards the treatment of persons temporarily absent from their declared activity. While before 2002 these groups were considered as active, the 2002 methodology introduce clearer criteria regarding the duration of absence and the certitude of returning to the declared occupation. Consequently, the most significant differences regard the older workers (over 50 years) and the participation rate in the rural areas. This is a further argument in favour of agricultural activities have the role of hidden unemployment – these activities are in many cases provided by labour force with lower chances on the formal labour market, and as long as no other job opportunities are available.

The decline is attributable to a reduction in participation rates for all the age groups up to 50 years. While the participation rate for persons aged 50-64 years remained fairly constant, the participation rate for persons over the legal retirement age (65 years and over) increased.
Also, while the participation rates declined for all age groups in the urban areas, the increase in the participation of older workers is entirely attributable to the rural areas. Active population over 64 years represented in 2002 5.5% of the total active population, out of which 95.7% were in rural areas. Again, these results point towards the important role that agriculture and the retro-migration holds in the design of labour markets in Romania.

Table A15.: Participation rates, by age groups (%)

	1996	1997	1998	1999	2000	2001	2002[45]
Total Romania	64.8	64.8	63.6	63.4	63.2	62.2	56
15-24	49.9	48.3	45.8	44	43.1	41.5	30.5
25-34	85.6	84.8	83.4	83.8	84.5	83.2	73.7
35-49	87	87.2	85.7	85.2	85	84.2	76.0
50-64	57.9	59.5	58.1	58.2	57.8	56.6	46.8
65 and over	32.5	33.8	34.8	36	35.7	35.4	18.5
Total Romania- urban areas	60.5	59.3	57.7	56.7	56.1	55	53.2
15-24	40.5	37.4	35.8	34.3	33.3	32.0	31.5
25-34	86.7	85.5	83.9	83.5	84.2	83.3	82.9
35-49	87.7	87.4	85.8	84.7	84.2	83.3	81.6
50-64	41	41	38.9	39	38.5	37.5	36.2
65 and over	5.4	5.5	5.0	4.6	4.4	4.0	2.0
Total Romania-rural areas	69.9	71.5	70.8	71.7	72	71.2	59.3
15-24	61.2	61.9	58.7	56.9	56.5	54.7	48.9
25-34	84	83.9	82.7	84.2	84.8	83.1	77.9
35-49	85.7	86.8	85.6	86.2	86.6	85.9	81.7
50-64	72.5	75.9	75.7	76.9	77.5	77.1	61.7
65 and over	49.7	52.0	54.1	56.5	56.4	56.4	29.4

Source: NIS - Labour Force Survey (2002)

Special attention deserves the younger group of active population. Roughly half of the decreasing trend in participation rate of 15-24 years can be explained by their larger education enrolment, which increased from 38% in 1996 to 42% in 2001. The rest of the decline is attributable mostly to the difficult transition from school to work observed in Romania[46].

In the same time, the average level of education of the labour supply is rising: the share of both active and employed population with high school and higher education tends to increase, while the share of active population with primary education decreases. However, this also hides a mismatch phenomenon: a rough estimation would show that in 2002 only 80%[47] of

[45] Due to changes in methodology, data for 2002 is not comparable with the rest of the time series

[46] During the period 1990-2000 only 48.4% of the persons leaving the educational system (as graduates or not) have found a appropriate job. From those, roughly half have find such a job during the first 3 months. 23% need to wait more than two years for a significant job. In what concerns the distribution on occupations, from those finding a job, most are qualified workers (23.8%), specialised workers in trade and services (15.3%) and higher specialists (12.9%) (NIS (2000)).

[47] Calculated based on NIS - Labour Force Survey (2002) as share of employees with long and short term education working as high-level clerks and specialists with intellectual and scientific jobs

the active persons with tertiary education had a job corresponding to their educational attainment.

Corroborated with the data on unemployment (see Table A13.), the conclusion is that the persons with lower education tend to exit from the labour market once the opportunities are no longer available. The higher educated population might play the role of push-factor for the modernization of the economy, but given the six of the mismatch phenomenon, questions are to be rose regarding on one hand the capacity of the educational system to prepare the students for the local labour market, and on the other hand on the possibilities of the economic system to accommodate the increasing labour supply with higher educational attainment. These issues will be discussed further in Chapters G and I.

A.3.3. Changes in labour productivity

The estimation of labour productivity has to take account of the high share of non-wage-earners in the total employment in Romania. As for the year 2002, the share of wage-earners (employees) in total employment amounted to only almost 62%. The difference consists in employers (1.5%), but mostly self-employed and unpaid family workers (36.5%). The formula used to define productivity in Table A16. is: Value Added in 1994 prices/Employed population:

Table A16.: Dynamics of labour productivity

	1997	1998	1999	2000	2001	2001/1996, average yearly growth
Total productivity gains	-7.69%	-5.98%	2.29%	2.33%	6.64%	**-0.63%**

Source: Authors calculations based on NIS (2003a) for value added and NIS - Labour Force Surveys, various issues for the employment data

This dynamics hides a significant aggregation bias, as the agricultural and non-agricultural sectors have diverged: while the average yearly growth of productivity in agricultural sector was over the same period –3.25% yearly, the rest of the economy registered a growth in productivity of almost 1% per year.

The growth of productivity in the non-agricultural sector was therefore below the average growth of real wage (-3.3% per year), implying important competitiveness gains over the period.

A.4. Major structural changes

Romania's economy and society have undergone major changes during the transition process. Market forces have gradually replaced the tightly centralised communist system. A European profile is emerging for Romania, along with the negotiations for the EU membership. Romania shares, with some specificity, the characteristic features of transitional structural changes common to the East-European area.

Behind the changes in the **structure of output on the demand and supply side** and in the **structure of employment**, referred in the previous chapters, among the most important main underlying forces of change, we will refer briefly to the changes in ownership structure and in the reorientation of external trade.

The private sector increased its contribution to GDP creation from 12.8% in 1989 (NIS (1995)) to 67.1% in 2002 (NIS (2003)). The private sector is located mostly in agriculture (97.8% of sectoral value added in 2002), but also in services (78.4%) and construction (81.8%). Industry is lagging behind (57.7%). However, at the level of enterprise sectors in industry, construction trade and market services, private sector is responsible for over 98% of the total turnover in the SME sector, again lagging behind in the case of big and very big enterprises. This has implications regarding the role that the private sector effectively has on the market: while it becomes very important for the competitive environment, it shares with the state the influence on the internal market as a factor of alignment of industrial networks. Nevertheless, privatisation of major companies during 2002 and 2003 as agreed with IMF and World Bank as well as opening the telecommunications and utilities markets to private initiative had and will have an important role in further adjusting this situation.

Opening the external trade allowed to Romanian firms early exposure to market competition. This lead to major changes in the structure of external trade, both in terms of structure on goods as well as in geographical orientation. The structural reorientation of exports towards EU (see Table A17.) was the result of an impressive growth of exports towards these destinations, growth that outpaced other trends.

Table A17.: EU as trade partner for Romania

	Share of EU in total exports	Share of EU in total imports
1990	33.9%	21.8%
1994	48.2%	48.1%
1995	54.1%	50.4%
1998	64.5%	57.7%
2000	63.8%	56.4%
2002	67.1%	58.4%
2003	67.7%	57.7%

Source: NIS, Romanian Trade Statistics database, 2002

During transition, the Romanian exports saw a strong concentration towards few groups of products. In 2002, four commodities groups account for 72.3% of total exports, namely light industry (33.7%), machinery (15.7%), metallurgy (12.9%) and wood industry (10%). In 1990, the same groups accounted less than 50% of the total exports. Both the trade reorientation and the FDI contributed to some extent to reshaping the structure of output.

On the imports side, there is a less strong process of concentration. Nevertheless, as in 2002 four categories of goods accounted for 59% of total imports (machinery 22.9%, clothing 16.4%, mineral products 12.8%, metal and metal goods 7.4%). In 1990, the same groups accounted for 65% of total imports. There is a high dependency of imports to exports, given the high share of subcontracting in leading export industries and the high consumption of energy and intermediary inputs specific to Romanian industry. Machinery has the highest share in imports and the highest growth in share (growing from 14.3% in 1990), most of which being capital goods for investments (Romanian Government (2003b)).

A.5. FDI and cross border capital flows

Although various programs were put in place to attract FDI, the volume of foreign investment in Romania remained very low. Foreign investors are cautions giving the country well known legal and macroeconomic instability and the widespread corruption.

At the end of 2001, the number of companies that benefited from FDI was the equivalent of roughly 30% of the total number of active enterprises on the Romanian market. On the other hand, with the exception of the first transition years and 1994, the share of capital subscribed as FDI in total investment ranged between 4 and 16% of the total investment, with the highest values recorded after 1999.

However, the MDP has stated that FDI has contributed to the development of telecommunications, trade and certain manufacturing sectors as textiles, wood and furniture, and electronic devices.

Greenfield foreign investment represents 80% of the total, other 17% are oriented towards privatisation[48] and the tiny rest act on the capital markets. Industry is the destination of major FDI. From the economic sectors of subscribed commercial companies, in the period between 1991 – and of 2002, 56% of registered capital is in industry, followed by services (15%) and wholesale trade (11%).

Three ICT companies are among the first 10 FDIs in Romania as at the end of 2002, all in telecommunications: Mobifon (the leader on the mobile communications market and owner of Connex)- 3rd FDI in the top 10; Romtelecom (the incumbent on the fixed telephony market) – 8th FDI in the top 10 and Orange (second mobile communication leader) – 10th FDI in the top 10.

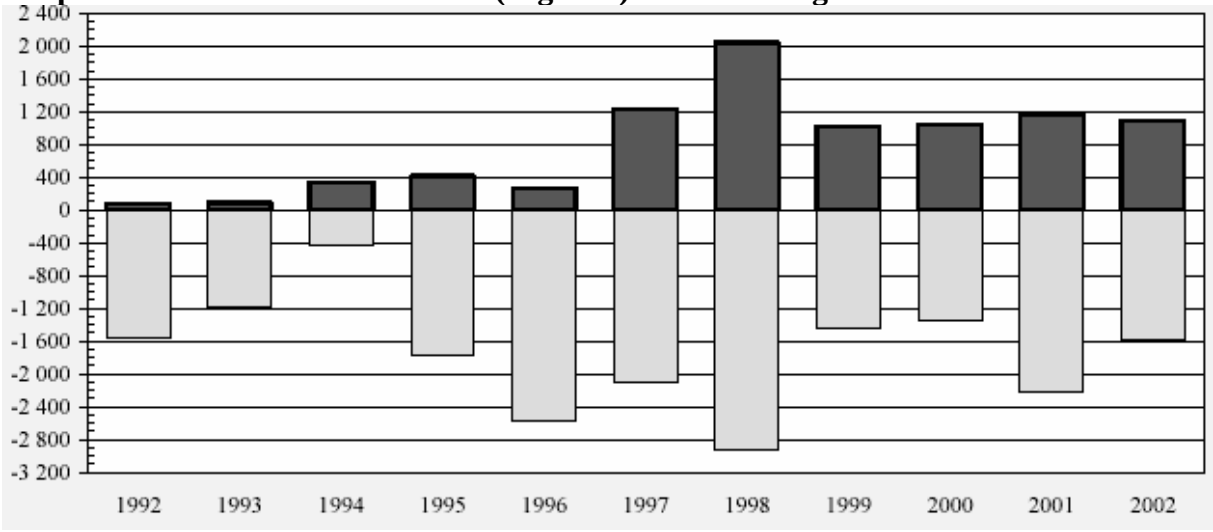
From the total FDI, European investors subscribed 80%. From a regional perspective, the areas preferred by the foreign investors are Bucharest, the western Romania and the free trade zones (Arad-Curtici, Giurgiu and Timisoara).

With the exception of food and means of transportation, primarily oriented to the domestic market, the top FDI helped the Romanian producers to penetrate foreign markets as exporters (metallurgy, chemical industry, petroleum processing, electrical equipment). Still, when possible and efficient, subcontracting was used rather than pure FDI investment (leather and footwear, clothing, software and IT). Strategic investment was oriented towards automotive industry. Most of the FDI is cost-seeking, and its impact on transfer of technologies, modern business practices and know how is consequently below the potential.

FDI had an important role in the developments at the level of balance of foreign payments. Especially after 1997, when the Romanian capital market was open for non-residents, the portfolio investments started to increase. Also in 1997, emissions of bonds on international markets brought in important financial resources. After the boom of 1997-1998, foreign investments stabilised at around 1200 mil. USD yearly, and, despite their modest penetration on the domestic market, remains an important source of financing for the current account deficit.

[48] Data for 2001. Contribution of privatisation process to attracting foreign investment is relevant only after 1997, when the privatisation of bigger SOEs started de facto

Graph A4.: Current account deficit (negative) and net foreign direct investment



Source: NBR (2003)

A. Conclusions

Romania is a medium sized country in terms of territory and population, while Romanian regions are at the lower end of per-capita revenues when compared with EU-15 and ACC-12. The painful transition, marked by the two phased transitional recessions, reflects the gradualist approach and the prevalence of the stop-and-go policies especially over the first ten years of transition.

Changes in the structure of value added during the '90ties were driven by the pattern of price liberalisation and mirrored nevertheless by slower structural changes in real terms, as the direct consequence of protracted structural reform, credit crunch and weak implementation of property rights. Nevertheless, external trade was open and price and currency liberalisation started in early stages of transition, but this was favouring the labour intensive – low cost branches.

It is only in 2000 that Romania started to pull out of the recession in a coherent manner. On the supply side, year 2000 saw a significant one-shot decline in the share of agriculture, while services (excluding trade and governmental services) increased, as well as the industry. On the demand side, a higher emphasis is given to gross fixed capital formation. Nevertheless, major challenges are still ahead, especially in responding to the need of enhancing the institutional-implementation capacity, fighting corruption, in balancing the state intervention in order to minimise the market distortions, in continuing decisively the structural reforms, attracting strategic foreign investment and preventing the further increase in regional disparities. A particularly important issue is the current design of labour market, with still significant retro-migration, hidden unemployment and signs of misuse of qualified labour force. Under the assumption of successfully addressing these challenges, sustained growth is forecasted over the incoming years, bringing hopes for convergence in terms of GDP with the EU. However, labour market participation and employment objectives associated with the social cohesion targets will be, in our opinion, more difficult to meet.

SWOT

Strengths	Weaknesses
• Recent signs of commitment to improve business environment; • The favouring macroeconomic stance since 2000; • Still low regional disparities; • Increasing productivity in the non-agricultural sectors; • The rising average educational level of labour supply;	• Romania is lagging behind in terms of per capita revenue; • The misuse of labour; • Private sector located preponderantly in the SME sectors; • Still low level of investment; low domestic capital; • Low FDI and associated technological transfer;
Opportunities	**Threats**
• Sustainable growth trend beginning with 2000; • Ongoing negotiations for EU integration; • Financing the acceleration of structural reforms and the investment growth set as the main short and medium term objective of the fiscal and budgetary policies; • An emerging process of technological upgrade on the wave of digital technology; • Tight commercial relations with EU countries; • Occurrence of high-tech niches in the structure of exports;	• Path-dependency in designing the restructuring policies; • Heritage of the perception of Romania as unfriendly business environment; • Increasing polarization and poverty; • Accelerated increase in regional disparities; • A still low level of marketable domestic demand, especially in case of households; • Re-agriculturalisation of economy and only a limited trend towards tertialisation;

IS SWOT Analysis

1. Favourable macroeconomic stance and commitment to improve the business environment are essential for the development of IS, given its pro-cyclical character. While the IS can contribute to growth through higher competitiveness of economic activities, higher revenues of households and enterprises and the improvements in the business environment may favour further investment in the ICT.
2. The low investment (including FDI) reflects both the low ICT penetration rates, as well as simply the technological transfer. In the catch-up phase, FDI is essential for the technological upgrade. Moreover, the preponderant cost-seeking FDI implies the risk of delocalisation.
3. Misuse of labour and the migration of labour towards rural, underdeveloped and based on the subsistence agriculture is a negative factor for IS development for two reasons. Firstly, the labour force so migrating is gradually loosing skills for being a producer in the IS, and, given the consumption model in the rural areas, this process of migration accentuates the digital divide.
4. EU integration is providing a whole range of opportunities for development of IS, from those resulting from the implementation of relevant acquis to those brought by the economic and social convergence.

B. NATIONAL AND REGIONAL IS POLICIES

B.1. The institutional settings - their influence on IS policies

In order to understand the Romanian IS policies, a distinction must be made between two periods: the one between 1990 and 2000, on the one hand, and the one after 2000, when the new government started a widespread institutional reform, on the other hand.

B.1.1. A short overview of the changes in the institutional settings (1990-2000)

The institutional environment related to the IS policies focused on ICT was to a high degree unstable until 2001, as described below. This had a negative impact on the development of both ICT and IS.

In 1990, the National Commission for Informatics (NCI) was created, as the apex government body dealing with IT in Romania. This institution was responsible for developing strategic national IT policies focused on the following goals:

- The development and improvement of the national information infrastructure;
- The development of IT industry, with a special emphasis on software products and services;
- The increase of the number of IT workers and training the citizens or the information society;
- The use of IT to support reform in the public administration;
- The development of education institutions in the field of informatics.

For ensuring that these policies are implemented, NCI shared responsibility with a number of other government institutions for particular aspects of IT policy. Together with the former Ministry of Research and Technology it initiated and coordinated national R&D programs in the field of informatics. Equally, NCI collaborated with the former Ministry of Telecommunications on issues of public computer network creation and connection to international networks. Putting into practice the actions proposed by the Government Program for the period 1998-2000 required not only institutional changes, but also intensive and coordinated use of IT. As a result, in 1998 the NCI and the former Ministry of Telecommunication were unified and transformed into a governmental agency (the National Agency for Communications and Informatics - NACI). However, this institutional change did not ensure the necessary coherence of the policies, because of the inadequate governmental level of this institution. Thus, the results of the IS policies were modest. This lack of performance of IS policies carried out between 1990 and 2000 explains, to a certain degree, the modest figures for Romania in EC (2004) report.

In order to make up for the institutional dysfunction in designing and implementing IS policies, at the end of 2000 NACI was transformed into The Ministry of Communications and Information Technology (MCIT), presently the main institutional actor responsible (as restated by the Governmental Decision (GD) no. 1440/2002) for the implementation of the IS policies in Romania.

B.1.2. The main institutional settings after 2000

In order to ensure a better co-ordination of IS policies, and to accelerate their implementation, a new institutional framework was set-up in 2001.

B.1.2.1. The institutional setting for co-ordination of IS Policies

The institutional framework of co-ordination of IS Policies consists in:

- **Advanced Technologies, Communications, and Information Technology Commission** (**ATCITC**), a parliamentary group, aimed to play an active role in the adoption of specific regulations, in compliant with the requirements of the EU Acquis.
- The **Promoting Group for Information Technology (PGIT),** a governmental group, led by the Prime Minister and composed of the Minister of Public Finance; The Minister of Administration and Internal Affairs; The Minister Co-ordinating the General Secretariat of the Government; The Minister of Education, Research and Youth and The Minister of Communications and Information Technology. **PGIT** is the main institution influencing the IS policies in Romania aimed at ensuring a coherent and coordinated approach for the implementation of the Information Society. Its role is to ensure the coherence of the implementation if IS policies in all sectors. It is the institution that approves the strategies, action plans, and all projects above EUR 100 000. Moreover, it oversees the compliance with roadmaps and milestones, so that the implementation process remains coherent.

B.1.2.2. The framework executive bodies

- **The Ministry of Communications and Information Technologies (MCIT)** co-ordinates the implementation of *"National Strategy for the New Economy and the Implementation of the Information Society" (NSNEIIS)*, the elaboration and revising of IS strategies and is also the supervisory and regulatory authority in the field of electronic signature and eCommerce. MCIT includes *"The Group for the Strategy for the New Economy and the Implementation of the Information Society in Romania **(GSNEIIS)",*** created in order to ensure a good collaboration with the IT industry, Academia and Civil Society in designing and implementing the IS policy and strategies. Most recent legislation (GD no. 744/2003) increased the role of MCIT in the implementation of projects regarding the coherent development of the national informational infrastructure and the programmes and projects for the informatisation of the governmental structures.
- **The General Inspectorate for Communications and Information Technology (GICIT)** is a public institution subordinated to the Ministry of Communications and Information Technology, but financed through extra-budgetary funds (GD no. 180/2002). Its main objects of activity are the surveillance and control of the activities in the field of electronic communications, as well as the implementation at a national level of computer systems providing public services through electronic means. GICIT's headquarter is in Bucharest, and there are four additional territorial departments (not legal entities) with offices in Bucharest, Cluj, Iasi and Timisoara. Each of these departments has been allocated a number of local control centres that are working under their direct authority, each local control centre covering the area of one county.
- **The National Regulatory Authority for Communications** (**NRAC**) was created (Emergency Governmental Ordinance (EGO) no. 79/2002) in order to insure the protection of rights and interests of the users of electronic communication services and networks, and postal services, regarding the transparency and protection of privacy in the

telecommunications sector, and the right to Universal Service[49]. NRAC has territorial offices in every municipality of every county, as well as in every sector in Bucharest. NRAC is financed through extra-budgetary funds (See also Chapter F).

B.1.2.3. The framework of the main institutions adjacently involved in the implementation of IS policies

As the IS policies affect many areas of society and regulatory areas, several other ministries and institutional bodies have responsibilities in the area of their elaboration and implementation, among which:

- **The Ministry of Education and Research (MER),** a key institutional actor involved in the implementation of IS Policies**.** MER implements the governmental program and the strategies in education and scientific research, leading the national educational and research system. Its Department of Research[50] has a critical role in strategic planning, design and implementation of policies in research, technology and innovation.
- **The Ministry of Administration and Interior (MAI),** responsible for the public administration reform and involved in implementing the eAdministration Action Plan, which is the bottom-up component of NSNEIIS. The reform of the public administration will be completed until the end of 2004. Among its objectives there are: 1) introducing equipment and information technology; 2) introducing the eAdministration concept; 3) generalization of the one-stop wicket system (the so-called "Wicket's" reform).
- **The National Agency for Medium-Sized Enterprises and Cooperatives (NASMEC**), established[51] for the purpose of implementing the Government's SMEs program, cooperatives domestic trade development. The role of NASMEC in the field of innovation will be strengthened by the newly adopted **"National Strategy for Intellectual Property (2003-2007)"**[52].
- The intellectual property and copyright related issues are under the jurisdiction of the authority of **OSIM (Romanian State Office for Inventions and Trade Marks)** and **ORDA** (**Romanian Office for Copyright). Beside ORDA,** there are other five institutions involved in ensuring that the copyright legislation is enforced: the Police, the Prosecutor's Office, the Courts, the Customs and the Border Police. In addition, there are other 10 collective administration organisations[53], which are operating in the field of copyright and intellectual propriety (having the role of overseeing or ensuring the functioning of the collection system in the field).

B.1.2.4. The regional development institutional setting

According to the **National Development Plan (NDP),** stimulating the ICT and building the information society are strategic priorities, which must be reflected in the elaboration and implementation of the regional strategies[54].

[49] The universal service principle refers, according to the acquis communautaire, to the minimum set of quality services, at accessible tariffs, which must be ensured across the country.
[50] MER has three departments: the Department of Education, the Department of Research and the Department of Youth.
[51] GD no. 753.3/2003. NAMSEC took over the attributions of former structures with similar attributions.
[52] This Strategy was adopted on 14 of November 2003 (http://www.osim.ro)
[53] See Chapter F
[54] MDP (2001), MIE (2004): Axe 6 "Stimulating scientific research and technological development, innovation, communications, information technology and setting up an information society"

Regional Development Agencies (RDAs) and **Councils for Regional Development (CRDs)**[55] are expected to play a key role in the elaboration and implementation of these regional strategies in the near future.

The **CRDs** have a responsibility to consult the main local 'actors', such as local public administrations, trade unions, private sector representatives, and NGOs.

The **RDAs** are the executive body of CRDs. Together with the local administration they have the role of implementing regional development programs and identifying disadvantaged areas, for which investment facilities could apply according to the law of disadvantaged zones. The RDAs elaborate the regional development strategies and development programs, present them to CRDs and to the Ministry of Economic Development, and are subsequently responsible for their implementation.

B.1.3. Other institutional actors

ICI (National Institute for R&D in Informatics) is a public institute subordinated to MCIT and is the manager of INFOSOC (main program for financing the research activities in the field of IST), the technical administrator of the "ro" TLD (Top-Level Domain) and operator of The National Computer Network for Research & Development (RNC). ICI is also the main supplier of technical assistance for the IS policies implemented by MCIT in the field of IT.

NISRC (The National Institute for Studies and Research in Communications) is the supplier of technical assistance for the IS policies implemented by MCIT and for the regulatory authorities in the field of communications (NRAC and GICT). NISRC is also a public institute subordinated to MCIT.

B.1.4. A short assessment on the institutional settings

- The institutional setting for the coordination of IS Policies, (**PGIT, ATCITC, MCIT, GICIT, NRAC**), created mainly in 2001 and 2002, managed to establish a good collaboration and to become efficient. These institutions are the most committed to elaborating and implementing the IS policies in Romania.
- **MER** is also very active in what concerns endowing primary and secondary schools with adequate multimedia laboratories. Moreover, this ministry together with the Ministry of Culture elaborated a draft law on Life-Long Learning. This draft law is not publicly available yet. However, „it is on the Government's Agenda and currently being developed" (EC (2003b)).
- The **institutional framework for research and innovation** was affected by the institutional instability. Since 1998, the National Agency for Science, Technology and Innovation (NASTI) has been the main actor responsible for elaborating the technology and innovation policy, given that the former Ministry of Research and Technology was dissolved as a consequence of government restructuring. In January 2001, following the elections of autumn 2000, NASTI was integrated in the Ministry of Education and Research. Until June 2003, a Delegate Minister for Research led the overall Research Department, and a subordinate Secretary of State for Research and for Relations with the Parliament was leading five specialised departments. For about six months (between June and November 2003) these two positions were vacant. This institutional instability has damaged to some extent the co-ordination of innovation and those IS policies tied to

[55] The framework for the Regional Development Institutional Settings was created by the Law no. 151/1998

innovation, especially through interferences created between research and innovation. The institutional system meant to gear research to innovation was still undergoing restructuring, visibly lagging behind the initial planning. In this sense we notice that, even though **Government Ordinance (GO) 14/2002**[56] decides the creation of **Investment Societies for Technological Transfer and Development**, such institutions were virtually inexistent up to the end of 2003. Thus, the IS policies cannot benefit from a new capital, risk-type, instrument constituted of public and private funds, in order to support directly the setting up and development of the innovative economic units. The newly created *"National Strategy for Intellectual Property (2003-2007)"* foresees the establishment of a **National Agency for Intellectual Property**, in order to encourage innovation. Nevertheless, in the near future there is a danger that the effectiveness of IS policies will be low, unless the same determination as in the case of research and development is felt. After the June 2003 government restructuring, the role of MAI in the implementation of the "eAdministration Action Plan" became unclear. However, this situation seems to be only transitory, given that presently MCIT is preparing the revised version of this action plan, as a component of NSNEIIS**,** called *"The Strategy For Development of the Public Services Provided by Electronic Means"*. (MCIT (2003))

- Regarding the **institutional copyright system**, we agree with the opinion that it „is sometimes ineffective, largely due to bad information management between the parties involved" (EC (2003b)). In order to surpass this situation, in 2002 The Romanian General Prosecution authority (PGR) teamed up with the Business Software Association (BSA) and representatives of other IP-related industries (recording, publishers) to offer a comprehensive training program, which is co-financed by PGR and BSA (EC(2003b)).
- The **institutional setting for regional development** is still far from playing a significant role in the field of IS policies. Making this institutional framework functional is a real challenge, taking into account the fact that Romania lacks an institutional tradition at regional level. The Agency for Regional Development Bucharest-Ilfov, which was formed three years ago, is an exception from this rule, as its administrative territory overlaps a former Romanian county (the former Ilfov County). In addition, beside this lack of regional approach tradition, the institutional capacities for the regional development are presently diminished by the uncertainty regarding the financing mechanisms due to the fact that, presently, public administration reform is also being implemented. In order to reduce this uncertainty, the Romanian Parliament adopted in 2003 a law[57] which increases authority of CRDs over the County Councils in which regards the transfer of funds from the budget of local authorities to RDAs. Moreover, the lack of thorough analyses for each region in particular is another obstacle in the way of starting up development strategies or programs at a regional level.

[56] Approved by the Law no. 50/2003 (http://www.mct.ro)
[57] Law no. 256/2003

B.2. Chronological description of all national and regional IS policies

B.2.1. The distinct stages of implementation of IS policies

B.2.1.1. The heritage of the pre-transitional IS policies

Under communism, the Romanian government invested a lot in technology sector skill-building, particularly in software development sector. The obsession of these policies was the independence of the Romanian IT industry. As a result of this obsolete and unrealistic economic approach, a lot of resources were wasted for creating an unsustainable IT industry wanting to produce the whole range of specific products, from microprocessors to computers and software. But this effort had also a positive outcome – it created the basis for the continuous development of a strong technological culture in the field of ITC. Presently, this culture is seen as the main strength of Romania in the field of Information Society by all relevant studies elaborated in the past three years. But, unfortunately, no entrepreneurial culture could be formed during communism. This asymmetric heritage had as a consequence the collapse of the majority of the former state owned companies, together with the establishment of a new, mainly green field built IT industry, largely based on outsourcing. In this way, the technical culture could survive and develop in a new industrial environment. Currently, the software industry shows a *risk of dependence on the outsourcing model*. But the market started also to mitigate this risk by going from outsourcing code writing to process outsourcing (OBG (2003)), showing an evolution within the added value chain (see Chapter C). There is also a *model of specialisation* within the software industry, as Romanian companies are recognized for their anti-virus products[58] (UNCTAD/WTO (2002)). These indicate that a certain degree of entrepreneurial culture appeared in these years. Moreover, on the background of the collapse of the old IT industry and of the birth of this new industry, a significant disequilibrium appeared between the dynamics of IT specialists formation and the economy's absorption capacity for them (see Chapter G).

B.2.1.2. The IS policies between 1990 and 2000

During the country's economic transition after 1989, the shaky economy has left much fewer government funds to support research and development, education and training. In spite of the numerous (more than 11) relevant strategies prepared after the 1989 revolution, reiterating Romania's position with regard to the emergence of IS**,** we can say that for about 11 years (from 1990 to 2000) the Romanian strategic commitment in building the IS was incoherent and hesitant (Jinaru *et al.* (2002)). For instance, Romanian government initiated a first version of the National Strategy for the Information Society in 1992, but this became a law only in 1997. This law called for strategic public-private partnerships, development of IT standards, development of infrastructure, and investment in IT R&D. The main conceptual weakness of this strategy was that it was grounded on an obsolete vision, ignoring the importance of stimulating the development of the new services made possible by the emergence of Internet and New Economy. A second weakness was the lack of a vision regarding the necessity of creating a new legal framework in the field of telecommunications. Thus, even though the first phase of the privatisation of RomTelecom (the national fixed-telephony operator) took place in 1998, the negotiated contract blocked the commitment for a full liberalisation of the telecommunication market for about 4 years instead of facilitating it, as the privatisation contract maintained the monopoly of RomTelecom until 1st of January 2003. Finally, the

[58] BitDefender http://www.softwin.ro, RAV http://www.gecad.ro

implementation of the strategies was only partial, due to the inadequate institutional position of NACI, which could not ensure the necessary coordination.

B.2.1.3. The IS policies elaborated and implemented between 2001 and 2003

Presently the situation has changed significantly. During 2001 – 2003, a coherent legal framework was established (see Chapter F), which allowed for the liberalisation of all communication markets in Romania to be finalised by January 1st 2003 (for statistical information on the current stage of penetration of private initiative on the telecom market see Chapter E.3.). The IST policies elaborated and implemented between 2000 and 2003 must be assessed also from the point of view of their level of vision and commitment for the preparation of the fixed telephony liberalisation moment[59].

The qualitative assessment presented by the Table B1 offers a synthetic vision on the importance of the policies implemented during the period 2001-2003, in what concerns their cumulative impact on the IST development. Some other accomplishments having to do with international relations are included, as they created a favourable background by substantially diminishing some uncertainty, risk-inducing factors among potential local and foreign investors. The substantial progress can be seen from comparing columns 2000 and 2003. Bolded items in 2003 column refer to elements due to IS policies.

[59] EC (2003a) appreciate that there are signs of tension on the market, which result probably from the lack of rebalancing tariffs in preparation of opening the market

Table B1.: Analysis of the main policy results over the period 2001-2003 that had a positive impact on the development of IST *by substantially diminishing some uncertainty, risk-inducing, sources and factors* among potential local and foreign investors

UNCERTAINTIES	Factors	2000	2001	2002	2003
NATO admission		Still unclear, especially in point o timeframe			(+) Became certain (for 2004)
EU accession	Elimination of visas	(-) Probable			(+) Became effective since 2001
	EU accession	*The status of candidate country*			
		(-) *Uncertain in point of wave and year of accession*		Included in the second wave, possible year stated. (+) Road Map 2007	
The change of the general legal environment	From the „Logic" of Transition	*Re-launched*	Clarified by the adoption of the PND 2002-2006, in accordance with UE		(+) Visible progress. (+) IST - Remarkable progress.
	Adoption of aquis	(-) *Delayed*	Re-launched by elaboration of impact studies, by intensified legislative efforts and by the Road-Map for 2007.		
	Relation with IMF	(-) *Precarious*	The relation with IMF was also, throughout all transition period, an instability factor and/or legislative limitation especially regarding the creation, and maintenance of already existing fiscal incentives. This was felt as well during the period 2001-2002. (This contributes to increased mistrust of investors). The first IMF agreement that was finalized.		(+) Creating the premises for stabilising the fiscal incentive policies, and consolidation of public trust.
The reform of the institutional system	Reform of Public Administration	(-) *Lagging*	Re-launched and correlated with IS policies (eAdministration, eGovernment, e-Tax) at a central and local level. Regarding the Development Regions, the financing system was improved and the premises for future correlation with IS policies were created.		(+) Progress (+) Launch of the National Electronic System
	Reducing bureaucracy	(-) *Lagging*	Establishing the Unique Office for Company Registration. The Law of Access to Public Information.		(+) The "Wicket's" reform
	Compatibility with EU	(-) *Lagging*	Reducing the number of Ministries and Governmental Agencies		(+)Government structure compatible with EU
Opening the communication market to competition	Preparing liberalisation	(-) *Neglected*	Adoption of over 40 legislative norms. Adoption of the new aquis in telecommunications and creation of the institutional system for liberalisation. Establishing Supervision and Regulatory Authorities compatible with EU. NRAC GICIT MCIT (for eCommerce and electronic signature)		(+) New regulatory framework put in function
	Effective liberalisation	(-) Blocked since 1998 by the privatisation contract for RomTelecom for the fixed-telephony and leased lines (E1, xDSL) Liberalisation of postal services (2002). The Monopoly of Radiocomunicatii for the radio leased lines (over 2Mb/s.) maintained (Before 2000, effective in the fields of: mobile telephony; ISP; cable-TV; internet connection by: cable-TV, optical cable and radio (up to 2Mb/s); audiovisual)			(+) Effective liberalisation of communication market (+) Creation of an institutional framewok for regulating the communication markets in line with the new aquis. Reducing the number of Ministries to 14.
Development of an favourable environment for RDI competition	Preparing the transition to RDI financing based on national programs National Plan for RDI (NP-RDI) and financing through risk capital	(-) *Interrupted*	The establishment of 10 new programs NP-RDI	Legislative simplification and introducing the premises for a strategic approach	(+) Eliminating legislative barriers for creating techno-parks (-) Financing through risk capital (Uncertainty!)
		(-) Hesitations regarding the mechanism for formation of demand and development of financing through risk capital Affected by the lacking entrepreneurial culture and the secondary importance given to programs for increasing consciousness and formation of a vision on innovation and gearing research to innovation.			
	Effective transition to a competitiveness-based financing system	(-) Blocked since 1999 The transition to project financing was ineffective due to the prolonging of the ORIZONT 2000 program up to 2002 (see Chapter D) (+) Launch of one IST dedicated program dedicated within NP-RDI (INFOSOC)		Program ORIZONT 2000 Stops	(+) Effective transition to project finance
	Protection of intellectual and industrial property	Efforts focused on the harmonisation with the EU legislation and more efficient cooperation between institutions involved. Starting training projects for public servants involved in the field.			(+) Approval of a coherent strategy.

Source: Authors' compilation based on data from various EC Country Reports and Romanian Government reports for the years 2000, 2001, 2002, 2003.

During 2001-2003, numerous strategies and programs pertaining to IS development were elaborated and launched, beginning with the milestone moment in 2001. Their number can be explained if we consider the context of the attempt to fill in gaps and push things forward at a high speed (see Table B2).

Table B2: Chronological list of IS Strategies and Programs.

Coordinating institution(s)	Strategy	Year
MCIT	Elaboration of a short term action plan (focused on eEurope+ objectives) and the launching of more than 20 pilot projects (http://www.mcti.ro) in the IS field	2001
	Romanian Government Strategy for information technology sector development (http://www.mcti.ro)	
	Romanian Government Strategy for stimulating and supporting the development of the communications sector in 2002-2012 (http://www.mcti.ro)	
	The national strategy for promoting the new economy and implementing Information Society (first draft put out for debate in 2001).	
MDP	National Development Plan (NPD) (*Axis 3*and *Axis 6*)	
MAI	Government Strategy for Public Administration Informatisation (*eAdministration* Action Plan)	
MER	The National Strategy on Research Development and Innovation	2002
MCIT	The National Strategy for the New Economy and the Implementation of the Information Society (NSNEIIS)	
PGIT	PGTI decides that the next revision of NSNEIIS to lead towards a "Development through Knowledge[60]" strategic approach	
***[61]	The National Strategy for Intellectual Property	2003
MCIT	The Strategy for the development of public services provided by electronic means[62] (first draft put out for debate by MCIT in November 2003)	

Source: *http://www.mcit.ro*

This conceptual stabilisation process, that was necessary due to the hesitations of the 11 precedent years of transition, finally lead to the approval by the Romanian Government (GO no.1440/2002) of the **"NSNEIIS", seen afterwards as the first step** towards the next generation strategy approach, entitled "Development through Knowledge" (http://www.mcti.ro). This period's political actions tend to indicate continuous clarification and adjustment of the strategic actions co-ordinated by PGIT. According to the Annual Report of MCIT for 2003 (http://www.mcit.ro), PGIT approved over 150 IT projects over the period 2001-2003, amounting to over 600 million EUR.

[60] http://wwwmcti.ro The MCIT's Knowledge Economy Project, is estimated at EUR 50-60 million with a World Bank grant

[61] OSIM, ORDA, MCIT, MER, NASMEC, National Custom Authority, Customer Protection Authority, Ministry of Justice, Prosecutor Office Ministry of Administration and Internal Affairs, Ministry of European Integration, Ministry of External Affairs, Ministry of Economy and Trade, National Chamber of Councellors in Intellectual Property Issues, Chamber of Commerce and Industry of Romania, ROMPRES

[62] Presented at the National Forum "Public Services of General Interest in the Context of Romanian Integration in the European Union", which took place between 17th -18th November at Parliament Palace, under the high patronage of the Romanian Presidency

B.2.2. Main IS Programs and Strategies

B.2.2.1. eAdministration Strategies

The **Government Strategy for Public Administration Informatisation (eAdministration Action Plan)**, adopted in 2001 refers exclusively to those eAdministration aspects pertaining to the use of IT-specific methods for modernising public administration.
The strategy comprises the following categories of actions:

a. Informatisation, designated to increase operational efficiency within central and local administration bodies;
b. Services informatisation, having as beneficiaries the citizens and the economic agents; this frequently involves the integration of the services provided by central and local administration;
c. Securing access to information via IT for the final users of the central administration services.

The specific approach within this strategy was that it enhances the (b) and (c) type of actions[63], fact that has a direct impact and relevance for users. It also proposes the involvement of all the central and local administration and of all state institutions: counties, cities, towns, schools, hospitals, public health local units, labour offices, commerce chambers etc. – basically, any agency or organisation providing public services for citizens or economic agents. Meanwhile, this strategy as it was adopted, partially stopped being full functional due to both institutional changes occurring in June 2003 and anti-corruption measures taken.

Therefore, in 2003 MCIT elaborated a new document, whose first draft was put out for debate in November 2003, namely „The Strategy for the development of public services provided by electronic means".

The strategy was meant to support the convergence to eEurope 2005, based on technological progress in wide-band communications and access multi-platforms, counting on the synergy between the development of wide-band infrastructure and the IT and digital services industry.

The strategy's action plans are correlated with the objectives of developing communications infrastructure, and those on providing the security needed for electronically provided public services. Thus, it foresees launching programs and projects over all four main components of eGovernment:

I. The interaction Government/Administration and population (G2C)

II. The interaction between Government/Administration and the business environment (G2B)

III. The interaction Government/Administration and their employees (G2E)

IV. The interaction various Government institutions and Public administration (G2G).

[63] In the past, the informatization applied by central administration bodies was mostly of type (a) and it generally functioned under sectoral responsibility, at the department /agency /ministry level or only at state central administration level.

This strategy makes possible the continuation at a higher conceptual level of the "eAdministration" strategy regarding informatisation of public administration, which is a component of "G2C" from "eGovernment".

B.2.2.2. The "National Strategy for the New Economy and the Implementation of the Information Society" (NSNEIIS)

NSNEIIS was elaborated through a consultative process involving the public administration, the industry, and representatives of the civil society and academia and has been adopted in December 2002. Its provisions are based on the eEurope+ action plans. It is to be revised on an annual basis to take into account the actual developments on the internal market as well as of the *convergence of the eEurope2005 with the eEurope+ plan.*

The implementation of NSNEIIS is expected to **impact** positively on the society through its contribution to the consolidation of democracy and increasing the quality of public services and public administration, to the development of the market economy and the progressive transition towards the new economy and to the improvement of quality of life due to the use of the new technologies in social protection, health care, education, environmental protection and monitoring of disasters, transport security, etc.

NSNEIIS defines a number of **areas of action** that overlay with the eEurope+ Action Plan (see Box B1). These objectives are to be achieved through 124 **strategic lines of action** to be implemented through programs and projects in various stages by 2010.

Box B1.: "National Strategy for the New Economy and the Implementation of the Information Society" - areas of action

A) Consolidate the National Information Infrastructure and the ICT Industry

- Supply Communication Services on a Large Scale
- Develop the National ICT Products and Services Industry

B) Ensure a Large Scale Access to the Internet Services

- Cheaper and Faster Internet Access
- Develop High Speed Networks for Research and Education

C) Education and preparing of the human resources for Information Society

- Education and training of young people for Information Society
- Working in a knowledge-based economy
- Enable access for all to Information Society specific services

D) Stimulate the implementation and use of Information Society specific services

- Accelerating eCommerce
- Government on-line: electronic access to public services
- ICT based medical services
- Stimulation of information generation and knowledge dissemination by electronic means

E) Network security, ICT anti-fraud and the smart cards promotion

Source: National Strategy for the New Economy and the Implementation of the Information Society

The lines of action for the IS policies regard:

- ***the development of the informational infrastructure corroborated with creating conditions*** to leverage the it through value-added services;
- ***the completion and the consolidation*** *of the legislative framework and of the regulations specific of ICT* and of the impact of these technologies in the social-economic development;
- ***the stimulation*** *of the domestic market demand of all economic actors, simultaneously* with *the encouragement of the export and penetration on the international market*;
- ***guided training*** *of specialists* in order to allow their rapid involvement in the development of ICT products and services on the upper levels of the added value hierarchy (the specification-conception-design phases).

As it can be observed, none of these orientations refers in an explicit way to the innovation and/or entrepreneurship. The increase of competitiveness is seen here as independent of the performance stimulus in the field of innovation. Such an assumption could be effective in a "competitive enough" economy, where the mechanisms of innovation work "properly enough". In the case of Romania the low performance in the innovation field (see Chapter D) might have in this atypical context a negative impact in the next phases of NSNEIIS implementation. (for further details on the innovation related issues in Romania see Chapter D).

Nevertheless, starting 2001 (when it was elaborated), NSNSEIIS was continuously adapted to the emergence of the complementary action plans and policies with impact on IS development, elaborated by other Ministries or institutional bodies between 2001 and 2003.

As it can be noticed from Table B2., in 2003 other two strategies were elaborated which are closely tied to NSSNEIIS being necessary to be adopted before its next revision which is foreseen to conclude a significant step towards a "Development through Knowledge" strategic approach.

B.2.2.4. The Policies regarding the Intellectual Property[64]

Romania is integrated in the main international organisations active in the field of protection of intellectual property: Romania is a founding member of World Intellectual Property Organization (WIPO), established in 1967. Moreover, Romania has been since 1920 a member of the Paris Union for protection of industrial property, and since 1927 it has been a member of the Bern Union for protection of literary and artistic property.

The Romanian policies in this field have concentrated, since 1989, on harmonisation with international legislation and with the EU aquis. Starting March 2003, Romania became member of European Patents Organisation (EPO), following the ratification in 2001 of most recent international regulations in the field of copyright and related rights. (The WIPO study based on copyright and interpretation, execution and phonograms signed in 1996 in Geneva).

[64] The main effort in this field until 2003 was focused on legislative issues and on increasing the institutional capacities of the institutional system presented in the first section of this chapter. For these aspects see the Chapter F.

Box B2.: The incentive scheme created through the policies on intellectual property

- GO no.41/1998 on taxes related to intellectual property establishes tax incentives for legal protection procedures for industrial property objects, depending on the gross average monthly income, or on turnover.
- Law no. 64/1991 stipulates that: „the profit or revenue obtained by effective use domestically of an invention licensed in Romania, by the owner or its licensed users, it tax exempt for the first 5 years of usage"
- The revenue obtained by the owner of license patent by assignment is tax free.
- GO no. 57/2002 on scientific research and technological development, approved by Law no. 324/2003, stipulates that when an economic agent finances 50% of a R&D project, in view of using its results, it can benefit entirely by the results of the research; "economic agents can take over free of charge the results of the research (except for patents, registration certificates for industrial drawings and designs), and can receive from public funds, as co-finance, up to 20% of the cost of applying the selected results.
- GD no.442/2003, approving measures for attracting, preparing and maintaining young people in research, foresees that MER can support the financing of projects for usage and technological transfer in economic sectors of the results obtained in the fields of high technology (30 % of the annual amount of the Ministry's budget, for this purpose). Based on the intermediation contract the R&D institution gives the young person up to 5% of the transfer contract's value.
- MER – can partially sustain up to 20% of the application costs for some innovative outputs of the research of young people, up to 35 years old, through their own firms.

Moreover, efforts have been made for creating an adequate institutional framework (see Chapter B1) and for increased co-operation mechanisms between institutions involved in enforcing the law, especially for software piracy (field in which Romania ranks among the countries with the higher level of piracy).

Besides, a set of specific provisions and incentives are put in place to stimulate the pro-active role of intellectual property protection, especially in the field of industrial property (see Box B2).

The "National Strategy for Intellectual Property (2003-2007)" was adopted by the Government in November, 2003. It represents a major step forward in what concerns the major threat for NSNEIIS, caused by the fact that the strategic action focused on RDI is still laggard (EC (2003b)). A short overview of its objectives and action lines, from the point of view of the threats and the weaknesses related to the link between the NSNEIIS (as it was adopted in 2002) and the innovation policies, gives us a synthetic image of the next strategic steps foreseen by the Government on the "fight" against the two major negative factors affecting the competitiveness of Romanian economy: the low performance of innovation and the lack of entrepreneurial culture (tradition).

Main measures and lines of action adopted refer to:

- Improving the application of legislation on intellectual property;
- Building a relevant administrative infrastructure within national bodies involved in protecting intellectual property;
- Training personnel specialised in intellectual property;
- Ensuring a transparent co-operation between national institutions and bodies involved in protecting intellectual property;

- Educating the population with respect to intellectual property and its importance;

In our opinion, there is significantly more awareness now at a governmental level regarding some of the main weaknesses of the policy mix in Romania. Undoubtedly, the results of implementation crucially depend on government's commitment in addressing bottlenecks, especially those at an institutional level (see Chapter B.5.). Nevertheless, this increased awareness might ensure the premises for a gradual increase in the competitiveness of the Romanian economy and for a sustained increase of the ICT sector. Moreover, the action plans mentioned above indicate that their implementation will require important resources. However, given that the access to foreign sources (from EU or World Bank) is conditioned on the existence of strategies and action plans that are well-shaped and assumed by the government, the adoption of this strategy opens the road to an important share of the resources required for putting into practice the predicted measures. Several things still need to be done in this field. According to MCIT[65] the policies for attracting the FDI are still insufficient and inefficient

B.2.2.5. The IS Regional components foreseen by the National Plan for Development (NPD)

NDP provides the strategic framework for the national development. It is the main instrument targeting to diminish regional disparities, including the digital divide and the knowledge gap (MDP (2001), MIE (2003)).

This document stipulates 7 Axes for orientating the development effort, which must be considered a priority at the national, regional and local level. Among these, two are of particular importance for IST development:

- ***Axis 3.*** Enhancing human resources potential, the capacity of labour force to meet market requirement and the improvement of social services quality;
- ***Axis 6.*** Stimulating scientific research and technological development, innovation, communications, information technology and building the information society.

The Regional Development Strategies are at present in course of elaboration, based on the basis of the NDP methodology, on the development axes, and economic and social analyses carried out by the staff of the Regional Development Agencies on behalf of the Regional Development Councils. Until now only three Regional Strategies containing components focused on IS were prepared by the RDAs of: North-West Region, Centre Region and Bucharest - Ilfov Region[66]. It is only the second time that the RDAs have been involved in this process and the exercise has demonstrated the need for further support to be given at regional level for future NDP preparation[67]. These strategies are at this stage only pure exercises, but they can become starting points for building a real strategic commitment at a regional level.

[65] Strategy for the development of public services provided by electronic means
[66] These are also the leading regions in the development of IS (Țurlea *et al.*(2003))
[67] Need highlighted also by the EC (2003a)

B.3. The driving motivations of IS policies

The development of the Romanian IT "elite" (see Chapter G) is a very particular aspect. Even though it takes place on the background of a reduced competitiveness of the Romanian economy, it makes possible "***to ensure the growth of the IT sector, which can be a power engine for the development of the national economy as a whole"***[68]**.** The high growth rates recorded in this sector over the last years, as well as the existence of some success businesses within the software industry represent two important arguments, making this possibility more realistic.

The IT industry associations share the same vision on IT, as a spearhead and vector for competitive restructuring of processes from other economic branches, and as a tool for ensuring a sustainable development, which could be put into practice mainly using the abilities of Romania's high tech specialists (Coalition Tech 21 (2002)).

Moreover, recent successes in implementation of public services provided by electronic means and the sustained rhythm of introducing new services or upgrading existing ones demonstrate that development of IT has not only an economic dimension, but is also a valuable resource for the development of the society as a whole. According to **NSNEIIS**, "the transition to Information Society is one of the strategic objectives of the Romanian Government for the 2001-2004 period and one of the EU pre-adhering conditions. The main directions of this strategy are defined on the basis of the principle according to which this kind of society is created to the benefit of all citizens".

Therefore, we can say that using the potential for ICT development as an ***engine for the development of the Romanian society*** seems to become the main driving motivation of IS policies in Romania.

The vision adopted for driving the IS policy is that of the "promotional state", committed to capitalize on what the state and the market can offer in the shortest period of time possible. Thus, the strategic approach is built so as to speed up as much as possible the transition to the concept of the development of a Knowledge Based Society. Given the multiple problems that Romania is facing, this is a "burning stages" approach. This concept is best illustrated in one of the background studies for the NSNIIS's action plan:

„Time can be saved by applying the knowledge society vectors to the development of the information society. Thus, in the case of Romania the actions taken for the knowledge society should be simultaneous with those pertaining to the transition from informational underdevelopment to informational development. Both objectives should be targeted simultaneously from the very start, instead of focusing first on information society and then on the knowledge society. Only thus can a developed informational and knowledge society be reached"(Drăgănescu (2001))

[68] Press Release – the Minister of Communications and Information technology, Dan NICA - in a conference from the series of "Successful businesses week". 11 March 2003

B.4. Objectives and Results

Any assessment regarding the effects of the Romanian IST policies must take into account the short period of time (1 year) elapsed from the moment of the effective liberalization of the telecommunication market and from the adoption of NSNEIIS. Numerous projects and programmes started during this short period, but the statistical data needed for a global evaluation are still missing. Therefore, only some isolated data can be used to identify new factors affecting the development of IS. It is obvious that such an assessment is necessary, too, for a correct interpretation of the statistical data, mainly for the diagnosis and scenarios in this paper. As it can be noticed from Table B2, 2003 can be considered as the end point of a preparatory phase for the policies started in 2001.

A synthetic assessment of the progress of policies focused on telecommunications stems from the comparison the assessments on the negotiation Chapter 19 (Telecommunications and Information technologies) in the EC Regular Reports on Romania's progress towards accession between 2000- 2003 (see Table B3)

Table B3.: Evolution of EU Overall Assessment on the achievements in negotiation

2000	„There were no substantial progresses in transposing the telecommunications *acquis*. Additional efforts are required to develop the regulatory framework."
2001	... a limited progress, **but the preparatory actions taken should facilitate future reforms**.
2002	... definite progress in transposing the telecommunications *acquis* and in preparing the liberalisation of communication and postal markets. Future exports will have to be oriented on developing the newly established implementation administrations into an independent and truly efficient body.
2003	... significant progress has been made, in particular as regards the establishment of the regulatory body, the liberalisation of the telecommunications market and transposition of the new telecommunication *acquis*. **Romania has already achieved a considerable degree of alignment as regards telecommunications**. Further alignment with the *acquis* should concentrate on implementing legal provisions on users' rights and on universal service."

Source: Quoted from the Regular EU Reports on Romania's progress towards accession between 2000-2003, http://www.mie.ro

As to the present stage of NSNEIIS' implementation, we notice an increased coherence in drafting the relevant IS policy mix. This can be considered a very important achievement in the field of IST policies, especially given the fact that until recently the lack of a coherent vision at the strategic level was one of the fundamental factors causing the low performances reflected by the statistics presented in the other chapters of this paper.

Further in this section, we analyse the achievements of IS policies and their impact from the perspective of *eEurope+* action lines.

B.4.1. Accelerating the development of infrastructure for Information Society

In order to reach the NSNEIIS objective of "**consolidating the national information infrastructure and the ICT Industry"**, communications sector was the first priority of the governmental policy implemented between 2001 and 2003.

The first step was to create a legal framework for the postal services and electronic communications in line with the latest EU directives[69] in the field. The new legal framework and the necessary institutional settings are already operational (see Chapter F). The postal services market was fully liberalised in 2001 and the telecommunication market was liberalised starting on January 1st, 2003.

The very high number of notifications received by NRAC from companies intending to deliver telecom services (see Chapter E.3) pinpoints the potential increased interest for the liberalisation of the telecommunication market. According to MCIT (2003) "in Romania the communications sector has known, after the liberalisation, an extremely dynamic evolution characterised by a constant growth rate of investments. Thus, during 2003 most foreign investments were focused on the electronic communication segment, with positive results on the Romanian economy as a whole" (see also Chapter C).

B.4.2. Accelerating the premises for equal access to communication services

All of the above indicate that the effects on prices, on the diversity and the quality of communication services started to become visible[70]. The level of all rentals and the price of national calls are relatively low in comparison with those of other candidate countries and the EU average as well ((see Chapter F.2. for a discussion on interconnection tariffs). Prices of evaluated international calls have decreased as well, and are now slightly higher than, but comparable to, EU average values. Prices of national calls of the alternative operator are lower[71] (IBM (2003a)). The liberalisation of the telecom market will induce significant further reductions in prices. According to the MCIT Annual Report 2003, a reduction by 10-30% in the prices for fixed telephony services is to be expected already in 2004. Various sources (SIBIS (2003a) a.o.) show that one of the main reasons for low Internet usage, especially in households is the high broadband costs. Dial-up peak costs are also very high, although the dial-up costs for residential (off-peak) users, are among the lowest in among the candidate countries (IBM (2003a)).

Nevertheless, although in point of Internet access cost (expressed in PPS) Romania ranks as the 4th cheapest in candidate countries (EC (2004)), the costs are still high if we take into account the priorities in consumption of Romanian households.

- As an effect of the priority given to the governmental policy aimed at preparing the full liberalization of the telecommunication market Romania has now, beside an efficient regulatory framework (see also Chapter F), a modern and flexible communications infrastructure based on a variety of technological solutions, providing the prerequisites for solid further development of this sector.

Some of these premises are presented below:

[69] Directives 2002/19/EC-2002/22/EC and Directive 2002/58/EC

[70] RomTelecom have announced new reductions in prices beginning with 1st of June 2004: for intercity and international calls the tarrifs have been declining already with 20%. (Newspaper Gardianul, May 2004)

[71] The charging system applied in Romania is pulse-based with an applied initial charge of 1 pulse. Newly the monthly rental charges are differentiated for residential and business subscribers. The standard residential rental includes calling credit in the amount of about 40% of the rental, while the business one does not include any credit. Low-end residential users may choose a lower rental, but this does not include any calling credit.

- **The well-developed TV-cable infrastructure** (see Chapter E.3.). Most of the cable operators notified NRAC of their intention to deliver telecom services and some of them already started to provide such services, both for local and long distance calls (i.e. Astral Telecom). All of these operators could offer flexible solutions including, beside the TV-cable connections, voice and data services.
- **The interconnection agreements:** Among the essential processes that need careful monitoring is the interconnection policy of the main national fixed line operator, RomTelecom. Until end of November 2003, RomTelecom has signed 13 interconnection agreements, but the main future telecommunication companies complained that their access was delayed and even that the negotiations were protracted purposely (Business Review (2003)). However, the Romanian regulatory body had decided that Romtelecom would be allowed to increase tariffs in 2004 if and only if it allows the access of more firms to its infrastructure. Moreover, Radiocommunicatii SA (publicly owned company) played a key role in preparing the liberalization of the telecommunication market from the point of view of adapting its offer as to create an alternative to Romtelecom for long distance interconnections and international for the new entrants on the telecommunication market[72]. Its interconnection agreement with Deutsche Telekom gives possibility to establish connections all over the world.
- **The first signs of a significant increase of competition** in providing fixed telephony infrastructure became visible as well. POSTelecom, a new major entrant on the telecommunication market, having as partners ZTE and China Unicom[73], announced that it would launch a their service by end 2003. The announcement states also that POSTelecom will provide the entire set of services, voice and data, ensuring high coverage and accessibility. Equally, ZTE announced its intention "to set up, in the next period, production and R&D points of presence in Romania due to the fact that Romania benefits from a highly qualified educational system[74]". Therefore, the liberalization of the telecommunication market could have in the near future a positive impact on other fields like the IT industry and research.
- **Availability of advanced mobile telephony solutions:** Romania is the first country in Europe (http://www.qualcomm.com) where Qualcomm's CDMA2000+[75] technology was

[72] Radiocomunicatii S.A. launched in 2003 Integrated Communications Services (the whole range of telephony services, including fax, Internet services and data transmissions services on the same transmission support). Radiocomunicatii S.A offers also RR leased lines (recently their price was reduced with 40%), high speed Internet and Broadband Services Videoconference and Satellite communications (source: http://www.snr.ro).

[73] ZTE, China's largest listed telecom equipment supplier, took part in the bid organized by the Romanian Post for the construction of the national VoIP data network and won it. ZTE, along with China Unicom, will be partners of the Romanian Post for POSTelecom operator. Beside the majority shareholder, which will be the Romanian Post, other shareholders of POSTelecom are: the Romanian Industrial Group, BCR, SIF Banat-Crişana and SIF Oltenia. Source: Press release: Gabriel Mateescu, President of the Romanian Post.

[74] Zhang Taifeng, President of ZTE Corporation – press release, 30th July, http://www.mcti.ro/mcti0.html?page=1548&mlang=2 .

[75] This technology is a G3 compliant one. It makes possible the use of the TCP-IP protocol and so it enables the internet mobileServices. The peak speed of data transfer is 153kb/s being upgradeable until 2,3Mb/s. The performances of this mobile solution are higher than those of ISDN used by the fix telephony and of the usual 128kb/s shared cable connections.

introduced in December 2001. Currently, the price per minute[76] of such a connection is 0.018 EUR. The access to Internet is possible. This technology made possible the first mobile banking and mobile POS services in Romania, which became accessible also for e-tax payment (http://www.mcti.ro, http://www.zapp.ro).

For the potential domestic or foreign investors it is not only this modern and flexible communications infrastructure that will matter, but also the overall effect of the policies implemented during 2001-2003 leading to *substantial fading of some uncertainty, risk-inducing factors* (see Table B1.). Starting 2004, these achievements will have a significant impact on accelerating the development of the communication services market and the universal service provision.

B.4.3. Stimulating the ICT industry

Several distinct measures are taken to stimulate the development of local ICT industry. Among those we mention:

- The **tax exemption** for the wages of software developers[77] was introduced in 1998 and is estimated to contribute by no less than 30%[78] to the increase in the export of software.
- Another **fiscal policy component** with indirect effect on the software industry, where the overwhelming majority of companies are employing 2-10 persons, is the new taxation regime of micro-enterprises. A step forward in this respect was made in 2001, by introduction of various facilities for this category, among which the most important refer to the profit tax which can be replaced by a 1.5% turnover tax [79].
- **Increasing the governmental demand.** the strategic actions promoted by PGIT and MCIT are based on the governmental demand for IT products and services and proved to be a very successful strategy in developing the local market. The new governmental services presently implemented will lead also to an increased local demand for ICT products and services coming from both private sector and from the population. If we take into account the value of projects approved by PGIT we expect that the impact on the growing rates of ICT market in Romania could be significant (see also Chapter C).

B.4.4. Cheaper, faster and safer Internet

B.4.4.1. Cheaper and faster Internet access

The multi-level liberalisation process of the communications sector in Romania is expected to lead to a cut in communication tariffs, to be reflected in a cut in Internet connection tariffs. Beside this, many integrated services (telephony/internet access/data transmission) became marketable. According to NRAC (2004) besides the telephony services, a number of **693** companies will also provide other types of services as follows:

[76] Until 2003 the system of pricing was per Mb. The price of 0,018EUR/min is accessible only for those users which have a data services contract of minimum 13,70 EUR/month for 10 h. The other users pay 0,036 EUR/min for their extra-traffic (http://www.zapp.ro)
[77] GO no. 97/2001
[78] According to MCIT estimations
[79] And also except for the first 6 months of activity.

Table B5: Other services authorised by NARC until end of first quarter 2004

Internet access	487
Data transmission services	436
Professional mobile radio communications	164
Radio-paging	3

Source: http://www.anrc.ro

The 487 companies authorised to provide Internet access services may either connect to international networks, either provide it directly - through optic fibre (55), satellite (34), leased lines (55), or have indirect access (405).

Anyway, even though the large suppliers' prices will continue dropping and the quality of the services provided will increase, the low income of Romanians will remain the most important barrier, especially in what the „faster" component of this objective is concerned.

Almost 2/3 of the companies that set forth their intention to expand from telephony into internet access consider providing this service by indirect access, and will implicitly operate on a local and/or conjectural scale. It is to be expected that some of these will try to sell cheap, but to the detriment of quality, trying to obtain a portfolio of clients that they would later pass on to more important suppliers. However, during the tumultuous transition to new market equilibrium, it is possible that many of those reluctant to Internet will be won over on its side (see Chapter E.10). Thus, public access points are expected to show a significant development initially. However, for an overall positive impact on cultural level and social development, focusing on programs for enhancing the cultural content, including through favouring the "public-access" type projects (in libraries, museums, etc), as well as protection of customers (especially under-aged) against pornography, is required.

B.4.4.2. Faster Internet for researchers and students

Education units and research institutes in Romania are part of an Internet connection program to be finalised in 2004. In June 2003, 100% of universities were connected to the Internet (through the **RoEduNet** and **Geant** networks). Based on university autonomy, higher education institutions are entitled to conclude research contracts with the private sector. There are two national networks in Romania with an exit towards the European research network Geant:

- RoEduNet – the national education research interconnecting education institutions at speeds between 128 kbs and 1 Gbps
- RNC network connecting research institutes and higher education institutions

B.4.4.3. Safe networks and smart cards

The market of solutions for computer systems security is developing in Romania. The electronic signature law introduced mechanism for users' authentication within computer systems and implements non-repudiation mechanisms for the transactions performed. E-Sign, the first qualified provider of certification services in Romania, was established in the first quarter of 2003. In six months E-Sign sold over 8.000 de certifications (each worth 40 EUR for 1 year).

An interesting fact is that "90% of these certifications were bought by managers from other regions than Bucharest for their subordinates":[80]

> 91% of the population and 90.7% of the employers live outside Bucharest[81]. This correlation of these figures shows that in the case of managers which are ready to adopt IST, there is no difference between Bucharest and the other regions of Romania! This kind of aspects might be studied for grounding the future regional strategies.

MCIT launched in 2001 a project for the unique smart card based identification of civil servants. GO no. 150/2002 stipulates that smart cards are to be introduced by October 2003 in the health sector, for medical insurance services. GO no. 69/2002 stipulates the introduction of the electronic identity cards for persons, as multifunctional smart cards.

B.4.5. Investments in people and skills

B.4.5.1. European Youth in the digital age

- On the background of the ongoing reform of the secondary education system (see Chapter G), and in connection with NSNEIIS, **MER** launched the "Computer Assisted Learning" program (see Chapter E.9.) aimed at increasing schools' endowment with computers, Internet connections and educational software. The program includes a preliminary training of teachers. From the conceptual point of view, the program is well balanced, considering the need of both info-infrastructures and educational content. 30 000 computers with Internet connection were introduced in schools and high schools, as follows: 100% high schools (1 400 high schools), 65% of the urban schools, and 18% of the rural schools. So far, 1 220 high schools were provided with an informatics lab including an advanced server, 25 working stations, network printer, scanner, router, switch, and software licenses for e-mail and office applications (MCIT (2004)). The application on these computers is called EAS (Educational Assistant for Schools[82]). It enables the management of the educational process and the using of electronic training materials for innovative teaching of topics such as biology, physics, chemistry, literature, mathematics, etc. In 2003 the first package of educational content for high schools was created[83]. Also, in 2003 MER presented the first multimedia kit (made with the UNDP support) for health education, designated to the educational units[84].
- The ADLIC[85] system ensures the secondary school admission and distribution at the national level. ALDIC works since 2001 and eliminated a lot of the social tension and corruption. This application was awarded the prize "eGovernment "Best Practice" during the conference "From politics to practice", held at the European Commission, on 29-30 November 2001.
- MER is currently developing a data centre to support multimedia access in foreign languages, educational materials etc. A portal for bi-directional communication and multimedia for pupils and teachers was launched in order support long-distance education, its pilot stage being under development (http://portal.edu.ro). This portal is foreseen to become an effective tool for e-learning initiatives.

[80] http://www.no-cash.ro The interview of November 2003 – e-Sign' General Manager.
[81] Authors' calculations based on Romanian statistical Yearbook and NIS – Labour Force Surveys
[82] Developed by the local company SIVECO (http://www.siveco.ro)
[83] Created by local company SOFTWIN (http://www.softwin.ro)
[84] MER press release, http://www.edu.ro.
[85] Developed by the local company SIVECO (http://www.siveco.ro)

B.4.5.2. Working in knowledge based economy[86]

- As developing the teleworking activities is considered one of the MCIT priorities for 2004-2006, specific preparatory measures are foreseen in this direction. However, the measures foreseen in the NSNEIIS do not cover the background of the problem, namely modernising the regulatory framework in the labour relation area, so that hiring online becomes possible, with fiscal deduction of hiring costs.
- The eAdministration[87] strategy stipulates the introduction of ECDL (European Computer Driving License) certification for civil servants. It also provides for the National Institute for Public Administration to organise training sessions for all public administration employees. ECDL ROMANIA established a national network of approximately 70 approved test centres, a network that is under enlargement, intending to cover all Romania's counties. Among these centres there are educational institutions (universities, high schools and even some elementary schools - mainly dedicated to get ECDL Start), training centres for public administration, and training centres in all the important cities of the country.

B.4.5.3. Equal participation in knowledge based economy

- The Government of Romania launched a project to computerise public libraries, as well as programs for creating the citizen multimedia centres and the info-kiosks in public places.
- A more recent measure is meant to increase the endowment for the poorer families. The Romanian Government approved on 7th April 2004, a draft law regarding the possibility of granting a financial support for acquisition of computers for families with low revenues and children enrolled in education at any level. This is meant to address the main barrier in increasing the penetration rates in households, which is the low revenue, as discussed further in Chapter E.10.
- The barrier represented by the very low income of the population remains and cannot be removed only by infrastructure-based policies, which can only offer alternative solutions for those people who cannot afford to pay for individual access. As communication does not mean only telecommunications, there are two sides of this problem: that of the public content offered to the citizens and that of the possibilities created for the public access to that content using telecommunication networks. According to NSNEIIS, until 2004 only some pilot or local projects regarding both of these aspects are expected to take place. Among these, the project "Multimedia Centres for Citizens[88]", focused on the content facet, is at the end of its first stage. But the real problem is that of creating the public points of access. A possible solution that started to be implemented is using the infrastructure of postal offices to provide cheap Internet Access (see Chapter E.6.). This possibility does not involve special difficulties in the case of the urban localities or of the developed rural ones, but for an important number of rural zones the modernisation of the telecommunications network is required before anything else. Therefore, the problem of creating public points of access to the Internet is closely linked to that of the universal service provision. This issue is addressed by projects

[86] See also the previous section for the case of the teachers.
[87] Approved by the GD no. 1007/2001
[88] The first stage requires building an initial multimedia information center for the general public, located within the MCIT headquarters. This initial center will focus mainly on information and activities that are typical to the MCIT. The main objective of this first stage is both the social and technological confirmation of the information center concept for the local administration.

started by MCIT, focused on some of the most disadvantaged areas. A possible solution for this problem was identified by MCIT - the launch of a new service (PostNetAcces) offered by the postal offices which will provide people with access to computers connected to the Internet. This solution is equally addressed by a project whose first stage started in July 2003[89]. This solution could have an important impact in the near future, being one of those few possible solutions that can be generalised fast, by using the commercial means for each location. One of these projects aimed at solving most of the problems concerning the access to communications services in Apuseni Mountains started in 2002 and was finished in July 2003. In this stage of the project digital telephony lines were introduced in 180 localities, enabling the installation of new telephone sets, and the automation of the telephone service was finalised in 374 localities (http://www.mcti.ro), ensuring the access to the international automatic telephone system, fax transmissions, internet access, as well as installation of public phone booths. As against the initial specifications, the project was gradually extended in the Sebeş Mountains. Moreover, a similar project was started in July 2003 in Suceava county, for introducing digital switches in 58 villages by the end of 2005. Several such projects are to be started for the isolated areas by 2007, according to NSNEIIS.

B.4.6. Stimulating the use of Internet

B.4.6.1. Stimulating the Electronic commerce through higher security of transactions and B2G push

- **The electronic commerce law** regulates the framework for electronic commerce services in Romania. The law stipulates severe punishments (up to 15 years of imprisonment) for fraud in the field of Information Society services and grants particular importance to financeBanking frauds. The key player appeared in 2003: E-Sign România S.A. - the first Romanian Authority for Certification services, provider of qualified certificates according with EC/99/93 and Romanian Law on electronic signature[90]. Through its cooperation with ADACOM, member of the VeriSign Affiliate Trust Network, E-Sign provides the establishment of any type of Public Key Infrastructure locally (http://www.e-sign.ro).
- In 2003, at the eEurope competition the Electronic System for Public Acquisitions (ESPA) was designated as one of the 65 examples of good practice in eServices.[91] Average savings for the budget from the introduction of the system in 2002 represent 22.6% of the closed transactions (reaching more than EUR 67 million at the end of 2003; with savings being estimated relative to the prices obtained in the classic acquisition system). The results of implementing the project consisted in an increase in transparency for public acquisitions and a decrease of corruption in the public administration system, as well as a boost to electronic commerce through B2G segment. The main advantages of the Electronic System for Public Acquisitions are: securing the transparency of the procurement procedures and the efficiency of the process for acquisitions implying public funds, simplification of the tender participation procedures for bidders, more effective and standardised working procedures for the buying agencies, providing public information upon the public procurement processes and creating auditing mechanisms for the public procurement process. Starting 2004, the system will be

[89] MCIT announced that, by the end of 2003, through the PostNetAccess service 12 postal offices in Suceava County will provide for citizens access to computers connected to Internet – http://www.mcti.ro (press release)
[90] Law no. 455/2001
[91] eBusiness, July 8th 2003.

developed in order to allow for more facilities such as on-line invoicing and ePayment (MCIT (2004)). According to MCIT, "the extension of the e-Procurement system to national level became a key component in the process of modernisation of Government in Romania. By procuring electronically, the Romanian Government can lower the cost of inputs, also encouraging the private sector to move to B2B and it creates the premises for lowering corruption, reducing bureaucracy and ensuring transparency, in an effort to build efficient and accountable public sector institutions, capable of sustaining long term development".

- The e-procurement system is to give a boost to the B2B market too, while the system will be opened also for B2B transactions. But, on the other hand this effect might be limited unless a national awareness programme for SMEs concerning the economical aspects of electronic commerce and the ways in which they can be implemented, is put in place, although some initiatives in this respect were supported by the European Union. The SME Ministry together with representatives from other Ministries initiated a national strategy on eCommerce during 2002, which, however, has not been concluded yet. Ignoring the emergency of such a program could be a serious threat for the future success of NSNEIIS. The newly adopted *"National Strategy for Intellectual Property (2003-2007)"* includes an action line in this sense. Equally, MCIT through the secretary of state declarations considers this issue as an emergency[92].

B.4.6.2. Stimulating Internet banking

In the last quarter of the year, Visa International has granted the acquiring license to Banca Transilvania. It should be noted that given the concern of international card organisations with the increase of the usage network in Romania, especially in retail, it is probable that the number of acquiring licenses will increase in the near future. This can also have a significant impact on the development of eCommerce, should the consolidation of public trust in electronic payment via Internet succeed.

On the background of these evolutions, MCIT approved a regulation[93] of the NBR, which focuses on the security of the systems used by the banks from the point of view of data protection. This regulation is in the interest of both consumers and banks. According to this regulation a security audit has to be performed in order to provide a certificate allowing the bank to offer the service. In 2003, MCIT has granted such certificates for 22 banks (using 29 payment instruments).

The impact on the evolution of Internet Banking is very important. The data presented in Chapter E.5. shows that while the value and number of transactions during the first three months of 2003 have an exponential trend, the average value of a transaction seem to have rather a linear trend. This indicates that there are several phenomena behind these evolutions. Among these, the most obvious are: the (exponential) increase in the number of card users, the increase in the number of banks and the (sudden) increase in electronic payment services by card, as well as an increase in the propensity of card holders toward the use of these means of payment.

Starting 2004, at least three more factors might add to the previous ones:

[92] Adriana Ticau, Secretary of State, MCIT – interview on http://www.no-cash.ro (November 2003)
[93] The MCIT Order no. 16/2003

- The Law no. 250/2003 compels the providers of public utility services to accept payments by card beginning with 2004.
- The big stores will have to install POS terminals by January 1st, 2004. However, there are some incoherences regarding the sanctions in the law for approving the GO no. 193/2002, which made them compulsory. Presently, efforts are made by the Government to solve this problem in the Parliament at the beginning of 2004[94].
- Law no. 291/2002 stipulates that the public administration authorities have to take all the necessary measures in order to allow people to access on-line information about taxes owed to local administrations and to pay them by POS, ATM (only Bankpost offers now such a possibility) home or Internet banking. Up to December 2003, approximately 60% of municipalities introduced electronic systems for the payment of local taxes (by June 2003 25% had interconnected their systems with the banking system).

B.4.7. Online government: public access to electronic services

It is interesting to note that given the approach of using IT as an ***engine for the development of the Romanian society,*** the Romanian Government started to harmonise the IS policies with the policies in other fields. Most noticeable, the Anti-Corruption Law no. 161/2003 includes a Chapter dedicated to "Transparency in the administration of information and public services by electronic means".

This chapter is meant to improve the access to the information and services of public administration authorities, to simplify the bureaucratic procedures by standardising the methodologies of work while establishing the legal framework for setting up the National Electronic System (NES). NES is defined as the unity formed by the eGovernance System and eAdministration System. It became accessible on-line at http://e-guvernare.ro since 29th of September 2003.

Beside the access to the information of public interest, over 15 other public services will be provided (e.g. e-health portal). The system shall allow also the possibility of electronic payment for taxable public services (e.g. the payment for the registration of a new car). Presently in the are implied over 465 public institutions (MCIT (2004)) and it is providing 8 services (http://www.e-guvernare.ro):

- On-line forms – allows downloading various administrative forms (over 160 currently available);
- On-line declarations of social insurance payments (available only for big taxpayers) – see also Chapter F
- On-line declarations of other budgetary obligations (initially available only for big taxpayers)
- TVA related forms (initially available only for big taxpayers)
- Balance sheet reporting online (only for selected economic agents – pilot project) – see also Chapter F

[94] Adriana Ticau, Secretary of State, MCIT – interview on http://www.no-cash.ro (November 2003)

- Licences for international transportation (public service exclusively offered online) – see also Chapter F
- Data collection on-line (eStatistics)
- Applications for issuance of driving licence

B.4.7.1. The stage of implementation of eGovernment projects

Out of the EU proposed list of 20 basic public services to be implemented online within the eGovernment programs, most of them are in different stages of implementation, from pilot projects to fully interactive communication with the administration.
According to the strategy for developing public services provided electronically these services breakdown into:

- **on-line public services for citizens (**the information system of tax payments, "e-Job"- Information System for Job Search and Recruiting, the information system for social security, work force and pensions issuance of personal identity documents, application for car registration, applications for construction licences, police declarations, public libraries access, certificates of civil status, applications for university and post-university education, notification of changes in residence, health and related services), and
- **on-line public services for companies** (declarations and notifications regarding: social contributions for the employers, corporate taxes and VAT, application for registration of a new company, the information system of surveys and statistical data, custom declarations, applications for permits and environment protection authorisations, public acquisitions)
- **intra-governmental use of ICT**. Computer systems for documents management were implemented within public institutions. Starting April 2003, Government meetings are hold based on the Governmental Meeting Informatics System that secures the management of the papers to be discussed by the Executive. Also, in 2003, MCIT launched a project for the building of a portal to secure the interaction between the administration and its own clerks. The objectives are the timely efficient information of the civil servant and their online training.

Since the launching of the portal, 50 000 visitors have been registered. The system will be gradually developed further, both in what concerns the number of services available and the targeted groups of users. In 2004 the number of online forms will reach several thousands (MCIT (2004)).

B.4.7.2. eHealth

The eHealth component of the NES is aiming at offering information both to patients and the medical staff regarding the national institutes of research in the field, the centres for disease prevention and control and medical units (this is a "one-way interacting service". If the medical units had the technical support, on-line scheduling would be possible. The portal also contains a medical library and a database of medical doctors (pilot project).

B.4.7.3. ICT based services for transport

The first step towards introducing G2B electronic based services in the field of transport was made in 2003 by GD no. 1173, regarding electronic distribution of authorisations for international

road transport of goods, (starting November 2003 these authorisations are issued exclusively electronically (http://www.autorizatiiauto.ro).

B.4.8. Network security, ICT anti-fraud and the smart cards promotion

Romanian IT industry and eCommerce are affected by the bad celebrity of Romanian hackers[95]. Romania is ranked 5th in the Top Ten Countries - Perpetrator in the 2002 Report of Internet Fraud Complaint Centre[96]. According to Associated Press (2003) the same organisation states in another report that: "Frustrated with the employment possibilities offered in Romania, some of the world's most talented computer students are exploiting their talents online" The same article remarks that this situation started to change. „Computer crime flourished in Romania because the country lacked a cyber crime law until earlier this year, when it enacted what may be the world's harshest. The new law punishes convicts with up to 15 years in prison - more than twice the maximum penalty for rape."

The legal framework aimed at enhancing network security and anti-fraud protection was created during 2001-2003. The Criminal Code, the Electronic Signature Law, the Electronic Commerce Law and the Anti-Corruption Law are the main legal instruments enforced in this field. A special IT anti-fraud Department was set up within MCIT. This department cooperates with the similar ones of: Ministry of Justice, Prosecutor's Office, MAI, and Romanian Service for Information. Equally, Romanian Police set-up in 2003 a computer crime task force. MCIT received in 2003 through the Anti-fraud web page over 100 complaints regarding frauds as: spam (10), "Nigerian letters" (50), bidding frauds (50). According to MCIT (2004), by the end of 2003, two projects focused on antifraud will be finalised, and will become entirely functional by in the first quarter of 2004.

- The public service eFrauda.ro (http://www.eFrauda.ro) enables informing the public regarding the legislation and offers a way for contacting the authorities and to report complaints by using electronic forms, which ensure the identification of the compliant, guarantees the delivery to the addressed authority, and guarantees the confidentiality of the delivery.
- The public service Centre for Expertise and Reaction to Security Incidents (CERIS), accessible at http://www.ceris.ro, enables collecting of security cases and practices and offers to the IT personnel of public institutions and to the public complete information on the security audit of the information systems and on other issues as vulnerability, viruses etc. CERIS will be affiliated to SPAS

B.5. The commitment of private and public actors

B.5.1. The commitment of public actors

Several issues of commitment at the level of public authorities will be considered in this analysis:

[95] In 2003 more than 60 Romanians have been arrested in joint operations involving the FBI, Secret Service, Scotland Yard, the U.S. Postal Inspection Service and numerous European police agencies (Associated Press (2003))

[96] U.S.-based Internet Fraud Complaint Center run by the FBI and the National White Collar Crime Centre http://www.ifccfbi.gov

B.5.1.1. The balance between the levels of commitment of major actors in accommodating the IS policies vectors

So far, the main actors of the strategic implementation are those belonging to the central administration, mainly MCIT and its satellites. It is the commitment of other actors that is hindering, in our opinion, the overall efficiency of the IS policy framework. There are two main public actors that we can pinpoint as the great absentees from the IS policies network: The Ministry of Economy and Commerce and NASMEC[97].

The driving motivation of using the potential for ICT development as an ***engine for the development of the Romanian society*** will be difficult to be met without an increased convergence between IS policies and industrial policies through innovation[98] and development of overall competitiveness (including: marketing, management and entrepreneurship – performances).

In this background, two examples of programs that are not included in the action plans analysed are relevant, these are extremely important for increasing the overall competitiveness of the Romanian economy: *"Upgrading of the assurance and control of quality process in traditional industrial sectors by means of stimulation and spreading of IT use"*, and setting up a *"Public Industrial Marketing Information System"* (Drăgulănescu et al. (2002)). For the time being, this type of programs are promoted especially by some civil society players[99], but their success is rather limited, especially given (in our opinion) the absence of efficient social structures to ease the bottom-top transmission of business-focused initiatives.

B.5.1.2. Commitment of various actors within a clearly defined system of responsibilities.

Given the stabilisation of the strategic concept regarding development of IS in Romania, there is an increasing number of players in the field of implementing and co-ordinating strategic programs at a sectoral level (e.g. NASMEC). The commitment of many of these public actors which are leading the elaboration and implementation of the IS policies have been referred to and discussed in the previous sections of this chapter (section B1). It has to be stated though that within the process of institutional build-up that was characterized in Romania by an inner volatility, the overlapping of various responsibilities or, contrary, the lack of their clear assignment has induced lower level of commitment in implementation of various programs.

For instance, within the government reshuffling in mid 2003 the former Ministry of Public Administration merged with the former Ministry of Interior. There were some malfunctions in managing the role of the new Ministry of Administration and Internal Affairs (MAI) in the implementation of the eAdministration Action Plan in relation with MCIT. Thus, the latter was technically unable to take over the administration of several components of this action plan. According to Law no. 161/2003, the newly created MAI was described a series of precise attributions related to the http://www.e-administratie.ro component of the National Electronic

[97] Through the recent strategies, NASMEC received new role in innovation policies

[98] Currently, innovation policy is tied to research, not to industry. This is an institutional shortcoming that has to be addressed to make the transition from the linear model of research to the systemic one.

[99] e.g. 9iNet, see http://www.mediafax.ro press release MEDIAFAX, Oct. 2002

System, i.e. sub-components under the jurisdiction of local administration, including matters related exclusively to domestic affairs. These matters made the Government include in the "priority measure and actions for preparing Romania's accession to EU for the period December 2003 – December 2004[100]" some provisions for adopting by June 2004 a National Strategy on de-centralisation, to clarify the responsibilities for the local implementation of eAdministration.

B.5.1.3. From policy initiative to decentralised implementation: the commitment at local level

The transfer of the implementation tasks towards local authorities and structures in charge with regional development was so far started only by purely administrative measures. However, in the next phase of the strategy, the roles of the local authorities and of the public (citizens, organisations and especially SMEs) will become increasingly important. This is why their training for taking over the tasks stipulated by the law or by the strategy objectives becomes extremely important in the near future.

B.5.1.4. Removing the barriers to deep commitment: fighting the lack of awareness and building the public confidence

The new legislation and strategies adopted and under implementation after 2001 represented a significant step forward. Nevertheless, this happened after numerous hesitations and involutions. This made the public reticent towards the government's intentions of directly approaching the IS issues, considering them rather a rhetorical exercise. The public found hard to perceive the consistency of the Information Society concept given the high dynamics of its adoption and the technical character of the documents, as well as the abundant, contradictory media coverage of the dot.com crisis. Thus, it was sometimes difficult to visualise the manner in which the respective policies could affect positively the everyday life, given the clearer costs and the perceived associated risk. Nevertheless, the promoters of IS policies built several instruments for communication with the public that eventually succeeded to increase the credibility of IS policy actions, mainly by keeping them under the constant focus of the media. The new websites of the Romanian Government[101], MCIT[102] and the high share of public institutions with a presence on the Internet (interactive websites) played a major role in supporting this credibility. However, the media push is only one side of the coin. As NSNEIIS also states "the necessary steps for the development of the economic sectors which are based on ICT must be taken at the level of the qualified factors (Government, Parliament, Professional and Patronage Associations)". In this respect, given the complexity of the measures to be taken in the case of Romania, which have to be simultaneously coordinated with various initially diverging strategies and to be aggregated on the way, the use of private-public partnerships is highly needed as a working instrument capable of allowing current cooperation, intensely and adequately structured. The lack of experience in establishing efficient Public-Private Partnerships is still a difficulty to overcome (Jinaru *et al.* (2002)).

[100] http://www.mie.ro
[101] http://www.gov.ro
[102] http://www.mcti.ro

B.5.1.5. Removing the barriers to deep commitment: dealing with fringe interests

The success of the e-procurement system, demonstrated that the use of IST could effectively contribute to diminishing corruption. The opposition of certain interest groups was to be expected. The speed and depth of implementation and upgrading of the projects that were part of the NSNEIIS action plan, over the period 2001-2003, made the possible losers of change to react weakly and late, especially since the IS measures with the most important impact on corruption were included in the anti-corruption law (Law no. 161/2003).

The following examples come to illustrate this post-factum reaction:

- Some counter-reactions to the e-procurement system have come, through the press, from some public actors (universities and hospitals) that noted the fact that they paid a higher price than the market price. However, the outcome of these actions was weak, especially since the number of such more expensive procurements is extremely low, and they were repeatedly signalled by the same actors (especially the „Al. I. Cuza" University, Iasi and Ophthalmology Hospital, Bucharest). MCIT analysis has revealed that, overall, in 2003 these institutions recorded significant savings due to this system (27.6% and 23%, respectively), and the complaints referred to some individual cases (http://www.mcti.ro). On the other hand, some public authorities employees have tried to elude the law, the National Control Authority discovering serious malfunctions[103].
- Following GD no. 1173/2003, starting November these authorisations are issued exclusively electronically. The opposition from some transport companies to this measure has reached the form of street protests. Although they invoked the fact that they do not dispose of the necessary technique and knowledge to implement this system, the government did not give in to their protests. However, the number of authorisations issued in the first four days after adoption (150)[104] and the fact that international goods transports were not affected proved that this opposition was not grounded.

Further clarification of property rights and separation of regulatory functions from ownership rights is necessary to avoid biased behaviour from the state authorities themselves. The fact that GICIT, which is subordinated to MCIT is the operator of the e-procurement system may be justified by reasons connected with insuring the security of the system. However, in our opinion, given the size that e-procurement reached, is already necessary to create an other non-governmental authority that would hold the monitoring and regulatory function in view of a strict surveillance on compliance with procedures and commercial standards laying at the basis of its functioning in order to guaranty consumer rights.

B.5.2. The commitment of the private sector

The major Romanian IT companies are equally interested in participating to the development of IS in Romania, some of them finding in it opportunities to demonstrate their competencies. In the project ***"Speeding up access to computers and Internet in Romanian schools[105]"***, SIVECO and SOFTWIN offered their competencies and technologies for creating and implementing the Automated Educational System (AES) learning management application and respectively for the

[103] See a.o. the newspaper Evenimentul Zilei - 24 October 2003 http://www.evenimentulzilei.ro
[104] http://www.mcti.ro
[105] This program is described in the Chapter G.1.

creation of the necessary educational content[106] (see Chapter E.9.). Equally, main MNC subsidiaries as IBM Romania, HP Romania, Compaq Romania and Microsoft Romania are providing the hardware infrastructure and the basic software. All of these companies involved to a large degree in the conception of the project from its early stage, are also main promoters of AES in Romania by organising numerous events aimed at demonstrating to the public (school teachers, students etc.) the advantages of the new educational technologies and at making the concept of IS more tangible.

The ICT industry participates in various execution phases of NSNEIIS projects launched by MCIT by implementing specific applications. In 2001, some of the major actors of IT industry offered their competency for designing and implementing the first 20 pilot projects which preceded the strategy[107], with minimum costs for MCIT. This involvement was a very important commitment for the launching of the strategic actions in time.

The Romanian NES system was developed based on a partnership between Softwin and Microsoft Romania, winners of the bids for pilot projects in 2002.

In September 2003, a strategic partnership between the Romanian Government and Microsoft Corporation was initiated. The partnership will run for three years, with a possibility of renewal, and has as objective the support provided to the Government in reaching its strategic purposes, with a view to creating an Information Society and the support for the development of the IT sector in order to enable Romania to become a European leader in software development. Also, the partnership creates conditions for concluding a framework-agreement of license between the Government and Microsoft[108].

There are also examples of private companies launching initiatives with effects in aggregation of industry. In November 2003 Zapp (with the participation of Qualcomm) launched the BREW Developer Lab, which offers technical and logistics support to developers in order to create and test Binary Runtime Environment for wireless applications. For one year, the lab provides, free of charge, application testing and validation for Zapp's application distribution system. This laboratory opens new paths for the software companies in Romania, giving them the opportunity to tap into the new mobile-content niches of business by providing the access to a fast growing global network of mobile telephony operators offering services based on BREW[109].

[106] Presently, they are involved in a "learning by doing process" which implies a tight collaboration with the content authors who do not have the necessary skills for designing such kind of multimedia content, the international standards (i.e. SCORM (http://www.academiccolab.org) and IMS (http://www.imsproject.org) in this field being still at an early stage.

[107] In this way, the special cost of all of these 20 pilot projects was under 60 000 EUR. MCIT was created at the end of 2000 after the elections. In 2001 its resources for financing its projects were very scarce.

[108] The agreement includes the possibility for Microsoft to provide experts from its local or regional branches, in IT projects, and to support the development of the activity and capacities in this sector. In addition, the company could run IT training courses for the public administration personnel involved in complex projects and work out an adequate curriculum for training centres. The agreement also includes the possibility to launch a specific educational program and to continue the Academic Program initiative, which will develop the entrepreneurial skills of the students (http://www.mcti.ro).

[109] http://www.qualcomm.com

B.5.3. The commitment of the civil society

A number of non-governmental private organisations, especially professional associations are involved in setting up the IS policies, but the cooperation between public and private actors is still far from being based on a coherent system of real public-private partnerships. A barrier to accelerating this process is the lack of aggregation (Coalition Tech 21 (2002)) concerning the IT industry at different levels, including at the level of the IT Industry Associations which could not yet find/define their common set of interests. Concurrently, it is because the IT industry itself is a new one, originating in sporadic outsourcing opportunities (see Chapter C) and not because of either a former policy or as a continuation in the social space of the businesses, therefore a weakly interconnected one. In our opinion, these are tied to the lack of entrepreneurial culture. Currently, a process of development of subsidiaries of the national IT associations has started at the regional level. Moreover, the main IT professional associations, namely Romanian Association for Electronic Industry and Software (ANIS – 77 members – representing mainly the large companies specialised in software and services), National Association of Software Enterprises (ARIES – 278 members – representing mainly the SMEs), Association for Information Technology and Communications of Romania (ATIC – data n.a.) and National Association of Romanian ISPs (ANISP – 34 members) decided to form the Coalition Tech 21 as a framework of structuring the dialogue with the Government, so as to overcome a part of the disadvantages created by the lack of aggregation at the representative level of the IT industry. ANISP succeeded in introducing on the Romanian market the first root-server, RoNIX (see also chapter C.11).

Two very valuable new initiatives promoted by The Tech 21 Coalition are the AURO-IT[110] program and the SPIRIT[111] initiative. Those two initiatives were prepared by a background study (Caragea *et al.* (2003)) aimed at finding the most adequate solutions for a common commitment of the Government and ICT Industry Associations for promoting the Romanian Software Industry at a global scale. The study found that due to the IT specificity the supporting funds for this industry would be allocated separately and recommended the set up of a public-private Task Force whose role would be to administrate a part of these public funds. However, the step from intention to commitment still delays[112], although on the other hand both ANIS[113] and ARIES[114] started various related programs and projects in 2002 and 2003. ANIS launched the programme Soft21.ro, aimed on the one hand at stimulating the networking within the Software Industry by promoting the best entrepreneurial and professional practices and, on the other hand, at stimulating the contacts with the Romanian customers by promoting the best commercial practices for the software solutions market. Equally, ANIS is preparing the SPIRIT-XXI programme aimed at promoting the use of the eCoaching and eIncubating technologies for entrepreneurial education.

[110] Meant to join efforts from all interested parties in the promotion, on international markets, of a unique Romanian brand in software

[111] Meant to promote programs in favour of a better aggregation of the industry

[112] The main causes of this delay are lack of experience in establishing public-private partnerships (PPPs) and the fact that the sectoral orientation of FDI was never a policy promoted by the Romanian industrial policies (see Chapter C).

[113] see http://www.anis.ro

[114] see http://www.aries.ro

ARIES organised in September 2003 within the framework of the Binary Fair the first edition[115] of Romanian Venture Capital Forum. The event was aimed at drawing the attention of the authorities and public to the lack of financing mechanisms needed for stimulating innovation and entrepreneurship. Moreover, it highlighted the fact that more commitment for raising the public awareness is necessary in this field [116].

ATIC is the main promoter of the ECDL in Romania and it is collaborating with the Government for licensing public servants. Recently, ATIC launched a pilot project in a school for blind youngsters in view to launch in Romania the ECDL-PD, (ECDL for People with Disabilities).

Beside the associations mentioned above, other three associations play a significant role in the process of building IS policies: The Cable Communications Association, The Romanian Association for Internet and The Romanian Association for Electronic Commerce. They mainly participate in the public discussions regarding the specific regulations promoted by NRAC, which publishes on its website all its draft documents and regulations elaborated, for public feedback. Equally, before adoption, NSNEISS was the subject of public discussion, with the participation of all these associations.

However, the lack of experience in moving from exchanging views with the private sector towards establishing real and effective PPPs represents a contextual weakness of the IS policies. In this way, the e-governance's facet of participative democracy might see a slower development. A social benefit, (rising from the development of the networks and communities of practices[117], which are currently seen as essential components for the social capital creation by networking business and governments[118]), could be lost. For instance, the setting up of venture capital in Romania asks for establishing strong PPPs between Government, business, and civil society and a strong commitment of all of them for designing the strategies and the action plans in this field, in a way which must re-build the trust of Romanians in this kind of financing instruments[119]. A better cooperation with European Investment Fund (EIF)[120] should offer a way for overtaking these difficulties (Jinaru (2003), Caragea *et al.* (2003)). A first step in this sense was made at the "Binary Venture Capital Forum" were EIF was invited by the representatives of the civil society[121]. Another adequate way of action which must be considered, especially in the Romanian context where a lot of social problems are also present, is the promotion of the new social

[115] This inaugural edition (Binary Venture Capital Forum) was organized in partnership with the National Securities and Exchange Commission
and the European Institute of Romania;
[116] http://www.noema.info
[117] http://www.co-i-l.com; http://www.lse.ak.uk; http://www.cordis.lu/ist/
[118] See in FP6, IST Programme the Action line "Networking the Business and Governments"
[119] A series of bank scandals was shaking the economy during the transition period. No less than 9 banks have gone bankrupt in the last 13 years, mostly due to corruption and unfair conduct (OBG, Emerging Romania, 2003). One of the scandals was particularly damaging the credibility of the banking system, the one around the National Investment Fund (NIF), that collapsed as a pyramidal scheme. NIF was run by a consortium including the main state-owned Saving Bank. This scandal exploded in December 2002 and its judicial consequences are not solved completely. The National Bank have adopted new regulation beginning with even 1998, but as yet, any attempt of setting an investment fund, including a venture capital fund, meets the still very low public trust.
[120] http://www.noema.info
[121] The initiator of the Romanian Venture Capital Forum is a fundamental research oriented NGO "The Centre for Complexity Studies", http://www.noema.info;

financing instruments (Vandemeulebroucke (2003)), which are emerging in Europe (i.e. social venture capital).

As shown in Chapter I.8., there is also a significant presence of NGOs in education, teaching and research areas, as well as in economic and social development (around 21% of the total number of active NGOs). From these, valuable initiatives arose.

For instance, a non-industrial organisation with is an increasingly active presence is The Resource Centre for Knowledge Economy[122] (RCKE). Romania Gateway Association and World Bank founded RCKE in 2003 as an expert-structure with national constituency. The Centre aims at unifying the national forces and energies in order to stimulate Knowledge Based Economy and to encourage the exchange of opinions between officials, civil society and business environment.

B.5.4. The commitment of academia

The Section of Information Science and Technology of the Romanian Academy (SISTRA) was actively involved in the elaboration of NSNEIIS and is one of the main promoters of the IS and KBS theoretical concepts in Romania.
In order to offer a complete image on the issues of IS and KBS, SISTRA involved a large number of Romanian specialists in the elaboration of a collection of studies which were published in two volumes during 2001: "The Information Society and The Knowledge Society" and "Romanian Language in The Information Society and Knowledge Society". Some of the authors of these studies participated in the elaboration of NSNEIIS. Further research and development activities are presently unfolding under the NP-RDI - INFOSOC[123]. One of the projects financed by INFOSOC - "Strategies and Solutions for Information Society-Knowledge Society in Romania"- is coordinated by the Research Institute for Artificial Intelligence (RACAI). This research is aimed at contributing to the elaboration of the "Development by Knowledge" strategy.

B.6. Specific Important Actors

The main institutional actors were presented in the first section of this chapter. The previous chapter presented the main industrial Associations involved mainly in the consultative process regarding the elaboration and implementation of the strategic action plans. This chapter describes the main actors of the telecommunication market and eCommerce.

- **RomTelecom** is still the major actor in the field of fix telephony. It owns also Cosmorom (GSM)[124]. As to the competition on the fix telephony market, it is premature to make any assessment. At the end of 2003, AstralTelecom, Atlas Telecom, and RDS launched their offers. Beside them, the new entrant PostTelecom (which is owned by the Romanian Post) has the potential of becoming the future major competitor of Romtelecom on the fix telephony market at a national scale.

[122] http://www.economia-cunoasterii.ro
[123] The National Research Programmes of MER are the competition based financing instruments. The structure of INFOSOC is a very similar one to that of the FP5 IST. http://www.mct.ro; http://www.infosoc.ro
[124] which presently faces real difficulties. In August 2003, RomTelecom announced its intention to give up providing mobile telephony services and, presently (December 2003), a dispute started between the shareholders OTE (owning 53% of the shares) and MCIT regarding this subject. According to MCIT, loosing Cosmorom could cause the market value of Romtelecom to decrease with up to 40% (source: http://news.softpedia.com)

- **Radiocomunicatii SA** is a publicly owned company which played a key role in preparing the liberalisation of the telecommunication market from the point of view of adapting its offer as to create an alternative to Romtelecom for long distance interconnections for the new entrants on the telecommunication market. Radiocomunicatii owned until 1st of January 2003 the monopoly of the radio-leased lines (over 2 Mb/s). In 2001 this company started an upgrading and restructuring plan in order to diversify the telecommunication services, thus preparing for the 2003 liberalisation of the telecommunications market and for privatisation. Presently, Radiocomunicatii is the nucleus in radio communication sector in Romania. It operates: a national STM-4 digital network (622 Mbit/s); 5 SDH digital microwave backbones with a transport capacity of up to 622Mbps, which cover half of the urban population, and can be considered the most developed microwave network in length and capacity from the Central and Eastern Europe (2000 km); the biggest satellite earth station from south-eastern Europe and different types of wireless point-to-point and point-to-multipoint access systems (2.4; 3.5; 5.6 and 26 GHz). In 2002, Radiocomunicatii S.A. signed a contract with Zapp, in order to extend the capacity and the nationwide covering of the digital network of this company. Due to this contract, Zapp (the last entrant on the mobile-market) became its most important client of on SDH network, and succeeded to penetrate the mobile communication market. In 2003, Radiocomunicatii launched its offer *Integrated Communications Services*[125], which includes high speed Internet (up to 100Mb/s) and long distance and international calls.
- Connex (GSM) and Orange (CDMA) on one hand and Zapp (CDMA) on the other hand are the main actors on the market of mobile telephony (see also Chapter E.3.). Their competition could be an interesting one also for the European market perspective due to the fact that CDMA20001x technology, which offers a better performance than GPRS but less than the 3G (UMTS) compliant technologies, can be very easily upgraded to CDMA1xEV-Do which allows data transfer pick-rates up to 2.3 Mb/s that are currently outperforming the G3 (UMTS) services launched in Europe.

B. Conclusions

The major factors which amplified the ineffectiveness of the IS policies between 1990 and 2000 were: the instability of institutional framework and the lack of strategic vision as well as of commitment in the strategic action. These factors continue to manifest a negative impact especially on the innovation and development policies and through these on the IS policies. Currently, the software industry shows a *risk of dependence on the outsourcing model*. The entire advantage of the technological skills is, to a large extent, crossed out by the inherited lack of entrepreneurial culture. There is a need for governmental firm action to timely launch programs for enhancing the capacity to generate knowledge capital and the continuous formation of the human capital. In our opinion, the entrepreneurial component of the educational programmes was neglected for too long. These weaknesses are taken into consideration in Government's assessments on which the "Knowledge for Development" strategy is based. Even if the institutional instability in the field of ICT seems to have been eliminated after 2000, there is still one possible negative consequence which can be felt: limiting the strategic and implementation commitment exclusively to dedicated bodies, mainly MCIT, while a coordinated involvement of other bodies is not felt as yet.

[125] http://voceen.snr.ro

The evaluation of the IS policies result has to take into account the short interval elapsed since their adoption (3 years). Nevertheless, so far it can be assessed that a first efficient stage has been completed, leading to the first visible results. The main spill-overs remain in the fight against anticorruption and red-tape, but also in stimulating the eCommerce as well as in increasing the general awareness of the public and the business environment in what concerns the importance of developing the IS. The policies focused on the development of the communication market created an infrastructure based on a variety of interoperable technological solutions which provide the basis for a solid further development of this sector in all regions, while contributing to the acceleration of the e-inclusion and telephony penetration action plans. The government's commitment for stimulating the development of a fully liberalised telecommunications market started showing its first visible effects, both for prices and for competition.

SWOT

Strengths	Weaknesses
• Setting the build-up of the information society as strategic priorities; • Recent increase in coherence and efficiency of the institutional setting for the coordination of IS Policies; • Liberalised market for communications; • Successful implementation of eGovernment and other related projects; • Balanced approach in developing the infrastructures and the content as well as educational projects and eGovernment; • Favouring factors for IST policies based on ICT industry push; • Several favouring fiscal measures; • Adoption of legislation regulating the regime of ePayment instruments.	• Lagging behind of the measures to fight the inherited lack of entrepreneurship; • Weak performance of the RDI system; • Limits of the demand-push policies related with the low income; • Lack of aggregation in the ICT industry; • Lack of experience in establishing PPPs; • Difficulties in designing and implementing policies as local level; • Lack of legal support for teleworking; • Lack of policies to counteract the predominace of outsourcing model; • Weak enforcement of legislation on property rights in IT, especially software;
Opportunities	**Threats**
• Increasing coherence in designing and implementing IS Policies; • Very recent major step forwards in approaching the major problems in innovation and entrepreneurship. • Increased trust in ICT solutions induced a.o. by the IS policies; • Increased access to external funding given the increased coherence of strategies; • Decision to design and implement Regional IS Strategies.	• A still laggard strategic action focused on RDI (manly on the innovation side); • Delays in implementing national awareness programmes for SMEs on the advantages of eCommerce; • Lack of awareness on the importance of IS instruments at the level of local and regional actors; • Ignoring the importance of developing the Public Private Partnerships and the bottom up channels; • Braid-drain in IT.

IS SWOT Analysis

1. The existence of an important pool of IT specialists allows for rapid implementation of IT projects and developing IT firms.
2. The new taxation regime of micro-enterprises (the profit tax which can be replaced by a 1.5% turnover tax) facilitates the start-up of IT micro-enterprises.
3. The tax exemption for the revenues of people involved in the design of computer programs proved to be an efficient fiscal incentive.
4. The liberalising market on the background of implementing the new aquis provides the perspective of regulatory stability for the investors in the communication market.
5. The predominance of outsourcing model, rises a delocalisation risk as soon as the wages will increase over a given threshold.
6. Weak enforcement of legislation on property rights in IT, especially in software is hindering further development of the sector.
7. Lack of commitment from MET and NASMEC in implementing the IS policies makes difficult the promotions of programs interfacing the IT and manufacturing industries.
8. Insufficient development of interfaces meant to connect the IT companies, Universities, research, and high-tech companies from other branches is affecting the emergence of high-tech clusters.
9. The high growth rates recorded in the ITC sector over the last years, as well as the existence of some success businesses within the software industry represent two important arguments for demonstrating that the Romanian IT industry has the capability to move towards market niches with higher value added. By offering international visibility, these figures become an argument for attracting foreign investors and, on the background of the existence of an important pool of IT specialists, to accelerate the growth of IT industry.
10. The emergence of the modern telecommunication market creates both demand and opportunities for the IT companies. (See the case of BREW Developer Lab).
11. The domestic demand for IT applications services and hardware for the next years is to increase by the approval over 150 IT projects, amounting to over 600 million EUR.
12. Lack of awareness regarding the importance of finding solutions for breaking the vicious circle of outsourcing in the IT industry, and generally the hesitations in using PPP for promoting the IT industry world-wide, is a factor of delaying the entering into the virtuous cycle of Information Society development.

C. INDUSTRIAL DEVELOPMENT, COMPETITIVENESS AND ITS GEOGRAPHY

C.1. Structure of industrial production

Romanian industry inherited from the pre-1989 period the effects of heavy protectionism and a structure of economic self-reliance. The protectionism ensured the supply was met by the domestic demand, but without the stimulus of competition, the technological and competitiveness gap versus the developed economies widened. Generally, the policy of subsidising basic intermediary goods led to a development trap, further generating a disproportional weight of industries that were intensive consumers of raw materials and energy (metallurgy, certain petrochemical branches, construction materials), while the developed countries were concentrating on more technologically advantaged branches. A second policy mistake was to orient several industrial branches to export only, addressing the international markets with average quality products at very low prices, thus neglecting the internal market and the preferences of Romanian consumers. This brought about a lack of maturity and sophistication of the local market (Hornianski (2003)).

After 1990, the efforts to increase the competitiveness of Romanian industries proved insufficient. Although external trade was liberalised at an early stage, and it constitutes the main channel for increasing competitiveness, other economic factors were not fully taken advantage of. The most important determinant was the resistance to change of Romanian economic actors. Major stakeholders, such as labour unions and state bureaucracy, managed to impose vested interests against in-depth reforms, and a sub-optimal redistribution of value added. In particular, a strong pressure for ensuring job security was put on the policy making process. The low revenues did not contribute to the development of the internal demand, either quantitatively or qualitatively. Croitoru *et al.* (2002) showed that postponing structural adjustment characterised industrial policy, especially until 1994. Given the particularities of the Romanian economic structure, the early devaluation of the currency had adverse effects[126]. Moreover, even nowadays the business environment does not encourage market competition, and the domestic capital is insufficient for the development of complex economic activities.

Currently, Romania is still a laggard in terms of competitiveness. According to Global Competitiveness Report 2003-2004, Romania is ranking on the 67th position out of 80 countries, far from most of the candidate countries (evaluation for 2002). This is particularly worrying, as besides the challenges coming from global market competition, Romania will confront with the internal competition of EU. This creates a huge pressure at the current gap. The goal of convergence calls for an accelerated transformation given that EU is in itself a fast moving target. In nominal prices, the share of electricity, gas and water supply has increased threefold over the period 1990-2002, at the expense of manufacturing and mining. In real terms, the trends differ fundamentally, mainly due to the realignment of relative prices (see Table C1.). The liberalisation of administrative prices pushed the energy price above the average PPI or CPI. The share of

[126] In theory, the devaluation of the national currency reduces the price of exports and increases the price of imports. However, for an economy that consumes intensively imported raw materials, the devaluation of the national currency might lead to higher costs of the domestic production, and a tendency to reduce the production of technologically complex goods (Croitoru *et al.* (2002)), in the absence of massive investment in technologies for reducing consumption of raw materials.

energy in the consumption basket and in the nominal industrial production increased, highlighting the low elasticity of energy consumption in the Romanian industry[127].

Table C1.: Structure of industrial production in real and nominal prices

	Distribution of industrial production in real (1990) prices			Distribution of industrial production in nominal prices		
	Mining and quarrying	Manufacturing	Electricity, gas and water supply	Mining and quarrying	Manufacturing	Electricity, gas and water supply
1991	9.1%	84.6%	6.2%	8.8%	83.6%	7.6%
1996	11.1%	81.9%	7.0%	6.7%	82.0%	11.3%
1998	14.4%	79.3%	6.4%	6.8%	78.7%	14.4%
2000	16.1%	77.8%	6.1%	5.6%	79.4%	15.0%
2001	15.5%	78.7%	5.8%	5.7%	79.7%	14.6%

Source: Authors' calculations based on NIS and WIIW (Vienna International Economic Institute) industrial database information

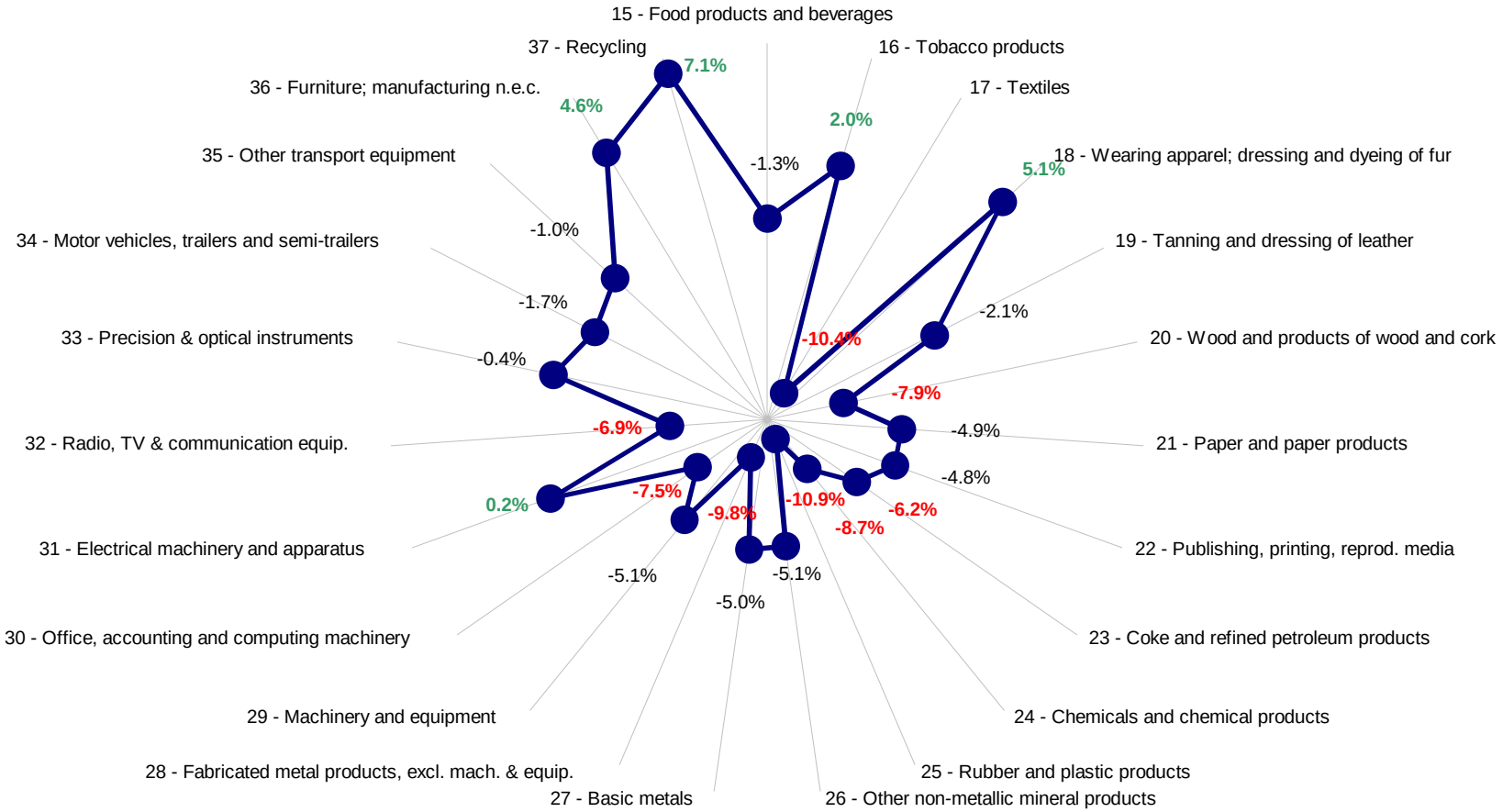
When analysing the structural changes of the Romanian industry one should remember that there is no similitude between industrial output growth and in depth economic re-launching. This argument is supported by the very modest growth of the share of value added in total industrial production. Thus, from 28% in 1990 it increased to 30% in 1996-1997, and stagnated around 33% after 1998, the year that saw the effects of privatisation and restructuring started in 1997. Governmental forecasts for budget construction foresee a fairly constant share of value added in industrial production up to 2007. Obviously, the target of increasing industrial competitiveness would require more thorough systemic changes. Unlike the CEEC's industrial development scenario proposed by Landersman (2000), in the case of Romania the advantages of lower unit labour costs were not used for the development of technologically advantaged branches (see Graph 1). However, they became a factor attracting cost-seeking FDI, located into branches that were intensive consumers of average or low quality labour force (in particular, wearing apparel[128] and furniture[129].

[127] According to the EURSTAT, the Energy consumption is 7 times higher in Romania than the EU average. Both the population and the industry show roughly the same percentage decline in consumption during the above mentioned period;

[128] Included by Landesmann (2000) into the low-tech industries group

[129] Included by Landesmann (2000) into the resource-intensive industries group

Graph C.1.: Average yearly growth rate of industrial production 2001/1990 on manufacturing branches, NACE classification



Source: WIIW Industrial Database

On the other hand, the technologically intensive branches[130] (with the exception of electrical machinery and apparatus) saw a steep decline over the period. Nevertheless, as detailed in Chapter C.2., some of them have recently recovered through various mechanisms, from FDI inflows to effects of various economic policies, showing hope for further development: in particular plastics, pharmaceuticals, but also electronics and office machines. These branches might play an important role in redefining the future profile and specialisation for Romanian industry (see Table C2.). According to government forecasts, the branches with the highest rate of growth will remain food and beverages, wearing apparel, oil processing, chemicals, and furniture, but equally machines and equipment. These estimates are based on sectoral strategies and estimated effects of forecasted economic measures to be taken up to 2007

Table C2.: Average yearly growth rates of selected manufacturing branches

	1990-1994	1994-1996	1997-1999	2000	2001	2002
24 – Chemicals and chemical products	-16.5%	-4.1%	-15.5%	20.2%	2.7%	5.0%
25 – Rubber and plastic products	-18.8%	-4.8%	-19.7%	-3.1%	26.3%	3.0%
27 – Basic metals	-18.5%	4.2%	-14.0%	27.4%	16.2%	29.7%
29 - Machinery and equipment	-19.4%	12.8%	-21.5%	29.3%	20.2%	NA
30 - Office, accounting and computing machinery	-31.2%	34.5%	-16.6%	-13.3%	6.4%	NA
34 - Motor vehicles, trailers and semi-trailers	-12.4%	15.7%	3.1%	-25.9%	-1.9%	NA
35 - Other transport equipment	-10.5%	-0.5%	3.9%	11.1%	2.0%	NA

Source: WIIW Industrial Database and NIS (2003a)

C.2. Main regions of industrial production

As shown in Chapter A.1., the pre-transition industrial development model in Romania was based on specialised, monoindustrial small areas, many of them badly affected by the effects of industrial restructuring during the transition period. Without having the potential to attract new investments, the collapse of some of the regions has contributed to the emergence of a centre-periphery polarisation in the redefinition of industrial profile of Romania. In particular, the total manufacturing industry turnover (see Table C3.) is more dispersed at regional level than the industrial value added and points toward a strong concentration of higher value-added manufacturing in the leading regions - Bucharest, Centre, Northwest[131].

[130] as defined by Landersmann (2000)

[131] The share of South region are heavily influenced by the presence of automotive industry, with high concentration of capital and intermediate goods consumption, not reflecting therefore in the structure of regional value added.

Table C3.: Regional distribution of manufacturing turnover, 2001

Northeast	Southeast	South	Southwest	West	Northwest	Centre	Bucharest
11.50%	10.68%	16.12%	8.96%	8.00%	12.58%	12.95%	19.22%

Source: NIS (2003c)

At the level of 2001, around 18% of the manufacturing turnover and 13% of the manufacturing employment are located in Bucharest (NIS (2003c)). The concentration of manufacturing turnover has increased over the period of available data[132], as well as the total value added (see Table C4.) and this is a trend very likely to have continued.

Table C4.: Industrial value added by regions, million EUR

	1995	1996	1997	1998	1999	2000	2001
Northeast	1 116.7	1 178.0	1 204.8	1 206.7	979.1	1281.7	1572.9
Southeast	1 075.0	1 118.8	1 116.5	1 395.8	935.8	1280.2	1457.8
South	1 479.0	1 450.2	1 406.1	1 498.7	1 138.0	1540.1	1593.6
Southwest	964.4	917.3	1 015.7	1 053.3	914.1	1237.6	1231.7
West	846.7	811.5	857	822.7	750.6	1039.2	1165.4
Northwest	1 006.4	1 019.9	1 080.7	1 186.5	924.9	1189	1398.4
Centre	1 299.5	1 528.3	1 587.4	1 604.5	1 268.3	1680.5	2005.7
Bucharest	1 184.3	1 290.9	1 348.5	1 515.4	1 367.8	1728.8	1971.5

Source: Romanian Statistical Yearbook, 2002

Furthermore, regional distribution of ICT manufacturing branches illustrates the very strong tendency of specialisation of certain regions in production of ICT (see Table C5.).

[132] The corresponding figures for 1995 are 16.5% and 13.3%. This also implies a relocation of more efficient industries and firms in Bucharest area.

Table C5.: Regional distribution of value added (2001)

NACE branches	Northeast	Southeast	South	Southwest	West	Northwest	Centre	Bucharest	Total
Total	**7.10%**	**0.30%**	**6.30%**	**6.40%**	**16.20%**	**13.80%**	**1.40%**	**48.40%**	**100%**
300[133]	4.30%	0.50%	15.60%	8.70%	2.30%	12.40%	1.40%	**54.70%**	**100%**
313[134]	0.00%	0.60%	9.70%	19.70%	1.60%	**46.00%**	2.70%	19.70%	**100%**
321[135]	17.50%	0.00%	6.20%	1.10%	**57.50%**	2.20%	0.90%	14.70%	**100%**
322[136]	0.10%	0.00%	0.00%	0.20%	19.60%	0.30%	0.00%	**79.70%**	**100%**
323[137]	0.10%	0.10%	0.60%	0.00%	1.60%	2.70%	3.20%	**91.70%**	**100%**
332[138]	19.00%	0.00%	4.50%	0.20%	**48.40%**	0.20%	2.50%	25.30%	**100%**
333[139]	33.10%	0.70%	6.50%	1.40%	2.30%	3.80%	1.90%	**50.30%**	**100%**

Source: NIS database of economic agents, authors' compilations

C.3. Rising sectors of industry and services (excl. ICT)[140]

C.3.1. Manufacturing

Table C6. shows the growth of several manufacturing branches that are seen as most dynamic during the last three years.

Table C6.: The growth profile of selected manufacturing sectors (industrial production)

	1990-1994	1994-1996	1997-1999	2000	2001	2002
25 – Rubber and plastic products	-18.8%	-4.8%	-19.7%	-3.1%	26.3%	3%
27 - Basic metals	-18.5%	4.2%	-14.0%	27.4%	16.2%	29.7%
15 - Food products and beverages	-17.0%	5.6%	-1.1%	16.0%	14.7%	12.9%
18 – Wearing apparel; dressing and dyeing of fur	-16.1%	30.8%	-4.6%	35.6%	10.7%	NA
24 - Chemicals and chemical products	-16.5%	-4.1%	-15.5%	20.2%	2.7%	5.0%

Source: WIIW Industrial Database and provisional NIS data (for 2002)

[133] Computers and office means
[134] Insulated wire and cable
[135] Electronic valves and tubes and other electronic components
[136] Television and radio transmitters and apparatus for line telephony and line telegraphy
[137] Television and radio receivers, sound or video recording or reproducing apparatus and associated goods
[138] Instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment
[139] Industrial process control equipment
[140] This section is based on observed recent trends and perceived potential, rather than on historical data

Plastics and rubber. In Romania, there are more than 600 companies (mostly SMEs) manufacturing plastics for packaging, construction, pharmaceutical, transport and electronics industries. They cover only 80% of local demand, the rest consisting of more complicated plastics that are imported. This sector, although expected to be record a high growth over the next few years prompted by the increase in local demand, still faces some typical problems for Romanian industry: outdated equipment, low productivity and efficiency and little adaptability to internal and external demand (OBG (2003)). Moreover, the monopolies supplying raw materials (Arpechim Pitesti, Oltchim Râmnicu Vâlcea, and Petromidia Năvodari) have maintained high prices, leaving little scope for negotiation. Observers say that the prices imposed on domestic buyers exceed by approximately 20% those for international buyers, making the derivative industry totally non-competitive on international markets (OBG (2003)).

Metallurgy. The steel industry in Romania is still largely oversized and mainly state-owned, as the restructuring process is striving to reduce output while increasing productivity. The main player on the Romanian steel market, who is at the same time the largest steel plate producer in Eastern Europe, Sidex Galati, was sold in 2001 to LNM Ispat (a UK-Indian joint venture), preparing the grounds for further privatisation in the industry. The aluminium industry has also been undergoing successful restructuring for the main companies – Alro and Alprom. Nevertheless, the privatisation and restructuring of this industry are far from being over, and are a top priority for the Government due to the large scale of operations, high volume of arrears generated by the unrestructured state owned companies and the significant social implications of their restructuring. The cheap labour force and the lower energy prices are expected to attract large heavy industry companies who are considering moving their operations to more favourable locations.

Food industry and distribution. The development of the food industry benefited from the change in consumers' behaviour, with a growing share of shopping being made in large supermarkets, cash and carry stores, commercial centres and malls. This, together with the large size of the consumer goods market, caused this sector to be one of the first to attract foreign investors, among which are Unilever, Kraft Jacobs Suchard, Danone, McDonalds', Pepsi Co. and Coca Cola (OBG (2003)).

Light industry. This sector has largely benefited from foreign investment, attracted by low entry and labour costs, together with highly skilled labour force. Due to the advantageous customs-inward regime, foreign investors chose to structure their operations as sub-processing ("lohn" system[141]), for industries such as textiles, clothing, footwear, and leather processing. This led to the private share of this sector's activity exceeding 98%, while boosting Romanian exports to record levels of almost USD 4 billion (i.e. 34.8% of total exports, and of which 26.2% represented by textiles) (Business Digest (2002)). Thus, textile is the most important industrial sector, employing 20% of the industrial workforce in more than 8 000 companies (OBG (2003)) and one of the most promising industrial sectors, as well. It managed to make a smooth transition from being mostly oriented to the markets of the former Soviet Union to Western markets, taking the first position on the EU market for outward processing trade. However, this type of trade has minimal value added and has a high level of dependency. Nevertheless, given the increased

[141] Thus, buyers deliver all materials and designs to factories in Romania, who provide the workplace and the workforce

competitiveness of the European textile market and the high competition from Asia, there is a trend that some companies are beginning to move away from outward processing trade to developing collections of apparel for both domestic and foreign markets.

Pharmaceuticals. All major multinational pharmaceutical corporations are present in Romania, and several are manufacturing products locally. However, most multinational companies operate as importers with representative offices in Romania, imported drugs now covering 60% of the market. This has been supported by the decrease in VAT rate for imports from 18% to 11% and the removal of all import duties for raw pharmaceutical materials and packaging, together with the enforcement of intellectual property rights issues related to pharmaceuticals. On the other hand, domestic production has a lot of potential, in spite of the thorough need for modernisation. The largest 10 companies are responsible for over 85% of domestic production. Among these are Europharm (bought by SmithKline Beecham), Antibiotics, Terapia, Lek (acquired by Sandoz), Sicomed (owned by Gideon Richter). Domestic producers have also benefited by the tax cut from 38% to 20%, the elimination of export duties and reduced VAT on certain expenses such as electricity and imported machinery. However, they lack capital for modernisation and research programs, limiting themselves to producing existing drugs with existing, old technology. Nevertheless, Romania's healthcare problems and requirements require better medicine, and there is still scope for further development of the pharmaceutical sector (OBG (2003)).

Other promising sectors, dominated by foreign investors, or seen as very attractive for the future investments are briefly presented below (OBG (2003), Capital (2003), Business Digest (2002)):

- **Construction materials.** This sector has proved to be extremely attractive to private capital, including foreign investors, as the share of private companies rose from 5% in 1991 to 80% in 2002. The cement industry is entirely private. The French group Lafarge acquired Romcim, the largest cement producer, in 1997. The Swiss group Holderbank Financiere Glaris Ltd operates Cimentul S.A. and intends to become the majority shareholder of Cimus S.A., as well. Heidelberger Zement also operated in the cement industry in Romania, while Pilkington Plc., the British giant, is preparing an important investment in a green-field factory for float glass. The growth of the internal market was estimated at 10% yearly in 2002 and 2003, and over 6% growth is expected for 2004.
- **Automotive industry.** The development of the automotive industry was triggered by the sale of a majority share of Dacia (the biggest carmaker in Romania) to Renault, in 1999. This has brought about investment in the manufacturing of car parts, with Le Belier, Sylea, Johnson Controls having announced their intention to enter the market. Other important incumbents on this market are Solvay, Autoliv, Phoenix AG, Krupp, Continental, Michellin, and others. Moreover, new entrants are expected to contribute to the increase in FDI and the development of the automotive industry, as major companies producing automotive parts have stated their intentions to open production facilities in the area.
- **Oil and gas.** The interest of foreign investors in this field has been attracted by the large natural reserves that Romania holds. Large companies such as Shell, Enterprise Oil, Paladin Resources, Elf Aquitaine are already present on the market. Moreover, further growth of this sector is expected to be supported by highly skilled labour force (due to the enduring tradition in manufacturing of oil-drilling equipment), the proximity to the Caspian oil and gas route, together with the traditional relations with the main international players on this market.

- **Petrochemicals.** Petrom, the national oil company, is the most important domestic player on this market, as it incorporates an oil producer, three refineries and a distribution network. Its main competitors are the foreign companies Shell, Moll, OMV, Agip, and Lukoil (who is also the majority shareholder of the third largest refinery in Romania, Petrotel). Nevertheless, given that the processing capacities in Romania exceed the volume of locally extracted oil, and given the highly qualified workforce, foreign investment is expected to increase in this sector, as large foreign companies are considering expanding into the region (e.g. BASF, Akzo Nobel, Huntsman, and others).
- **Energy.** The monopolistic utility supplier (Renel) was not reformed until 1998, when five new companies were created: one carrier (Transelectrica), one distributor (Electrica) and three power generating (Termoelectrica, Hidroelectrica and Nuclearelectronica). Further restructuring of this sector is expected, including opening the market to competition, removal of subsidies and attraction of foreign investment. The liberalisation of the power distributor (whose terms are included in PSAL II) is undergoing, with two of the eight subsidiaries of Electrica SA (formed as legal entities following the reorganisation of Electrica in March 2002) being in course of privatisation.

C.3.2. Services[142]

Trade and distribution. The mechanism of industrial goods distribution in Romania tends to be similar with the one in Western countries. The modernising of Fast Moving Consumer Goods distribution system was nevertheless drawn back by competition from small retailers, meeting relatively few emerging channels. Although continuously decreasing, the margins are still high given the long chains of intermediaries.

The main outlets type of retail system are: 1) specialised shops, with regional or even national coverage, developed mainly by electronics and households appliances companies but also furniture, construction materials, clothing, cosmetics, automotive components; most of the important computers and components suppliers (Flamingo, IBM, UltraPro) adopt this system, although less specialised products are distributed through supermarkets or in department stores; 2) supermarkets and cash-and-carry, although a very recent presence, have developed in a very high pace, being run by international brands as Billa, Gima, Metro, Selgros; 3) department stores, very popular and present in all cities of Romania, proved nevertheless rather unprofitable due mainly to bad management inherited from the former state ownership; 4) all-in-one outlets, very successful at the beginning of transition, now being increasingly replaced by specialised shops; 5) gas-station outlets, kiosks, street vendors, outlets in retail centres, all similar with their western counterparts. However, most distributors except the big retailers, lack appropriate storage capacities and transport means, but also marketing and management skills.

The banking sector is currently seen as one of the fastest growing sectors, after delayed restructuring, several years of scandals and consequent collapse of financial institutions. The legal framework is liberalised, but the Central Bank requirements and regulations are seen as tough, and an important share of this sector's assets still belong to the state. The main actors are Romanian Commercial Bank, integrally state owned and in process of privatisation, Romanian

[142] This section is based on data and analyses in (OBG (2003), Capital (2003), Business Digest (2002))

Development Bank, a jointly owned by the French Group Societe Generale and Romanian state and Savings Bank 'Casa de Economii si Consemnatiuni" entirely state owned. As at the end of 2002, they cover 54% of the total assets in the banking sector. Nevertheless, although late[143], the banking sector attracted important foreign investment. One of the most important development recorded in 2002, is the rapid credit growth towards the private sector, by 51.9%, as compared with only 12.9% for the credit towards the state sector. 18% of the credit was designed for capital purchase. Another critical trend, particularly from the point of view of IST developments, trend that continued from 2000 and 2001, is the growth in the retail banking, with a growth index of 122%. This segment is expected to increase further.

C.4. Changes in the structure of services

The value added in services has increased after the first years of transitional shocks, mainly based on services rendered mainly to economic agents, followed by certain services rendered mainly to population. After a decade of fluctuating contributions of the financial sector to total value added (see also Chapter A.2), the high investment and restructuring started to bear fruits during 2002. Increasing contribution to value added formation comes from governmentally provided services, following the reforms that took place especially in administration and education (see Table C7.).

Table C7.: Structure of value added in services, % in total value added (nominal prices)

	1993	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Trade, Hotels and Restaurants	11.1%	8.9%	11.4%	12.5%	12.4%	15.3%	15.5%	14.3%	13.7%
Transport and storage	9.5%	8.1%	6.9%	7.5%	7.4%	6.8%	7.1%	7.0%	6.6%
Post and telecommunications	1.4%	1.4%	1.5%	2.1%	2.3%	2.9%	4.2%	4.3%	4.1%
Financial, banking and insurance activities	5.5%	5.2%	5.4%	3.2%	1.8%	1.7%	2.0%	1.7%	1.7%
Real estate and other services	4.5%	4.7%	5.2%	5.8%	11.1%	13.1%	14.5%	14.7%	13.2%
General government	3.3%	3.5%	4.0%	3.3%	2.9%	3.7%	3.8%	4.9%	4.8%
Education	2.6%	2.7%	2.8%	2.7%	2.2%	2.5%	3.4%	3.3%	3.2%
Health and social assistance	1.9%	2.1%	2.0%	2.1%	1.6%	1.8%	2.2%	2.2%	2.1%
Total services	**35.3%**	**33%**	**34.4%**	**37.0%**	**41.2%**	**48.4%**	**51.0%**	**51.1%**	**48.1%**
Construction	**5.6%**	**7.1%**	**7.1%**	**6.9%**	**5.7%**	**5.9%**	**5.7%**	**5.5%**	**5.5%**

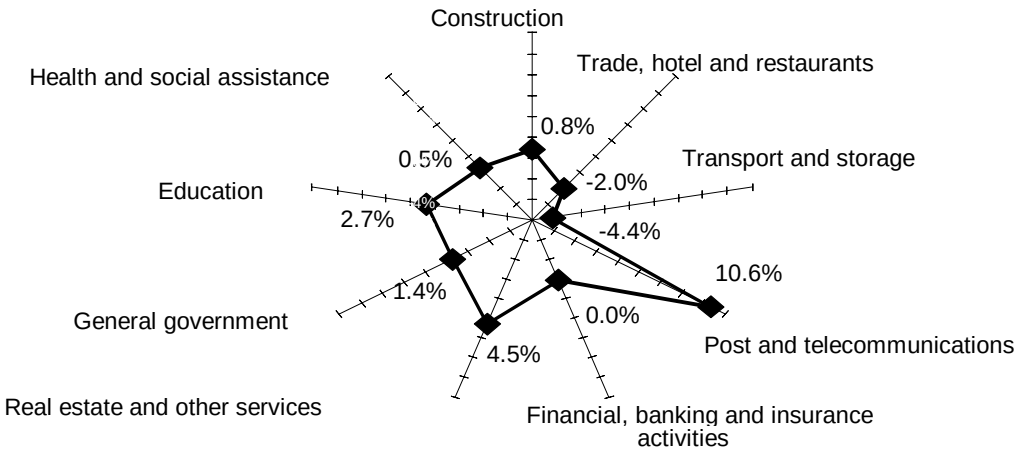
Source: Authors' calculations based on national accounts data in NIS (2003a)

Again, the alignment of relative prices plays a role. While Table C5. reflects to the evolutions in nominal terms, in terms of rate of growth (see graph C.2.), the drivers[144] were post and telecommunications, financial banking and insurance, real estate, governmental provided services and construction. On the contrary, the growth in trade, transport and storage has been permanently below the mean growth of value added. This is to be explained by higher competition in these sectors and implicit diminishing margins. Constructions continued to grow, although their evolutions were affected by the economic downturn and diminishing demands from the population after 2000. Financial sector registered a strong drop in the early '90ties together with the general collapse of the economy, followed by a sustained rate of growth (up to

[143] The first foreign bank to enter the Romanian market was the ING Baring (Dutch bank), no earlier than 1994.
[144] The economic branches with a rate growth higher than the one of total value added and/or GDP

7% in 1995), and a dramatic decline (by 21%) in 1997. The decline was due mainly to the sharp currency depreciation. During 1998 the turbulent international financial markets and the further drop in GDP affected the financial sector's chances to grow. Consequently, many bankruptcies and collapses of various banks were recorded in 1999 and 2000, and it is only in 2001 when the sector returned to its pattern of growth. Generally, it is worthwhile observing that besides the services provided by the government (especially education), the growth in terms of value added in services was recorded in sectors that were significantly under-dimensioned at the beginning of transition

Graph C3.: Average yearly rate of growth of value added in major services sectors (1990-2001)



Source: Authors' calculations based on National Accounts data in NIS (2003a) and National Commission for Prognosis

C.5. Changes in investment

Since 1992 the total level of investment increased constantly (see Table C8.) in almost of the economic sectors, except education and health, where the registered values are extremely worrying. Among the productive sectors, the agriculture had the lowest growth rate in 1992-2001, while the telecommunications had the most spectacular one.

Table C8. The evolution of investments, EUR million

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Agriculture	239	222	777	540	628	357	409	364	495	499	1014
Industry	1257	1595	1501	2055	2378	2444	2760	2281	2475	3140	3348
Construction	57	88	219	258	339	454	423	354	535	507	568
Trade, hotels and restaurants	147	308	345	435	536	478	723	472	750	947	967
Transport and storage	142	358	381	270	333	288	348	327	534	795	106
Post and telecommunications	51	152	153	140	197	373	459	577	622	1100	1188
Financial, banking and insurance companies	47	91	158	179	215	256	301	238	280	213	339
Public administration	20	64	148	220	209	334	229	271	268	238	282
Education	9	19	34	41	76	88	77	36	4	28	74
Health and social assistance	21	23	22	40	43	44	58	28	9	12	81
Other activities of the national economy	231	270	331	763	467	339	271	204	291	366	729
Total	**2221**	**3190**	**4069**	**4942**	**5422**	**5455**	**6058**	**5152**	**6263**	**7846**	**8694**

Source: calculated based on NIS (2003a) data. Industry includes electrical and thermal energy, gas and water.

C.6. Relevant cross country agreements

Romania has been a member of the WTO since 1995. As a developing country, it has benefited of a protectionist transitional arrangement up to 2000. WTO council for the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS) has reviewed and agreed the standards for intellectual property protection and their enforcement.

Romania has been a member of Information Technology Agreement (ITA) since 1996, but it has negotiated extended staging from the agreement until 2003, so as to try prolong the protective

period for its IT sector, and postpone the opening to international competition. Nevertheless, up to now Romania has eliminated all tariffs on IT products: personal computers, servers, printers, keyboards, network equipment, telecommunications equipment (including switching and transmission), semiconductor devices (ICs, processors, memory), PCBs and component-mounted boards, electronic components, capacitors, resistors and other similar products.

Romania is a signatory party for the WTO's Basic Telecommunications Services.

C.7. Major sectors of innovation activity[145]

As will be shown in the Chapter D.3., the innovation activities are extremely low in almost all sectors, situation reflected in indicators such the as budget allocated, the number of patents or of the companies introducing new products. It is enough to analyse the declining financial resources allocated by the companies from various fields for R&D (see Table C9.), to understand that the Romanian economic sectors are not innovation oriented.
However, this is probably not the case for the software industry. Although no data is available, regarding to the total innovation effort in this industry, this is shown by the important new products launched (see Chapter C.11.).

[145] This section uses data for Romania from dedicated national statistical publications (NIS (1999) and NIS (2001d) and draws from Jinaru *et al.* (2002).

Table C.9. Current expenditure from research-development activity in enterprises sector, by component elements and activity (million EUR)

	1995	1996	1997	1998	1999	2000	2001	2002
Agriculture, forestry and fishing	20.8	19.7	18.7	17.1	10.7	11.3	13.3	13.3
Mining and quarrying	8.3	7.6	7.4	7.3	6.7	5.3	8.3	10.2
Manufacturing	92.4	78.2	83.6	89.7	64.8	65.7	64.8	69.0
Food, beverages and tobacco	1.2	1.0	1.1	1.3	0.1	0.0	0.1	0.6
Textiles, textile product, leather goods and footware	2.5	2.6	3.1	3.9	2.0	1.4	0.7	0.7
Wood processing (excluding furniture)	0.1	0.0	0.2	0.3	0.1	0.1	0.2	0.1
Pulp, paper and cardboard	1.0	0.8	1.0	0.9	0.6	0.6	0.5	0.5
Crude oil processing, coal coking and nuclear fuel treatment	1.5	0.5	1.2	1.2	0.2	0.4	1.5	7.5
Chemistry and synthetic and man made fibres	16.4	11.3	11.6	8.5	6.7	5.1	5.1	6.3
Rubber and plastics processing	0.6	0.8	0.9	0.7	1.1	0.7	0.6	1.5
Other non-metallic mineral products	2.7	3.5	3.4	2.7	2.9	2.0	1.0	1.3
Metallurgy	8.1	6.6	6.7	8.5	6.3	10.8	10.6	6.1
Metallic construction, machinery and equipment	56.9	50.1	53.0	60.6	44.0	44.0	44.2	43.5
Furniture and other non-classified activities	1.4	1.1	1.4	1.1	0.8	0.5	0.4	0.8
Electric and thermal energy, gas and water	18.7	17.3	20.4	13.3	9.4	7.7	9.6	2.7
Construction	4.1	3.1	2.5	1.7	1.5	1.3	1.2	1.2
Other activities	15.8	8.7	5.1	5.7	3.7	2.7	3.7	5.1
Total	**252.5**	**212.8**	**221.2**	**224.5**	**161.63**	**159.65**	**165.6**	**170.5**

Source: Authors' calculations based on data from the Romanian Statistical Yearbook, 2003

Moreover, the data on R&D expenditures is a weak proxy for the innovation itself, especially in the case of Romania, where the efficiency of the R&D spending is a disputable issue. In 2002, only 10% of the total expenditures for R&D expenses have been allocated for equipment and apparatus (NIS (2004a)) recording a growth from 1995 (4.9%). However this growth is entirely attributable to the government and university sector, with enterprises slightly diminishing the share on equipment and apparatus expenditures in total R&D expenditures from 5.2% in 1995 to 3.2% in 2001 and 4.9% in 2002. The still low level of investment in R&D endangers the capacity of enterprise sector for building further research facilities. Nevertheless, from the information

available for Romania, the main data lacking is the effect of innovation on the profitability of firms. Needless to say, without this information the conclusions that we would draw are only speculative.

C.8. Specific sectors' market size and value (ICT industry)

Domestic ICT market in Romania is very dynamic, recording significant growth rates. According to EITO (2003) estimates (see Table C10.), the average annual growth rate recorded between 2000 and 2002 was of 23%, and a 9.8% average annual growth rate is estimated for 2003. These rates are significantly larger than the average annual growth rate of aggregate domestic demand over the same period, but the relative growth rate[146] is estimated as diminishing from over 4 in 2000-2002 to less than 2.5 in 2002-2003.

The growth rate was double than the ACC10[147] average (47% for Romania compared with 23% for ACC10 in 2002/2000) and this trend is expected to maintain in 2004/2002 (an estimated growth rate for Romania of 27% compared with 18% for ACC10). This situation is explainable considering the existing gap in ICT endowment (see Chapter E.3.).
However, on all the ICT markets Romania has significant lower share in total ACC10 than the share of its population (which is 21%). The CATV service, with its share of 19% shows the minimum lag behind. On the other hand, as the growth rates have been higher than in ACC10, convergence trends can be noticed in 2000-2002.

[146] Defined as the average annual growth rate of the ICT market / annual growth rate of total domestic demand
[147] Accession countries group, includes Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland Romania, Slovakia and Slovenia.

Table C10: ICT Romanian market (million EUR)

	Romanian market (million EUR)					Share of AC10 market	
	2000	2001	2002	2003	2004	2000	2002
Server station	39	58	64	73	66	4%	6%
Workstation	1	1	1	0	0	4%	6%
PCs	112	144	144	155	154	5%	6%
PCs/workstation add-ons	35	47	50	53	55	5%	7%
Computer hardware	**178**	**250**	**259**	**281**	**275**	**5%**	**6%**
Copiers	19	25	27	30	33	9%	12%
Other office equipment	37	38	42	46	49	17%	17%
Office equipment	**56**	**63**	**69**	**76**	**82**	**13%**	**15%**
Mobile telephone sets	139	155	132	129	129	11%	12%
Other end user communication equipment	95	105	120	124	124	11%	15%
End user communication equipment	**234**	**260**	**252**	**253**	**253**	**11%**	**13%**
LAN hardware	15	17	19	21	24	3%	3%
PBX, key systems and circuit switching equipment	203	224	255	245	233	10%	14%
Cellular mobile radio infrastructure	260	344	377	389	373	10%	11%
Packet switching & routing equipment	38	50	66	74	83	8%	10%
Other datacom and network equipment	96	121	158	175	188	10%	14%
Datacom and network equipment	**612**	**756**	**875**	**904**	**901**	**9%**	**12%**
System software	17	20	23	26	30	2%	2%
Application software	26	33	38	45	48	3%	4%
Software products	**43**	**53**	**61**	**71**	**78**	**3%**	**3%**
IT services	**73**	**109**	**128**	**153**	**165**	**3%**	**4%**
Telephone services	642	739	772	831	896	8%	9%
Mobile telephone services	578	946	1203	1493	1916	9%	12%
Switched data and leased line services	32	41	52	67	84	4%	6%
CATV services	192	220	245	275	305	19%	19%
Carrier services	**1444**	**1946**	**2272**	**2666**	**3201**	**9%**	**11%**
TOTAL	**2647**	**3438**	**3916**	**4403**	**4954**	**8%**	**10%**
Total IT	**459**	**603**	**680**	**764**	**801**	**5%**	**6%**
Total telecommunications	**2188**	**2836**	**3236**	**3639**	**4153**	**9%**	**11%**

Source: EITO (2003). The share in total AC10 was calculated using EURSTAT population data.

Although the growth is still vigorous, we believe that there is a risk of market saturation, especially regarding the growth of the *hardware market* (excl. the gain in ICT endowment financed from public resources), because it is only the viable segment of the private economy that can provide a proper respond to the IS challenges. This concentration of the demand for ICT can

be revealed by the extremely large share of population working in agriculture (with extremely low demand for ICT) and also by the large discrepancy between the low general level ICT penetration rates in the corporate sector (see the Chapter E.1.) and the fact that most of the medium and large companies from the large cities have at least one computer and 73% have a computer network (Mercury Research (2002)).

Moreover, the structure of the market show that Romania did not enter the maturity stage of the IS development. Thus, both software and IT services have shares less than half of the registered ones in ACC (see table C.11.). Correspondingly, the share of carrier services (including mostly telephone services, but also switched data and CATV) are considerably larger, situation that support the idea that in what regards ICT, Romania is in the first stage that of ensuring basic communication networking. The upgrade on this scale is requires more then the development of infrastructure, or even of IT services. Technology adoption is still not sufficient, is has to be associated with managerial restructuring and flexible business organisation. This implies the need for permanent training for the employees, new managerial models and adjusted human resources.

Table C.11. ICT market structure in 2003

	UE	ACC10	Romania
Computer hardware	13%	11%	6%
Office equipment	2%	1%	2%
End user communications equipment	4%	4%	6%
Datacom and network equipment	7%	18%	21%
Software products	11%	5%	2%
IT services	21%	8%	3%
Carrier services	43%	53%	61%

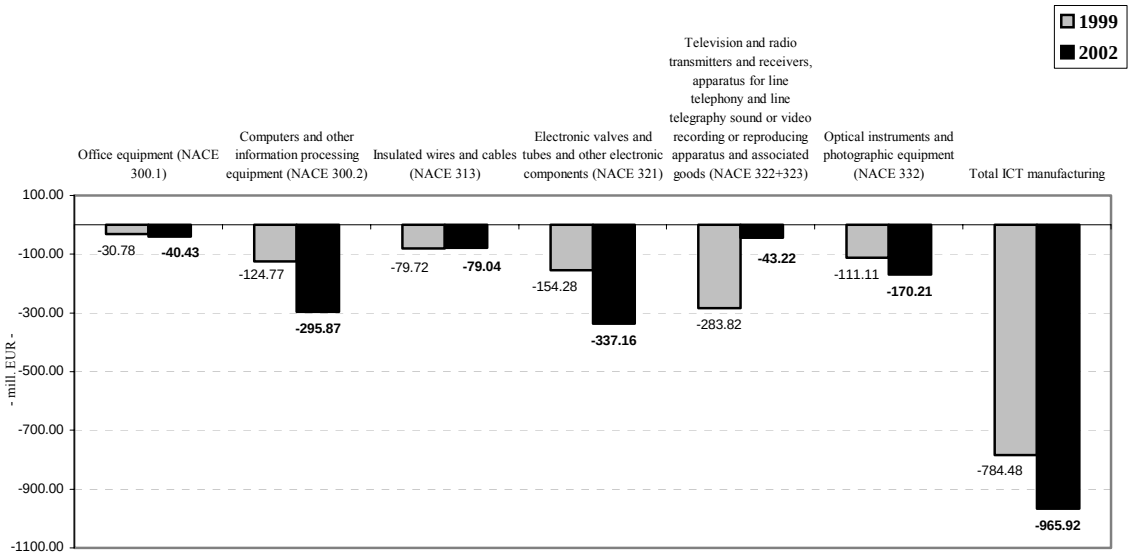
Source: Author's calculations based on EITO (2003)

C.9. Trade balance of ICT industry

C.9.1. The evolution of sectoral trade balance

With the demand generally increasing at a higher pace than the local supply, the trade balance of ICT industry is widening. In this respect, most of the increase in the sectors trade balance comes from products in NACE 300.2. and NACE 321. Graph C4. shows the most recent trends (1999-2002).

Graph C4.: : Trade balance of ICT manufacturing industries



Source: Data provided by NIS

Computers and other information processing equipment (NACE 300.2) and electronic valves and tubes and other electronic components (NACE 321) are the main responsible for the growing trade deficit. The diminishing in the NACE 322+323 trade balance is the effect of the developments in 2002, when the import dropped by more than 34% against the previous year. The market share of Romanian producers in NACE 322+323 stood at 20%, while the market size dropped by around 6%. On the other hand the exports from the same groups increased by 12% mainly following the boost in the export of parts and components for radio and TV receivers and transmitters from the equivalent of EUR 20.7 million in 2001 to the equivalent of EUR 165.6 million in 2002. This last group of products is the second biggest contributor to the increase of the share of highly processed goods in total exports (by 1.2 percentage points) observed during 2002.

C.9.2. Import and export flows

The fluctuations in the trade balances in ICT related sectors are mostly connected with the volatility of export flows, while imports recorded, generally, a steady increase. This would suggest an ongoing development of the internal demand, indicating that export penetration is a secondary strategy for the local industry, based on international cost opportunities. At a growing market, the decline in imports of more processed goods with an increase in imports of parts and

components (NACE 321) reflect a competitiveness gain of local producers on the internal ICT market (see Table C11 and C12).

Table C11.: ICT Imports (million EUR)

	1999	2000	2001	2002
Office equipment (NACE 300.1)	31.75	50.54	44.05	41.86
Computers and other information processing equipment (NACE 300.2)	222.03	282.44	341.76	312.62
Insulated wires and cables (NACE 313)	92.79	114.34	186.58	174.21
Electronic valves and tubes and other electronic components (NACE 321)	159.90	530.41	305.84	375.70
Television and radio transmitters and receivers, apparatus for line telephony and line telegraphy sound or video recording or reproducing apparatus and associated goods (NACE 322+323)	319.02	595.10	625.74	476.64
Optical instruments and photographic equipment (NACE 332)	127.30	177.85	208.87	198.71

Source: Data provided by NIS

The recent (2002 onwards) orientation of domestic producers for final stages of the hardware production towards the internal market results also from the decline of foreign trade with an increasing market. This is particularly true for computers and office equipment, but also for optical instruments and photographic equipment[148]

Table C12.: ICT Exports (million EUR)

	1999	2000	2001	2002
Office equipment (NACE 300.1)	0.97	1.51	3.57	1.43
Computers and other information processing equipment (NACE 300.2)	97.25	141.06	85.39	16.75
Insulated wires and cables (NACE 313)	13.07	26.18	61.91	95.17
Electronic valves and tubes and other electronic components (NACE 321)	5.62	62.18	60.58	38.54
Television and radio transmitters and receivers, apparatus for line telephony and line telegraphy sound or video recording or reproducing apparatus and associated goods (NACE 322+323)	35.20	366.13	385.56	433.42
Optical instruments and photographic equipment (NACE 332)	16.18	19.66	28.40	28.50

Source: Economic agents database, 2002, NIS

C.9.3. The trade partners in ICT

Data for 2002 shows that in what concerns both the imports and the exports, the geographical distribution is focused on two main areas: China and East-Asia and EU.

[148] Mereuta *et al.*(2003) estimate the increase in the market size for NACE 332 of 10% in 2002

Table C13. and C.14. show the first five countries trading in ICT with Romania.

Table C13.: Geographical orientation of Romanian imports (share of top sources of imports in total imports of the respective NACE group)

NACE group	1	2	3	4	5	Total
3001	CHINA	UK	GERMANY	BULGARIA	JAPAN	**TOP5**
	16.37%	*16.20%*	*15.80%*	*12.35%*	*11.87%*	***72.61%***
3002	CHINA	UK	GERMANY	TAIWAN	USA	**TOP5**
	15.32%	*11.29%*	*10.60%*	*9.97%*	*6.69%*	***53.87%***
313	AUSTRIA	GERMANY	ITALY	CZECH REPUBLIC	GREECE	**TOP5**
	26.79%	*17.70%*	*9.64%*	*5.32%*	*4.79%*	***64.24%***
321	TAIWAN	JAPAN	KOREA	USA	ITALY	**TOP5**
	26.00%	*11.44%*	*8.92%*	*8.11%*	*4.90%*	***59.39%***
322	FRANCE	GERMANY	ITALY	USA	HUNGARY	**TOP5**
	15.39%	*12.35%*	*10.60%*	*10.59%*	*7.10%*	***56.03%***
323	TURKEY	POLAND	CHINA	HUNGARY	JAPAN	**TOP5**
	13.25%	*12.63%*	*9.87%*	*8.25%*	*7.48%*	***51.47%***
332	GERMANY	USA	ITALY	FRANCE	UK	**TOP5**
	23.07%	*21.10%*	*14.03%*	*8.23%*	*5.78%*	***72.21%***

Source: Romanian trade database, 2002, NIS

Table C14.: Geographical orientation of Romanian exports (share of top sources of imports in total exports of the respective NACE group)

NACE group	1	2	3	4	5	Total
3001	NETHERLANDS	GREECE	USA	REP. OF MOLDOVA		**TOP4**
	28.80%	*26.88%*	*13.44%*	*9.29%*		***78.40%***
3002	UK	ITALY	GERMANY	ISRAEL	FRANCE	**TOP5**
	39.31%	*17.74%*	*7.43%*	*5.12%*	*4.13%*	***73.72%***
313	UK	GERMANY	ITALY	AUSTRIA	GREECE	**TOP5**
	30.64%	*25.17%*	*16.74%*	*8.61%*	*7.21%*	***88.36%***
321	FRANCE	ITALY	HUNGARY	AUSTRIA	SWITZERLAND	**TOP5**
	33.88%	*23.64%*	*22.15%*	*3.58%*	2.8%	***86.07%***
322	FRANCE	GREECE	CHINA	NETHERLANDS	GERMANY	**TOP5**
	36.73%	*23.21%*	*10.56%*	*9.07%*	*7.72%*	***87.29%***
323	CHINA	UK	FRANCE	NETHERLANDS	ITALY	**TOP5**
	60.17%	*18.93%*	*9.15%*	*5.16%*	*2.16%*	***95.57%***
332	ITALY	GERMANY	SWITZERLAND	FRANCE	NETHERLANDS	**TOP5**
	32.50%	*30.13%*	*5.63%*	*4.48%*	*4.43%*	***77.18%***

Source: Romanian trade database, 2002, NIS

By products, out of the of NACE 300.1 import significant shares had the cashing machines and ATMs, each granting more than 20% of the group.

The export of NACE 300.2 is dominated by computer components (more than 60%). For NACE 313 "electric conductors fitted with connectors" amounted over 65% of the exports, the microprocessors representing less than 2%.

Highly concentrated is the export of NACE 322 where "electrical apparatus for line telephony or line telegraph" grants more than 80%, while the mobile phones have only 2%.

C.10. Major actors of ICT industry

As in 1998-2001 *the hardware production* had a slower growth rate than the market, the market share of the Romanian companies significantly decreased. (see Table C15.)[149].

Table C15.: Market share[150] of Romanian companies

		1998	1999	2000	2001
300	Computers and office means	29%	19%	16%	18%
313	Manufacture of insulated wire and cable	50%	36%	45%	37%
321	Manufacture of electronic valves and tubes and other electronic components	18%	12%	8%	13%
322	Manufacture of television and radio transmitters and receivers, apparatus for line telephony and line telegraphy	35%	37%	25%	22%
323	Manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods	34%	22%	7%	12%
332	Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment	14%	25%	31%	31%

Source: Mereuta *et al.* (2003)

In 2002, both the Computers and office equipment (NACE 30) and Computers and related activities (NACE 72) the concentration process continued. The number of companies with a turnover exceeding 1 million USD reached 103 (from 78 in 2001), 13 of them with more than 10 million USD. The largest 100 companies, which represent only 1.6% out of their total number, were responsible for 65% of the sales. In the same time, more than half of the 6480 companies do not have at least one permanent employee, their monthly sales maintaining under 1000 USD, and their contribution to the total turnover being only 6%.

Between these two extremes, there are of almost 600 companies with turnover between 0.1 and 1 million USD, most of them in NACE 72, amounting approximately 25% of the total sales of these two industries (Vuici (2003b)).

[149] However, it should be mentioned that the result is slightly distorted by the fact that statistical registration of companies follows their own declaration of main activity, usually based on the activity that produce most of the company turnover. As such, many producers as Intrarom and Flamingo had not been included in NACE 300 until 2002.

[150] (production-export)/domestic market

Table C16. lists the market leaders on various manufacturing branches. The companies with largest market shares in 2002 in NACE 72 are IBM, Romsys and Forte. Very dynamic (growth rates higher than 70% regarding the turnover in 2002) are recorded by Romsys, Siemens Automotive and Ultra Pro, and regarding the added value (over 60% growth rates) Siemens Automotive, Softwin, RDS, Ubi Soft and ITCNetworks. The highest profits (over 5 million USD) have been made by Asesoft and IBM (Vuici (2003b)).

Table C16.: The market leaders in 2002

NACE section	Company	Location	Market share in NACE 2 digits classification
300[151]	INTRAROM SA	Bucharest	22.6%
	FLAMINGO COMPUTERS SA	Bucharest	13.9%
	K-TECH ELECTRONICS	Bucharest	8.6%
313	PIRELLI ROMANIA CABLURI SI SISTEME SA	Slatina	4.4%
	ICME ECAB SA	Bucharest	3.9%
321	SOLECTRON ROMANIA SRL	Timisoara	25.4%
	I.P.E.E. SA	Curtea de Arges	1.8%
322	ALCATEL NETWORK SYSTEM SA	Timisoara	39.4%
	ELECTROMAGNETICA SA	Bucharest	6.2%
	TOPEX PUBLIC SWITCHING SA	Bucharest	2.6%
323	RELCO SA	Bucharest	6.8%
332	CONTOR ZENNER ROMANIA sa	Arad	11.7%
	AEROTEH- G.P. SA	Bucharest	7.7%
	GENERAL FLUID SA	Bucharest	4.2%
333	FEPA SA	Barlad	5.4%
	ELASCO ELECTRONIC SRL	Botosani	5%
	G.B.T. –IMPEX SRL	Bucharest	2.8%

Source: Mereuta *et al.* (2003)

Founded in 1993 as a subsidiary of Intracom Group of Companies from Greece, **Intrarom** is a manufacturer of telecommunication and information systems. With 700 employees it provides products and integrated services for the design, turn-key projects implementation and support in the following areas: Public Telecommunication Networks, Network Management Systems and IT Management Systems. In the Romanian market, Intracom is the main supplier of telecommunications hardware and software to Romtelecom and Cosmorom.[152]

Flamingo Computers is a success story, as it generated a consistent market by developing an attractive brand of computers and delivering complete solutions to its clients. It started as a domestic player but after gaining experience in working with vendors, organising logistics and managing an efficient distribution channel for this particular region of Europe, the company started expanding the business outside Romania. It operates from the Giurgiu Free Trade Zone where it assembles its various brands of PCs. The product mix of Flamingo computers comprises

[151] The top for NACE 30 is significantly different for 2002 than for 2001 because it is only in 2002 when large companies as Flamingo and Intrarom have been included in this NACE group.

[152] http://www.intrarom.com/AboutIntrarom/intrarom.htm

key computer components (16%), peripherals and printers (14%), storage devices (15%), video and multimedia (13%), monitors (12%), software and services (14%), PCs and notebooks (10%), networks and accessories (6%). In terms of its growth, from a revenue of 3 million USD in 1995, it reached 30 million USD in 2000, maintaining a CAGR of 50%.

Romsys was founded in 1993 as a 100% private Romanian company, and provides advanced information technology solutions in Romania, used primarily in banking, health care and government sectors.[153]

FORTE Company is an IT-services supplier for the national level informatic systems (e.g. Ministry of Public Finance, Customs, National Employment Agency).[154]

Electromagnetica is one of the few electronic companies succeeding after privatisation. In 1999 it was divided into smaller joint ventures companies - EMCOM SA in co-operation agreement with Siemens for the manufacture of EWSD digital telephone exchanges and PCM transmission equipment; EMGS SRI in co-operation with Goldstar for manufacturing digital telephone exchanges; and ATOEM SRI in co-operation with ATOFORM of Germany for the manufacture of orthopaedic and medical equipment. The company is a ISO 9001 company. Its quality system is certified by Underwriters Laboratories Inc. (UL), AEQOQ SA and OMACS. It deploys state-of-the-art SMD and SMT-based pick and place lines for the assembly of PC Boards. Its turnover has increased steadily from 11 million USD to 20 million USD in 2000.

Solectron is by far the largest single investment in IT that has been made in Romania. It employs about 5000 professionals and is expanding facilities to accommodate up to 10000 workers for the production of sub-systems for network equipment, mobile phones, servers, PCs and computer peripherals. The non-availability of electronic components is one weakness of the industry, which has led to the erosion of the industrial base.[155]

Softwin Consulting Inc. has emerged as a leading software service and product company operating in Sweden, the United Kingdom, the USA, France, Finland, Germany and many other countries. Their success has been in developing cutting-edge technology products, managing technology and co-operation with leading players overseas. Softwin, with over 500 software applications and over 1000 data conversion projects, is the only company from the Southeast of Europe and from the candidate countries that has won the European IST Prize. This Romanian company has been declared[156] as the most innovative IT Company from the south-east of Europe in 2003.

GeCad is another company which managed to develop innovative products and demonstrated their performance at the global scale, a Romanian medium software and services enterprise, created and developed the RAV Antivirus technology, bought in 2003 by Microsoft in view of being integrated in its future versions of Windows.

[153] http://ro-gateway.ro/node/185754/hardsoft
[154] http://www.forte.ro
[155] http://ro-gateway.ro/node/185754/hardsoft
[156] According to IST Price official rules (http://www.cordis.lu)

C.11. Past and future of ICT industry

Before 1989, the main institution in the field was the Institute of Calculus Techniques and Informatics (ICTI), which employed around 3 000 IT specialists. The IT sector was nevertheless huge, employing around 75 000 persons (UNCTAD/WTO (2002)). This institution was divided into two branches: 1. The Calculus Techniques Institute (CTI), founded in 1968, which focused on hardware components, boards, and microprocessor operating systems and 2. The Central Institute for Informatics (CII), founded in 1970, which focused on software production. The two institutions were fairly well represented at regional level, and they had a role in both implementing computing solutions and consultancy, and in training specialised staff. The most important achievement in the pre-transition Romania was, however, the creation of the networks of Electronic Calculus Regional Offices (ECROs), meant to assist small local factories and organizations. Together with the computing departments in the big companies, the ECROs represented the location of IT expertise during communism. The applications were almost exclusively custom-build[157].

Romania has a strong tradition in the IT field, but mostly as a follower of Western developments than as an innovator or leader. In 1957, Romania was the 8th country worldwide to make a computer at the Atomic Physics Institute. The design of the first national network started in 1972 (only few years after the ARPA – US Advanced Research Projects Agency -initiative) and in 1979 Romania had a 19 nodes functional national network. The first local area network (LAN) was designed and produced in 1982. These projects were stopped by the communist regime in 1985 (Drăgănescu (2001)).

Although Romanian IT was importing and copying Western technology, its products were lagging behind from technological point of view, by estimated 10 years (Drăgănescu (2001)).

The shock of liberalisation on the local industry was felt differently by the software and hardware industries. As the key factor of the IT tradition was the skilled staff, and the software activities needed considerably lower investments, it is only this industry that managed to build a level of competitiveness which opens for a considerably future development.

According to Vuici (2003b), for the NACE section 30 ("Computers and office means"), that stagnated in the last decade, 2002 marked a trend shift, by approx. 160% for both turnover (264 million USD) and production (110 million USD) (see Table C.17.). One should take into account that mostly this increase is due to the migration of large companies from other NACE groups.

Looking at the drop in investments made in this industry it is hard to anticipate that production will increase further.

This sector is still less developed than the NACE section 72 (“Computer and related activities”), which maintained the high growth rate from the last years.

[157] Information Technology Landscape in Nations Around the World, Country Profile, Romania, 1999, http://www.american.edu/carmel

Table C17.: The evolution of turnover, production and added value of the companies of NACE 30 and 72 (mill USD)

	Turnover			Production			Added value
	2001	2002	CAGR	2001	2002	CAGR	2002
Computers and office means (NACE 30)	103	264	156%	42	110	162%	40
Software and related activities (NACE 72)	349	536	54%	233	317	36%	192

Source: Vuici (2003b)

The total number of companies registered in these sectors reached 6 480, 1 300 growth from the previous year, and the employed persons also increased by 3 700, reaching 22000 people.[158]

In 2002, only 53% of the turnover is represented by production, the rest coming from sales. As in the previous year, in 2002 the sales grew much faster (113%) than the production (55%).

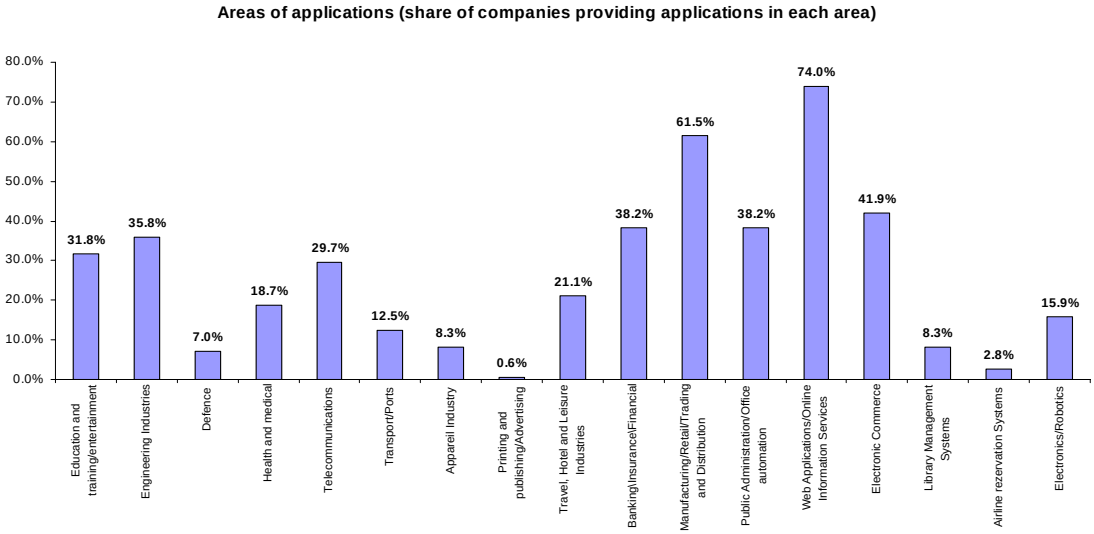
A concentration process can be noticed, as the proportion Bucharest in the turnover of these two industries increased from 59% in 2001 to 67% in 2002. Timisoara comes second with 7% of the turnover.

Also, in 2002 the efficiency and profitability indicators improved considerably. Operation surplus increased by 106%, and gross profits by 131%, reaching over 100 million USD. The average profitability rate reached 11,4%, value that can be considered high when compare with that from the other sectors. In 2002 the productivity grew faster than in the previous years, the added value exceeding 10 000 USD/person.

ITC (Institutul pentru Tehnica de Calcul SA) estimates that in 2003 for these two industries the turnover exceeded 1.1 mld. USD (+37.5) and the added value 330 million USD (+42%).

The local software industry is described by UNCTAD/WTO (2002) as vibrant. It has developed specialisation patterns to follow both the internal demand and the export and outsourcing requirements. In terms of *software demand*, the local market is dominated by Microsoft and applications running on it, and by Oracle for the database management segment. The internal demand is fuelled mainly by the local need for customised software for the SMEs and SoHo segment, by the growing demand for standard software packages with Romanian interfaces, and by the modernisation of technologically driven sectors in manufacturing and services. The standardisation of the products for accountancy and interfacing with authorities have limited the access of new initiatives on the market, but stimulated the total demand (UNCTAD/WTO (2002)).

[158] Partially these increase can be explained by a migration of some important companies into these NACE sections especially in NACE 72.



Source: Authors calculations based on company level information in the Software Directory Romania, 2001, sample of 327 leading companies

Romanian companies offer a large range of products and services oriented towards all the interested segments of the economy. Web design is dominating both the specialisation and application areas, although it is worth mentioning the rather artisan character of production, given the lack of available training systems or educational programs for web design specialists.

The specialisation niche of the Romanian software industry is the production of anti-virus programs, the best known being RAV from GECAD[159] and BitDefender from Softwin.

Manufacturing, public administration, education, banking and financial institutions, telecommunications, and tourism form the large part of the demand for Romanian software industry. The market for EAS-Enterprise Application Suite continued to consolidate, registering in 2002 a 28% growth to a value of 13.77 million EUR. The share of international providers decreased from 57% in 2001 to 49.3% in 2002. Accountancy applications covered 4.73 million EUR[160].

As the government is progressing with the e-governance and other major IT projects, including introduction of ePayment systems, the demand for standard software products and services is expected to grow at a sustained pace. Moreover, given that on one hand, over 50% of PCs in Romania use outdated software (OBG (2003)), and on the other hand the low enforcement in this field is expected to become stronger in the near future, the potential for the domestic market in this field seem very high, and it is more likely that the EITO evaluations for 2004 to be exceeded in what concerns the software market.

The strategies developed by Romanian companies are based on diversification of specialisation portfolio and reliance on the outsourcing. In 2002, the volume of offshore outsourcing

[159] Anti-virus for IBM mainframes, worldwide (eWeek, April 2003, pp. 29)
[160] http://www.computerworld.ro, October 2003

represented 43% of the total software production (Vuici (2003a)). For the same year, the value of offshore outsourcing in the software industry was estimated at 127 million EUR. The main export and outsourcing activities in software industry are related to software development (for business/enterprise management, eCommerce, content and document management, database management, multimedia, telecommunications etc) but also to IT-enabling services[161].

It is interesting to note that, according to the same source, companies involved in outsourcing have higher profitability than the average industry (14% net margin as compared with 7% for the overall software industry), they generate more value added (58% value added in turnover, as compared with 34% for the overall software industry) and they have higher productivity (8200 USD/employee, as against 6050 USD/employee for the overall industry). More then that, the engagement in outsourcing is more profitable for the local firms than direct export, which points towards a lack of effectiveness of marketing and distribution policies of the local developers. In addition, the certification system is weak (only around 30 software companies are ISO9000 certified and no CMM[162] is reported (Vuici (2003a))). Therefore, there is a risk of persistent dependency on sub-contracting model in the software industry. The market has started to respond to this risk by shifting from subcontracting for code-writing to subcontracting processes (OBG (2003)), showing an evolution in the value added chain. Governmental policies for supporting local innovation, especially through building technological and scientific parks, are welcomed but should be complemented by more active policies referring to trademark and intellectual property rights, as well as by real incentives for research and innovation in this field.

The expected progress will be achieved by plunging the Romanian local producers into the international market. In this respect, the MNCs have a crucial role, and they started to show increasing interest in Romania as destination for implementation of complex centers for IT sevices and support services.

[161] Pierre Audoin Consultants (PAC) GmbH (2003) claims that Romania is emerging as a promising alternative supplier of IT outsourcing services in addition to India, China and Russia

[162] The Capability Maturity Model® for Software (SW-CMM®) is developed by the Software Engineering Institute at Carnegie Mellon University. It is a widely adopted model guiding an organization to conduct its software process improvement activities and build its organizational capability (www.sei.cmu.edu/cmm/cmm.html)

Box C1: Oracle Technology and Support Centers in Romania

On the 17th of February 2004, Oracle launched officially the Technology and Support Centers in Romania. According to Oracle officials the decision of implementing the centers in Romania was based on local factors endowment as the number of IT specialists, geographical position, experience in software creation as well as the tradition in the field. The Support Center in Romania is the third in the world (the other two being implemented in USA and in India) and will constitute nucleus of global activity providing supports for clients in Europe, Middle East and Africa. Romania was included as business area in the organisation Oracle EU Enlargement Countries, together with the ten countries that become members of the EU on the 1st of May 2004. Oracle Romania team is a regional leader in what regards the efficiency of the client oriented solutions. Oracle express ts intention to continue the main development directions in the area, with accent on know-how transfer, investment in education and exploitation of the abilities of Romanian specialists. At this stage three Oracle Technology and support Centers are created in Romania: **Partner Resource Network (PRN), Global Support Services (GSS)** and **Application Consultants' Team (ACT).**

Source www.mcit.ro

Based on the consultation with the major national and international players in the Romanian IT market UNCTAD/WTO (2002) team suggests that Romania should aspire to becoming the "Internet Hub" for the Black Sea Region. The role of Romania as an actor of Internet development is indeed increasing. ANISP signed a contract with the Swedish organisation Autonomica, for the installation of the first root-server in the Central and Eastern Europe.

The Romanian IT industry will be the leading regional supplier of Internet-based services, specialized software and contract manufacturing by 2010, by leveraging national competitive advantages. Moreover, according to the same study, Romania should increase its IT industry exports to 1 billion USD by 2004, 5 billion by 2007 and a target of 10 billion USD by 2010.

C. Conclusions

FDI in Romania oriented mostly towards the exploitation of the basic competitive advantage, the low labour cost of the low-skills demanding activities, reflecting therefore the level of competitiveness of the Romanian economy.

The question arises why the FDI did not attempt, or at least not to the same extent, to expoit de cost advantages of cheap skilled labour. The situation started to change only recently, mostly based on the recognition of advantages of Romania given its valuable human capital in this field. A logistic explanation would be the more complex infrastructure needed, including here the innovation and ICT infrastructure.

A vicious circle seems to function, at least before 2001, between the under-capitalisation of the economy and the performance indicators of the technological intensive activities, reflected in the under-use of the high-skilled human potential. The breakthrough was partially made by the software industry, which is intensive consumer of high-skilled labour and which was able to benefit from outsourcing. The booming software industry drives the learning process which might allow the creation of an innovative environment that further helping other industries to technologically upgrade their production.

The fact that in Romania the high quality human capital has not been supported by other factors into development of a potentially flourishing high-tech industry is reflected among others, by the still low FDI in the hardware industry. However, the recent evolution of Solectron, the largest IT investment shows that the situation is changing rapidly, and this might represent an incentive for further investments. The recent (2002 onwards) orientation of domestic producers for final stages of the hardware production towards the internal market results also from the decline of foreign trade with an increasing market.

Romanian ICT market is still underdeveloped when compared with the other ACC, but the relatively fast growth rate and the dimension of the country might represent in the near future an attractor for the ICT multinationals. Moreover, it is appreciated that, by leveraging national competitive advantages, the Romanian IT industry has the potential to becoming the leading regional supplier of Internet-based services, specialized software and contract manufacturing by 2010.

SWOT

Strengths • Fast growing software industry with proven competitiveness on the global market. • Increasing investments in manufacturing and market services.	Weaknesses • The Romanian companies did not reached the level of competing through innovation. • FDI are not mostly located into hi-tech manufacture branches. • The decline of technologically intensive branches. • Although increasing, the share of the Romanian ICT market in total AC10 is still half of the share of its population. • Very low investment in education and health.
Opportunities • The size of the country market. • The low unit labour costs. • Creating a national innovation system might turn the companies towards a more innovative approach. • Given the recognised skills of the ICT specialists, the hardware industry might replicate the software success if more consistent investments emerge.	Threats • Unless the Romanian companies do not turn to innovation based competitiveness the investments will continue to be channelled towards low labour intensive activities. • Risk for ICT market to soon reach the saturation point because of its almost exclusive concentration in urban areas.

IS SWOT ANALYSIS

1. The booming software industry represents an incentive for larger investments in hardware industry, thus enabling the use of the existing human potential.
2. The decline of the innovative level of Romanian industry and generally of the technologically intensive branches has limited an important opportunity for the ICT industry, which is that of participating as partner in building hi-tech products.
3. The local ICT manufacturing industry is not a push but more a follower of the emerging information society.
4. The risk for ICT market saturation due to the deep segmentation of the economy might severely affect the domestic ICT industry.
5. The very low investment in education and health are affecting the quality of the human capital, which proved to directly influence the development of the information society.

D. PRESENCE OF MOST RELEVANT ECONOMIC ACTIVITIES FOR IST APPLICATIONS

D.1. Level of ICT investment

In 2002, the amount of expenses and investment in industry and services reached EUR 384 million for IT products and services (EUR 93 per employed person) and EUR 376 million for communication products (EUR 91 per employed person)[163]. As this means less than EUR 8 per month per person for IT and almost the same figure for communications, we can assess that it is a very low level. For more relevance, the EUR 8 represents the equivalent of 25 local calls of 10 minutes (monthly rental of line not included)[164].

International comparative data is available only for the IT and telecom expenditure, including households. The values per capita in Romania are considerably lower than the candidate countries average, in 2000 being 24% of this average for IT and 58% for communication[165]. However, a significant increase can be noticed in 1999-2001, especially for telecom expenditure (see Table D1. for the evolution of IT and telecom expenditure)

Table D1.: IT and telecom expenditure per capita (EUR)

	1999	2000	2001
IT expenditure	14	16	19
Telecom expenditure	63	80	98

Source: EURSTAT (2003c)

The importance of ICT for the economic activity is reflected in the share of ICT in total investments. By economic sectors, for banking and insurance ICT investment oscillated around one quarter of total, but in the other sectors ICT has insignificant shares (see Table D2.).

More worrying, in 2002, is the share of ICT investment in total investment of the companies halved. If we correlate this with the evolution of the domestic hardware market, which had a small increase in the same year, it becomes clear that the enterprises are not the main drivers for the IT penetration rates.

[163] NIS data, data per employed persons was calculated based on 2001 employment.
[164] Calculated based on call prices from IBM (2003a).
[165] Calculated based on Source: EURSTAT (2003c)

Table D2.: Share of hardware investment in total investments

	2000		2001		2002
Economic sector	Total	Private sector (%)	Total	Private sector (%)	Total
Industry and constructions	**1.4**	1.9	**1.5**	2.2	**0.6**
Trade	**4.3**	4.3	**3.9**	3.9	**1.2**
Services	**5.7**	4.1	**4.2**	7.1	**2.4**
Banking and insurance	**21.9**	18.2	**28**	22.8	**24.3**

Source: Data provided by NIS. Public administration not included.

The amount allocated for hardware and software per employed persons in 2000, with the exception of services and especially of banking and insurance field, are very low (see Table D3.). For instance, with the amount invested per employee in industry, one EUR 500 computer could by bought per 26 employees.

Table D3.: Software and hardware investment by economic sector in 2000

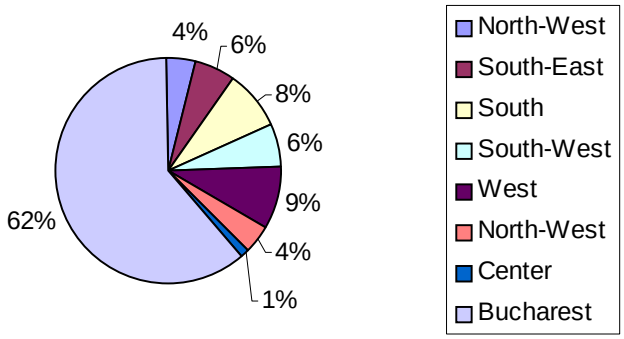
	Software		Hardware	
	Total (EUR million)	Per employed persons	Total (EUR million)	Per employed persons
Industry and constructions	19.6	8	44	19
Trade	1.8	2	27	35
Services	19.4	25	87	111
Banks and insurance	29.6	400	31	419

Source: NIS (2001b). Public administration not included.

The distribution of hardware investment by region was extremely uneven, Bucharest accounting for two thirds of the total amount, the rest of areas ranging from 3% to 10%. (see Graph D1.)

Source of Graph D1: Authors calculation based on NIS (2001b).

Graph D1: Hardware investment in non-agriculture enterprise sector, by region in 2000 (weightened by the number of non-agriculture employees by region)



D.2. Investment levels in ICT sectors

The evolution of investment follows that of the ICT industries (see Chapter C). Thus, investment in telecommunication saw a spectacular increase (56% in 2001/2000), exceeding EUR 1 billion only in 2002 (see Table D4.). Significant growth rate had also the investment in the booming software industry (95% in 2001/2000) but the values are considerably lower, being less than EUR 13 million in 2001.

Investment in ICT manufacture is concentrated in the NACE groups 3210, 3220, 3230 which represent the activities with the highest value added in the computer production chain.

Table D4.: Investment in ICT industry (thousand EUR)

		1999	2000	2001
	ICT manufacturing industry	**49 540**	**87 646**	**46 187**
3000	Computers and office means	1 326	1 416	1 703
3130	Manufacture of insulated wire and cable	1 314	3 045	13 056
3210	Manufacture of electronic valves and tubes and other electronic components	26 779	73 373	10 916
3220	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy	15 460	20 115	12 905
3230	Manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods	4 408	930	133
3320	Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment	14 751	7 917	6 614
3330	Manufacture of industrial process control equipment	2 276	965	860
6420	**Telecommunication**	**462 143**	**594 517**	**1 059 472**
	Consultancy services	**6 148**	**18 245**	**18 385**
7133	Renting of office machinery and equipment, including computers	NA	NA	NA
7210	Hardware consultancy	294	4 437	1 369
7220	Software consultancy and supply	2 180	6 646	12 908
7230	Data processing	1 739	456	487
7240	Database activities	0.5	47	425
7250	Maintenance and repair of office, accounting and computing machinery	1 436	3 123	855
7260	Other computer related activities	499	3 536	2 341

Source: NIS database of economic agents

Moreover, it should be noted that increase in volume and more importantly in profitability brought about an increase in IT industry capitalization. Thus, the social capital doubled in 2002 after a sharp decrease in 2001, and total equity increased by 126%, mainly on account of retained earnings. Very significant is the 7 times increase in working capital. Thus it can be said that, even though still severely undercapitalized and with low investments, the IT industry nonetheless recorded an improvement in working capital financing and investment sources (Vuici (2003b).

It should be mentioned that national IS strategies include in IT industry only the NACE codes 300 and 721-726, thus limiting the interest for production only to the final stage (assembling). This could affect the future development of more value-added production.

From abroad Romania has attracted investment totalling approximately USD 1 billion in the information technology, telecommunications and Internet Service Provider sector since 1989. With the introduction of the new law on investment requiring a minimum of USD 1 million and with no wage tax on IT programmers, it should be possible to make Romania a preferred IT destination for foreign investment (UNCTAD/WTO (2002)).

D.3. Trends in innovation

D.3.1. General situation of R&D activities in Romania

Romania's turbulent economic transition, combined with an inertial policy in the R&D field resulted in the loss of the connection between industry and research. As a consequence, a vicious circle was created: the state is ensuring the minimum financial resources for maintaining the system functional and, on the other hand, as its human and technical capital is deteriorating, the demand from the industry is very weak. To the low level of demand for Romanian research contributes also the technical gap, which makes buying technology still a priority. The fact is that few Romanian companies have reached the level of competing through innovation.

The research system is severely under-financed. According to EURSTAT (2004), with 0.37 gross domestic expenditure on R&D as a percentage of GDP, in 2000 Romania had the lowest value in Europe except Cyprus, showing also a strong trend of divergence from the EU-15 average, which is close to 2%. For subsequent years, this share showed only minor variations (see also Chapter D.4.).

Maintaining the tradition of specialisation from the communist period, the industrial R&D activities are mainly externalised, 87% of them being made in research units and only 13% in enterprises (see Box D1 for the structure of research system). This situation is reflecting the fact that R&D has not become yet an integrated part of the economic activity, being perceived more as an incidental input.

Box D1. The structure of the R&D system

The Romanian R&D system consists of approx. 590 units:

a) 34 national R&D institutes institute, coordinated by several central public institutions, mainly by MER;

b) 227 public institutions, mostly universities subordinated to MER, the ministers, Romanian Academy and **Academy for Agricultural Science and Forestry**;
c) 15 R&D institutes, functioning based on GD no.100/1991, which are being reorganized into legal forms in compliance with existing regulations;
d) Approximately 310 enterprises, public or private, whose objects of activity includes R&D.

Source: MER (2003)

D.3.2. Results

From the very beginning it should be mentioned that the whole set of documents released by the Romanian authorities regarding the evolution of research, development and innovation system do not address the issue of patents. It is, for instance, the case of the *Annual Report for Research, development and innovation in 2001-2002* issued by MER, or of *the Pre-Accession Economic Programme* issued by the Romanian Government in August 2003 (although it has a dedicated Chapter called *Scientific research, technological development and innovation).*

Moreover, the report for 2001-2002 does not refer to the way in which the results of research would be monitored. On the other hand, in PEP it is mentioned that in 2003 451 programs (out of 3286 financed by means of the National Plan for Research, Development and Innovation**)** have been "finalized, and permit the transfer of the respective results, in their larger majority new or improved products or technologies, to the economic environment".

This situation where the results are not evaluated or are self-evaluated maintains the R&D system closed and unable to connect with the industry. There are two possible reasons for this.

First, intellectual property is still appreciated only for its basic function, that of protection, without consideration for its more important role, that of creating a market. This maintains the validity of the statement that "the limited comprehension, among the various actors, of the process of technological transfer (i.e. Romanian research- Romanian patent-investment-beneficiary company practically stopped the relation [between R&D and economy]" (EC (2003b)).

Second, internal patents show extremely low values, revealing the crisis of Romanian research system (see Table D5.).

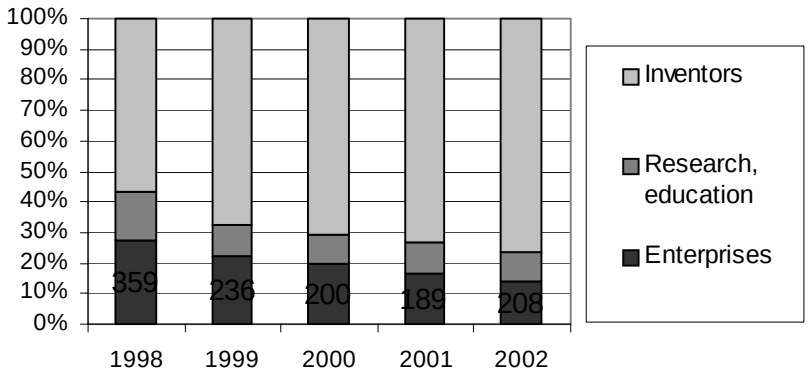
Table D5.: Patent applicants at Romanian State Office for Inventions and Trade Marks

	1998	**1999**	**2000**	**2001**	**2002**
Romanian applicants	1299	1061	1003	1228	1477
Foreign applicants	473	342	289	281	205
Total (Law 64/1991)	**1772**	**1403**	**1292**	**1569**	**1682**
Romanian patent applications per million inhabitants	58	47	45	55	66

Source: OSIM (2003)

As can be noticed from the graph D2., most of the patents applications are coming from inventors, their share showing an increasing trend since 1998, reaching 75% in 2002. This fact is reflecting at the same time the creativity potential and the weak capacity of the research system to use this potential (although 70% of the research units are supposed to perform technological research) and to direct it towards more complex innovations.

Graph D2: Structure of pattent applications at OSIM (%)



Source: Authors' calculations using OSIM (2003).

The distribution of applications for patents by region is extremely uneven, Bucharest registering 34% of the patent applications (see Table D6.). However, as most of the patent applications are not coming from the research system, their number is not always correlated with the level of R&D expenditure. Comparatively large is the number of patent applications in North-East (especially in Iasi), fact that can be explained only by the existence of the National Institute for Invention which includes the Regional Centre for Industrial Property Promotion, and also by the local tradition (proved for instance by the large number of medals won at the International Salon of Invention from Brussels).

Table D6.: Patent applications by region in 2002

	Number of patents	Patents per million inhabitants
Northeast	435	1134
Southeast	96	327
South	103	298
Southwest	65	271
West	90	443
Northwest	109	384
Centre	72	273
Bucharest	507	2230

Source: Authors' calculations OSIM (2003). Data per million inhabitants was calculated using 2001 population.

The crisis of the research system is also reflected in external patents. Although Romania had a Co-operation Agreement with the European Patent Organisation (EPO) on the extension of the effects of the European Patents to Romania, the number of applicants for EPO patents is insignificant (see Table D7.). However, it is expected that at least from the point of view of access, the situation will improve, as since March 2003 Romania became a member of European Patent Convention (EPC), agreement replacing the extension of patents.[166]

Table D7.: Number of patent applications to the European Patent Office (EPO) per million inhabitants

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001p
US	86	88	91	96	106	117	130	142	166	170
Japan	97	89	90	88	101	115	123	132	160	175
EU15	84	83	86	92	97	115	130	141s	159 s	161
ACC average	:	3.0	3.0	3.7	3.8	4.5	5.5	5.4	7.7	7.6
Romania	0.35	0.35	0.26	0.79	0.75	0.40	1.33	0.98	1.11	0.76

Source: EURSTAT (2004). *p=provisional*

Data registered by the United States Patent and Trademark Office (USPTO) refer to patents granted as opposed to applications, which is the case of the EPO data. However the situation for Romania is not different: not only that it ranks on the last place, but at a great distance from the other candidate countries, except Bulgaria (see Table D8.).

Table D8.: Patents USPTO per million inhabitants

	1998	1999	2000	2001
US	304	315	315 i	322 s
Japan	248	249	250 i	265 s
EU15	67	69	74	80 s
ACC	2.18	2.30	2.31	2.54 s
Romania	0.18	0.27	0.31	0.49

Source: EURSTAT (2004).

[166] http://www.European-patent-office.org/news/info/2002_12_19_e.htm

One should say that when referring to this indicators there are several different benchmarks: first U.S., then the "engines" of Europe (Germany and at a great distance France), then the most of EU members and some more advanced candidates, and a more heterogeneous group of the latecomers. The quantitative gaps between these quite distinct benchmarks reveal systemic differences. From this point of view, the number of Romanian patents is simply characterising a non-functional system, which requires a profound reconfiguration.

The weak competitiveness of the Romanian research is demonstrated by **the reduced number of projects won in the Framework Programme** (FP), by now their value being much under the contribution of the Romanian Government to the programme. However, this situation was not entirely due to the quality of the research itself but also to the mentioned low level of initiative and of administrative and marketing skills.

In order to improve the awareness and also the skills needed to formulate the proposals for participating in FP, some projects were started, mostly with EU funding (e.g. *IST Menthor* which targets the increase of participation in IST Programme). MER also organised a national network of contact points[167].

It is estimated that in 2003 recuperating funds invested from the State budget to FP budget doubled since the previous year (Romanian Government (2003a)).

Finally, the overall performance of the entire system is perceived as weak by international standards. According to the Global Competitiveness Report 2002, with respect to indicators as Quality of Scientific Research Institutes, Local Availability of Scientific and Training Services, and University-Industry Research Collaboration, Romania is either the clear laggard among European countries or close to this situation.

D.3.3. Bottlenecks

The Romanian research system did not manage to become an innovation system and the causes are twofold: from the supply and the demand side. We will address both of the aspects and also the possible interfaces between the two.

D.3.3.1. Supply side issues

As R&D activity is still concentrated in the public sector, covering about 80% of research expenditures (MIE (2003)), it presents the specific bureaucracy and lack of initiative (reflected also in the weak marketing activity), all these resulting in the weak capacity to produce marketable outcomes. The situation is aggravated by the legal ambiguity regarding the possibility in paying the researchers from the state-owned research units for the non-budgetary projects, which creates a major constraint in stimulating the researchers' initiative.

[167] idem.

The trials made so far to privatise some of the R&D units proved unsuccessful, as 95% of the privatised units were closed afterwards[168], mostly because up to now the privatisation of the R&D units have been made through the same procedures as for the other economic units.

As a consequence of the low budget, the number of researchers decreased constantly (from 1.62 per 1000 inhabitants in 1991 to 0.11 in 2002 (NIS (2004c)), simultaneous with the increase in the average age. Moreover, infrastructure became morally outdated (5 to 10 years) (MER (2002a)).

The research system structure is very diversified by domains, fact that represents an opportunity for future development but, in the context of the low total budget, is translated in a dissipation of resources. Instead of being prioritised, money from the state budget dissipated into a very large number of projects, sometimes affecting their chances to produce substantial output.[169]

D.3.3.2. Demand side issues

The demand side of research can be addressed from the financial point of view (see Chapter R&D financing), but also from a qualitative one. Beside the low level, the financial resources allocated from the state budget are very inefficiently allocated. In 2003 the Court of Accounts[170] has finalised an audit report regarding the efficiency of the public funds allocated for the National Research programme Horizon 2000 (ongoing between 1996-2002, with a budget of approximately EUR 343 million) revealing the bad management and the lack of interest for the efficient allocation of resources[171]. The report also noticed the absence of a unique board to co-ordinate the whole programme and that "some of the resources have been used to finance different companies by accepting their collaboration without being fully covered by documents". On the background of the lack of transparency, similar topics have been financed under different organisations, and also loss-making companies have been accepted (which is against the law). Taking these facts into account, it is unlikely that the artificial demand created through public resources will meet the real demand from the industry. As long as the state is not behaving as an exigent beneficiary for the financed projects, the research units will not learn to produce marketable outcomes. This also explains how it is possible that "many institutes have been studying the same subjects for 20 years".[172]

When referring to enterprises' demand for innovation, one should take into account the difficult and delayed privatisation of the large companies (traditionally the main source of financing) and also the economic instability that oriented them towards short-term objectives. Thus the share of enterprises with applied technological innovation decreased from 32% in 1996 to 10% in 2000 and the share of enterprises in which new or improved products value is over 10% of turnover decreased from 16% to 3% over the same interval (ADE (2003)).

[168] Declaration of Radu Minea, President of R&D Trade Union in Romania during the debate "Romanian research- Where to?", in daily newspaper "Adevarul", December 19th 2003

[169] The trend towards dissipation of resources was recognised in MER (2003).

[170] The Court of Accounts is the supreme body of external subsequent financial control on the formation, administration and use of the financial resources of the state and the public sector. (Law 94/1992 on the organization and operation of the Court of Accounts, republished, modified and completed by the Law 77/2002)

[171] Daily newspaper "Gardianul", 15 November 2003.

[172] Declaration of Alexandru Athanasiu – Minister of MER during the debate "Romanian research- Where to?", in daily newspaper "Adevarul", December 19th 2003

As mentioned before, the technological gap, compare with the advanced countries, is inhibiting the propensity for creating new products in favour of technological transfers from abroad. The latter aspect can be compensated only by a better correlation of research to the international evolutions.

Unfortunately, this correlation is one of the most important failures of the research system. It should be mentioned that during the communist period, a major role played by the Romanian research was to design products to substitute for the restricted import, thus targeting a *national* quality optimum. Moreover, it is a well-known fact that cutting the connections with international technical evolutions was aggravated by the weak access to foreign publications. These are already historical facts but still reflected in the behavioural pattern of the researchers. From this point of view, Internet access (meaning one PC with Internet connection per researcher)[173] and international mobility of researchers are extremely important.

D.3.3.3. The interfaces between the research community and industry

In conclusion, the R&D system is facing two inter-correlated forms of isolation: from the international scientific evolutions and from the local industry. However, in this direction some measures have been taken in the last years.

The weak linkages between the research community and industry have been recognized by MER which estimates that only 12% of the research results are applied to industry. Consequently, some interfaces between industry and research have been promoted beginning with 2003.

In response, a National Plan developing the infrastructure for innovation and technological transfer was proposed as a Governmental Decision. The budget of 1000 mrd. ROL[174] for 2003-2007 is destined mainly to co-finance (with non-refundable funds) centres of technological transfer, centres of dissemination for the technological information, offices for connection with industry, technological parks, technological and business incubators. In April 2003 the Government approved the methodological norms for creation of technological transfer centres (Governmental Decision 406/2003). The Law 50/January 2003, approving the Government Ordinance 14/2002 regarding the Scientific and Technological Parks introduces local tax exemptions.

MER also announced the intention to facilitate free transfer of research results from the R&D projects financed by public funds towards the interested enterprises, 69 such finalized projects being already selected (NIS (2004c)).

MER is under discussion with 5 consortia for creating scientific and technological parks. [175] . As at the end of QII-2003, two such parks received functioning authorisation (NIS (2004d). Some

[173] IT penetration increased significantly in the national research units over 2001-2002 as MER allocated EUR 1.8 million according to MER (2003). The same source states that in 2003-2004 the priority will be implementation of high performance labs with multiple uses.

[174] Approx. EUR 25 million (at the average exchange rate forecasted for the period)

[175] There are more than one actors at policy level involved in the process; the Ministry of Education and Research is responsible for the establishment of the Scientific and Technological Parks, while Ministry of Economic Development and Prognosis is responsible for the setting up of the Industrial Parks and MCIT advises.

examples of projects that are in an advanced stage are listed below: 1) The Institute for Electronic Research (ICPE) and the Bucharest Polytechnic University. 2) The Magurele Science and Technology Park – the Research Institute for Aeronautics, Research Institute for Turbo-Engines and 3) The Baneasa Science and Technology Park – the Platform for Micro-technologies (the Research Institute for Micro Technologies).

MER estimates that around 50 business incubators have been created, most of them private[176], but no comprehensive list is available and, most important, there is no relevant criteria for including them in this category, except the simple denomination. What is reliable is that under the new legislation 3 incubators have been created.

An example of a successful regional initiative is the **Transylvania Business Centre (CAT),** funded in 1992. It is a non-profit, non-political and non-governmental organisation with more than 1 000 member companies. Its main goal is providing assistance for initiating and developing direct economic contacts, providing consulting services, training programmes and organising SMEs' participation in international events. CAT has recently launched a number of new initiatives, the most innovative being "**Infocat**". "Infocat" facilitates direct contacts with firms, banks and organisations from all over the world. It also provides access to a database containing requests and offers of services and goods, useful information about companies, catalogues of products and business opportunities, information about leasing and renting different means of transport and many other (ADE (2003)).

Regarding the venture capital, one can notice that this kind of companies finance in Romania only large projects, starting from 500 000 and reaching 10 000 000 USD.[177] This situation is reflecting the weak confidence of the financing companies in the chances of survival of the small companies. It can be stated that the venture capital *per se* is not a significant presence on the Romanian market – mainly general investment funds exists, (in an insufficient number and with rather low level of portfolio investments) financing only occasionally innovative enterprises. [178]
Beside the built interface structure and the capital structure, another important dimension that should be addressed for the R&D personnel is the *entrepreneurship and marketing culture and skills.*

[176] No full evidence of these entities is available. For a partial list see: http://www.mimmc.ro/consultanta/incub.php
[177] http://www.basepoate.ro/financiar/ventures.htm On this site a list of 10 companies providing venture capital for Romanian firms is published.
[178] Panel "Imperativul Venture - Forme şi instrumente pentru finanţarea inovării" realised by Center for Complexity Studies within the Forum Binary Capital Venture (Organised at ROMEXPO in September 2003 by ARIES) http://www.noema.info

D.3.4. Main R&D&I policy issues

One important aspect of the National Program for Developing the Innovation and Technological Transfer Infrastructure proposed by MER in draft of a Governmental Decision, is that it includes in the innovation infrastructure only the accredited innovation entities, which are specifically defined through GD 406/2003. Therefore, only such innovation entities are eligible for state financing within the framework of the proposed program.

Box D2: What does the Romanian Government understand by innovation entity?

In GD 406/2003, there are specific conditions regarding the eligibility of a firm or a department of a research institution to be considered as an innovation entity. The applicants for such a status must provide certain documentation, and need to score at least 70 points out of 100, according to several criteria, in order to be accepted in the innovation infrastructure.

Although the governmental initiative is commendable, as it aims at creating a strong network of entities, capable of giving more substance to the innovation infrastructure, there is also a negative side of the project, which needs to be addressed. Do we really need such strict definitions, and restricted access to join the innovation infrastructure? The answer depends on several factors, as the ability to ensure a real transparency of the selection process (in order to avoid suspicions), the costs and bureaucratic efforts needed have to pay, and, most important, of a real access to public financing once they qualify. Unless all this conditions are accomplished, the decision will lead only to further lost of the competition for innovation financing.

Other measures meant to encourage the technological transfer include[179]:

- The INVENT Program (with a total value of 500 billion ROL in 2004-2006[180]) destined to support the appliance of inventions. However, there are serious doubts regarding the stimulating effect for innovation, as by now a large part of the patents accepted for financing in this program were older than five years.
- The enterprises co-financing 50% of the R&D activities obtain the full right of applying it. Moreover the state may finance 20% of the applying costs.[181]
- The Ministry of Education and Research may finance the technological transfer of the innovation from the high-tech industries.[182] Also the ministry may co-finance the appliance of some research results for the companies owned by persons less than 35 years old.

The National Strategy on Research-Development and Innovation has been drafted by MER and should have become operational by Government Decision by summer 2003 (EC (2003b)). The

[179] According to the National Strategy for Intellectual Property (see Chapter B.1.)
[180] Daily newspaper "Gardianul", 18 March 2004.
[181] According to the GO no. 57/2002 approved by the law 324/2003
[182] According to GO no. 442/2003.

document includes Action Plans for: the domain of scientific research and technologic development (between 2001-2004); the development of dissemination, transfer and capitalisation of Research Development and Innovation results (between 2003-2005); innovation and technological transfer infrastructure development (between 2003-2005).

Although this National Strategy on Research Development and Innovation was prepared and referred to by the Government Ordinance regarding The Research and Technological Development[183], this draft is still lacking some essential elements for meeting the requirements of the systemic research activity promoted in the EU. This is indirectly confirmed by the fact that this Government Decision was not issued yet, although, in the meantime[184] the government has approved "The National Strategy for Intellectual Property" including measures pertaining to innovation (see Chapter B).

This strategy lacks commitment regarding the weak results obtained by now, moving the emphasis towards external factors as "the low level of companies' interest for research, development and innovation reflected in the level of expenditure", without mentioning the deficient management, research marketing and entrepreneurial culture[185].

Even if research and innovation are not understood and approached yet as different processes (as they address distinct markets and they have different timelines, objectives and funding mechanisms), the strategy shows an increased importance of innovation policy in Romania. An evaluation of the real priority ranking within the innovation policy mix in 2000-2003 period show that education alongside strengthening the IPR were the front runners (EC (2003b) and EC (2003c)).

In the last years the increased importance of innovation was sustained by some additional measures to encourage innovation, among which are (EC (2003b)):

- The tax-exemption for import of equipment and know-how could have been used and was used as incentive for increasing the innovation rate through technological transfer, but recently the new Law 345/2002 on VAT abrogated it. The measure of tax exemption for implementation of patents, although one of the most common fiscal incentives, was abrogated in 2000. The elimination of taxes on salaries for IT specialists of software companies
- Encourages patenting by public research and universities by offering 50% deduction for the registration taxes to State Office for Inventions and Trade Marks (the Law 64/October 2002).

D.3.5. ICT research and development

ICT represents a major domain for research. Thus, in 2001 out of the scientific research units, 18.5% are in mathematics and informatics (MER (2002b)) and in the same yeas 4% of themes developed in Horizon 2000 program were ICT related, representing 28% of the total budget.

Information society also plays a major role in the *Plan for Research, Development, and Innovation 2001-2005,* being considered as one of the four main areas identified for R&D, alongside with biotechnology, new materials and micro-mechanical circuits for microwave and

[183] GO no. 57/2002, adopted in August 2002 (http://www.mct.ro)
[184] 14 November 2003
[185] For a detailed analysis regarding the mentalities which are behind this lack of commitment see Caragea (2004)

mini-wave applications, aeronautics and space applications. Under this programme, the information society component (called INFOSOC) would get the maximum allocation of 75 million USD which would enable 20 national institutions to revive their R&D programmes and develop a foothold in the emerging technology markets (UNCTAD/WTO (2002)).

ICT research proved also to have a relative international competitiveness, as 15% of the EC contribution for Romanian partners in the Framework Programme V was for Information Society Technologies (MER (2003)).

The success of the ICT companies also attracted the interest of some companies for establishing ICT business incubators (see Box D3).

Box D3: Business Incubators for ICT industry

NEST

Business incubator NEST has been established by the Advantage Software Company. It targets the entrepreneurship from the following IT markets: wireless, software, Internet, Intranet, telecommunications, eCommerce. The eligible candidates should not be involved in other similar activities. The maximum budget allocated is 250000USD and covers the office space, utilities, consulting services, legal and strategic counselling. In return the incubator will own 51% of each project. The entrepreneur will be allowed to buy another 2% of shares from NEST after the company moves to its own head office. http://.nest.ro

ECO-NET or Internet genesis.
ECO-NET offers already designed business schemes in the form of web-sites that can be developed (some of them already in advanced stages). Additionally it offers the necessary assistance, the legal and copyright assistance and also the initial investment. http://www.internetgenesis.ro/

The financing agreement between the Ministry of Development and Prognosis and the company "Cons Management Parc de Soft" administrating the **software park in Galati** was signed in January 2003, providing EUR 300 000 non-refundable funding for the deployment of the project. The park in Galati also received the first title of Scientific and Technologic Park, awarded by Ministry of Education and Research. The project in Galati is carried out by the local administration, which benefited by the advise of the MCIT. MCIT is involved in the development of some other local projects, which are in process in several cities in Romania. The park was officially opened in April 2004, hiring 300 persons. It embeds already three Centres of Excellency, six Technological Transfer Centers and 32 companies. For the companies acting in this park, a 40% growth in the turnover is expected for the year 2004, following by 25% in 2005[186].

[186] www.markmedia.ro

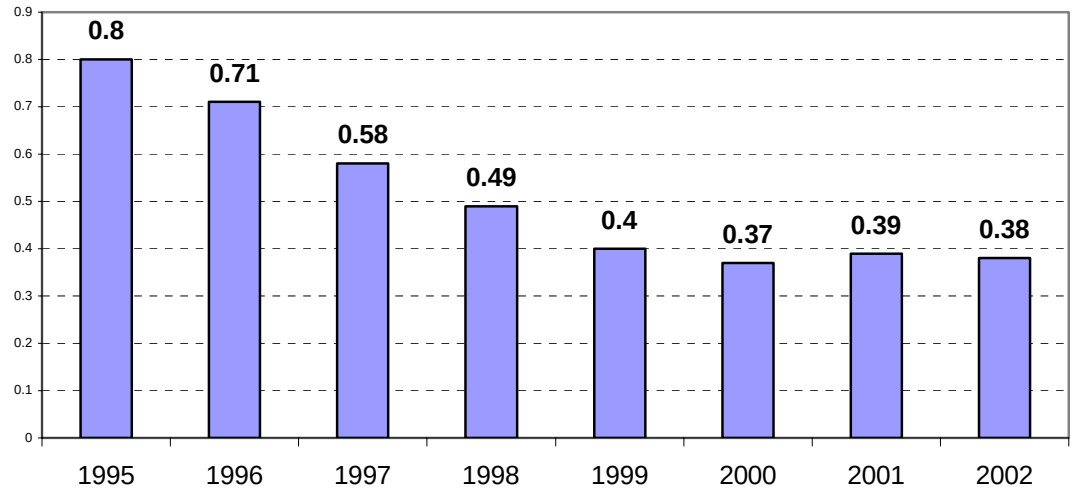
The software park in Galati, having its headquarters is in Galati's Navrom Business Centre can offer office space for approximate 100 private companies with software development activities. The space has variable dimensions with relocation possibility - according to the company's rate of development. Conference, negotiation and presentation rooms, as well as research facilities are provided. The rent and maintenance costs will be set at a lower level than in any other similar location. However, all companies that will be hosted by the software park will have to follow a set of strict minimum guidelines regarding the company's profile and activity, set-up date, number of employees and will have certain community engagements.

In October 2002 „e-Austria Timişoara" was established. It is an institute for research and technological transfer in the field of IT, created in collaboration by the Institute of Simbolic Calculus of Linz University -Austria, West University (Computer Department)- Romania, Timisoara and University Politehnica (Computer Department)- Bucharest. This is the first stage of a project of creating a scientific and technological IT park. Pilot stage (one year) has a budget of 200 000 EUR from The Austrian Government, 15 000 EUR from the Romanian Government and 55 000 EUR from other sources. For the beginning, „e-Austria Timişoara" has the headquarters at West University the research facilities at Politehnica University.[187]

D.4. R&D financing

In the interval 1995-2001 the share of R&D expenditure in GDP decreased by half (see graph D3.)

Graph D3: R&D Expenditures as a share of GDP



Data source: NIS (2004a)

[187] http://www.agenda.ro/2002/41-02-8.htm

As mentioned by an ex-member of the Consultative Council for Research, Development and Innovation (which played an important role in co-ordinating the resources before 1997), "For a long period of time it was a common opinion that the recovery of demand for research will simply follow the spontaneous recovery of the general domestic demand, ignoring the fact that this kind of opportunity would most probably address the global technological transfer market". (Munteanu (2003))

A relative different perspective can be noticed in the Romanian Government (2003a) which states that "significant growth of budgetary resources allocated for this area" and "constant growth of funds invested by economic agents for the development of these activities... *are to be done*".

As the reduction of R&D expenditure in 1995-2001 was smaller for economic units, their share in financing increased (see Table D9.).

Table D9.: Structure of R&D expenditure by source

	1995	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Economic units	39%	42%	53%	42%	50%	49%	48%	42%
Public funds	57%	54%	42%	51%	45%	40%	41%	42%
University public general funds	1%	1%	0%	2%	1%	1%	2%	6%
Tertiary education units	1%	1%	2%	3%	1%	5%	1%	3%
NGOs	0.01%	0.27%	0.00%	0.00%	0.00%	0.14%	0.01%	0.01%
External funds	3%	3%	3%	2%	2%	5%	8%	7%

Source: Romanian Statistical Yearbook, 2003.

According to Romanian Government (2003), in 2002, the funds allocated for research from the state budget represented EUR 96 million, or the equivalent of almost 0.21% of GDP, marking a slow increase from 0.2% in 2001 (include self-financing). In 2003 these share had again a comeback to 0.18% (0.16% before the rectification of the state budget) and for 2004 the announced share is 0.21%.[188]

In 2002, 71% of the amount has been allocated from the budget of MER, 18% from the Romanian Academy and 10% from the budgets of other ministries.[189] There are some tensions regarding the distribution of the state financial resources between the universities and the research institutes of the Academy, mainly because universities have their utilities paid by the state, whereas research institutes pay them themselves.[190] Such tensions are generally affecting the collaborations between the universities and the research institutes.

[188] Declaration of Alexandru Athanasiu – Minister of MER during the debate "Romanian research- Where to?", in daily newspaper "Adevarul", December 19th 2003.
[189] idem.
[190] Declaration of Alexandru Athanasiu – Minister of MER during the debate "Romanian research- Where to?", in daily newspaper "Adevarul", December 19th 2003.

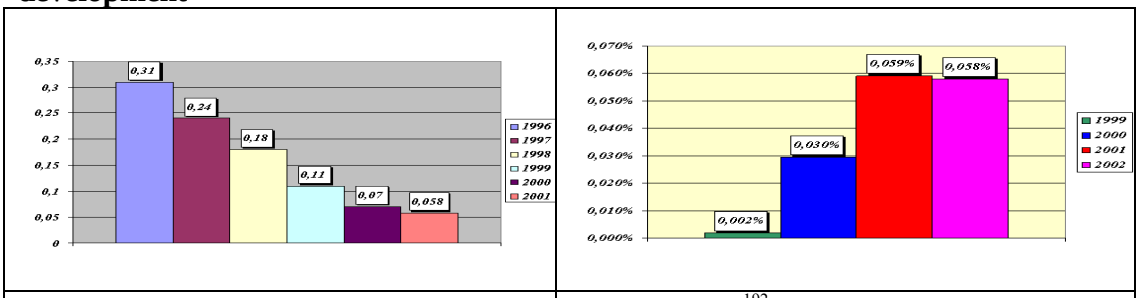
MER has included in its budget, besides financing sources for national research programs, funds for institutional financing of national institutes and other public institutes subordinated to MER, as well as funds for developing RDI infrastructure (MER (2002b)).

In both 2001 and 2002, the number of the projects implemented jointly by units with R&D profile and economic agents increased to more than 80% of the total projects. Over the same years, approximately 28%, respectively 35%, of the total budget of the National RDI Plan covered co-funding projects (Romanian Government (2003b)).

D.4.1. Financing schemes

It is only in 1997 that the first system for financing projects not institutions was introduced, namely the National Plan for Research, Development and Innovation[191] **(NP-RDI).** This was based to a higher degree on competition, its priorities being established according to the Medium-Term National Strategy for Economic Development, updated within the Pre-Accession Economic Programme. But the hesitations and the "half commitment" in implementing the policies were felt once more. Law 191/1999 prolonged the operability of the previous programme 'Horizon 2000' until the year 2002. Hence, the tow systems have been simultaneous in operation, the switch being performed gradually (see Graph D4.).

Graph D4.: Shifting emphasis between the main programs for financing research and development



Horizon 2000 %GDP	NP-RDI % NDP[192]

Source: MER http://.mct.ro

Until 2001 there were 4 NP-RDI programmes, the resources being allocated mostly for RELANSIN (Re-launching Industry by Scientific Research). But, this program covered too many fields, was ineffective and in disagreement with the new system of resource allocation described above. As result, NP-RDI was restructured to cover another 10 programs in line with the national priorities established by the Pre-Accession Economic Programme, including one regarding the development of the information society.

In 2003, **two new forms of funding by means of programs** of RDI activities were launched (beside the NP-RDI) (Romanian Government (Romanian Government (2003a):

[191] Regulated by GD 48/1998, and GD 562/1999. Though GD 556/ 7 June 2001, the number of RDI programmes increased to 14 (source: http://www.mct.ro)

[192] The difference between 2001 and 2002 in point of share in GDP is due to inflation, the funds allocated on a multi-annual basis having the same absolute value in ROL in 2002 as against 2001.

- **Funding by means of nucleus research and development programs** (programs specific to the national institutes or public institutions), on medium and long-term, those institutions that support the lines of research of strategic interest in the scientific and technical domains specific to the respective institution. The nucleus programs are advised by the co-ordinating central public administration body and approved by the MERT. The funding shall be done directly by the MERT, to a maximum level of 50% of the R&D revenues of the R&D institution of the former year;
- **Funding by means of sectoral R&D programs,** dedicated to solving sectoral technological development problems, in agreement with the strategies of the respective sector development;

Although these financial schemes have been introduced, it is not clear which players can benefit from them, as these units have not been clearly attested yet.[193]

In point of distribution by regions, Bucharest accounted for more than half of total R&D expenditures in 2000, the next region being responsible for only 13.3% (South-West), while the other regions remained below 8%.

Table D10.: R&D expenditure, by region in 2000

Region	Share (%)
North-East	5.5
South-East	6.3
South	13.3
South-West	4.5
West	5.5
North-West	3.8
Center	7.8
Bucharest	53.3
Total	100

Source: Authors' calculations using: NIS (2001b)

Conclusions

The level of ICT expenditure and investment in Romania, both per capita and per employee, is considerably under the average of the other candidate countries. This situation reflects the weak chances for Romania to significantly narrow the gaps regarding ICT penetration rates for the enterprises and households in the near future. In Romania the information society is still concentrated in relatively centralised systems such as education and public administration.

On the supply side, the level of investment in the ICT domestic industry reflects the different pattern of evolution for its components, the level of investment being strongly correlated with the perspectives envisaged for this fields. Thus, the communication sector where the level of

[193] Declaration of Virgil Gândea, General manager of the National R&D Institute in the field of Modernising Masinilor Agricole, position sustained by the minister of MER during the debate "Romanian research- Where to?", in daily newspaper "Adevarul", December 19th 2003.

investment exceeded EUR 1 billion in 2002 can be still considered to be on the increasing side of the evolution curve, as the fixed telephony market has been only recently liberalised, and the mobile penetration rates are still far from reaching their climax.

The situation is relatively different for software and hardware industries as they are acting on a more global market. The software industry that gained its competitiveness based on the quality of the local specialists, is now registering important growth of investment, whereas the hardware industry which specifically needs large investments from the start, did not manage to convince some important investors. To this situation may have contributed general reasons which prevented important FDI flows in Romania.

Over the last years, IT started playing an important role in the RDI system, not only on the demand side but also by becoming a priority research field. However, this domain suffers from the general crisis of the Romanian RDI system, characterized by severe under-financing and weak market orientation of the output, weaknesses only partially compensated by the activism of the IT innovative companies, especially from the software production. Additionally there is a need for correlating this innovative dimension with more consistent measures for supporting the IT industry as a whole.

SWOT

Strengths • High native creativity potential; • Availability of some fiscal incentives for innovation activities; • Inclusion of a research program regarding the development of the information society in the National Plan; • Increased governmental support for developing the infrastructure for innovation and technological transfer; • High level of investment in telecoms; • Increasing investment in software industry;	Weaknesses • Low IT and telecom expenditure and investment; • Loose connection between RDI system and industry; • Severe under-financing of the research system, including very limited role of venture capital; • Inefficient allocation of resources for RDI from the state budget. • Lack of propensity of RDI system towards marketable results; • Weak participation and poor results in Framework programmes; • **Most of the Romanian companies are not yet competing through innovation.**
Opportunities • Project financing schemes for the state-budget resources for RDI; • Emergence of around 50 business incubators, many with private funding; • A potential increase of the internal demand for research, following the recent economic upturn; • The positive example of the first (recent) successes in creating a technopark; • Emerging IT specific incubators.	Threats • Lack of awareness for the need to introduce management, marketing and entrepreneurial culture in the RDI system; • Large discrepancy regarding hardware investment between Bucharest and the other regions; • Biasing support for the ICT manufacturing industries situated in the first stages of production chain (e.g. semiconductors production).

IS-SWOT Analysis

1. The very low IT and telecom expenditure and investment represent a major constraint for converging with the European ICT penetration rates.
2. Although ICT research has a somehow better situation than the rest of the RDI system both on the financing and recognition as a priority, the expenses are it is still very low and affected by the inefficient allocation of resources for RDI from the state budget. and on the attention from the intermediates with industry.
3. The strategy regarding the support for the ICT manufacturing industries is not considering important activities in the production chain (e.g. semiconductors).

E. IST PENETRATION RATES

E.1. The evolution of computers and Internet connections in the main economic sectors

E.1.1. ICT endowment in the corporate sectors

The number of personal computers (PCs) per 100 employees rose significantly over the period 1998 to 2002 (see Table E1.), throughout all economic sectors, but the value of 11.4 PCs per 100 employees registered in 2002 is still far from ensuring the base for an Internet penetration rate comparable to that of other candidate countries. The highest growth was recorded among trade companies, fostered by the law enabling electronic bookkeeping and by the increasing number of large shops. On the other hand, banking and insurance companies experienced a slower growth in the number of PCs, due to their already existing ICT infrastructure at the beginning of the period.

Table E1.: Number of PCs per 100 employees, in corporate sectors

Sector	**1998**	**2001**	**2002**[194]
Industry and constructions	2.2	5.6	6.7
Trade	1.4	11.8	13.7
Services	3.9	16.1	21.1
Banking and insurance	38.9	54.1	61.7
Average corporate sector	**3.0**	**9.4**	**11.4**

Source: Authors' calculation using data provided by the NIS.

E.1.2. Internet penetration in the corporate sector

The number of Internet connections grew faster than the number of PCs, in virtually all major economic sectors, showing a tendency of rapid catching-up (see Table E2.). Thus, the number of Internet connections grew 13 times over the period 1998 to 2002, when it reached 4 connections per 100 employees[195] (as against a less than 4 times growth for PCs, over the same interval).

Table E2: Number of Internet connections per 100 employees, in corporate sectors

Sector	**1998**	**2001**
Industry and constructions	0.14	1.45
Trade	0.17	4.01
Services	0.71	5.35
Banking and insurance	1.35	8.89
Average corporate sector	**0.27**	**2.71**

Source: NIS (2002a)

Nevertheless, Internet usage per employee remains low in 2002 (see Table E3). This is the direct result of a still low endowment with PC's in the corporate sector, as well as of a still limited share of companies connected to the Internet (7.8% in 2002)[196]

[194] Rates for 2002 were calculated using the employment data for 2001
[195] Source: Data provided by NIS
[196] Data provided by NIS

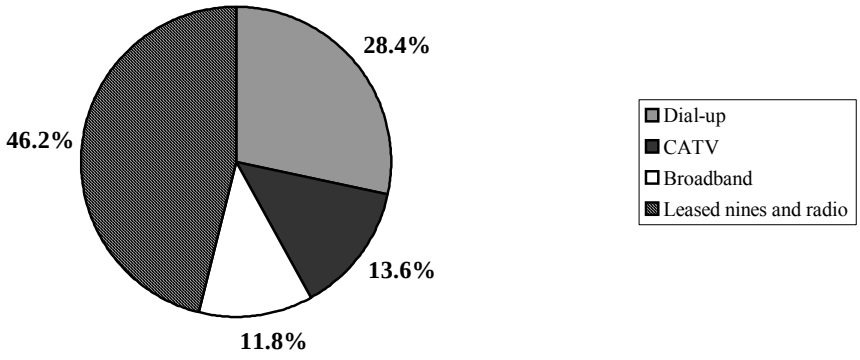
Table E3: Share of employees using the Internet (%), in corporate sectors

Sector	2001	2002[197]
Industry and constructions	4.0	3.7
Trade	4.1	7.8
Services	5.2	13.1
Banking and insurance	11.5	18.1
Average corporate sector	**4.4**	**6.3**

Source: Authors' calculations using data provided by NIS

Most of the PCs in the corporate sector are connected through networks operating leased lines or radio connections. Following up is the dial-up connection, the most common among single users. Share of CATV and broadband (other than through CATV) are still low, even at the level of corporate sector (see Graph E1.).

Graph E1.: The structure of PCs connected to the Internet in the corporate sector according to the type of connection (2002)



Source: Data provided by NIS

The dispersion of companies having their own website according to the area of activity is very high (see Table E4).

[197] Figures for 2002 were calculated using the 2001 employment

Table E4.: Share of companies with their own website (%)

Economic sector	2002
Industry and constructions	2.1%
Trade	0.8%
Services	2.8%
Banking and insurance companies	75%
Total	**2%**

Source: Data provided by NIS.

E.1.3. Employment of ICT specialists

The number of ICT specialists, defined as ICT graduates involved in ICT-related activity, reached almost 60 000 in 2002. Given that their number grew by approximately 4000 from the previous year, and that the average number of new ICT graduates is 5000 (see Chapter G), it could be inferred that the market absorbs maximum 80% of the ICT graduates. Regarding the breakdown on major economic sectors (see Table E5.), it is again the banking and insurance sector that prevails. Nevertheless, it should be considered that the variance of all IST indicators, including penetration rates, is expected to be very high at the level of industrial sectors and sub-sectors.

Table E5.: Employment of ICT specialists[198]

Economic sector	ICT specialists per 100 employees			Number of PCs per ICT specialists		
	1998	2001	2002	1998	2001	2002
Industry and constructions	1.1	0.9	0.9	2	6	8
Trade	0.7	2.4	1.8	2	5	7
Services	1.6	3.2	4.4	2	5	5
Banking and insurance	5.7	3.0	4.2	7	18	15
Total	1.2	1.6	1.7	2	6	7

Source: Data provided by NIS

As the number of computers is growing faster, the average number of computers per ICT specialist is increasing.

Unlike the growth in productivity and profits in IT branches during 2002, the gross wage has a much lower growth (only 4% as against 17% the average growth for the previous 5 years). This is the result of the tighter world market, but also of the applied fiscal incentives for software specialists (Vuici (2003b)). This allowed a more important increase in the nominal wage, showing the effectiveness of fiscal incentive on both diminishing the brain drain and maintaining the cost attractiveness for the FDI.

[198] Figures for 2002 were calculated using the 2001 employment

E.1.4. Regional disparities in ICT penetration

Significant regional disparities can be noticed in the share of companies with Internet connections and in the number of PCs and ICT specialists (see Table E6.).

Table E6.: Distribution of Internet connections, PCs and ICT specialists, by region in 2001

	Share of firms with Internet connections in the region in 2001 (%)	PCs per 100 employees	Share of PC with Internet connections (%)	ICT specialists per 100 employees
Total	6.1	3.8	28.9	0.7
North-East	5.7	1.9	33.3	0.5
South-East	4.2	2.2	30.8	0.3
South	5.5	2.0	18.3	0.4
South-West	3.2	1.5	20.3	0.3
West	7.6	2.6	27.1	0.6
North-West	5.7	2.5	24.7	0.6
Center	5.7	2.8	26.2	0.7
Bucharest	8.9	18.2	31.9	2.4

Source: NIS (2002a) and NIS (2003c)

The observed regional disparities very likely depend on the structure of regional economic activity (see Chapter C), in terms of technology, FDI presence, distribution of companies by size and distribution of corporate revenues. Lack of available data regarding the IST penetration in the corporate sector for more detailed sectoral breakdown prevents us from making further inferences on the origins of the observed regional disparities.

E.2. eCommerce

As shown in Chapter F, the legislation regarding eCommerce has been adopted and is in line with the most updated EU regulations. Nevertheless, presently eCommerce is still underdeveloped in Romania, following three categories of inhibiting factors:

- the **low purchasing power and revenues,** with still high Internet access prices (average monthly cost for 20 hours of Internet access is USD 16.62[199]); the rather low number of Internet users (see Chapter E.10) and low penetration of Internet in the corporate sector (see Chapter E.1.);
- the **limited development of ePayment**, including the low spread of electronic cards (see Chapter E.5.);
- the **lack of trust** in the virtual market, and especially in ePayment (see Chapter E.5.), is a relevant barrier to the use of eCommerce at this stage of its development in Romania (SIBIS (2003a)).

Therefore, the incidence of eCommerce supply is rather low, both in terms of number of companies[200] as well as weight of the activity in total turnover (see Table E7.).

[199] http://www.cid.harvard.edu/ profiles.html

[200] Comparatively, 22% of the companies in the EU15 area sell online, via eMarketplaces or auctions SIBIS (2003b)

Table E7.: **Sales online**

	2002
Share of enterprises selling online (total)	0.6%[201]
Industry and constructions	1.0%
Trade	0.4%
Services	1.0%
Share of total revenues obtained via Internet	0.4%
Share of total revenues obtained via Internet in the revenues of the companies selling via Internet	9%

Source: Data provided by NIS

E.2.1. B2C segment

According to SIBIS (2003a), the regular users of B2C eCommerce represent only 0.6% of population, while the occasional users represented 0.78% in 2002, virtually all being in the group of 24-49 years. Out of the total number of Internet users, only 5% are regular online shopping users and other 4% occasional users (in 2002). 48% never tried to buy online (the highest share in Candidate Countries, followed by Slovenia with 39% (SIBIS (2003b)).

EC (2004) offers an alternative measure by reporting interest of consumers in conducting eCommerce related transactions to the number of Internet users. 36% of the Internet users during 3 months before the survey have searched the Internet for goods, while 7% actually purchased goods electronically. When compared with the averages in the candidate countries of 51% and 12% appears as a laggard, with actually only Bulgaria reporting lower values. This is due to the limited supply goods for eCommerce, mostly given the limited trust of both consumers and producers.

Only 30 e-shops were operating in the business to consumer (B2C) sector at the end of June 2002, while the overall volume of B2C eCommerce for the last years was estimated at USD 2 million (SIBIS (2003a))[202]. Until recently, the payment was to be made exclusively by cash on delivery at the receipt of the respective goods or by post office order, implying a rather high risk for the shops (fake orders) and money getting blocked in the system[203]. This is still the most used payment method, showing that there is practically only a primitive eCommerce activity (RITI (2003)) Nevertheless, recent analyses tend indicate eCommerce, and particularly the B2C segment as a booming sector (Biz magazine no. 62/March 2003).

E.2.2. B2B segment

The B2B seems the less-developed segment of the Romanian eCommerce. The statistical information on it is scarce, but shows rather limited incidence of the activity (see Table E8.).

[201] The data supplied by SIBIS (2003a) is 0.8 in 2001. The differences originate in methodology of the surveys and the target groups.

[202] Alternative sources, RITI (2003), estimate the number of on-line shops with more than 2000 visitors per month at 50

[203] None of the existing online shops in 2000 allowed the payment of the products online in Romania.

Table E8.: **Business expenditures online**

	2002
Share of enterprises buying online (total)	0.4%[204]
Industry and constructions	0.4%
Trade	0.3%
Services	1.0%

Source: Data provided by NIS.

There are, nevertheless, some examples of success stories among the B2B companies, the office supplies distributor http://www.rtcoffice.ro/, or the B2B virtual market http://www.premierbc.com/. The decision of MCIT to extent the e-procurement system, http://www.e-licitatie.ro, during 2003-2004 and open it for private auctions is expected to boost the transactions in the B2B segment. It is estimated that this measure will allow finalising over 100 000 transaction per day (RITI (2003)).

E.2.3. B2G segment

The development of the B2G in Romania is instead noticeable, mostly due to the national electronic system for public acquisitions, through public auctions organized via the Internet. The system was introduced by MCIT, and has been functional since 2002 (see Chapter B.4.). The system allowed a significant reduction in prices and in marketing and distribution costs.

By the end of 2003, approximately 1000 public institutions were using the electronic system for acquisitions[205], as against 159 at the date the system was launched. 10000 providers asked to be registered as users in the system. Over 80 categories of goods are traded in the system, compared with only 7 in 2002. By the end of 2003, over 220 000 bids were successfully closed using the electronic system for public acquisitions (for further information see Chapter B.4.). The web site of the programme, http://www.e-licitatie.ro is the second most visited governmental-political site.

In 2003, the public acquisition system was designated as one of the 65 examples of good practice in eServices at the eEurope competition.[206]

E.3. IST in telecommunication

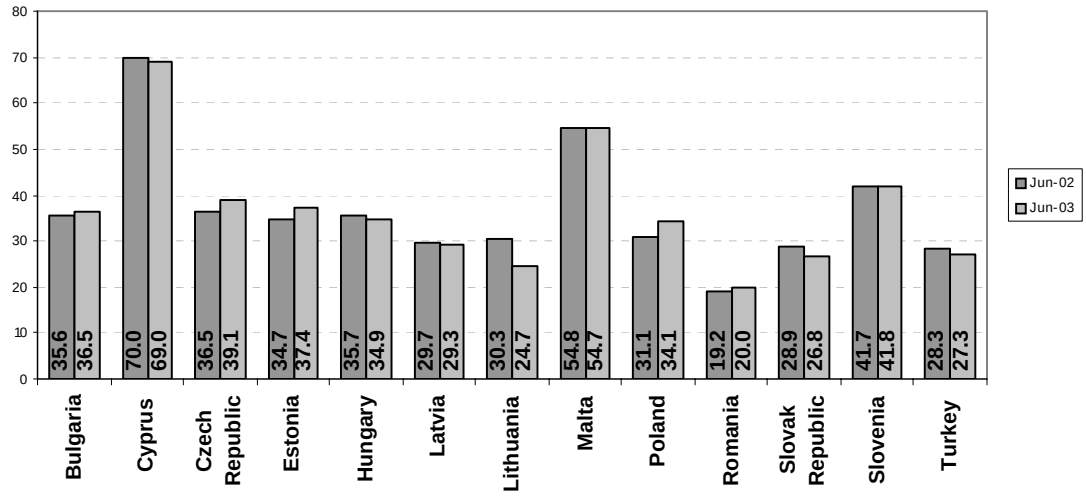
E.3.1. Fixed telephony

Romania ranks on the last position in ACC regarding the number of fixed lines per 100 inhabitants, which was of 20[207] in June 2003, slightly above half of ACC average which was 36 (see Graph E2). An average of 58.1% of the Romanian households is connected to fixed telephony (MCIT (2004)). At the end of 2003, out of the total number of lines 72% were digitised and 98% automated (MCIT (2004)).

[204] NIS (2003a). The data offered by SIBIS (2003b) was 0.6% for 2001.
[205] The participation of these public institutions is mandatory for the categories of products registered within the system.
[206] eBusiness, July 8th 2003.
[207] IBM (2003b). Data is close to those provided by alternative source OBG (2003)

The rate of growth in fixed telephony penetration progressed from 9.5 fixed lines per 100 inhabitants in 1991 and 16.6 in 1999[208]. It is expected that the number of subscriptions to the fixed telephony will be with 30% higher at the end of 2004 as compared with the end of 2001[209]. This follows the liberalisation of the market in 2003 but mostly the further digitisation of the lines[210]. For 2003, the revenues of the incumbent are estimated at approx. 2% of the Romanian GDP[211].

Graph E2: Fixed lines per 100 inhabitants in Candidate Countries



Source: IBM (2003b)

[208] Roland Berger estimation, eWeek February 2003
[209] Approx. 24 lines per 100 inhabitants
[210] According to the declaration of Minister of Communications and Information Technology in daily newspaper "Cotidianul", 7 April 2004
[211] Daily newspaper "Cotidianul", 7 April, 2004

Box E1: **The current stage in access of private initiative on the telephony market**

Until Tuesday, May 26, 2004 were authorised a number of 2081 companies, which were thus entitled to enter the market as providers of electronic communications services or networks. 191 companies have obtained the right to provide telephony services, from which 186 through fixed public networks. Within the number of companies which provide or will provide telephony services through fixed public networks occurs the following distribution: 138 companies expressed their intention to cover the local call segment, 144 the long distance call segment, and 160 provide or intend to provide services on the international call segment. A number of 83 companies intend to install a public phone and 59 will provide ISDN services.
17 companies have signed interconnection agreements with Romtelecom, 5 with Mobifon and 5 with Orange Romania. This follows the adoption at the end of 2003 by NARC of a package of decisions aimed at accelerating the negotiation of such agreements.

(Source: NARC web page, http://www.anrc.ro/en)

In December 2003, through an investment of USD 30 million, the first alternative fixed telephony service was launched by Astral Telecom Cluj-Napoca, beginning with four cities (including Bucharest). The services provided are in average 30% cheaper.[212]

E.3.2. Mobile communications

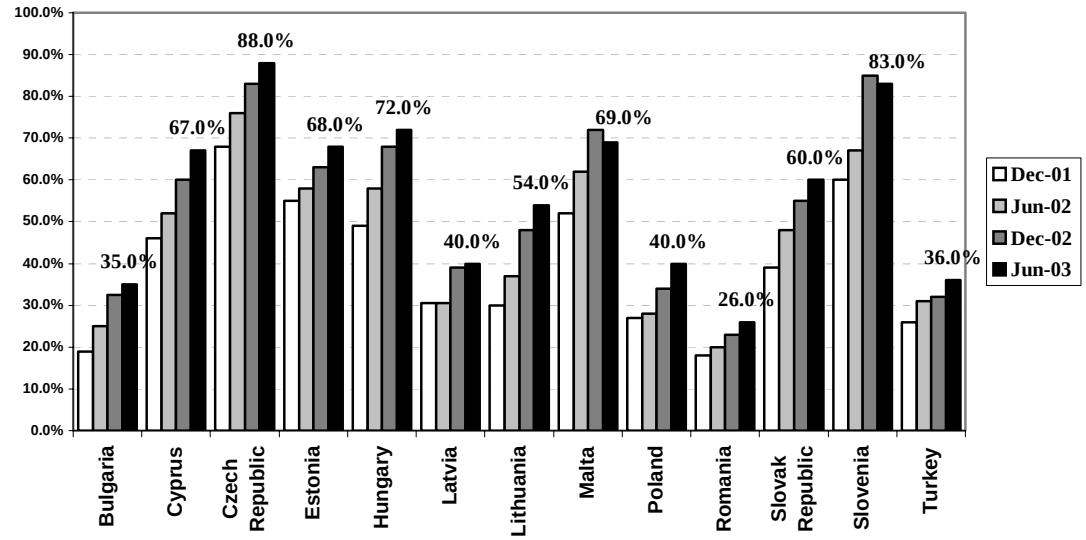
Mobile services in Romania are developed in terms of competition. Four operators (1 operating in 450 MHz band, 2 GSM 900 and 1 GSM 1800) are currently competing on the mobile market. The leading companies are Connex (owned by MobiFon S.A. - 51% market share) in April 2003 and Orange (owned by MobilRom S.A. - 46% market share). Connex and Orange cover each over 70% from the territory and over 90% from the population (potential clients). The estimated revenues of all operators amounts to EUR 880 million in 2002, growing to EUR 985 million in 2003[213], or the equivalent of roughly 2% of the GDP. Two operators are offering GPRS (2.5 G/GSM900) services used by several thousand subscribers since January 2001. Currently, an alternative to GPRS is available, provided by Zapp (owned by Telemobile S.A.), on CDMA 20001x on 450 MHz technology allows data transmission at superior rates (up to 153 Kbps). Some progress has been recorded recently in regulation regarding the UMTS networks (see Chapter F). MCIT is expected to launch the tender for 3G licences during 2004, but for the moment only one operator (Orange) announced the intention to bid[214].

In July 2003 Atlas Telecom Network Romania launched the first "limited mobility network", using DECT (Digital Enhanced Cordless Telecommunication) technology, developed by Alcatel. This technology, introduced for the first time in the world only at a town scale (Oradea city), is expected to extend to 19 towns by 2005.[215]

[212] The Portal no 29, December 2003, http://www.theportal.ro
[213] Daily newspaper "Cotidianul", 7 April, 2004
[214] Business Magazine InvestRomania, no 35, Nov. 2003
[215] Week Romania, July 16 2003.

However, the mobile penetration[216] of only 26% at in June 2003 is the lowest in ACC, far from the next country Bulgaria with 35%[217] and the rates of growth do not seem impressive, either (see graph E3.). The most recent estimates claim at the end of first quarter of 2004 a number of mobile subscribers of 7.35 million, or a penetration rate slightly above 30%[218].

Graph E3.: Mobile penetration in Candidate Countries



Source: IBM (2003b)[219]

Still, during the first half of 2002, mobile telephony attracted around 10 times more new subscribers comparing to fix telephony (RITI (2003)). Programs are put in place to boost the development of public access points, whose number remains nevertheless below 0.1 per 1000 inhabitants, half of the candidate countries average.

The grey market[220] for mobile phones decreased to 40% of total mobile acquisitions in 2002, from 45% in 2001 and 70% in the previous years.

E.3.3. Cable television

The cable television had a remarkable evolution in Romania since its liberalization in 1992, accounting for 3.750 million subscribers in 2003, with 50% of the households being connected to the CATV, as against 32.40% in 1999 (MCIT (2003)). International comparisons rank Romania on the 5th position among the candidate countries in what concerns the CATV penetration[221]. The

[216] Mobile penetration rate is defined as the number of mobile subscriptions per 100 inhabitants
[217] According to the MCIT (2004), the mobile telephony penetration rate at the end of 2003 rose to 28.5% (6 229 675 subscribers)
[218] According to the declaration of Minister of Communications and Information Technology in daily newspaper "Cotidianul", 7 April 2004
[219] NIS data for 2002 in Romania is 23.5
[220] Here, grey market refers to direct transactions between people.
[221] Source: IBM (2003a). Data as for December 2002

successful market penetration of CATV was favoured by the low tariffs (3.2 EUR/ month). Nevertheless, the penetration rates are very different for urban and rural areas: for 2001, the last data available on urban-rural breakdown while the urban penetration rate was 78.5%, the rural penetration rate stood at only 17%[222]. Home pass reaches 81% of the households and could be connected with a minimal cost of the local loop.

Additionally, 9% of the TV owners are using satellite.[223]

Although Romanian CATV is the second largest cable industry in Central and Eastern Europe, until recently the use of cable TV to supply access to the Internet and digital services was not widespread (EC (2004)). Nevertheless, the number of Internet connections through CATV increased by 50% only between 2002 and 2003 (MCIT (2004)).

Two Multiple Subscriber Organisations, financed by foreign investments and covering around 45% of the market dominate the cable industry. The leader is RCS&RDS with a market share estimated at 22-24% (after the acquisition of another top actor on the market, TerraSat, in the last quarter of 2003), followed by the former market leader, Astral Telecom with an estimated market share of 20%. The tendency of concentration on the CATV market continues: a consortium formed by RCS&RDS and Astral Telecom announced early December 2003 the intention to buy the forth competitor, FX Communications[224].

The large number of TV channels contributed also to the high rate of cable penetration: there are nine Romanian, eight foreign and two musical television channels. In 2000 there were 74 public and 104 private regional stations, situation that made some media analysts believe that private television has reached its saturation point (OBG (2003)).

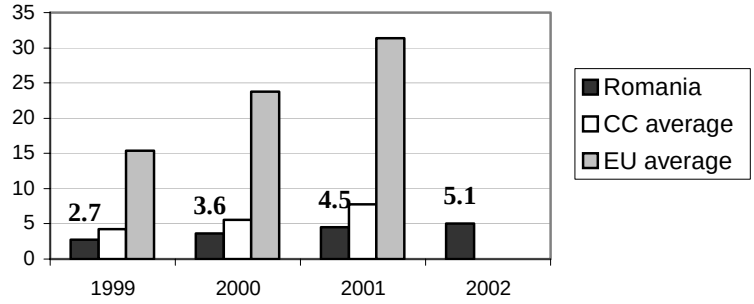
E.3.4. Internet Services Providers

In Romania there are now almost 400 companies acting as Internet Service Providers, 50 of them as countrywide companies[225]. The number of ISP companies increased rapidly from only 210 in 2001 (MCIT (2004))just as well as the number of *.ro* domains.

The competition contributed to reducing the price and increasing the availability of the service for both the population and the companies. The number of Internet users increased steeply over the recent years (see graph E4.).

[222] According to OSF (2003), in 2003, the cable penetration reached 80% in urban areas and 30% in rural areas;
[223] http://www.mcti.ro
[224] http://www.agora.ro/news
[225] http://www.mcti.ro

Graph E4.: Number of Internet users per 100 inhabitants (%)



Source: Authors' calculations using EURstat data for 1999-2002, NIS data for 2002[226]

Table E9.: The evolution of the number of *.ro* domains

Year	Number of domains (at the end of the year)
1993[227]	5
1994	19
1995	24
1996	410
1997	3 008
1998	6 167
1999	4 085
2000	16 639
2001	30 971
2002	45 000
2003	57 500
2004-Q1	62 000

Source: National Computer Network (the institution regulating the .ro field) in eWeek Romania, February 11th, 2003, and MCIT data

One of the obvious barriers in spreading the Internet usage is, besides the cost of the infrastructure, the affordability of the Internet connection. The average spending on Internet access by a user as a % of monthly income is in Romania as high as 7%, as compared with 4.1% the candidate countries average (EC (2004)). So far, at least for the households, the dial-up

[226] Available data on Internet usage in Romania seem rather controversial. According to SIBIS (2003b), as in 2002, 81% of population do not use the Internet, 6% are occasional users, 3% have a low usage of Internet, 7% a medium one and 3% a high one. Also for 2002, EURSTAT gives an estimation of 5.1% of population being Internet users. The methodology used by EURSTAT is compatible with the data provided by the NIS. In particular, NIS includes as Internet users only persons accessing the Internet from work, home or school, excluding therefore the users from Internet Cafes or other places. Having mentioning this methodological aspect, the differences between various sources are less significant. For the year 2003, OSF (2003) estimates the share of population using the Internet in 2003 at 11.1%, with 5% using it more than 15 days per month. The MCIT (2004), as well as EC (2004) claims a share of 16% regular users of Internet, with 23.8% occasional users.

[227] At 26 February 1993, IANA accepted the membership of Romania and the .ro appellations

connection is the most common. According to the same source, the cost of 20 hours peak dial-up cost as % of monthly households income is 14.4% in Romania, as compared with the average 9.8% for the candidate countries region. Only in Bulgaria, Poland and Slovakia, peak hours tariffs are higher.

Up to now, broadband communications in Romania are not really widespread, due to poor services and high prices. The RomTelecom offer on broadband communication is now oriented on 56Kbps ISDN and 2Mbps PBX Trunk. For the moment xDSL is not available (in most part of the country), but other technologies emerge instead. Mobile phone service providers (Mobifon, Orange, Cosmorom, Zapp), and many others (Alvarion's Breeze, ACCESS, PCNET), offer wireless broadband access (SIBIS (2003a)).

The number of Romanian hosts (0.2 per 1000 inhabitants in April 2003) is 4 times lower than the ACC average (IBM (2003b)). According to a MCIT quoted by EC (2004) there are 28 securised servers per million inhabitants in Romania.

E.4. IST in transport

Several important IST projects have been developed in transportation field, both as national programs (see Chapter B.4.) and as private initiatives, among which:

- **"The integrated electronic system for transport optimisation and monitoring support for e-business in transport area" - SOMCET-Net** is an integrated and interactive support for vehicle monitoring, route optimisation and an interactive tool for electronic commercial transaction (demand, supply, and orders) developed by National Institute for Research and Development (ICI – the coordinator of the project) and CEPETET (research centre for electronics in transport area from the Polytechnic University). It is intended for the use of the National Union of Road Transportation (representing more than 1,800 carriers), providing Web services for all agents involved in transport area (customers or providers). The main uses of the system are: the management and selection of transportation demand, supply and orders, based on selection criteria input interactively by the user; assisting the negotiation and contacting between business partners; automatic route optimisation with route visualization on the digital map; and location and real time survey of the means of transportation (using GPS, GSM, and GIS technologies)[228]. Together with the e-acquisition system, SOMCET-net has been designated as an example of good practice at the eEurope competition[229]
- The Rompetrol group is launching a completely **automated system for monitoring vehicles - "Fill&Go"**.[230] The investment reaches 6 million dollars, for implementing the system all throughout the Rompetrol network by end 2004. Orpak Industries (Israel), the worldwide leader in the field, contributed to the project. This system is automatically recording, centralizing and storing data from the vehicles (number of kilometres, hours of engine operation, date and hour of fuelling etc.) and sends it via the Internet the manager of the convoy in the form of reports with graphics. "Fill&Go" ensures the total and real-time control of the fuel consumption, and increases the efficiency of the vehicles convoy and labour force,

[228] http://www.ici.ro/ici/portofoliu/somcet-net.html
[229] eBusiness, 8 July, 2003.
[230] http://www.business.rol.ro

while preventing fraud. Daily information on the all transactions completed using the "Fill&Go" can be accessed online via the "Fill & Go Manager".

- **IRIS project** developed with the national Railway Company is an electronic system providing information on the technical aspects related to railway transport facilities in Romania. IRIS offers the largest technical database in Romania.[231]

E.5. IST in financial services

E.5.1. ePayment instruments

Over the period 1995-2002, 470000 cards have been issued in Romania, out of which 4100000 were still active at the end of the period (meaning 18% of the population). In 2001 the number of credit cards had the highest growth rate (15%) over the Central and Eastern European Countries.[232]

In 2003, the number of active cards increased with more than one million (by 25%) and the number of card accounts increased to 5 million at the beginning of 2004. The three largest issuers (BCR, Banc Post and BRD) covered at the end of 2003 76% of the total cards and 65% of the ATMs, respectively 71% POSs. Also in the last trimester of 2003 the first virtual shops[233] accepting on-line payments using the ePay service[234] provided by Bankpost were open.

The number of ATMs reached 966 in 2000 and 1060 in 2001 (NIS (2002c)), or one ATM per 17 300 inhabitants[235]. On November 15, 2003 the national ATM network had over 2511 operating units, as against 1900 in November 2002. Out of these, 2434 are located in the urban area[236] and 77 in the rural area[237]. At the end of the first quarter of 2004, there are 2600 ATM points and 9300 POS, the last having a rate of growth of 200% compared with 2002. The growth in issuance of user cards was partly due to the fact that state institutions were compelled to pay salaries via cards**.** However, the cards themselves are used almost exclusively for withdrawing cash from the ATMs[238], also because few traders accept them[239]. Therefore, the potential users' pressure in this direction is not high. The Romanian market represented at the end of 2002 an estimate of 4% of

[231] http://www.iris.umd.edu/adass/proj/closed/romania.asp

[232] Declaration of Adriana Ticau, State Secretary for Information Technology, within the conference "The Card – a Payment Instrument for Utilities" in February 2003. (http://www.mcti.ro)

[233] http://www.kogaion.ro

[234] http://www.bancpost.ro

[235] Hungary registers one ATM per 4 100 inhabitants (source: Roland Berger Strategy Consultants in eWeek no 12/2002).

[236] Even at the level of urban areas, the availability of ATMs is very dispersed. In 36 urban towns, as considered by the Law 351/2001, there is no operating ATM. In many cases, the closest town with an ATM is 30-40 kilometres away. Out of these towns, six have a population above 10000 inhabitants. The 36 towns are inhabited by 270000 altogether (over 2% of the total Romanian urban population). It was not until November 2002 that all municipalities had at least one ATM. BCR is the only Romanian bank that has ATM in every municipality (Source http://www.no-cash.ro).

[237] http://www.no-cash.ro

[238] At the beginning of 2003, an estimated 80% of the cards were used for cash withdrawal from the ATMs (source: RITI (2003)

[239] According to a survey of MasterCard for Eastern Europe that analyses data for the first quarter of 2003, the number of shops accepting MasterCard and Maestro cards is 15 times lower in Romania than in Poland and 5 times lower than in Czech Republic and in Hungary. RITI (2003) estimates that the number of shops accepting cards as mean of payment was 6900 at the beginning of 2003, with only 4000 having POS terminals installed.

total deals with credit cards in Southeast Europe, and 20% of transactions made through debit cards (OBG (2003)).

According to eFinance 2003 – Gfk, Romania's 44% of the card holders use Maestro, 29% use Visa Classic in ROL, 26% use Visa Electron, and 10% use Eurocard and Mastercard in ROL.

A measure recently passed by the Government (Law 250/2003) stipulates that it becomes mandatory for all the traders with sales exceeding 100 000 EUR to accept payment by card starting July 2003. Another regulation (EO 193/ 12 December 2002) institutes as compulsory for the public utilities companies and for the institutions that cash various penalties to accept card payments beginning with January 1st, 2004. However, the most important impact of the ePayment development relates to its influence on eCommerce. In fact, the lagging behind of the ePayment systems has been, until recently, the major barrier in the further development of the eCommerce (RITI (2003)). More precisely, the major obstacles have been identified in the lack of a functional clearing system between the banks (planned to start functioning only in 2004 at the earliest), and lack of supply of an insurance service covering transactions made by cards.

Therefore, there are limited incentives for the banks to develop systems that would allow on-line payments by means of cards issued by other banks, due to the low commissions they can charge and the high and uncovered risk related to real time card authentication (RITI (2003)).

Nevertheless, the banks, as well as the on-line traders have promoted a series of related financial services in order to support the development of eCommerce, as follows:

- In March 2003, The Romanian Commercial Bank introduced the first **eCommerce card**, which allows online transactions, based on debit operations and exclusively meant for Internet transactions (OBG (2003)).
- **Payment from Romania to foreign online stores** (RITI (2003)): using cards issued by Romanian banks and dedicated to the Internet payments abroad[240] (Taifun card issued by BancPost which has an associated virtual card– Taifun Virtual, VISA Virtual - issued by Banca Romaneasca).
- **Payment from foreign countries to Romania online stores** (RITI (2003)): through various on-line payment methods[241]:
    - Possibilities to make payments on-line by credit card for the Romanians located abroad by the shop opening an account with a foreign processor.
    - Possibilities to make on-line payments for the Romanians located abroad by bank transfer – by the shop opening an account with a bank transfer site.
- **Micro-payment systems** (RITI (2003)) – developed to allow for the payment of small amounts of money especially for the access to the content of certain sites – usually in the form of value added SMS.
- The **new payment system using the 3D Secure** standard Romcard is under testing.

[240] According to RITI (2003), nevertheless, due to multiple frauds originated in Romania, these cards are sometimes not accepted by the foreign traders (e.g. http://www.amazon.com/).

[241] The spreading of this methods is prevented nevertheless, by high charges required by the Romanian banks and the accounting problems given the different accountancy standards

E.5.2. eBanking

Recent data show that in 2002 only 1.79% of the Romanian population uses the Internet to conduct online banking or to buy financial products (SIBIS (2003a)).

This percentage increased only marginally during 2003, to 2% (EC (2004)) despite the development of eBanking after the adoption of legislation regulating the regime of electronic instruments in the early 2003 (see Chapter F).

Equally, Romanian companies have a very low use of Internet for banking and financial services (12% of the enterprises with Internet access, as compare with the candidate countries average of 46%).

After the adoption of the legislative framework, up to the end of the first quarter of 2004, the Ministry of Communications and Information Technology has issued 31 certificates for the use of electronic payment instruments, for 23 banks. Out of the 31 certificates, 15 were issued for Internet-banking applications, 14 for homeBanking and 2 for Mobile banking[242].

The first results soon became visible. At the end of the first half of 2003, almost 2 million Internet transactions[243] were registered in the banking system, with a cumulated value of over 151 thousand billion ROL[244] and over EUR 2 billion[245]. From these, the number and value of the Internet banking transactions conducted by the card holders increased significantly during 2003: by 26,4% (QII/QI); 39,3% (QIII/QII) for the number of transactions and by 36,1% (QII/QI); 45,6% (QIII/QII) in value. The average value of a transaction increased by 22,4% (QII/QI) and 17,3 (QII/QIII)[246].

E.6. IST in postal services

The Romanian postal services provided by the state-owned company Posta Romana have been reformed and modernised, including through the introduction of modern technology in assisting their basic functions.

Several services have been developed as SkyPak, eOrder or ePost (the later being an e-mail service provided by 941 offices – approx 9% of the total number of offices). Additionally, Posta Romana offers through its offices cheaper Internet access (280 offices – approx 3% of the total number of offices). One important innovation was the introduction of a computerised system of monitoring postal transmissions, "Track and Trace". The system allowing to track parcel post was introduced in February 2002, and monitors currently internal and external registered mail, internal and external declared value mail and parcel services[247].

[242] http://www.mcti.ro
[243] Card holders only have made approximately 16200 Internet banking transactions – including Internet shopping – in the first nine months of 2003, as against 6310 transactions recorded in 2002.(Source: http://www.no-cash.ro)
[244] the equivalent of EUR 4 million
[245] http://www.agora.ro
[246] http://www.no-cash.ro
[247] Data from InvestRomania, November 2003, no. 35 and http://www.postaromana.ro

Beginning with 2003 Posta Romana initiated collaboration with Fiscal Authorities, which will allow payment of taxes, fees and fines at computerized post offices.

Recently, Posta Romana signed a three-parties memorandum with China Unicom and ZTE Corporation in view of development of an alternative telephony operator (see Chapter B.4.)[248].

The postal infrastructures have been also used to supply modern services made available through ICT, in particular the online money transfer services:

- ON-LINE is offered by Posta Romana;
- Moneygram service offered by Commercial Bank of Romania and "Ïon Tiriac" Commercial Bank;
- Western Union is offered by BRD-Societe Generale, Banca Romaneasca, BancPost and the state-owned postal company – Posta Romana;
- Eurogiro through BancPost and Posta Romana.

E.7. IST in public administration

E.7.1. The ICT penetration in the public administration

The basic indicators regarding the ICT endowment, the Internet connections and the ICT specialists in the public administration are summarised in Table E10. Estimates indicate that in 2001 21.5% of the employees in the public sector used ICT tools in their work.

Table E10.: Indicators of ICT penetration in public administration

	1998	2001	2002
Number of ICT specialists per 100 employees (in public administration)	1.1	0.8	0.9
Number of PCs per 100 employees (in public administration)	4.6	11.4	14.2
Number of Internet connections per 100 employees (in public administration	2.7	4.2	9.8
Number of Internet users per 100 employees	NA	NA	25%
Share of public administration units with Internet connections (except local authorities)	NA	NA	80%

Source: Authors calculations based on NIS data. Data for 2002 was calculated using 2001 employment.

Regarding public institutions, all the state ministries, 74% of county councils and 98% of the municipalities have their own website. 60% of the municipalities have implemented informational systems for payment of local taxes (MCIT (2004)). Nevertheless, the same document (i.e. the above-mentioned strategy) deems as low the number of software applications run in the public institutions, as well as an inappropriate management of data and information.
The reform of the public administration through IST instruments is ongoing. Among the most relevant projects, the feasibility study for the data communication network for the public administration (NetPad) has been finalized, but it is still waiting for financing[249].

[248] InvestRomania, November 2003, no. 35

As the estimated weight of public servants with computer skills is of only 30%, the governmental strategy regarding the informatisation of the public administration devotes an important part to IT training. The GD no.1007/2001 approved The Strategy for the informatisation of the public Administration which is stating that 250 000 public employees will attend IT courses, for acquiring basic or advanced IT skills.[250] However, it also stated that this would occur only in the limits of the allocated budget. Moreover, the methodological norms for this law were introduced only in 2003 (Order of the Public Administration Minister no.252/2003).

Out of other projects aimed at strengthening the institutional capacity through ICT-enabling technologies, the following are worth noting: the **informational system for licences for international road transportation**; the **electronic bid program** assisting the privatisation of state companies; **e-Referendum** project referring to public opinion pools which are part of a referendum framework, at national or local level.

E.7.2. The IST-enabled supply of public administration services

For insuring an integrated view on the supply of online public administration services Romanian MCIT organised a national portal for eGovernment services, the National Electronic System (NES) available at http://.e-guvernare.ro.NES was the only European eGovernment application that received the World Summit Award (WSA) at the World Summit for Information Society (WSIS), Geneva in December 2003[251] (see Chapter B.4.).

E.8. IST in health services

The IS penetration in hospitals is low, as yet another consequence of the low budget allocated for health services. However, several projects have been and are being developed in order to ensure that the health services benefit form the use of information systems. For example, as a result of the participation of the medical institutions in the system of electronic public acquisition, they closed nearly 30000 bids for which the savings reached over 16% (up to 90% in some of the cases).[252]

MCIT is in the process of developing a health gateway (see Chapter B.4.). On the other hand, MCIT is contributing to making the national system for emergency calls 112 functional, at least for Bucharest, Prahova Valley (mountain resorts area) and the Romanian seaside.

A regional system for emergency medical services (REMSSy) has been operational since 2000, and is now available in 6 counties (out of 43). It has been financed by the Government of Switzerland and created by ROMSYS. It aims to optimise the use of material resources, of specialists, as well as the administration of the ambulance system. This system has been selected for eHealth 2003 competition (that took place in May 2003 in Brussels).

Another project selected from Romania was **Elias-HIS** program, implemented at the University Hospital C.F. WITING. Its objective is to provide medical care by ensuring an extensive mobility

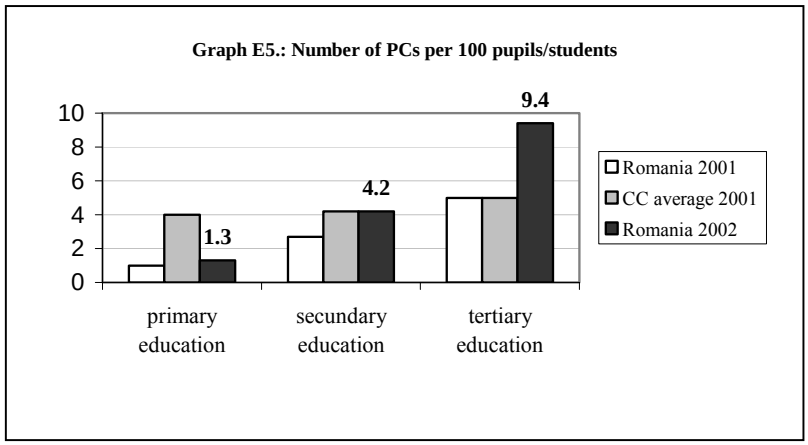
[249] http://www.ecdl.org.ro
[250] The courses are intended to be ECDL type (European Computer Development License) which was adopted as a standard by many European governments.
[251] http://www.mcti.ro
[252] http://www.mcti.ro

of medical staff, allowing doctors to be rapidly informed of the evolution of the patients' state. This system was developed in the framework of a contract with Ministry of Research and Education (RELANSIN National Program for Research and Development), benefiting of the financial support of the Familia M H Elias Foundation and of the technical support of the National Institute for Research and Development in Informatics and ICI (the National Institute for R&D in Informatics), who implemented the system.[253]

E.9. IST in educational services

E.9.1. ICT endowment in the educational sector

After several years of uncoordinated measures and projects meant mainly to ensure a minimal access to ICT in selected (mostly tertiary) educational centres, in 2001 the Romanian Government made a first decisive step in a systematic approach of improving the ICT infrastructure. Governmental decided the introduction of 500 000 computers in the Romanian schools and high schools (the equivalent of rising the number of PCs per 100 pupils in primary and secondary education by approx. 6, accompanied by the provision of Internet connection and educational software. The value of the project is about USD 260 million and is expected to be finished at the end of 2004[254]. By the end of 2003, within this programme, 1220 schools received over 30000 computers, integrated in 1220 networks with 1220 servers (MCIT (2004)).



Data source for Graph E5: NIS for Romania 2002, EC (2004) for the rest of the countries.

The number of computers per pupil increased significantly in 2002 as compared with 2001, especially in the tertiary education (see graph E5.). As a characteristic feature of Romanian program of increasing the ICT penetration in the educational system, the penetration rates per pupil for different levels of education show a more pronounced dispersion than for the average for the candidate countries in favour of tertiary education. This unbalance is expected to decline, as more resources were oriented further towards undergraduate education[255].

[253] http://www.ici.ro

[254] Communications and Information Technology Report ROMANIA, February 2003.

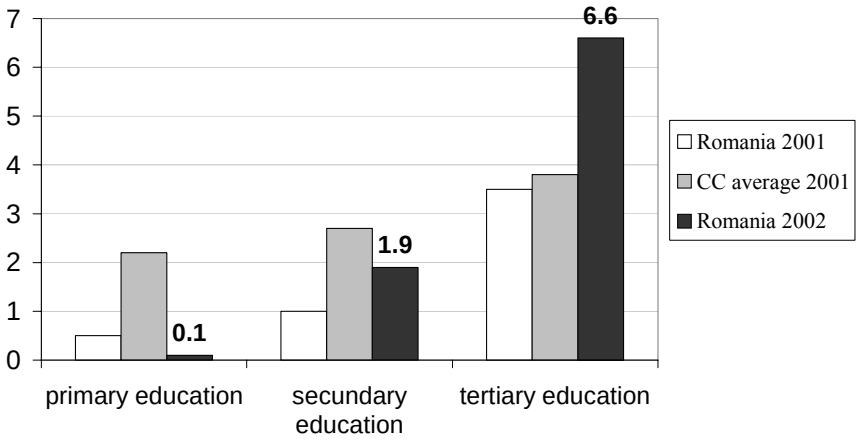
[255] At the end of 2003, the number of PCs in high schools (representing only a part of the secondary education) reached 51 000 meaning 9.7 per 100 pupils (Source: MER).

During 2003, is the endowment in the secondary education that saw the highest increase reaching 10.4 PCs per 100 pupils. With this progress, Romania is now among the countries in central and Eastern Europe with the highest level of endowment in the secondary education, with only Hungary and Cyprus reporting comparable levels (EC (2004)) (the region average is 6.5). Romania is still lagging behind in the endowment of the primary schools, at less than half of the candidate countries average, but the situation is expected to change in the near future given the scheduled investments.

E.9.2. Internet penetration in the educational sector

The same program ensured a significant increase in the Internet penetration in schools. As in the case of PCs the penetration rates are much higher for the tertiary education (see graph E6.). Moreover, according to the eEurope+ indicators for Romania, the presence of high speed Internet is almost insignificant (around 0.2 per 100 students and none for pupils).

Graph E6.: Number of Internet connections per 100 pupils/students



Data source: NIS for Romania 2002, EC (2004) for the rest.

This is reflected also in the distribution of the share of educational units connected to the Internet on level of education, as at the end of 2002 (see Table E11):

Table E11.: Internet penetration in the educational system

	Undergraduate, from which:			Tertiary
Share of educational units connected to the Internet in 2002	**11.93%**	Primary	Secondary	**100.0%**
		5.3%	**72.0%**	

Source: Data provided by NIS

Nevertheless, following the progress in 2003, the gap between undergraduate educational units and the tertiary educational units connected to Internet diminished, as at the end of 2003 around 20% of the undergraduate units are connected to the Internet.

E.9.3. From ICT endowment to effective use of IST in the educational process

About 1500 high-schools and 6400 schools in Romania will be provided with IT laboratories during 2001-2004 period[256], as part of the first action line called "Speeding up access to computers and Internet in Romanian schools", included in the "Computer Assisted Learning" program of MER (see also Chapter B.4.). This is seen as an attempt to address the limitations created by the fact that until very recently the computer skills training was only a distinct subject and a starting point towards introducing the **computer assisted teaching** methodology in schools, the IT laboratories being almost exclusively designated for computer assisted teaching. MER selected a number of pilot high-schools for the implementation of the project. The teaching materials are flexible, supporting a wide diversity of multimedia content, easy to enter and manage. The available test types are more diversified and there is a stronger support for electronic testing during classes as well as for computer-assisted teaching. [257] The system introduces also electronic communication tools dedicated to the educational system (communication between pupils, teachers, inspectors, parents etc.) [258].

Moreover, the national education network (RoEduNet) was created in 1993, as an open structure allowing the access of all the education units and of all cultural and scientific NGOs (see also Chapter B.4.). RoEduNet is an organization and at the same time a data communication system. The aim of this technical establishment is to offer the participants - universities, cultural and scientific non-profit institutions - the means to communicate with each other, as well as to have access to Internet.[259]

E.10. IST in households

E.10.1. ICT endowment of households

The main indicators of ICT endowment show that over the last years the penetration of ICT in households increased substantially (see Table E12.).

Table E12.: ICT penetration rates in households

	2001 (%)	2002 (%)	2003 (%)
Fixed telephony	45.8	52[260](*56.4*)*	58.1*
Mobile	10.5	13.6	NA
Computers	4.5	6.0	NA
Cable	NA	44.6*	50.7*

Data source: Data provided by NIS (*) MCIT (2004)

Nevertheless, in a regional perspective, Romania ranks low in terms of ICT penetration in households. Thus, according to IBM (2003b) the number of 52.7 fixed lines per 100 inhabitants registered by Romania in June 2003 was the lowest for the candidate countries. However, related

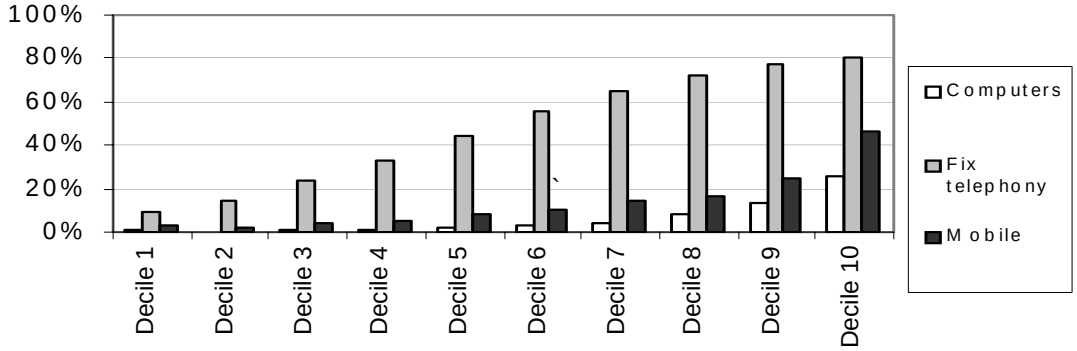
[256] A project assignment memorandum appointed: SIVECO Romania to be software integrator, COMPAQ Romania, HP Romania and IBM Romania to be hardware providers.
[257] For the pilot phase the main educational content provider is SOFTWIN.
[258] http://www.siveco.ro
[259] http://www.roedu.net
[260] Data provided by the INS is very close to the data in IBM (2003b)

to the same period of the previous year only in Romania and Malta the fixed telephony penetration in households increased.

An analysis of penetration rates by deciles of revenues in 2002, shows that the penetration rates seem highly dependent of income, especially for mobiles and computers. In fact, for these two indicators there are huge differences between the 9th decile and the 10th (see graph E7.)

EC (2004) reveals the fact that, in what concerns the affordability of computers, Romania ranks the fourth worst position among the candidate countries, with only Lithuania, Latvia and Bulgarian citizens needing to spend more, in terms of average revenues, for a standard PC[261]. In this respect, at a price equivalent with 196% of the average revenue, the affordability of a PC is half in Romania that when compared with candidate countries' average (91% of the average revenue).

Graph E7.: Share of households with computers, fixed and mobile telephony lines, by income deciles (2002)

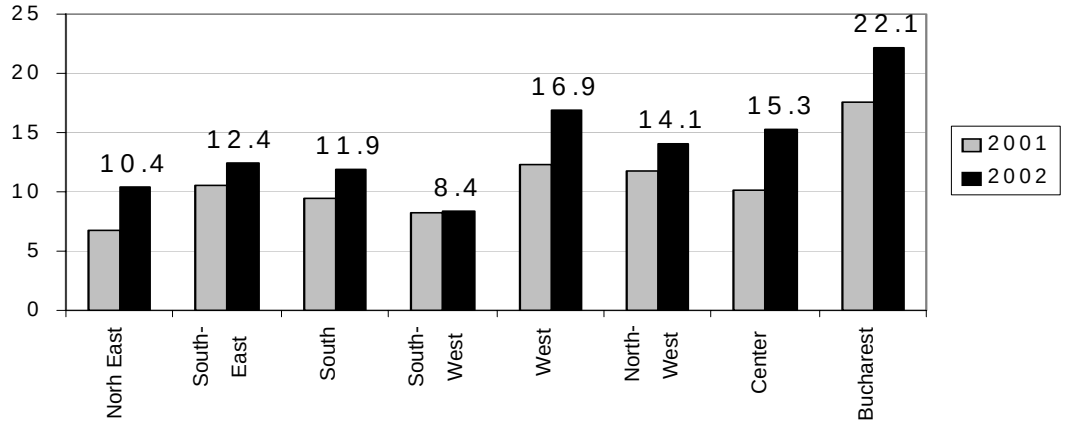


Source: Authors' calculations using NIS (2003e)

There are also significant regional differences regarding the telephony (see graph E8.) and computers penetration rates (see graph E9.), and, most worrying, a divergent trend can be noticed. This is a sign of an accentuating digital divide.

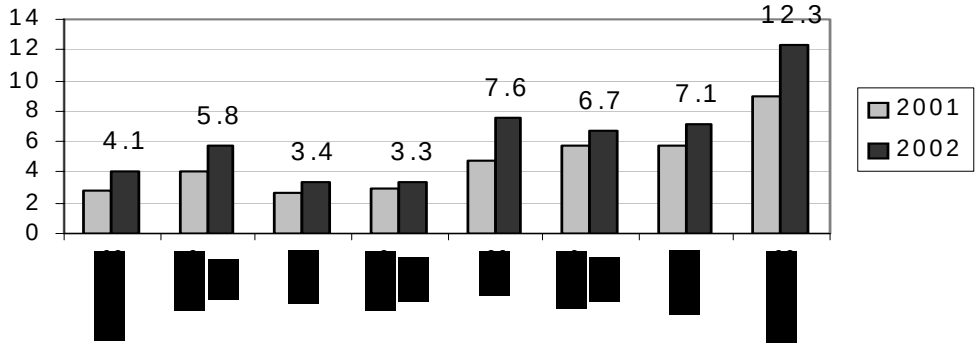
[261] EC (2004) defines a standard PC as a Pentium IV or equivalent, with DVD/RWCD drive, 256 Mbyte memory, 15 inch monitor, Internet connection

Graph E8.: The share of households with mobile, by region (2001-2002)



Source: Authors' calculations using NIS (2003e)

Graph E9.: The share of households with PC, by region (2001-2002)

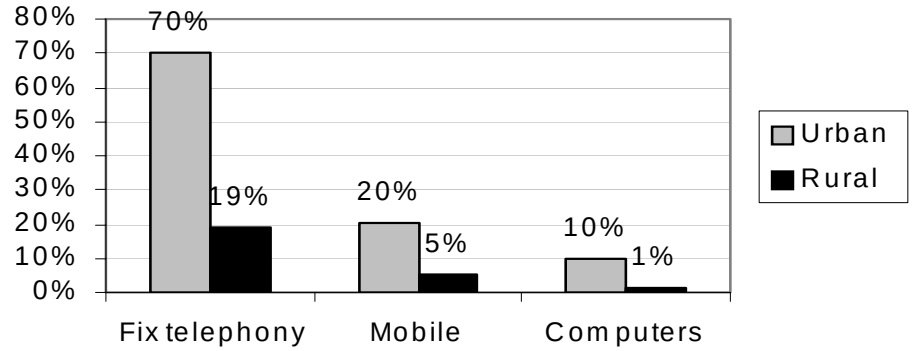


Source: Authors' calculations using NIS (2003e)

Nevertheless, the regional dispersion seem to reflect the highest gap at a rural-urban level, the major ICT penetration rates in urban areas being up to ten times higher than in the rural ones (see graph E10.)[262].

[262] According to OSF (2003), the Internet penetration reached 9% in urban areas and 1% in rural areas;

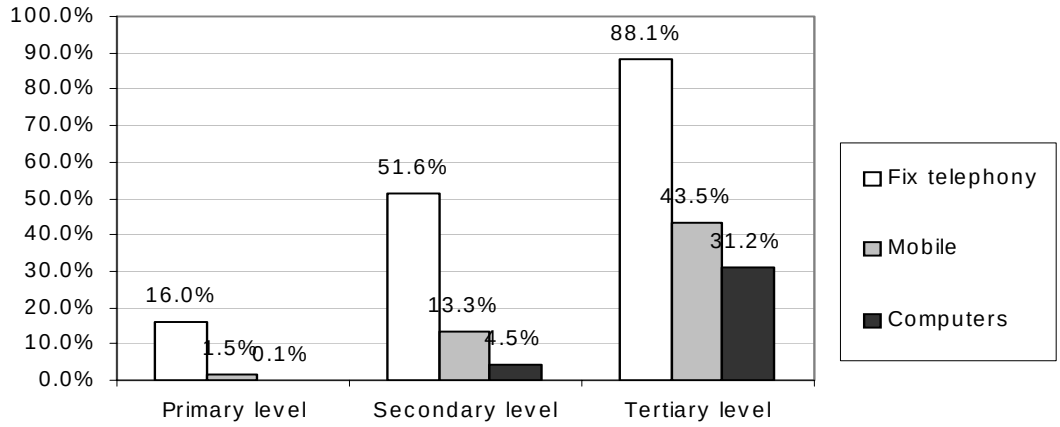
Graph E10.: Share of households with fix telephony, mobile and computers in 2002, in urban and rural areas



Source: Authors' calculations using NIS (2003e)

The level of education of the head of household seems a determinant factor for the ICT endowment of households (see graph E11.).

Graph E11.: Share of households with fix telephony, mobile and computers in 2002, by education level of head of household



Source: Authors' calculations using NIS (2003e)

As well as the endowment with PCs, the Internet penetration in households increased rapidly from 2.95% of homes having an Internet connection installed in 2001 to 4.5% in 2002[263]. According to the survey run for EC (2004) in 2003, the share of population with a PC connected to Internet in at home was 7%. This still places Romania on the last position among the candidate countries, with slightly more than 1/3 of the region average (19%).

[263] NIS data

E.10.2. Internet and computer users profile

The OSF (2003) estimates the share of population with computer literacy at 21%. Out of the persons that are computer literate, most of them use computers mainly at work (35%), followed closely by the use at home (29%). Only 11% of the computer literates use it at school, and other 16% at the Internet cafés or other places (OSF (2003)). In the same time, 35% of the computer literates use mostly the computer for reasons related with their job, but 44% as a source of information or for entertainment. This would suggest that while the computer remains a significant working tool, it is in the same time, for a considerable share of population with computer literacy, a part of their households' everyday life. The entertainment related purposes seem to prevail in the use of Internet also. More than a cultural pattern this might be interpreted equally as an statistical effect of the underdevelopment of other alternative uses as banking or even of informational resources in the Internet.

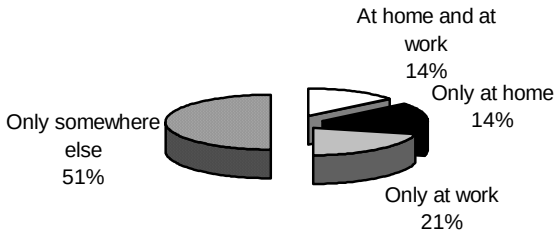
Table E13: Reasons for Internet usage (% of Internet users, Q2-2003)

	Romania	Candidate countries average
Use for information of relaxation		
- for games and music	40	38
- for information	78	84
Use for communication		
- send/receive email	77	77
- chat	33	32
Use for eBanking and other financial services		
- eBanking	2	23
- other financial services	1	3

Source: EC (2004)

Also the share of non-occasional Internet users accessing the Internet at home seems significant (see graph E12.).

Graph E12.: Non-occasional Internet usage by location



Source: Authors' calculations using SIBIS (2003a)

Alternative sources confirm the rather high share of Internet users from home. In March 2003, MCIT released on its web site a pool regarding the places from where Romanians most often access the Internet. According to the results, 48% of those who participated are connected to the Internet at the office, and 32% at home. Only 7% people access the Internet from an educational institution, and 9% from Internet cafés[264,265]. The Info desks are used in proportion of 2%, and the same percentage of people access the Internet from other locations.

Nearly half of the Internet users access it mainly for e-mail[266]. Nevertheless, e-mail usage frequency in Romania is the lowest in candidate countries: 9% of the Romanian population use the e-mail, of which only half have high or medium communication intensity, according to the SIBIS survey. The Open Society Foundation survey estimates the share of population using the e-mail in 2003 at slightly over 9%, with less than 4% using the e-mail more than 15 days per month.

As a specific feature of Romanian society, a significant divide between rural and urban areas is to be observed in what concerns also the use of ICT (see Table E14.).

Table E14.: Share of population that:

	Rural areas	**Urban**
Have computer literacy	8%	31%
Use daily the computer	1%	10%
Use daily the e-mail	0%	3%
Use daily the Internet	0%	4%
Have use the chat in the last year	2%	9%

Source: OSF (2003)

There is also a lack of Internet culture in Romania – even from the persons with computer literacy, an estimated share of 42% (SIBIS (2003a)) in 2002 and 41% (OSF (2003)) in 2003 never use the Internet.

30% of population does not even know what Internet is. Moreover, out of the persons declaring that they do not use the Internet but have heard of it, 86% does not intend to use it in the next 6 months. These results suggest not only a weak Internet use but also a strong digital divide (SIBIS (2003a)). The reduced number of households and schools with access to Internet gives motivation for such a high percentage of people unfamiliar with the Internet usage in Romania. Less than 5% of the Romanian population never heard of the Internet or accessed it from home (SIBIS (2003a). Almost half of the occasional Internet users consider that "Internet requires advanced computer skills", which is one of the highest percent in ACC.(SIBIS (2003b)). On the other hand, 34% of the Romanian Internet users consider that they would feel socially excluded without Internet. In what concerns other barriers to Internet consumption as 'Internet is not easy to get access to', 'Internet is too time consuming', 'Internet lacks useful or interesting information', and 'Internet

[264] According to the MCIT (2004), there are 6000 Internet Cafés in Romania

[265] These results differ from those of EC (2004) according to which 33% of the respondents access the Internet in the workplace, 40% at home, 13% from a educational institution and 26% from an Internet Café

[266] Source: Gfk 2002 (survey on 859 Internet users) in eWeek Romania, 11 February 2003

is not something for me', the Romanian population, who have ever heard of the Internet, in less extent perceive those barriers as EU/NAS average (SIBIS (2003a)).

Conclusions

The level of ICT penetration rates is generally reflecting the technological appropriation specific to the current development stage of the Romanian economy as a whole, as well as the rural-urban gap.

Communication technologies, although firmly adopted and in use, are still much behind the ACC level, their evolution being highly dependent on income. The supply already reached a certain stage of development, but important uncovered areas for fixed telephony and cable in the rural zones still exist. The large number of cable connections mirrors the income restrictions for alternative time spending, and are used almost exclusively for TV channels.

The situation is much worse in the IT field: until 2000 at the national level the computer use can be considered as sporadic, especially at the level of enterprises and households. Since then the number of computers began to increase in this areas but the pace for the enterprise sector is still hesitant. In addition, the mentioned low level of income, another restriction is rose by the small share of population with computer skills.

The late start is reflected of course in the Internet use, which seems to be relatively quickly implemented after the introduction of computers, but limited by it.

The education system which achieved a good computer and internet/pupil ratio, represents an important push for increasing the IT penetration. It is also the case for the project in eGovernment already implemented. These two factors are important drivers of IT penetration in Romania. Unfortunately, the general economic context is preventing a faster reaction from the enterprises and households, and it is unlikely that without more support for IT demand of these categories, Romania might hope for a rapid convergence with EU. Paradoxically, given the current number of computers, the eGovernment has as a side effect deepening the digital gap.

As all the eServices are dependent of the basic infrastructure (computers and Internet access) their emergence has been also delayed: eCommerce and eBanking are almost absent, but there are signs that the level of demand is reaching the point of stimulating a more consistent supply.

SWOT

Strengths	Weaknesses
• ICT projects implemented in transport and postal services; • Relatively large number of computers and Internet connections in higher education. Significant further increase is expected for secondary education;	• Low ICT endowment and Internet usage in the corporate sector, • Low share of broadband connection. • Underdeveloped B2B and B2C eCommerce. • Low presence on the web from Romanian enterprises; • Low number of mobiles and fixed lines per 100 inhabitants; • Large urban-rural discrepancy regarding CATV connections. • Very low number of Internet users. • Low development of ePayment. • Low ICT endowment of primary schools; • Very low ICT penetration rates in households;
Opportunities	Threats
• High CATV penetration in urban areas, favouring future broadband connection; • Positive effects of the decrease in telecommunication prices brought by the market liberalisation; • The economic recovery will soon reflect in higher incomes of the households, triggering the households demand for ICT. • Visible response of the economy to the implementation of ePayment instruments;	• An increasing risk for age-related digital divide; • Increasing urban-rural gap regarding the ICT penetration rates in households. • Regional disparities regarding mobile penetration.

F. INSTITUTIONAL CAPACITIES AND REGULATORY BACKGROUND

F.1. Regulation and Deregulation of major markets affecting the IST industries

F.1.1. Communications

As described in Chapter B, the telecommunication market became fully liberalized on January 1st, 2003 when the monopoly of RomTelecom for fixed-telephony services (local, national and international) and leased telephony lines ceased. Romania has started to adapt and implement the provisions of the New Regulatory Framework for Electronic Communication Services, the new *acquis* adopted at the level of EU in 2002, (Directives 2002/19/EC-2002/22/EC and Directive 2002/58/EC) The new acquis establishes „the obligation of the regulatory authorities to identify the relevant markets, at a national level, for the electronic communication services and to analyse these markets so as to identify the (in)existence of effective competition. The regulatory authorities impose (*ex ante*) certain specific obligations on the respective companies, so as to balance the competition on those markets". According to the new acquis, NRAC was in charge for identifying the relevant markets in the electronic communication sector in Romania, based on EC Recommendation OJ L114/8.05.2003 and considering the specific national conditions. Once the New Regulatory Framework started operating, this instrument became applicable for all companies, including those that were previously regulated based on Council's Regulation no.2887/2000 regarding unconditioned access to the local loop.

F.1.1.1. The general regulatory framework in communications

GO no. 79/2002 establishes the general framework for the regulation of activities related to electronic communication networks and services, by defining the objectives and attributions of the National Regulatory Authority for Communications, in the field of electronic communications, the conditions of authorization of such activities, as well as the specific rules governing competition in the market for electronic communications networks and services;

F.1.1.2. The regulatory framework for the access to public electronic communication networks, their associated infrastructure, and their interconnectivity

GO no. 527/ 2002 establishes the main regulatory principles for promoting competition, ensuring the interoperability of electronic communication services and protecting consumers' interests. It establishes the rights and obligations of operators and of the undertakers seeking interconnection or access to the networks installed, operated, controlled or made available by the former, or to the infrastructure associated with these networks.

F.1.1.3. The operation of the unique national system for emergency calls.

GO no. 18/2002 ensures that, in accordance with the law, emergency calls can be made also in the languages of the national minorities from the territorial-administrative units and, as the case may be, in one or two languages of international circulation.

F.1.2. The Postal Services

Regarding postal services, the monopole of the national company (C.N. Posta Romana S.A.) has ended as at September 22, 2001, when the market was fully liberalised. Law 642/2002 establishes the conditions for the provision of postal services and for ensuring the access to the universal service, with a view to create a competitive market and to promote users' interests, ensuring compliance with EC Directive 97/67/EC.

F.1.3. eCommerce

The legal framework for the development of electronic commerce comprises over 11 specific laws that were adopted or modified between 2001 and 2003. The implementation of this framework was finished and the new specific regulatory authorities were set up and are functional as at this moment. eCommerce Law (no. 365/2002) establishes the conditions for the provision of IS services, as well as categorising as criminal offences certain deeds committed in relation to the security of domains used in the electronic commerce. Moreover, it classifies as crimes certain acts committed in relation to the issuance and use of electronic payment instruments and to the undertaking of financial operations, in order to ensure a favourable framework for the free circulation and development in safe conditions of these services.

Privacy protection is insured by Law 677/2001 for the protection of individuals with respect to personal data processing and free circulation, and Law 676/2001 on the Processing of Personal Data and the Protection of Privacy in the Telecommunications Sector. In the elaboration of the Law 677/2001, EU directives 95/46/EC and 97/66/EC were consulted.

Digital Signature Law no. 455/2001 regulates the legal status of the electronic signature, of the documents in electronic form, as well as the requirements for the provision of electronic signature certification. Moreover, it introduces the mechanisms for users' authentication within computer systems and implements non-repudiation mechanisms for the transactions performed.

eBanking - GO no. 16/ 2003 refers to the approval procedure for remote payment instruments, such as Internet-banking or homeBanking applications that the Romanian banks have to comply with. It sets the procedure for obtaining the technical authorization according with Art. 31 of Regulation 4/ 2002 issued by National Bank of Romania, regarding transactions using electronic payment instruments and the relations between the parties involved. This regulation requires a technical audit of the information systems and instruments used for the banks that provide Internet, Home and Mobile banking services so that confidentiality and security of operations is ensured.

ePayment - Law no. 250/2003 approves GO no 193/2002 regarding the introduction of modern means of payment,[267] compelling municipalities, utility providers and shops with annual turnover above 100 000 EUR to accept payment by debit and credit card. However, an ambiguity of the law that came up during the Parliamentary debates eliminated this obligation. Currently, efforts are made to eliminate this error[268].

[267] See Chapter B4
[268] Adriana Ticau, Secretary of State MCIT – Press release – The Interview of November – http://www.no-cash.ro

The Universal service and user rights relating to electronic communication networks and services is regulated by Law 403/2003 establishing "the regulatory framework for the relations between the providers of electronic communications networks and services, on the one hand, and the end-users, on the other hand. Moreover, it establishes the rules for providing services in the area of universal service, the obligations for the providers of electronic communication networks and services which have significant market power, the rights of end-users, and the obligations of providers of public communication networks and electronic communication services assigned to the public."

F.1.4. Information Security

Cyber-security – Romania signed on 23 Nov 2001 the **Council of Europe's treaty "***Convention on Cyber Crime***"**[269] (ETS 185) and drafted the law for the ratification of this document. Law 161/2003, title III is devoted to preventing and fighting cyber crime and to implementing the mentioned convention. This law defines and introduces sanctions[270] for the following deeds, offences against the integrity and confidentiality of information data and systems: unauthorized access to an information system (with the purpose of obtaining information, by violating security measures of by unauthorized interception of a private information data transmission); modification, deletion or deterioration of data or unauthorised transfer of data from an information system; serious, unauthorised disturbance of the functioning of an information system; utilisation of internet in child pornography. Other aspects regarding these issues are regulated by the law on eCommerce, which stipulates severe punishments (up to 15 years of imprisonment) for frauds in the field of IS services and grants particular importance to financeBanking frauds.

NBR's Regulation No. 4 (June 2002) regulates the utilisation in Romania of electronic means of payment, imposing the security audit of systems and instruments. The law on electronic signature introduces the mechanisms for identification of ES users and implements the mechanisms for non-repudiation of transactions. Additionally, MCIT launched in 2001 a project for unique identification of public servants based on smart cards. Thus, GO no. 69/2002 establishes the legal regime for electronic identity cards for the population, as multifunctional smart cards to be generalised by year-end 2006. GO no. 150/2002 foresees the introduction of smart cards in health services, for social security.

As shown in Chapter B.3, these measures occurred in a period of increase in the use of cards for internet banking, indicating the fact that their applicability increased people's trust in electronic means of payment.

F.1.5. Intellectual Property

The legal framework for copyright and patent rights includes the following recently adopted measures:

- Law 8/1996 on copyright revised in 2003 extended patent rights to software.
- Law 64/1991 on patent rights was revised in October 2002 so as to make the relevant Romanian legislation compatible with the European one. Starting March 1, 2003 Romania

[269] http://conventions.coe.int
[270] As per Law 161/2003, the sanctions related to cyber crime are punishable by imprisonment up to 12 years.

became member of the European Patent Organisation, after ratifying in 2001 the last international regulations in the field of copyright and rights related to the digital area. (World Intellectual Property Organisation Treaty on copyright and that on the interpretations, implementations, and phonograms signed in 1996 in Geneva). Among numerous Government decisions, OSIM (Romanian Patent and Trade Mark Office) or ORDA (Romanian Office for Copyright) decisions or orders, issued for the application of the above-mentioned enactment, Law 202/2000 regarding measures meant for ensuring the observance of intellectual property rights within the framework of the customs operations, updates the legislation considering the latest provisions outlined in the global TRIPS treaty, WTO's copyright instrument used to discipline countries that condone copyright infringement. According to the provisions of the Romanian Constitution, the international treaties ratified by Romania are part of its internal law. Moreover, in case of any inconsistencies between the national legislation and the above-mentioned international treaties, the latter shall prevail.

To the adopted measures described above add the following regulations related to intellectual property.

- *Industrial property*: Law 64/1991 on patents; Law 16/1995 on integrated circuit topography protection; Law 129/1992 on industrial designs; Law 84/1998 on geographic trademarks and terms; GO no. 41/1998 on industrial property protection taxes.
- *Literary and artistic property:* Law 8/1996 on copyright and related rights; GO no.. 45/2000 on measures against unauthorized production and sale of phonograms; GO no. 124/2000 for the completion of the legal framework regarding copyright and related rights, by adopting measures for fighting piracy in the audio and video sector and the computer program sector.

In addition to the above mentioned, MCIT drafted in 2003 a law regarding the *temporary trademark*[271] which can be used for checking an electronic signature on a document or the validity of the electronic signature certificate, in Internet auction systems, or to be able to date with certainty works protected by copyright.

F.1.6. Industrial, Scientific and Technological Parks

Law 50/2003 sets the legal framework in the area of scientific and technological parks. According to this law, a scientific and technological park represents an area with activities in the field of education, research, technological transfer and capitalisation of research results through economic activities. A scientific and technological park is based on a consortium of an institute for higher education and/or an R&D institute, and national companies, enterprises and professional associations. An industrial park is based on a consortium of central or local public administration authorities and enterprises and R&D institutes. The land corresponding to the scientific and technological park must be free from any encumbrances and not be subject of any pending litigation.

[271] The temporary trademark is a set of techniques by which any person can check if an electronic document has been created or signed at (or before) a given point in time. In practice, most systems of this type use a third reliable party. The temporary trademark is a digital authentication of this third party, namely that an electronic document exists at a given point in time.

According to GO no. 65/2001, an industrial park is defined as a precisely determined area where economic activities, scientific research and/or technological development activities take place, in view of using the human and material potential of the respective area. The creation of an industrial park is based on a joint venture agreement between the public authorities, economic agents, universities, research-development institutes and/or other interested partners.

F.2. Institutional implementation capacities

The enforcement of these laws involves key institutional players[272] mentioned below, playing the most important roles in regulating communications and eCommerce. (For a detailed description, see Chapter B. Institutional Settings):

- **The Ministry of Communications and Information Technology[273] (**MCIT is the specialised regulatory authority in the field of communications and information technology)
- **The National Regulatory Authority for Communications[274]**
- **The General Inspectorate for Communication and Information Technology[275]**
- **The Prosecutor's Office by the High Court of Causation and Justice[276]** (through the Division for Fighting Cyber Crime within the Division for Fighting Organised Crime and Anti-Drugs.)
- **The Romanian Copyright Office[277]**
- **The Patent and Trade Mark Office[278]**
- **The Ministry of Education and Research[279]**

F.2.1. Communications

Romania has started the implementation of the New Regulatory Framework for Electronic Communication Networks and Services (the new acquis communitaire in the field, adopted in 2002, containing Directives 2002/19/EC-2002/22/EC and the Directive 2002/58/EC), by setting up two key extra budgetary institutions: NRAC and IGCIT.

[273] http://www.mcti.ro
[274] http://www.anrc.ro
[275] http://www.igcti.ro
[276] http://www.scj.ro (http://www.just.ro)
[277] http://www.orda.ro In addition, the following collective administration organisations are operating in the field of copyright and intellectual propriety: For copyright: UCMR-ADA - musical field (appointed by the Romanian Copyright Office to collect the remuneration for private copy and sound recordings) / 2500 members: LITERARY FUND - literary field / 836 members: DACIN-SARA – audio-visual field - authors (appointed by the Romanian Copyright Office to collect the remuneration for private copy in audio-visual field) / 150 members: UPFAR - producers of film and audio-visual / 41 members: VISARTA - copyright in visual arts / 93 members For related rights: CREDIDAM - performers (groups) / 2,432 members: SADCO - performers (soloist) / 256 members: UPFR - producers of phonograms/ 22 members: Some anti-piracy associations are also involved, like: ARA - in audio-visual field GRAP - in musical field.
[278] http://www.osim.ro
[279] http://www.mct.ro , http://www.edu.ro

NRAC was set-up under the EO no. 79/2002, which institutes the new regulatory framework in communications from the viewpoint of user rights and creates the grounds for the development of IS by promoting competition in the field of communications (including that of eCommerce).

a. establishing the general regulatory framework for activities related to electronic communication services and networks, by defining the objectives and attributions of the National Regulatory Authority in Communications (NRAC) in the field of electronic communication, authorising these activities, as well as specific rules governing the competition on this market;
b. establishing the objectives and attributions of NRAC in the field of postal services;
c. establishing NRAC as the specialised public administration body in the field of electronic communication and postal services.

IGCIT was set-up under Government Decision 180/2002 as the surveillance and control authority in the field of electronic communication, being the institution which makes the new regulatory framework operable by creating the technical and market-based grounds for the development of IS in Romania.

According to the new acquis, NRAC was in charge for identifying the relevant markets in the electronic communication sector in Romania, based on EC Recommendation OJ L114/8.05.2003 and considering the specific national conditions. In 2002 and 2003, the main implementation effort currently ongoing was related to establishing the national regulatory framework for unconditional access to the local loop, so that the liberalisation of the telecommunications market allows free and effective competition.

To this end, the Regulation on the identification of relevant markets in electronic communications was adopted[280]; based on which two markets related to the access to the local loop were identified:

- The market for unbundled access, full or shared, to the local loop, for the purpose of providing wide band electronic communication services and fixed-telephony services, for which the relevant market is the entire country; and
- The market for bit stream access to the local loop, and to the local radio loop, for the purpose of providing wide band electronic communication services, for which the relevant market is the entire country.

Up to now, NRAC has made analyses for all relevant markets identified[281] following the procedures described in the Regulation for market analyses and establishment of the significant market power[282].

For the market of *unbundled access*, full or shared, to the local loop, NRAC has issued several decisions. One decision establishes RomTelecom as an operator holding significant power. Another decision establishes the obligations to be imposed on RomTelecom in relation to

[280] Decision no.136/2002 and Decision no.174/2003 (http://www.anrc.ro)
[281] http://www.anrc.ro
[282] Decision no.137/2002 – summarising the provisions of the EC's directives on market analysis and evaluation of significant market power (OJ C 165/11.07.2002).

granting unconditional access to the local loop, among which are: non-discrimination, transparency (publishing a reference offer of unconditional access to the local loop), introducing tariffs based on costs, provision of services and granting access to certain facilities. The projects were posted on the NRAC web site, being open to discussion up to July 2003. The decisions (as resulting following these comments from the public) formed, together with the above-mentioned decisions on identification of relevant markets and undertaking relevant market analyses, the national regulatory framework for unconditional access to the local loop.

The tariffs established by NRAC (1.15 Eurocents for peak hours and 0.90 Eurocents otherwise) are below the average of the similar tariffs from other EU countries that have liberalized the electronic communication market. (According to the third IBM Report, published in June 2003, the average local inter-connection tariffs in EU is 0.77 Eurocents. In candidate countries, this average is of 1.4 Eurocents). As to the mobile telephony, the inter-connection tariffs between providers have been established as follows:

To From	Romtelecom	Mobifon	Orange	Cosmorom	Telemobil
Romtelecom		11 $ cents	11 $ cents	N/A	N/A
Mobifon	2.14 Eurocents		11 $ cents	N/A	N/A
Orange	2.14 Eurocents	11 $cents		N/A	N/A
Cosmorom	2.14 Eurocents	11 $cents	11 $cents		N/A
Telemobil	2.14 Eurocents	11 $cents	11 $cents	N/A	

Source: NRAC http://.anrc.ro (NRAC Activity Report for 2003)

As to Cosmorom and Telemobil, given the bilateral character of interconnection contracts, NRAC considered that a possible abusive behaviour of these companies regarding the tariffs established could be discouraged by the counter-acting power of the contractual partners, imposing that these two companies ensure transparency[283].

Following these decisions, the interconnection tariffs for ending calls from fixed to mobile telephony are now below the average of member and candidate countries.

The market for bit stream access to the local loop for provision of wide band electronic communication services is new and still forming. Thus, NRAC has considered that in this field it is not possible to apply, as of now, the necessary criteria for a complete market analysis or to precisely assess the degree of competition and the extend to which some operators will hold a significant power on the market. Hence, the monitoring of this market by NRAC is in progress. Finally, it should be mentioned that regulating the telecommunication market according to the new acquis shall continue in the following year as well, so that these measures can operate in all market segments, given the need to ensure the long term viability of the universal service suppliers and the identification of the most adequate financing method for the costs of the universal service on the liberalised communication market. The following short-term actions are included in NRAC (2004).

[283] NARC has limited its regulation activity, applying the principle of minimum intervention in what the two companies are concerned. Should their market behaviour prove that the counter-acting power of the other providers is not sufficient to prevent abuses, NARC maintains the right to revise the level and force of its regulations.

Presently, NRAC started the public consultation regarding the relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with *Directive 2002/21/EC* of the European Parliament and of the Council on a common regulatory framework for electronic communication networks and services. The following markets are susceptible to be object of the enforcement of the regulatory measures: 1) Access to the public fixed telephone network – residential customers; 2) Access to the public fixed telephone network – non-residential customers; 3) Market of local and/or national calls provided at a fixed location – residential customers; 4) Market of local and/or national calls provided at a fixed location – non-residential customers; 4) International telephone services provided at a fixed location – residential customers; 5) International telephone services provided at a fixed location – non-residential customers; 6) Provision of leased lines service (minimum set).

At the same time, information owned by NRAC on the situation of the Romanian electronic communications market was taken into account. Therefore, according to the provisions of the Regulation on the identification of the relevant markets within the electronic communications sector, approved by NRAC's *Decision 136/2002*, completed by NRAC's *Decision 174/2003*, the following segments of the retail markets will be analysed by NRAC, with a view to establish the specific retail markets: 1) Access to fixed telephone network; 2) Local calls provided at a fixed location; 3) National calls provided at a fixed location; 4) International calls provided at a fixed location; 5) Fix – mobile calls; 6) Dial-up and ISDN Internet access; 7) Broadband Internet access; 8) Leased lines services provision. For every market segment the necessity to separate it according to the type of users (residential or non-residential customers) will be analysed.

F.2.2. ECommerce

The eCommerce Law 483/2002 establishes MCIT as the competent authority to supervise and control the compliance by the service providers with the specific norms established in the field of eCommerce, to ascertain the contraventions and to apply the sanctions. This law is grounded on the following principles governing the provision of information society services:

- The provision of information society services by natural or legal persons is not subject to any prior authorisation and shall be pursued in accordance with the principles of free and fair competition, in compliance with the legal provisions in force, specifically and exclusively targeted at the information society services or at the service providers.
- The provision of information society services by service providers established in the Member States of the European Union are carried out under the conditions provided for in the European Agreement establishing an association between Romania, on the one hand, the European Communities and their Member States, on the other hand.
- The provision of information society services by service providers established in other states shall be made under the conditions provided for in the bilateral agreements concluded with those states, to which Romania is a party.

The same law states also that the associations and non-governmental organisations with professional or commercial character, or those constituted for the purpose of consumer protection, or protection of minors or of disabled people, may draw up codes of conduct in

collaboration with MCIT and the Ministry of Justice, in order to duly apply the legal provisions in the field of eCommerce.

MCIT is the specialised supervisory and regulatory authority which has the responsibility for applying the provisions of the digital signature **(Law 455/2001)** and of the related regulations.

The certification service provision is not subject to prior authorisation and is performed in agreement with the principles of free and fair competition. Certification service provision by service providers established in the Member States of the European Union are made under the requirements of the European Accord, establishing an association between Romania and the European Communities and their Member States. Any person that contemplates providing certification services shall notify MCIT of the start-up of activity no later than 30 days before the date of commencement. Along with the notification, certification service providers shall supply exhaustive information about the security and certification procedures they use. Certification service providers have the obligation to notify any intention of changing the security and certification procedures to MCIT, with at least 10 days in advance, indicating the date and hour when the change enters into force, as well as the obligation to confirm in 24 hours the change effected. In emergency cases, where the security of certification services is affected, certification service providers can perform changes of the reported security and certification procedures and shall notify in 24 hours the specialised supervisory and regulatory authority of the changes made and their justification.

According to NBR's Regulation no. 4/2002 (on the use of electronic means of payment in Romania), MCIT is granting the technical authorisations for internet banking payment instruments, based on security audits of banks' information systems[284].

IGCIT is the public authority that operates the *Public Acquisition Electronic System*. According to GO no. 20 /2002, concerning public acquisitions by means of electronic bids, having the mission is to facilitate the transparency, correctness, and efficiency in the public acquisition domain.

The obtained increased public trust in electronic commerce, in using electronic means of payment as well as the results obtained in the field of public acquisitions by electronic means, (see Chapters B and E) indicate that over a short period of time (starting 2002) the capacities needed for implementing legal regulations have been formed.

F.2.3. Information Security

F.2.3.1. Processing of Personal Data and the Protection of Privacy

According to the Law 676/2001, MCIT is the authority in charge with monitoring and controlling the lawfulness of the operations concerning the processing of personal data subject to the legal provisions that govern the protection of individuals with respect to the processing of personal data and the free movement of these data.

[284] http://www.mcti.ro

F.2.3.2. Cyber Crime

MCIT has started the implementation of the regulatory framework in the field of IS security by setting up an Antifraud Division and already launched the first on-line public services for internet fraud fighting (see also chap B. for details on *antifrauda.ro* and *ceris.ro* on-line services). Moreover, the Centre for Fighting Cyber Crime was formed within the Prosecutor's Office by the High Court of Causation and Justice[285]. It is meant to ensure immediate and permanent international cooperation in the fight against cyber-crime. As to the security of the information systems, Romania has been undertaking the necessary measures for becoming a member of the eSafe programme[286] since 2002. Starting January 2004, European Commission will establish the European Network and Information Security Agency (EC (2003d)), with whom Romania is to co-operate.

F.2.3.3. Intellectual property

The institutional system related to intellectual property, as well as the other institutions involved in the provision of intellectual property rights (public institutions or collective administration organisations) were described in the Chapter B.

As it was also mentioned in the Chapter on National IS Policies, the most questionable area remains the enforcement of copyright laws. The relevant institutional system exists but to a certain degree it „is still ineffective due, in the main part, to bad information management between the parties involved" (EC (2003b)). Moreover, given the general low income of population, there is a high propensity for piracy which is difficult to fight.

Nevertheless, over the period between the adoption of copyright law in 1996 and 2002, the software piracy rate has dropped from 93% of total sales in Romania to 67%, while the industry-estimated piracy rate for music dropped from 92% to 75% and the audio-video import market piracy rate dropped from 90% to 55%[287]. According to Datamonitor, the losses incurred by software producers in 2002 due to piracy are estimated at EUR 17.3 million.

In order to increase the effectiveness of combating piracy, a task force for intellectual property was created in 2001, comprising representatives of the US Embassy in Bucharest, the Prosecutor's Office, the Ministry of Internal Affairs, the Customs' General Direction, the Romanian Office for Copyright and the Business Software Alliance (BSA). This could be an accelerating factor for reducing piracy.

In our opinion, a factor influencing the capacity of action in this field is the limited financial resources that ORDA currently has. As it can be seen on Table F.1 below, although the resources show an increasing trend, they are still low. Relative to the number of territorial units (tu.) each representing a county (counties + Bucharest's sectors = 45 units), ORDA has less than one employee/tu and has less than 6300$ / year/tu. (in 2001, for example, it had only 3300$ / tu.) This

[285] http://www.scj.ro (http://www.just.ro)
[286] eSafe programme 2003-2004 is the extension of the Safer Internet Action Plan 1999-2002. http://www.Europa.eu.int
[287] IIPA 2001-2002 http://www.iipa.com/pdf

makes the number of controls performed to be extremely limited: 33 controls/tu in 2003 (less than one /week/tu!)

Table F.1.: Responsibilities and budget for ORDA

Year	Personnel	Budget	Notifications processed	Controls
1996	10	n.a.	n.a.	n.a.
1997	17	150 000$	n.a.	n.a.
1998	35	135 000$	n.a.	693
1999	30	121 000$	1 800	999
2000	37	156 000$	2 500	916
2001	42	130 000$	3 000	1 032
2002[288]	42	280 000$	3 600 (4 800 *)	1 168 (1500*)

Source: Authors computations based on data from ORDA web site http://www.orda.ro

F.2.4. Setting-up technological and industrial parks

The titles for scientific and technological parks are granted by MER based on the joint venture agreement, business plan and the manager's by-laws. The industrial park title, which may be granted only by the MAI, is valid for a period of at least 15 years, within the prescribed perimeter and conditions established by the MAI. The title may be obtained by filing an application, based on a proof of fulfilling the conditions regarding the corresponding land, feasibility study for the creation of the industrial park and of the approval from the local administrative authority for the park's infrastructure and of its connection to the utilities networks.

The institutional capacities for setting-up technological and industrial parks are still low, being mainly affected by the wide lack of experience of Romanian authorities in this field, but mainly at the level of local public administration. This adds to the above-mentioned lack of entrepreneurial culture of Romanian researchers and higher education personnel. Moreover, the conclusion of the March 2003 report European Trends in Innovation, according to which „Romania is in the early stages of developing cluster policies so there have been no evaluations of cluster policy initiatives. Also no studies have been done to assess the performance of a particular cluster", highlights this lack of abilities.

F.3. Privatisation policies

The privatisation process in Romania started in 1992. The privatisation law created the State Ownership Fund (SOF), which privatised 7,244 companies until the end of 2000. SOF's portfolio included companies restructured from regies autonomes[289].

[288] Values reported at 10 October 2002* - values estimated by the authors for 2002

[289] <<Regies autonomes>>, which are translated into English as "public utility companies", are industrial and commercial establishments belonging to the State or local public authorities, which are set up according to Law 15/1990. Regies autonomes are organized and designed to operate in strategic sectors of the national economy, such as defence industry, energy, mining, natural gas exploitation, post and railway transportation, as well as in certain areas belonging to other sectors established by the Government. According to law, the regies autonomes may operate and manage public property assets within the scope of their statutory activities. Most regies autonomes have already been or are about to be reorganized as commercial companies, according to Government Emergency Ordinance 30/1997. Reorganisation is carried out based on restructuring plans drafted by the relevant

Law 55/1995 for acceleration of the privatisation process was adopted in 1995 because the process was too slow. Romanian citizens were entitled to subscribe their nominative privatisation coupons to around 4,000 companies, corresponding to up to 60% of the share capital. The rest was offered for sale to Romanian or foreign natural or legal entities. Between 1977 and 1999, a significant progress could be noticed in the privatisation process due to the Emergency Ordinances 88/1997 and 15/1998, which simplified the privatisation procedures. By Emergency Ordinance 296/2000, SOF was restructured and the Authority for Privatisation of the State Ownership (APSO) was set up to continue the privatisation process. In 2002, its portfolio comprised 1 395 companies with a managed share capital of around EUR 1 billion. In the following period, APSO is expected to finalise the privatisation process (Tran (2003)). However, there is no urgent privatisation in the field of infrastructure for IST.

The privatisation of Romtelecom- the national fixed-telephony operator - took place in two stages (1998 and 2003), as the monopoly of RomTelecom was maintained until January 1st, 2003. At present, OTE's[290] share in RomTelecom increased to 53%. Following the completion of this transaction, MCIT has as long-term objective to sell its remaining stake in Romtelecom and is considering listing the company on the Bucharest Stock Exchange in 2004[291].

Currently; the Government has decided to grant[292] four licences for third generation mobile communication, of which at lest one will comply with the UMTS standard. These will be granted for a period of 15 years and will be renewable at request for 10 years without additional fees. The frequency ranges 1,900-1,980 MHz and 2,110-2,170 MHz were granted for the third generation licenses. To this end, the former will be cleared by the Ministry of Defence in exchange for a fixed fee of EUR 35 million for each licence granted.

The legislation adopted in 2002 allows the privatisation of some postal services, in compliance with the acquis communitaire. The area of services which can be reserved and reduced by government decision, for a gradual and controlled liberalisation of the postal services market. Thus, the gradual compliance with the provisions of Directive 2002/39/EC is achieved, by reducing the weight and tariff limits and by liberalising international postal services. Nevertheless, the influence of some essential factors has to be considered in deciding the schedule of the gradual and controlled liberalisation of the postal services market: the need to ensure the long term viability of the universal service supplier and the identification of the most adequate financing method for the costs of the universal service on the liberalised market.

The Government Decision 931/2001 regarding the strategy for privatisation of ICT state-owned companies currently in the portfolio **The Authority for Privatisation and Management of State Ownership** (APMSO) states that the privatisation of these companies will take place by selling their shares exclusively to strategic ICT investors (companies with a significant power on

ministries or by central or local public administration authorities under whose subordination the regies autonomes are organized and operate. Regies autonomes are reorganized as joint stock companies, according to the legal provisions in force on their reorganization date. The joint stock companies resulted from reorganization, acting in national interest activities sector are called national companies, and are subject to the privatization process.>> (Musat&Asociatii (2003))

[290] Hellenic Telecommunications Organization SA (OTE)

[291] MCIT Newsletter 31st of January 2003, http://www.MCIT.ro

[292] http://www.MCIT.ro

the international market). The buyers and their successors must preserve the ICT company profile for at least 5 years. Investments in ICT also benefit from the general legislation in force, on disadvantaged regions, the industrial and technological parks. Moreover; the National Strategy for the New Economy and the Implementation of the Information Society has within its objectives the elaboration of a coherent privatisation strategy, including sanctions for discarding ICT as the main area of activity of the privatised company. A common directive of MCIT and APMSO (320/2002) established the list of those 21 ICT companies which are to be privatised and for which the rules mentioned above are compulsory. The privatisation of these companies is as of this date ongoing.

F.4. The effects of these on the economy in the future

The overall assessment of IST related realities, as described by this chapter, indicate that the competition in the communication markets and in all related fields is bound to increase considerably. This will create new opportunities in many other fields, but it is difficult to make an assessment regarding the future evolutions and the spill-over effects which will appear as a result of the liberalisation. The telecommunication market is expected to enter a deep transformation period, to find its new equilibrium. The only assessment that can be made is that the prices of telecommunication services will drop. The price war has already on the communications market started and it will continue (see Chapters B. and E). This will be a positive effect for all the economy and for the population, and it will have visible effects on the penetration rates. However, the share of the costs incurred with telecommunication services in total population income is expected to stay relatively high, as against the other European countries, for a period.

From another perspective, by looking at the entire system of regulations as established by the new regulatory framework and institutional attributions which were implemented in these 30 month of regulatory effort, we notice that they started to have a systemic impact on IS issues. This systemic impact shall continue to produce its effects in the field of electronic communication and IT, namely:

- more efficient management of the limited resources, while providing access on a non-discriminatory basis;
- more effective competition;
- more adequate consumer protection, together with higher increased level of information;
- better prevention of abuses;
- better promotion of competition in order to make available high quality services and equipment, for proper costs in accordance with the Romanian market;
- better surveillance and control of the activities carried out by electronic means;
- provision of a secure framework for the operation of the Electronic System of Public Acquisitions;
- increased efficiency of the implementation, at the national level, of those projects on the electronic management for public services;
- better assessment and the conformity certification of the radio equipment and of the terminal equipment for electronic communications with the essential requests set forth in the legislation;

- the creation of the premises for the use of electronic signature by the public central administration and for developing of other given activities.

On the background of the general favourable factors occurring in 2003 (See. Chap. B.), the regulations on technological, scientific and industrial parks as well as those on intellectual property represent a good opportunity for setting up more coherently administered actions of authorities and business environment, focused on attracting investment into high value added IST sector. Thus we can estimate that the regulations adopted in the field can contribute to eliminating the danger of dependency on the outsourcing model that Romanian IT industry is facing. However, the positive effects of adopting these regulations will be felt only after the central and local authorities accumulate experience in this field.

The effects of the privatisation of these 25 companies cannot be assessed in terms of their economic impact. However, some assessments can be made regarding the social impact of the measures established by Government Ordinance 931/2001. Considering the large number of IT specialists who cannot find work in Romania (see chap. B.2.), it can be expected that these measures will reduce the amplitude of brain drift and brain drain. Nevertheless, given the history of privatisation in Romania, it is not certain that the high quality of labour force in this field will be a positive factor in the privatisation process. The only measure related to privatisation expected to have a significant impact on the telecommunication market is the granting of the three frequency ranges licenses 1,900-1,980 MHz and 2,110-2,170 MHz. In our opinion, the current CDMA technology makes granting a license for UMTS difficult for the time being, as the possible operators interested hesitate to invest a significant amount in a market that already has a substitute technology, at least for the time being (see chap B).

F.5. Regulation and Deregulation of IST-based public information and services

Law 544/2001 on the free access to public information is the main legal instrument that regulates and ensures the unrestricted access to information of public interest, defining clearly which are such kinds of information and establishing the civil right of citizens to get the requested information generally in a term of 10 days and in exceptional cases in 30 days. However, this law could lead to administrative complications, by instance in the case of abuse of this right (when the authorities would have a huge number of information requests to process using classic methods). The law establishes that citizens can legally claim damages if public servants do not answer in time (10 days for usual information or 30 days if the requested information implies a higher effort of elaboration). Thus, the IST solutions are pivotal in implementing the new legal framework.

The issue of corruption is a second factor that led to increased governmental commitment for finding IST-enabled solutions at the interface of the administration or public organisations with the business environment.

The following laws were adopted for the development and generalisation of applications aimed to improve and simplify the relation between citizens and businesses, on one hand, and between citizens and public administration, on the other hand:

- Law 468/2002 on public procurement by electronic auction[293] (mandatory for the public authorities and the categories of products established by Governmental Decisions, as the system develops. See also Chapter B.3.).
- Law 291/2002 on electronic payment of local taxes[294].
- EO 150/2002 foresees introducing an electronic card for the insured, containing a minimal set of personal data[295] that can be recorded and accessed.
- Law 161/2003 containing measures for ensuring the transparency in the exercise of public duties of public functions and of the business environment, the prevention and the sanctions against corruption. Title II of this law is dedicated to the transparency in the administration of public information and services by using the electronic means.

This Title establishes the legal framework for setting up the National Electronic System (NES), defined as the unity formed by the E-Governance System and EAdministration System. The National Electronic System is accessible on-line at http://www.e-guvernare.ro and at this date[296] is under development. For the beginning, beside the publication of the public interest information, over 15 other public services will be provided (see Chapter B.3. for the list of services under development or available on-line in November 2003). The system shall allow also the possibility of electronic payment for taxable public services (e.g. the payment for the registration of a new car). The law also specifies the budgetary funds for the development of the system, and states the rules of interoperability and the requirements regarding the content and the applications which will be provided to citizens, public servants and business, each of them having different levels of access to the information. Equally, the law establishes the types and frequencies of the reports on the development stages of this system. The entire set of articles of this law is reproducing the general principles and the main objectives of the eAdministration Action Plan[297]. This law introduces also a new institutional player which will be the operator of the "eAdministration System" (the *e-administratie.ro* component of the National Electronic System): **The National Centre of the Integrated Data Base of the Ministry of Administration and Interior**

In accordance with EU initiatives, (WAI-DA European Commission programme) some regulations are being prepared in order to improve the Internet access for older and disabled people. In this area, the following actions are in progress:

- elaboration of standards regarding distance learning,
- regulation on the use of smart cards in health care, education, tax payment, etc.,
- support for the development of a professional code for Internet Service Providers,
- development of technical regulations for eGovernment applications which observe international standards and regulation systems (ISO, UE, ETSI, etc) regarding system architecture and interconnectivity, and exchange of information.

[293] See the also the Chapter B.4.
[294] idem
[295] This includes: identification data, personal numeric code, the proof of paying social security contributions, number of requests for medical services of vital risk, disagreement on donation of organs, blood type. This card will include the degree of compensation for medication.
[296] August 2003
[297] See the Chapter B.

Presently MCIT drafted and put out for public debate a set of regulations on the design of web sites for central and local administration institutions in Romania, regarding accessibility for disabled people. Many solutions included in these regulations led to improving the access and use of public services provided by electronic means to those users (representing a large category in Romania), that having low incomes use old PCs with low performances.

F.6. Institutional Implementation Capacities

The main institutional players involved in implementing the regulatory framework for the development of services for the citizens and the business environment are:

- MCIT (regulating authority in communications, in charge with the national co-ordination of the implementation of electronic in public administration– see. Chapter B. For details),
- MAI, with the "eAdministration System" operator to be set up, in 2004 (The National Centre of the Integrated Data Base of the Ministry of Administration and Interior) (after the relation of this ministry with MCIT is clarified in what their roles in implementing electronic services in administration is concerned– see Chapter B. For details) and
- IGCIT as operator of the National Electronic System and of the System of Public Acquisitions.

Moreover, important parts are played by:

- The Ministry of Public Finance (MPF) and Municipalities regarding tax payment and fiscal reports (like delivering financial statements and fiscal declarations) by electronic means, as well as
- Ministry of Health (MH), National and Local Social Security Institutions (CNAS and CJAS) and the Offices for health insurance (OAS), regarding introducing in Romania the „electronic card for the insured" and the implementation of the Unique Integrated Information System of CNAS[298].

In assessing the Institutional Capacities for the implementation of the IST based public services we must consider the fact that the development of such services has two dimensions: the application *per se* and the content provided by a particular service. As the activity of the authorities is, to a high degree, a bureaucratic one, both the produced informational content and the services provided (seen as a protocol of work) can be standardised to a large extent (for example by introducing re-utilisation standards for data and practices and those for joined operation). All public services, which are implemented or expected to be implemented in the near future by the laws described in the previous section can be standardised. This means that they can be generalised for many public institutions (mainly in the case of those institutions from the local level which are similarly for all the counties) without a significant effort of skills for creating such applications. Moreover, they can be managed and used with a minimum set of computer skills.

The benefits of standardisation are demonstrated also by the success of the implementation of the e-Procurement system, for whose functioning two bodies are responsible: GITIC is in charge

[298] The Integrated Information System will benefit: CNAS, 44 local health insurance institutions, (CJAS), 50 de health insurance offices (OAS),

with the technical operation, while the supervision of operations and transactions is done by the Supervising Commission for the operation of the public procurement electronic system (Government Decision 179/2002). These bodies are approving the standardised description of the offers regarding to those products that are introduced in the system. If we take into account that through this system are sold also products with a large degree of complexity in what concerns the requirements regarding the description of the quality of these products (like in the case of the pharmaceutical products or of the sport halls[299]) we would see that this capacity exists at the level of the central authorities and that a certain amount of practice was accumulated.

Consequently, we cannot identify special problems at the governmental level from the viewpoint of the institutional capacity for implementation the regulatory framework for the electronic services foreseen by the eAdministration Action Plan and its developments (see Chapter B.) . However, some difficulties are expected regarding the capacity to stimulate and train the local authorities and new regional organisations so as to be able to adapt to, and get involved in, the implementation process. The weak points in this respect are the lack of financing, the underdevelopment of training industry and limited human resources at a central level in order to implement such a large scale campaign and moreover for the local development of services that cannot be made centrally, in a standardised manner (e.g. for facilitating the communication between mayor and inhabitants for specific local issues).

MPF regulates the services related to the fiscal field, deciding upon the categories of taxpayers that can fill in the fiscal reporting forms through the National Electronic System. For example, submitting the financial statements through the Internet can initially be done only by the economic agents selected by MPF. In order to do submit the balance financial statements by the Internet, a company must receive a digital certificate from MPF[300]. Moreover, for the services related to tax payments to: social security budget, state budget, and VAT settling, MPF has authorised only large taxpayers in the first stage of application. This limitation is due, on the one hand, to Government's intention to launch the system as soon as possible after the adoption of the new anti-corruption law no. 161/2003. On the other hand, it is due to the need of preparing a public information campaign for the other taxpayers based on the experience accumulated by providing the same service to more experienced firms.

As to the capacity of implementation of such regulations, it should be mentioned that there are doubts about this at a local level. The fact that there were some delays in implementing services for local taxes payment as against the legal deadline of November 1, 2003 (see Chapter B. for the current situation), seems to show that at a local level the implementation capacity is lower and more unevenly distributed over the country. In our opinion, one of the main causes is financial in nature, the municipalities facing serious lack of resources relative to the investment needs (especially in the less developed areas of Romania - see. Chap....). These issues will probably appear also in the implementation of other services for citizens and the business environment, which are related mainly to the eAdministratie component of the a National Electronic System (see the previous section and also Chap. B). Obviously, to this adds the ambitious timeframe that the Government adopted for developing these services, requiring an adaptation effort on behalf of

[299] See also Chapter B.

[300] It contains the data of the economic agent, so that he is uniquely identified; the digital certificate is used for signing balance sheet, authentication during communication with servers of MPF and local administration.

the other authorities involved and a serious effort on behalf of the population (see the case related to electronic attribution and distribution of transportation authorisations, presented in Chapter B.).

As for the IS particular implementation capacities for some institutional players in health field, we can state that it is still deficient. Another argument for this appraisal is the fact that "electronic insurance card" was not yet introduced[301] although according to OEG 150/2002, this should have taken place by October 31, 2003.

F.7. The effects of these on the economy in the future

It is premature to assess the effects of the new regulatory framework and of the first IST enabled applications on the Romanian economy in the future. However, we attempt such an assessment by starting from a minimal, optimistic assumption:

> *The majority of the services expected to be provided as effect of the Anti Corruption Law no.161/2003 will become available within a reasonable period and all public institutions from the level of central administration and those from the major University Centres will succeed to integrate in NES.*

However, we can say that in a relative short period of time the regulatory framework and the IST enabled applications created could ensure a faster development of the services in the future due to their conceptual design which is modular, their minimising the costs and reducing, as much as it is allowed by technological constraints, the possibilities of failure caused by the lack of experience in the implementation of such projects in less developed regions and counties and at the level of the towns and communes. Moreover, the social mimetic effects and the possibility of learning from practice are offered in an implicit way to the less skilled public authorities. Given that the new regulatory framework claims the implementation of some services whose estimated cost exceeds 150 Million EUR (see Chapter B), the development of the ICT-based public information and services, will be significantly influenced. Moreover, there will be an economic impact on the development of IT industry in Romania, since it is the main beneficiary of substantial governmental grants, due to the legal provisions mentioned in the beginning of this section. Equally important, this setting will sustain the development of the public IS culture and would contribute to the diminishing of corruption at a national level in a wide range of domains (from corruption of public servants which work directly with the tax-payers in the agglomeration characteristic for the Romanian tax payment places to corruption in the field of constructions or renovation of the public buildings[302]). This is a complex advantage given that it results in important savings from budgetary resources while eliminating from the business environment part of the seemingly profitable, corruption based businesses, and helping the honest entrepreneurs to reach better positions in the Romanian business environment.

However, we note that in the case of a pessimistic scenario concerning the assumption that *the law 161/2003 will fail (especially through major delays to an ambitious implementations schedule[303]) in its throughout implementation*, the social effect could imply major and

[301] 31 December 2003.
[302] These aspects started to become real achievements due to the relative maturity reached by the public procurement system. See also Chapter E
[303] Government officials statements and MCIT reports.

irreversible costs. Given this, maintaining and increasing the commitment of all the public players involved in the implementation of the next phases of these IST application-laws is crucial.

Finally, it should be added that, in Romania there seems to be no regulation that would refer explicitly to the provision by the private sector of some public services with a value added, based on exploitation of information resources in the administration of the public sector. A source of economic development is thus wasted, as in the case (presented in Chapter B) of unsuccessful promotion of some products that originated outside the strategic design laboratories of public players. This type of service requires, besides elaboration and implementation of some of clear regulations, to secure equal access to resources, refining the legal framework to establish public-private partnership. Like the regulations by which public authorities can „entrust private investors the construction up and/or operation the „*classical"* public property assets"[304], a set of regulations could be elaborated for using public information for commercial purposes. In our view, speeding such a progress of legal refining becomes increasingly critical, especially since Romania is facing both corruption and its psycho-social consequences.

F.8. Regulation and deregulation in main services and infrastructure sectors

F.8.1. The construction up and/or operation the public property assets

The Romanian legislation provides for several types of legal instruments that allow the State and local authorities to entrust private investors the construction up and/or operation the public property assets. The following are such types of instruments: concession, asset management, public - private partnership and rental. It should be noted that the application norms for GO no. 16/2002 provide even for the possibility for public assets to be subject to leasing contracts. The main regulations in this field are: Law 219/1998 on concessions regime, Law 213/1998 on the regime of public property, Oil Law 134/1995; Mining Law 61/1998, GO no. 30/1995 on concession of building and operation of highways and railways concessions and Law 50/1991, on the authorisation of dwellings construction (regarding concessions), Law 326/2001 on local public services management (regarding local public services management) GO no. 16/2002 on public - private partnership contracts, (regarding PPP's), Law 15/1990 on reorganising state-owned entities as autonomous companies and commercial companies, Law 215/2001 on the public local government (regarding rental).

F.8.2. Energy

The first steps taken for the deregulation of the Romanian energy sector were marked by the reorganisation of the National Electricity Regie (RENEL- has controlled the whole energy sector until 1998), which consisted in establishing The National Electricity Company ("CONEL"), National Company "Nuclearelectrica" and the Regie Autonomous for Nuclear Activity. EGO no. 63/1998 was the first legal instrument after 1990 issued with the purpose to unitarily and completely regulating the electric and thermal power sector in Romania.

In 2000, CONEL restructuring process began and presently the energy market becomes gradually accessible to competitors. According to Musat&Asociatii (2003) „currently – starting with February 1st, 2002, the energy market competitive access rate is 33%, and the natural gas market

[304] See chapter F.8.3.

access rate rises to 30% of the total domestic consumption in 2002." The same study is assessing that „despite the notable efforts made for the deregulation of the national energy system, a multitude of issues are still pending, awaiting so far to be addressed by the competent authorities, in order to reach the final goal: the sector privatisation"[305]. Presently, the power to get forth, organise, manage, co-ordinate and control the operation of the energetic services of local interest is an exclusive right of the local public administration authorities. Additionally, these authorities have the power and the responsibility to monitor and control the management of such services, as well as the operation and exploitation of the related infrastructure.

F.8.3. Privatization of utility suppliers

The privatisation legal framework comprises several special provisions regarding utility suppliers which are in the portfolio of the Ministry of Economy and Commerce. For the companies of strategic interest in the utilities sector, the privatisation mandate is approved through Government decision. In this context, GD 556/2002 approved the privatisation mandate for S.N.P. Petrom S.A., Hidroelectrica S.A. and for subsidiaries of Distrigaz S.A., or Electrica S.A. For some of the companies subject to privatisation, such as SNP "Petrom" S.A., "Distrigaz Nord" S.A. and. "Distrigaz Sud" S.A, "Electrica" S.A. This decision specifies in detail the requirements regarding privatisation, (including payment of expenses related to the provision of advisory services). An innovative feature meant to raise investment by increasing the share capital, introduced by Law 137/2002, consists in the option granted to the investor having subscribed and paid up capital contribution, pursuant to a capital increase of a company from the utilities sector, to subsequently buy stock owned in that company by the public institution involved, under the terms and within the time periods agreed upon the share capital increase. The Methodological Norms expressly stipulate the possibility to grant the investor having contributed to the capital increase, the option right to buy sufficient stock to ensure the same at least 51% of the total voting rights.

F.8.4. Institutional implementation capacities

The next two emergency government ordinances: EGO no. 63/1998 on the electric and thermal power and EGO no. 29/1998 on the establishment, organisation and functioning of the National Electricity and Heat Regulatory Authority represented an important progress in what concerns the creation of the legal framework for later development in the energy sector. During the last two years, the regulation of the energetic sector has seen substantial changes by the Government Ordinance 73/2002 on the organisation and operation of public services of central thermal energy supply and by the Electricity Law 318/2003. Such enactment have regulated the separation of electricity related activities (including CHP-co-generated thermal energy), where the National Authority of Energy Regulation (NAER) is the regulatory authority, from central thermal energy, where the National Authority for Regulation of Public Community Services[306] (NARPCS) is the regulatory authority.

NARPCS has under its jurisdiction the operators managing, using and operating the energy systems of local interest, irrespective of their organization, property or subordination form, that perform one or several activities specific to energy related services of local interest.

[305] idem

[306] NARPCS is an autonomous public institution of national interest with legal status, coordinated by the Ministry of Administration and Internal Affairs.

Exceptionally, operators that perform activities in cogeneration thermal power production, exclusively or together with other activities specific to the energetic services of local interest, fall under the jurisdiction of NAER.

NARPCS' main task is to regulate and control the operators' activity regarding their compliance with the service performance indicators, substantiation of prices and tariffs, users' protection, and the efficient operation of the public and/or private property of the local administrative authorities, related to such services. Licensing and/or authorisation of the energetic services operators of local interest is granted by NARPCS, except for operators acting in the production of thermal power in cogeneration which need to be authorised by NAER.

Recently, the role of APSMO (see the previous section F.3.) has diminished due to the progress of the privatisation process and to the transfer of the major companies to the portfolio of the Ministry of Economy and Trade – The Office of State Ownership and Privatisation in Industry[307] (MET-OSOPI). Still, APSMO has retained major competencies within the privatisation and post privatisation process for companies included in its portfolio. The role of the relevant ministries in the privatisation of certain state-owned commercial or national companies was strengthened through successive legislative amendments since 1999, aimed primarily to ensure co-ordination of the privatisation process in fields of great significance for the national economy, and an articulate management of privatisation strategies. MET has in its portfolio state-owned strategic companies such as national companies active in energy, oil, or steel sector. In accordance with the privatisation legislation, MET fulfils through OSOPI any other activities than those established by GD 556/2002, required in order to put into practice the privatisation strategy of the companies in its portfolio. Beside MET, the Ministry of Transportation, Constructions and Tourism (MTCT) has an important role in the privatisation. Starting January 2001, certain state-owned companies have been transferred from APSMO' competence to that of MTCT, which took over the duties of public institution involved, in view of exercising on State's behalf, its rights as shareholder in those companies, and, on the other hand, the decision-making powers for privatising the companies in its portfolio, including the preparation of the privatisation strategy and execution of the privatisation contract. The powers of the MTCT in the privatisation sector relate also to the preparation of the privatisation strategy for companies in its portfolio, and to promoting and preparing special enactment for the acceleration of the privatisation in the tourism sector.

F.9. The effects of these on the economy in the future

The main effects of regulations adopted in energy sector and the construction up and/or operation the public property assets are those regarding increase in quality of management through increased competition, (thus reducing losses due to bad management of public funds), creating the possibility for modernising public utilities infrastructure, and increasing the number of industrial segments, where the economy is controlled by a system of regulations and authorities specific to advanced market economies. These comply with European practices in the field. Overall, these regulations and privatisation policies increase the chances of consolidation of the market economy. One must bear in mind, that, unlike the other transition countries that started

[307] MET's powers, as public institution involved in privatization, are exercised by OSOPI, a public institution with separate legal status, but subordinated to the ministry.

opening in the late '80s, Romania saw in the same period a reverse process. The heritage of that stage is still to be felt. In our opinion, legal measures adopted after 1998 (Muşat & Asociaţii (2003)) are a real turning point for the future evolution of Romanian economy. If Romania will receive the market economy status in 2004, this will mark another turning point, but also a signal for the foreign investors. As such, this would constitute a further factor with indirect positive influence on IST, beside those presented in Table B1.

F. Conclusions

The communications' market became fully liberalised on January 1st, 2003. Romania has started the implementation of the New Regulatory Framework for Electronic Communication Networks and Services (the new acquis communitaire in the field, adopted in 2002, containing the Directives 2002/19/EC-2002/22/EC and the Directive 2002/58/EC), by setting up two key institutions. As acknowledged by the EC (2003a), "Romania has already achieved a considerable degree of alignment as regards telecommunications. Further alignment with the acquis should concentrate on implementing legal provisions on users' rights and on universal service**"**.

The legal framework for the development of electronic commerce comprises over 11 specific laws that were adopted or modified between 2001 and 2003. The implementation of this framework was completed and the new specific regulatory authorities were set up and are functional as at this moment.

Copyright and patent rights legal framework is fully compliant with the EU practices and with the most recent international regulations but the lack of resources of ORDA and the inter-institutional coordination dysfunction in the field of copyright are reducing the efficiency of fighting against the software piracy.

The overall effect of the progresses in regulating the markets sensible to monopolistic behaviour creates a better business environment. This facilitates the increasing of foreign investments as well as the development of local businesses. On the background of the general favourable factors occurring in 2003 (See Chap. B.), the regulations on technological, scientific and industrial parks as well as those on intellectual property represent a good opportunity for setting up more coherent mix of policy actions in order to eliminate the danger of dependency on the outsourcing model that Romanian IT industry is facing. However, the positive effects of adopting these regulations will be felt only after the central and local authorities accumulate experience in this field.

The only measure related to opening further the ICT market that might impact significantly the telecommunication sector is the granting of the three frequency ranges licenses 1,900-1,980 MHz and 2,110-2,170 MHz.

SWOT

Strengths • The regulatory framework fully compliant with the new aquis (2002) in telecommunications and the functional institutional framework for enforcing it; • Progress in deregulating the markets sensible to monopolistic behaviour; • Well-designed legal framework in the fields of network security, users' protection and antifraud; • Copyright and patent rights legal framework fully compliant with the EU practices and with the most recent international regulations in this field. • Accelerated privatisation process close to finalisation; no delayed privatisation in the field of infrastructure for IST.	Weaknesses • Limited implementation capacities especially in the Health sector; • The lack of resources of ORDA and the inter-institutional coordination dysfunction in the field of copyright are reducing the efficiency of fighting against the software piracy • The institutional capacities for setting-up technological and industrial parks are still low
Opportunities • The new legal framework adopted for setting up industrial, scientific and technological parks; • Well-articulated new legal framework enabling eCommerce and implementation of a wide range of IST-based projects; • Commitment of MCIT to sell its remaining stake in Romtelecom and to listing the company on the Bucharest Stock Exchange in 2004.	Threats • Lack of awareness regarding the need for training programmes for the staff in public administration; • Lack of legal base for systematic activity of PPPs in the field of IST-based public information and services. • An abuse reliance on the administrative-methods of promoting the use of IST by mandatory measures; • Decision of granting the three frequency ranges licenses (1,900-1,980 MHz 2,110-2,170 MHz) in an unfavourable moment.

G. EDUCATIONAL SECTOR

G.1. Achievements in secondary and tertiary education

G.1.1. The structure of educational system

Upper secondary education is not compulsory in Romania[308] and begins with the 9th form (see the next box for the structure of education system). The total enrolment in upper-secondary education maintains over 70 per 100 15-18 population (73 in 2001/2002 and 75 in 1996/97). The rate of enrolment in the first year is over 92% but around 20% are abandoning afterwards, the possible reasons for abandon being difficulties to cope with the curricula and lack of financial support (except for public schools, which are free of charge) (Bârzea (2001)). Thus, it can be noticed that the highest abandon rates are in vocational and apprenticeship schools were more pupils are coming from poor families (MER (2002c)).

The high abandon rate can be also explained by the fact that most of the school units (over 85% in 2001) (MER (2002c)) are located in urban areas, which makes it more difficult for the pupils from rural areas to reach them[309].

Box G1: The structure of educational system in Romania

1. General compulsory education
- primary education (forms 1-4, age 6/7 - 10/11)
- lower secondary education (forms 5-8, age 10/11 - 14/15)

2. Upper secondary education
- high school education (forms 9-12/13, age 14/15 - 18/19) which can be:
  - theoretical high-schools
  - industrial high-schools
  - military, theological, sport, arts and pedagogy (forms 9-10/12, age 14/15 - 16/18)
- vocational education
- apprenticeship education (forms 9, 9 - 10/11, age 14/15 - 15/16)

3. Post-secondary education:
- post high schools
- foremen schools

4. Higher education:
- short-term education (1-3 years)
- long-term education (1-4/5 years)

5. Post-graduate education
- master level (provided by Universities and through MBA programs)
- PhD level (provided by Universities and Romanian Academy, incl. through its Research Institutes)

Source: Velea *et al.* (2002) and Bîrzea (2001)

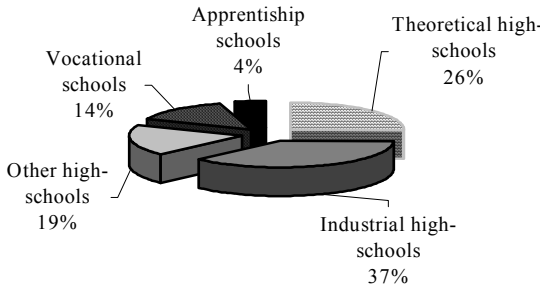
[308] Compulsory education was extended from 8 to 10 years because of an amendment to the Education Law, in June 2003. Therefore, compulsory education will cover primary education (4 years, the age group from 6 to 10 years), lower secondary education (4 years, the age group from 10 to 14 years) and the first two years of upper secondary education (the age group from 14 to 16 years). Source: http://http://www.socrates.ro/old/ROMANIA_EN.pdf , EC (2003a)

[309] Recently, programs are put in place to provide school buses for pupils from remote areas.

Over the period 1996-2002 the structure of the upper secondary education remained relatively constant, consisting in: vocational and apprenticeship schools offering at graduation a professional qualification certificate, and high schools offering a baccalaureate diploma. The latter form of education includes the theoretical high-schools, which have the lowest degree of specialisation, the industrial ones and more specific high-schools, as military, theological, sport, arts and pedagogy (see graph G1.).

Only based on the high school baccalaureate diploma, a person can enrol in the higher education. The high-school graduates, with or without baccalaureate diploma, can also attend post high-school education. The graduates from vocational and apprenticeship schools have the option of enrolling into foremen schools.

Graph G1.: Structure of enrolment in upper-secondary education in 2001/2002



Source: authors' calculation based on NIS data.

As public secondary education is for free and provided on a large scale, the private secondary education is insignificant, representing only 0.8% of total high schools enrolment in 2001/2002 (increasing from 0.4% in 1997/1998) and 2.3% of vocational and apprenticeship schools (half of the value registered in 1997/1998).

Box G2: The quality of secondary education

Traditionally Romania is having good results in the international contests for the secondary education in the field of math or science education. According to Communications and Information Technology Report, Romania (February 2003), Romanian pupils won in international contests 16 medals in 2002 and 41 in 2001. However this aspect is not a relevant measure for the quality of the general education in Romania, especially if we consider the capacity to apply knowledge to real life situations.

The OECD Programme for Students Assessment, the PISA survey, conducted in 2000 with the purpose of measuring the quality of education of 15-years-olds "assessing young people capacity to use their knowledge and skills in order to meet real life challenges, rather than merely looking at how they have mastered a specific school curriculum" ranked Romania on position 30 out of 32 countries (28 being members of OECD), before only Mexico and Brazil.

PISA Survey results

Evaluated capacity	Description of the capacity	Romania score (relative to 500, the average score)	Rank (out of 32 countries)	Rank for the 1 level and below (the lowest)	Rank for 5 level (the highest)
Reading literacy	Retrieving specified information, interpreting and evaluating it.	428	30	17	29
Mathematical literacy	Recognise and interpret mathematical problems encountered in everyday life; translate this problems into mathematical context; use mathematical knowledge to solve the problems; interpret the results in term of the original problem; reflect on the methods applied; formulate and communicate the outcomes.	426	30	-	-
Scientific literacy	Capacity to use scientific knowledge; recognise scientific knowledge identify what is involved in scientific investigations; relate the scientific date to claims and conclusions; communicate these aspects of science.	441	30	-	-

Source: OECD (2000)

More worrying than the high abandon rate is the enrolment after the secondary education, measured by the early school-leavers. Thus, the percentage of the population aged 18-24 with at most lower secondary education and without further education or training was 23% in 2002, almost double than in most of the candidate countries (EURSTAT (2004)).

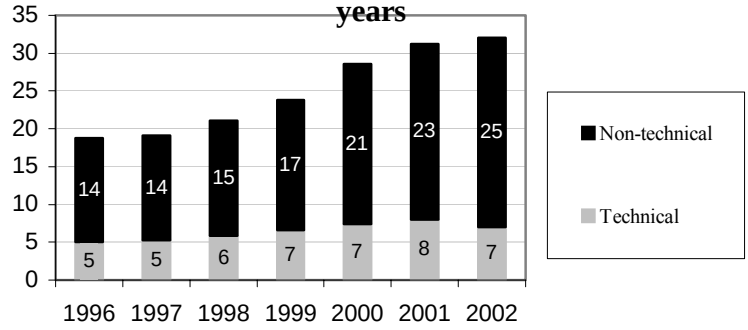
The intermediate education level between secondary and tertiary education is represented by the **post high schools** which enrolled 3.6 students per 100 persons of 19-23 years in 2001/2002 (3.5 in 1996/1997) and the **foremen schools,** enrolling another 0.4 students per 100 persons 19-23 years old in 2001/2002 (decreasing from 1 in 1996/1997).[310]

[310] Data provided by NIS.

The number of students in long duration tertiary education (minimum 4 years long) grew significantly in 1996-2002 period, i.e. by 64% reaching 32 per 100 persons of 19-23 years in 2002/2003 (see graph G2.). As this increase was larger in the non-technical fields, the share of students enrolled in technical fields decreased from 27% in 1996 to less than 22% in 2002.

However, one should take into account that a great share of the increase in enrolment is owed to the fact that many public universities admit a larger number of students, requiring fees for the additional students.[311]

Graph G2.: Enrolment in long duration higher education per 100 persons of 19-23 years



Source: Authors' calculations using NIS (2003a) and NIS (2003d)
Note: Enrolment at the beginning of the year. For the year 2002 the calculations are made using the 2001 population data.

Enrolment in private tertiary education in 2002/2003 was of one quarter of the total number of students. Although the tuition fee is not high compared with the average European salary, ranking mainly between the equivalent of EUR 400-500, this burden is unaffordable for too many Romanians, given that, for instance, 40% of the Romanian population meet serious difficulties in paying the utilities and monthly rates (NIS (2003e)). Moreover, the state universities started admitting more students, and the private ones did not manage to build their own identity (partially because of the weak support offered by the Ministry of Education and Research).

As the structure of enrolment in private tertiary education by area is nevertheless more market oriented, and the number of students enrolled in technical field (including agriculture) reaches just 4.2% in these universities in 2002/2003, it could be inferred that there is a lack of interest for the technical fields. The most important fields in private universities are economic studies (42.6%) and legal studies (29.3%). This situation is reflecting the delayed industrial recovery and also the lack of vision for longer term (in the sense that the long term development strategies are not transparent for the population).

Short duration tertiary education system (which lasts at most three years), represented another 2.7 students per 100 inhabitants of 19-23 years in 2002/2003, 90% of them being enrolled in public universities. Here, the share of technical fields was slightly higher than in the long duration university system, reaching 35% at the beginning of 2002.

[311] The fees are comparable to those of the private universities.

G.1.2. Lifelong training

Lifelong training is a priority included in the National Development Plan[312], and provision of periodical work-related training became compulsory for the employers with the adoption of the New Labour Code (adopted in 2003). Nevertheless, the attention paid to it is rather low, both on the part of employers and of the social partners.

SIBIS survey (2002/03) showed that less than 5% of the Romanian labour force had participated in work related training provided by employers or other organizations over the four weeks prior to the survey. This percent is not only the lowest in the candidate countries, but is less than half of the average of the candidate countries. However, 16% of the Romanian respondents took part in self-directed lifelong learning (in work related matters), which is not a small figure.

The survey carried out in the second trimester of 2003 by the NIS (NIS(2003f)) showed that 18.1% of persons over 15 years had have participated in lifelong learning in the prior year. For the 15-64 years population, the share is 20.8% (25.1% in urban and 15.1% in rural areas). These figures include self-directed learning, which represented two thirds.[313]

The rate of participation in life-long learning for employed population is considerably lower than the average, as the number of inactive persons involved is double than of the active ones (the share of inactive persons being extremely high especially in total lifelong training carried out in the national education programs, where it reaches 90.6%) (see Table G1).

Table G1.: Participation rate in lifelong training of the employed population in 2003 (%)

Economic sector	Total	of which non self directed learning:
Total	**11.1**	**1.1**
Agriculture	4.3	0.5
Industry	10.1	0.9
Trade	15.0	1.5
Social services	24.6	2.5

Source: NIS (2003f).

As can be noticed from the Table G1., the self-directed method of learning represented 90% for the employed population. This situation might be caused by the fact that the employers are not paying for courses (considering the fact that 70% of total training are of professional purpose) but could also reflect the lack of trust in the education system. On the other hand, as the participation rate for individuals with tertiary education was almost double than for the rest, it is possible that the participation is also dependent of the level of awareness.

[312] EC (2003a) highlights the fact that the legislative framework for adult training is still not yet complete and operational

[313] From the rest, most were involved in national education programs and only a small share have participated in other courses or workshops.

A survey carried out in 1999 showed that the reasons for the low level of participation of employees in lifelong learning are (Bârzea (2001)):

- 77.9% of the companies which do not organise training courses declared that they are consider the existing level of skills of their employees as satisfactory;
- the companies prefer to hire people which already have the necessary training;
- the trust in the initial training level of the employees (39.7% of respondents);
- too large costs (29.3% of respondents).

The same source highlights that this situation is in contradiction with the national collective labour contract (2000), and the Government Decision regarding adult professional training (No. 129/2000), as well as with the new Labour Code (2003) all stipulating the obligation of the employer to provide periodical training courses.

NIS (2003) also revealed that 35% of persons involved in self-directed learning are using the Internet as one of the information sources (46% of urban and 10% of rural).

A time series for participation in life-long learning is available only for the number of persons attending training courses registered by the Agency for Labour Force and Employment (ALFE-one of the main providers of life long training). This number grew since 1996, reaching 93 000 in 2001 (0.9% of the active persons). The share of unemployed persons attending the training decreased, reaching 30% in 2001. In the same year, the share of these unemployed persons participating in ALFE training represented 3.6% of total unemployment. However, it should take into account that much of this training represents in fact professional reconversion.

Table G2.: Number of persons attending training courses registered by the Agency for Labour Force and Employment (1996-2002)

	1996	1997	1998	1999	2000	2001	2002
Total	49074	61479	70763	79295	87018	93786	99664
Of which: unemployed	20409	23575	27157	30559	26410	27698	19536
Total as % of active population	0.4%	0.5%	0.6%	0.7%	0.8%	0.8%	0.98%

Source: NIS (2004a)

ALFE is organising, free of charge, formation courses for unemployed. Starting with 2001, 80 % of the courses are organised only to the extend that employment can be provided for the graduates of these courses, usually at the request of employers that have to ensure for these graduates an occupation rate above 60% over the following 6 months. The structure of the formation training ranges from courses providing specialisation on certain occupations, to courses for improving an existing qualification. Moreover, there are courses for introduction to market economy, or preparatory courses for those who want to start up a small company. In order to effectively reach their targeted beneficiaries, the unemployed, these courses are locally organised by providers of training that can be public or private training institutions, companies or

NGOs. The costs are paid by ALFE, for the training period that can be up to nine months long.[314] In 2001 almost half of the trainees participated in programs carried out through ALFE at the request of the employers, but this share dropped to 24% in 2002 (NIS (2004a)). 70% of the persons attending these courses in 2001 found a job after training.

Although ALFE is also covering the transportation fees, there is a big rural-urban gap regarding training: less than 30 % of the persons attending training in 2001 were from rural areas, fact that supports the idea that the participation is also dependent on the level of awareness.

G.1.3. The output of higher education system - number of graduates

In 2002, there were over 93 000 new graduates from tertiary education of long duration, representing 5 per 100 inhabitants of 19-23 years (4.4 in 2001), of which 20% were majoring in a technical subject, mostly in public schools. Additionally, there were 14,000 new graduates of the short duration tertiary education representing 0.7 per 100 inhabitants of 19-23 years, less than a quarter of these majoring in a technical field, and only 15% from private schools (NIS (2002b)).

Although the number of new graduates is increasing, the share of population with tertiary education (9.97 % of 25-64 age group in 2001) is much below the EU average (21.22% in the same year) (EC (2003b)).

The number of **tertiary graduates in science and technology per 100 of population aged 20-29** of 0.39 is again one of the lowest in Europe, almost half of most candidate countries (EURSTAT (2004)). However, in terms of quality, Romanian education in math and science is quoted as very high[315].

G.1.4. The demand for higher education - number of university applications

For the Romanian private universities the number of applications has been equal to that of accepted students, at least for the last years, given the mentioned low level of income. It should be mentioned that most of the private universities have problems in finding students.

Thus, speaking of competition means speaking exclusively of state universities and, in many cases, only of the places financed by the state. However, not even for public universities does the number of applications always exceed that of available places. As it has been pointed earlier, there are some departments for which the inflow of applications is greater. In the case of legal studies the number of applicants is currently exceeding ten times the number of available places (and there have been years in the past when there were 25 applicants per place). The Academy of Economic Studies has also more than one application per place, for some faculties reaching 7 candidates per place. Other fields attracting many applications are the university-pedagogy (especially journalism) and medical school. In the technical area, in ICT related departments the demand is exceeding the supply, but most of the other faculties hardly find enough students (because of the large number of engineers produced in the communist period and to the delayed economic recovery).

[314] http://www.anofm.ro/servicii_oferite/cursuri_calificare_recalificare_bun.htm

[315] WEF (2004) ranks Romania on the 9th position (out of a sample of 82 countries), with a score of 5.81 (out of a maximum of 7) in terms of quality of Math and science education

This structure of demand for education (with huge proportion of demand for economics and law) that can not cover the needs of any country on medium and long term, is caused partially by the delayed industrial recovery, but also by the very weak labour market information for supporting career information profiles (WB (2003)) and by the lack of direct link between occupational and educational information.

This is obvious when talking about the applicants for ICT fields: their number although exceeding the number of places for the state universities being extremely low for the private system[316]. This fact could reflect only the lack of vision regarding the future of the information society (given at least the shortage of ICT specialists at European level and the booming software industry).

G.1.5. Reforms, evolution and trends in secondary and tertiary education

With one exception in 1998, public expenditure on education as percentage of GDP slowly oscillated around 3%, despite the fact that the Education Law clearly specifies a minimum of 4% (art.170). The existing level of these expenditures is ranking Romania on the last position not only comparing with the EU members (at a significant distance from the 5% EU average), but also in the group of the candidate countries (EURSTAT (2004)).

The relative uniformity of the budget allocated to education is hiding some *changes in structure*. Thus, the share of higher education decreased to 10.8% in 2000 after a peak of 19% in 1998 (UNDP (2003)).This situation is reflecting the priorities of the education policy, its orientation towards improving basic education conditions, fact explainable if we consider for instance the bad conditions in rural schools.

According to SIBIS (2003b), the Romanian strategy to advance towards knowledge economy regarding education is based on: schools' endowment with computers and Internet connection, teachers' preparation to use computers and new methods in education and centers created for long life learning and qualification flexibility.

Included in the reform process, in 1998 and 1999 some major changes have been implemented, as follows (UNDP (2003)):

- The New National Curricula for high-schools was introduced, enabling the pupils to choose a part of their study fields and also enabling the high-schools to built their own identity; also by choosing to offer some study fields.
- Alternative school books were printed an all the study fields.
- A larger autonomy was granted to universities regarding both the curricula and the allocation of financial resources
- Learning in Hungarian, German, Pollen, Jewish, Bulgarian was introduced (learning in minorities language was allowed since 1992) enabling the children from the minorities to learn in their native language.

[316] In October 2003 Prof. Camelia Cămăşoiu, Pro-Rector at the Ecological University of Bucharest declared in an interview with the authors that the university launched in 2000 an Informatics Faculty but it did not have enough applicants.

- The first program for Roma education was put into practice[317]

Moreover, during the period 2000-2003:

- Scholarships started being granted to pupils and students from low wage families and to adults included in alphabetisation programmes[318].
- "The strategy concerning initial and continuous training of teachers and managers in education (2001-2004)" was adopted in November 2001[319].

In the Romanian Tertiary Education Strategy 2002-2010, The Ministry of Education and Research (MER) considered that the 84 private universities were too many for ensuring a high quality teaching-learning process, so it proceeded to a drastic selection, instead of stimulating them to meet the quality requirements. Moreover, the selection criteria, besides the material conditions and the quality of teachers (which proved indeed weak in many cases), were the compliance with the standards in state owned faculties, fact that diminished the chances of the private universities to build their own identity.

As the UNDP (2003) shows, financing remains the main problem of the Romanian educational system. In some poorer rural areas, there are even schools which do not comply with minimum hygienic requirements or do not have the necessary facilities (current water, electricity, and sanitary units).

In the UNDP (2003) there are six priorities regarding the education system:

1) Continuing the Curricula reform;
2) Didactic and learning methods reform;
3) Comprehensive reform for a more effective link between primary schools, high-schools and universities;
4) Improving usage and application of advanced technology
5) School and university management reform through decentralisation and increase of the educational institutions' autonomy;
6) Advanced forms of international co-operation.

Despite the financial constraints, some important programs have been developed, many of them with international financial support:

- With the support of PHARE RO 9405 programme, "a substantial reform of the vocational education and training (VET)[320] system was carried out in Romania in the late '90s. The reform targeted the main components of initial training, namely the curriculum, teacher training, evaluation and certification, adjustment to labour market demands, and involvement

[317] PHARE ProgrammeRO.0104.02 Access to education for disadvantaged groups, with a special focus on Roma. The project includes building schools in disadvantaged communities with a large Roma population and the introduction of educational equipment and materials in Roma related teaching subjects. http://Europa.eu.int/comm/enlargement/pas/phare/programmes/national/romania/2001/ro-0104-02%20roma%20education.pdf

[318] MER (2002c). The number of an-alphabets reached 3% in 2001.

[319] Nevertheless, the EC (2003a) appreciates the progress in its implementation as limited.

[320] VET includes industrial high-schools, apprentices schools, vocational schools, post high-schools and foremen schools.

of social partners" (Rogojinaru (2001)). The difficulties mentioned relate to the shortage of qualified personnel in rural schools to teach these subjects, difficulties encountered in involving employers and social partners. Additionally, even though the participation of schools in the program proved self-sustainable, most of non-PHARE schools are still in a critical situation regarding equipment and materials needed for the new curriculum.

- In 2001, MER started implementing a school consolidation and busing program. So far 200 rural schools have been consolidated, 195 school buses have been purchased to serve 5 600 pupils from rural areas where a village school has been closed and children have been transferred to a larger center (180 such centers are currently operating). In 2002, the school consolidation process continues and another 195 mini buses are being procured and distributed to schools. Starting with 2001, the Government initiated a program that provides standard packages of student supplies to students from poor families. In 2002, the program "Roll and Milk" for primary students is implemented throughout the country. In the future, the program may be extended to cover all students in compulsory education, as well as preschoolers.[321]
- Under the School Rehabilitation project (co-financed by the Bank and the Council of Europe Development Bank), 850 schools have been rehabilitated; about 75% of them being in rural areas. By the end of the project, 350 more schools will be rehabilitated. These were schools of which building were not safe. In addition, a significant number of rural schools lack minimum utilities: water, sanitation, heating, and lighting. This is a situation that represents a high risk for students' health and has a negative impact on school attendance.

  The schools in rural areas suffer from a chronic lack of teaching and learning materials. The shortages in learning materials started being addressed in a pilot activity under the Education Reform project. 2 039 rural schools in eight counties received basic teaching materials (benefiting about 210,000 students), as well as training for teachers on how to develop their own teaching materials.[322]

  In 2003, MER obtained a loan of USD 60 million from International Bank for Reconstruction and Development (with the obligation of MER of co-financing another USD 30 million), the main objectives being the improvement of the teaching-learning process in rural schools, by up-grading the professional skills of the teachers and improving the material conditions in schools, and also building a closer connection between school and community.[323]
- One important component of the reform in the educational system is the first step towards introducing the **computer assisted teaching** methodology in. The integrated system is optimised for class utilisation, sustaining the teaching process. The system offers the possibility of customising the interface, each user being able to define specific client profiles and provides modules for school managing assistance: timetable and catalogue management, school structure management. By August 2003, the technical infrastructure was introduced in 120 high schools and the first tests with computer assisted teaching were organised.[324]
- MER project "Training by Practice Firms" has as objectives to improve educational standards in economics, and to provide the students with the necessary professional skills. So far the

[321] The World Bank Group, http://www-wds.worldbank.org/servlet/WDS_IBank_Servlet?pcont=details&eid=000094946_02062004091123
[322] idem
[323] http://www.edu.ro
[324] http://www.siveco.ro

project, an absolute novelty in Romania, has several achievements: the elaboration of curriculum for practical training in upper-secondary education and post-graduate courses approved by MER, training of approximate 25 trainers and 150 teachers, and creation of a framework for effective collaboration between the secondary education institutions and host firms.

At the higher education level, more and more courses offer specialisation in management and business, situation that will contribute to the improvement of entrepreneurial culture in Romania, which is still relatively weak. Over the last four years these possibilities have been integrated in Economic Engineering Degrees. Other courses offer engineers training in the management of SMEs (drawing up a business plan, launching a business etc).(EC (2003b).

In 2001, Romania introduced a system known as ADLIC (Electronic High School Admission). This system is the first Romanian system used to centralise the exam results and assign candidates to high schools according to their results and their preferences. The assignment of the high school candidates is made according to the specifications of the Ministry of Education and Research (EC (2004)). Using RoEduNet (the information network for the education units), a national information system (EMIS -Education Management Information System) will be created in the near future in order to ensure a better administration of resources.

Romania is participating in the second generation of Community Programs in the field of education, namely Leonardo da Vinci, Socrates and Youth. The EC (2003a) appreciates this participation as basically satisfactory, although the quality of implementation needs to be improved in some areas.

G.2. Mobility of scientific personnel

MER put in place a yearly financial support program for the international mobility of students[325], research workers and teachers. It includes financial support (usually partial) to over 800 persons with activity in R&D, covering all domains. Also, the CORINT program (part of the National Plan for Research and Development – coordinated by MER) promotes the mobility of researchers as well as the cooperation between foreign and Romanian companies and research units.

G.3. Links between education and research and innovation capacities

G.3.1. Issues in technical transfer and innovation

There are a number of links between universities and enterprises. Examples of this type of collaboration include: Polytechnic University of Bucharest and Turbomecanica SA Bucharest; University of Bacau and Machine Tools SA, Bacau; Timisoara University and Solectron Company and Continental AG Romania. Companies like Procter & Gamble, Unilever, L'Oreal, Orange Romania, and others, have put in place programs that stimulate research in universities, focusing on the cooperation between universities and companies.

[325] The amount allocated by MER for international scholarships in 2002 was 1.2 million EUR. In 2003 it reached app. 1.12 million USD, and for 2004 it reached app. 2.1 million USD).

A large number of Centres for University-Enterprise cooperation have been created in TEMPUS programme.
In 2003 the methodology for financing innovation and technical transfer units was adopted, creating opportunities for universities in this direction. (see Chapter D.3.)

In October 2003, MCIT announced the opening of an ICT technological park at the Politechnica University (the largest technical university in Romania).[326]

G.3.2. Role of academia in research and development

There are no available data on the output of research undertaken by universities, but we can asses that the number of patents granted for the universities can not be significant, given their reduced total number (see Chapter D.3.).

This is not surprising taking into account the low level of expenditure allocated by universities as share in GDP. However, as can be noticed from the Table G3, their share in GDP is on a decreasing trend, as well their share in total R&D expenditure.

Table G3.: R&D expenditure in higher education

	1996	1997	1998	1999	2000	2001	2002
Shares in total R&D expenditure	4.2%	3.4%	4.0%	7.5%	10.8%	10.2%	15.7%
Share of GDP	0.03%	0.02%	0.02%	0.03%	0.04%	0.04%	0.06%

Source: Authors calculations based on NIS (2004a).

The share of foreign financial resources for R&D undertaken by universities recorded a significant increase since 1996, from 0.4% reaching 38.5% in 2001 (20.7% in the previous year) (NIS (2003a)).

The number of research units in universities increased from 36 in 1998 to 69 in 2001, and the number of R&D employees doubled in the same interval reaching 8875 (15% of total), (NIS (2003a)) but it is not clear how much of these transformations are more than formal. The universities are the only category (the other are enterprises and government) where the expenses for fundamental research are larger than for the empirical research (44% comparing with 38%, in 2001, the rest being experimental development). (NIS (2003a))

[326] http://www.smartnews.ro

G.4. ICT related education[327]

G.4.1. ICT related secondary education

ICT specialisation in **secondary education** is ensured mostly by the informatics sections of high-schools and in a smaller proportion by the electrotechnics and telecommunication vocational schools.

Total ICT enrolment in secondary education slowly increased since 1996 reaching 7.7% of total secondary enrolment in 2001/2002 (7.1% in 1996/1997), value representing 5.7 per 100 persons of 15-18 years old (see Table G4.).

Table G4.: ICT enrolment in secondary education

	Form of education	1997/1998	2001/2002
Informatics	High schools	60 533	61 942*
Electrotechnics and electronics	Vocational schools	8 581	11 298
Post and telecommunications	Vocational schools	1 274	1 754
Total		70 338	74 994

*in 1998/1999. Starting 2000/2001 the statistical data has included informatics in the theoretical field.
Data source: NIS (2003a).

At the intermediate level between secondary and tertiary education, ICT specialisation have only the post high schools with informatics, electrotechnics and telecommunication profile, the total number increasing significantly in 1996-2001 (see Table G5.), at the end of the period reaching 8.2% of this type of education (0.2 per 100 of 19-23 population).

Table G5. ICT enrolment in post high schools

	1997/1998	2001/2002
Informatics	1678	3346
Electrotechnics and electronics	1152	430
Post and telecommunications	1115	1593
Total	3945	5369

Source: NIS (2003a).

At the **tertiary education** level the ICT specialisations (see Table G7) are science of computers and systems, mathematics and informatics electronics, representing 1.95 per 100 persons 19-23 years old (see Table G6.), almost all from the state-owned universities.

[327] The enrolment in informatics is from 1998/1999.

Table G6.: ICT enrolment in tertiary education in 2002/2003

Specialization/ Duration	Science of computers and systems	Mathematics and Informatics	Electronics	Total
Long duration (>4 years)	14 470	7 625	10 238	32 333
Short duration	1 603	2 030	1 569	5 202

Source: NIS (2003d)

The *Information Management* specialisation is still missing in the Romanian education curricula although this kind of specialists may contribute to the improvement of the quality of information systems implemented both by companies and by public administration.

G.4.2. University ICT graduates

The total number of new ICT graduates in 2002 is 7 148, representing 0.19 per 100 persons aged between 20-29 years (see Table G7.). As mentioned before, almost all of them (except 50 students) are coming from the state-owned universities.

Table G7.: The number of new university ICT graduates in 2002

Specialization/ Duration	Science of computers and systems	Mathematics and Informatics	Electronics
Long duration (>4 years)	1451	2245	1250
Short duration	325	1570	307

Data source: NIS (2003d).

According to Brainbench (2002), Romania has over 16 000 IT specialists (with at least one of the 30 top certificates in 2001), thus ranking the sixth in the world, and the first in Europe (see Table G8.).

Table G8. Countries ranking by the number of IST certified specialists

Rank	Country	Number of professionals
1	United States	194 221
2	India	145 517
3	Russian Federation	68 050
4	Ukraine	23 349
5	Canada	19 181
6	Romania	16 122
7	United Kingdom	14 642
8	Bulgaria	8 844
9	Pakistan	8 084
10	Australia	6 800
13	Germany	4 802

Source: Brainbench (2002).

On the other hand, for the period 1993-2000 the share of ICT tertiary graduates per 1000 inhabitants aged 20-29 is estimated at 4.5, placing Romania on one of the lowest positions in Europe, including candidate countries (EC (2002)).

This apparent contradiction can be explained by the fact that the number of ICT graduates is not very high, but the quality of the output is very good. This may mean both that the tertiary IST education is under-dimensioned if correlated with the human potential, and that the quality of IST education in certain field and specialisation is very good**.**

G.4.3. The role of education in increasing the general level of ICT skills

66% of the urban population and 87% of the rural population declare that they do not know how to use a computer. Moreover, 36% of the persons declaring their ability to use the computer, evaluate their own skills below rank 5 (on a 1 to 10 scale) (Gallup (2003))

One of the reasons for this (besides the cost of technology) could be the language barrier, as only 34% of the total population declare they have the ability to speak a foreign language at a conversational level ((Gallup (2003)). It should be mentioned that most of the existing software in Romania is not translated, and that, even for the translated software, the Romanian version is not very popular, situation that may deepen the digital divide.

Out of the lifelong training carried out in educational units in 2003, computer sciences represented 7.9% (almost two thirds made by persons with secondary education) (NIS (2003f)) but this means only 0.08% of total 15-64 years population.

So the main sources for ICT skills formation remain school and work. Thus the 2003 "Public Barometer", survey carried out revealed that from the persons having computer literacy 30% have learned to use the computer in school and another 30% at work (see Table G9.).

Table G9.: Structure of persons with computer literacy according to the source of their knowledge

Answers to the question "Where did you learned to use the computer?"	**Share of total respondents**
- At school	30%
- By themselves	30%
- At work	19%
- From training courses	15%
- Other	6%

Source: OSF (2003)

G. Conclusions

At the secondary education level, Romania confronts with high abandon rates, which can be mainly explained by the costs involved, especially for the pupils from the rural areas, given the fact that almost all the secondary education units are in towns.

Regarding the quality of the education, it seems that it is not enough practice-oriented, situation reflected also in a weak connection with the skills in demand on the labour market. It could be inferred that this is also a stimulus the abandon.

The lack of perspective regarding the future connection with the labour market explains also the large demand for Law and Economics at a tertiary education level, demand that is by far exceeding the possible needs of any country.

As a reaction, the universities increased the number of students mostly in these fields, thus reducing the share of science & technology.

Overall, the number of students increased significantly when compared with the 1996 level, but not sufficient for ensuring a consistent convergence trend with the proportion of tertiary education graduates in EU population. The main factor restricting a more consistent increase is the level of income that makes for most of the population the paid faculty unaffordable. It should be mentioned that at the existing level of wages, self-financing by working is very unlikely in Romania. Therefore introducing schemes of financial support for students based on cheap credits would be welcomed.

ICT education is remarkably good, especially at the tertiary level. Unfortunately, the success of the state universities did not transferred also to the private ones, where this field is almost absent.

SWOT

Strengths: • Capacity of the education system to produce high skilled in math; • Internationally recognised high quality of ICT graduates; • Positive effects of the VET reform on improving the chances of the graduates on the labour market; • A program for improving the conditions in the rural schools is put in place • Increased supply of management and business training at the higher education level; • Satisfactory participation to European Community Programs in education.	Weaknesses: • Low general education level (high number of drop-outs and low share of ICT graduates in total population); • Quality of secondary education evaluated as weak; • Low share of population involved in non self-directed life long learning; • Generally unaffordable private education for most of Romanians; • Very low R&D expenditures in universities. • Labour market information is very weak and unable to support career information profiles. • Very weak involvement of private universities in technical fields and especially in ICT related fields. • Low share of population with computer skills. • The absence of "Information management specialist" among the ICT occupations or training fields.
Opportunities: • The relatively large share of self-directed life-long training as expression of the interest in permanent training; • Opening of an ICT technological park at the Polytechnic University may create a bridge between university and IT industry.	Threats: • Too low number of students; • Lack of transparency for the public of the vision regarding the future of the information society in Romania;

IS SWOT Analysis

1. Several factors under the influence of the educational sector, directly connected with IS are seen as weaknesses from the perspective of its development. Among these we mention: the low share of population with computer skills; the absence of "Information management specialist" in the occupational classification or among training fields; the low share of ICT graduates in total population.
2. The high quality of ICT graduates is nevertheless the result of a tradition in education of the technical ICT skills. Moreover, the capacity of the education system to produce high-skilled in math represents an important input for the ICT education.
3. The low share of population with tertiary education is a major constraint for ICT penetration rates in households, as the two are strongly correlated.

4. The weak labour market information is preventing a easier orientation of the youth towards following a carrier in the most prosper industries (as ICT industry tends to become in Romania). Thus, the relative competitiveness of the ICT industry is not yet correlated wit a similar one on the educational market.
5. The low quality of secondary education endanger the quality of the higher education , including the ICT one.
6. Very weak involvement (partially because of the weak demand) of private universities in ICT related fields endanger the capacity of the educational system for further increasing the supply of ICT specialists.
7. The generally unaffordable private education for most Romanians also represent a major restriction for increasing the number of ICT students.
8. The creation of some bridges between universities and IT industry may result in a higher level of innovation in ICT industry and, at the same time, may increase the involvement of students, thus of future labour force in the most advanced activities in the field. However, the very low R&D expenditure in universities is for the moment a serious constraint.

H. NATIONAL AND REGIONAL DEMOGRAPHIC DATA AND PROSPECTIVE

H.1. Population dynamics

Starting from 1991, the rate of growth of population has been negative. As it can be noticed from the Table H1., over the period 1991 to 2001 the population has decreased, usually by less than 0.3% per year, with the lowest growth rate recorded in 1992, of - 1.71%.

Table H1.: Population dynamics

Year	Population (mid-year, millions)	Growth Rate (%)
1990	23.20	-
1991	23.18	-0.09
1992	22.79	-1.71
1993	22.75	-0.15
1994	22.73	-0.11
1995	22.69	-0.22
1996	22.60	-0.32
1997	22.54	-0.27
1998	22.50	-0.19
1999	22.46	-0.20
2000	22.43	-0.10
2001	22.40	-0.12
2002	21.79	-2.7

Source: NIS (2004a)

The fall in population is mainly due to the negative natural increase recorded throughout the period under analysis and, to a lesser extent, to the negative net migration flows recorded up to 2000, as described in the chapter on migration. Simultaneously, the negative natural increase is caused by the decline in the number of births per 1000 inhabitants, and by the rise in the number of deaths per 1000 inhabitants, as shown in Table H2.

Table H2.: Vital statistics (rates, per 1 000 inhabitants)

Year	Birth rate	Death rate	Natural increase
1990	13.6	10.6	-3.0
1991	11.9	10.9	-1.0
1992	11.4	11.6	-0.2
1993	11.0	11.6	-0.6
1994	10.9	11.7	-0.8
1995	10.4	12.0	-1.6
1996	10.2	12.7	-2.5
1997	10.5	12.4	-1.9
1998	10.5	12.0	-1.5
1999	10.4	11.8	-1.4
2000	10.5	11.4	-0.9
2001	9.8	11.6	-1.8
2002	9.6	12.4	-2.2

Source: NIS (2004a)

Possible causes of the declining birth rate after 1990 are the social insecurity produced by transition and the legalisation on abortion. On the other hand, the increase in death rate is a result of the ageing process (discussed in the following section), as the life expectancy remained relatively constant at approximately 69 years from 1990, and exceeding 70 years from 1998. However, this level of life expectancy is considerably lower than the European (EU-15) average, of over 75 years for male and over 81 years for female in 2000.[328]

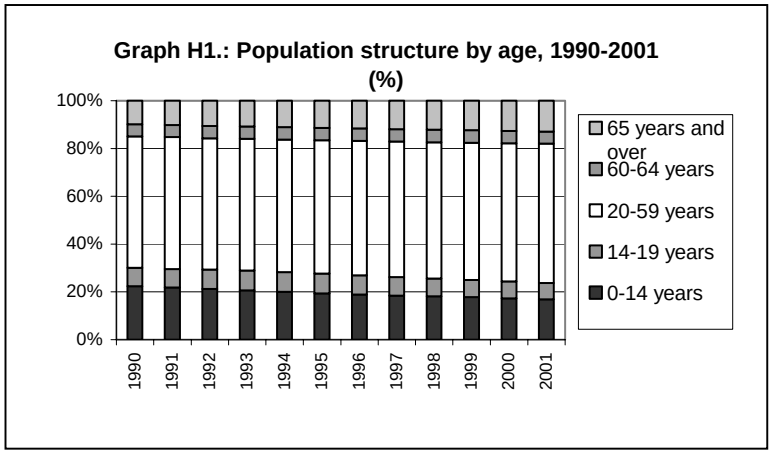
Moreover, there is a large gap between urban and rural areas (the latter representing 45% of population in 2001) (NIS (2003a)) with respect to these indicators. Both the rate of live-births and the rate of deaths are higher in the rural area, while the natural increase rate is much lower (-3.1 as against -0.6 in urban areas, in 2001) and exhibits a negative trend. The larger number of deaths per 1000 inhabitants in rural areas can be due to the different structure of population, with a higher proportion of inhabitants older than 60 years (e.g. 24%, as against 14.4% in urban areas, in 2001). Furthermore, the life expectancy in rural areas remained almost constant, lower by one year than the level recorded in the urban areas.

As a result, it is likely that this decrease in the number of births, both in rural and urban areas will accentuate the ageing of the population, fact that may increase the amount allocated for each pupil/student in the education system.

H.2. Age distribution

Since 1990, the share of population under 14 years in total population has been declining. Moreover, there is a simultaneous increase in the share of the population aged 65 and over. Consequently, Romania is experiencing an ageing process (see graph H1.).

[328] EURSTAT (2003).



Source: Authors' calculations using NIS (2003a).

For the first time over the last 40 years, in 2000 the share of old population (over 60 years) exceeded the share of young population (0-14 years), both being around 18%.

The number of children under 4 years is constantly decreasing, as well as the number of population in the 15-19 years category. This is expected to result in a reduction in the number of pupils and students enrolling in the education system.

The ageing process has negative consequences on the overall economy, as the increase in the number of inactive persons burdens the social insurance system, bringing about, on the background of the lack of substantial reform, higher tax rates.

By regions, one can noticed that lower GDP per capita (the case for South, Southeast and Southwest – see Chapter A) is correlated with higher share of old population and also of the rural one (see Table H3.).

Table H3.: Share of older age groups and rural population on regions

Region	**Share of old population (60 yeas and over) inn 2001**	**Share of rural population in 2001**
NE	18%	56%
SE	21%	43%
S	21%	58%
SV	19%	54%
V	18%	37%
NV	17%	47%
C	17%	40%
Bucharest	19%	11%

Data source: NIS (2003a)

H.3. Main economic and social effects of population dynamics

As the **Human Development Index (HDI)** is taking into account mainly longevity (which in Romania is significantly below EU average), education level (in Romania having a low share of population tertiary education, as can be seen from the chapter on education graduates) and income (extremely low, as described in the corresponding chapter) the low HDI value of 0.722 estimated for 2001 does not come as a surprise (UNDP (2003))

Thus, Romania ranked 58th out of 162 countries in 2001, which marks a slight improvement from the last years (64th in 2000), while indicating that transition's effects are still visible, at least for the poverty level. Out of the 13 candidate countries, Romania ranks on the 12th position, ahead of Turkey and very close to Bulgaria.

H. Conclusions

There is a large debate around the issue of the demographic optimum, thus it is difficult to say whether the population decline taking place since 1990 is good or bad for the general economic evolution. More relevant are the qualitative indicators, as the fact that most of the emigrants have an education level above the average.

The existing ageing process is also double-sided as it involves an increased non-productive category that of pensioners, but compensated by a lower effort with the other non-productive category, the children. However, from the point of view of the information society, the ageing process means a decrease in the social categories most opened to the new, those of the children and the youth.

The low level of HDI scores reveal the difficulty of increasing the IT penetration rates in households, as the computer simply do not resonate with the standard of living.

SWOT

Strengths**:** • The relatively large population offers a large internal market . • The low birth rate represents a reduced economic burden in the short term.	Weaknesses: • Low HDI indicating the persistence of the negative social effects of transition.
Opportunities: • Potentially the same educational expense for less pupils/students may allow higher investment per pupil/student.	Threats: • Economic overpressure on the reduced active population, because of the ageing process.

IS-SWOT ANALYSIS

1. The relatively large population offers a large internal market including for ICT products.
2. As the major driver for ICT education is the education system, the ageing process is increasing the digital divide.

I. CULTURAL AND SOCIOLOGICAL ASPECTS

I.1. Changes in employment structure

Analysing changes in employment structure, one can notice the increase of the already high share of agriculture in total employment, from 38% in 1996 to 43% in 2001[329], a worrying process especially because it is associated with a decreasing productivity. It should be mentioned that this is the highest share in EU and candidate countries, followed at great distance by Poland (19% in 2001[330]).

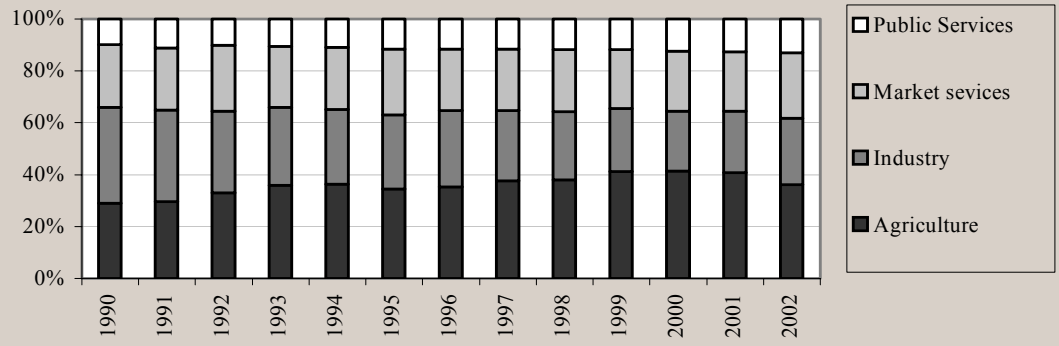
This situation is reflecting the weak absorption capacity of the labour market, which has made agriculture an alternative to unemployment (see Chapter 1).

The increasing employment in agriculture cannot be explained by the income level, as the total income of farmers' households was only 60% of the income of employees' households in 2002 (59.3% in 2001) (NIS (2003e)).

A complementary phenomenon is the maintaining of the rural areas as agriculture oriented (67% of rural employment being in agriculture in 2002 (NIS (2003g))). The solution to this situation is a comprehensive rural development pattern, to discourage the migration of a significant share of the population into the urban areas.

As the share of employment in services remained constant at approximately 31% (see graph I1.), it follows that the increase of agriculture employment is compensating the reduction of industrial employment (following the restructuring process taking place in the large companies).

Graph I1.: Employment structure by economic sectors, 1990-2002



Data source: NIS (2004a)[331]

[329] According to NIS (2003g), the corresponding value was 36% in 2002, but this value was calculated based on a different methodology (see Chapter A).

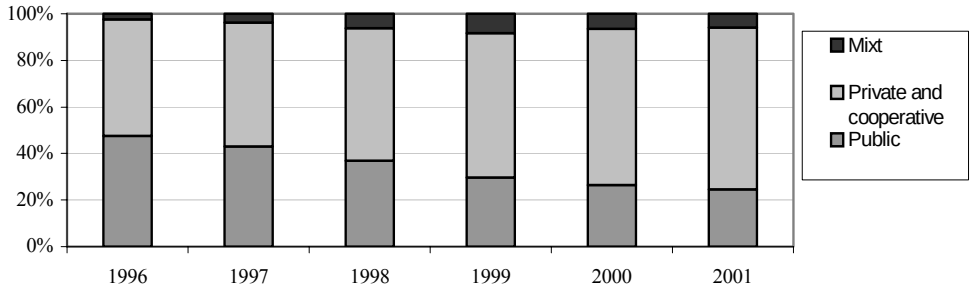
[330] http://www.ilo.org

[331] "Agriculture" includes also forestry, "Public services" includes public administration, education, health and other activities

Employment in medium-high and high-tech manufacturing was only 4.9% of total workforce in 2001. This is rather low, being 20% below the EU average (7.6%).(EC (2003c)) In the same time, as shown in Chapter A, a general trend of increasing average education level can be noticed in the structure of employed persons beginning with 1996.

The significant transfer of employees from state-owned units to private ones is determined mainly by the changes in the ownership of the economic units (through privatisation). Mixed ownership is a transitory state between public and private ownership. As privatisation proceeded, mixed ownership had an increasing trend up to 1999, followed by a decline (see graph I2.).

Graph I2.: Employment distribution by ownership type



Data source: International Labour Office, http://.laborsta.ilo.org

I.2. New forms of employment and their link to IST

The number of teleworkers, defined as employed persons working outside the premises of the company that employs them, usually at home, and using ICT to tele-cooperate with company's management, partners, clients and suppliers is estimated by the National Institute for Statistics as insignificant, at 0.2% of total employment in 2002 (growing from 0.1% in 2001).[332] Moreover, the teleworkers are concentrated in a few activities, in 2002 their share in employment being the highest in IT activities (10.6%), telecommunications (8%), gas, energy, water production and distribution (7.4%) and trade (5%).[333]

SIBIS survey carried out in 2002/03 estimates the share of teleworkers at 2% of employment in the same year. The difference between the two sources is more connected to methodological issues than to biases in estimation. The definition of the National Institute for Statistics implicitly excludes *some of self-employed teleworking in the SOHO segment*[334]. On the other hand, the SIBIS survey registers *any person that provides some regular or occasional teleworking from home* as home-based tele-worker. Finally, *mobile teleworking*, seen by the SIBIS survey as the tele-cooperation activities of employees provided occasionally while travelling, are not included in the NIS definition.

[332] Data provided by NIS.
[333] idem.
[334] For the self-employed many of the homes becomes working places.

According to SIBIS survey:

- 0.3% of employment is home-based teleworking full time, value far from the newly associated countries average of 0.8%. Supplementary teleworking reaches 0.9%, but it is again significantly below newly associated countries average of 2.2%;
- Another 0.6% are mobile teleworkers (compared with 9[335]-newly associated countries average of 1.2%); and
- 0.3% are self-employed teleworkers (compared with 10-newly associated countries average of 1.7%).

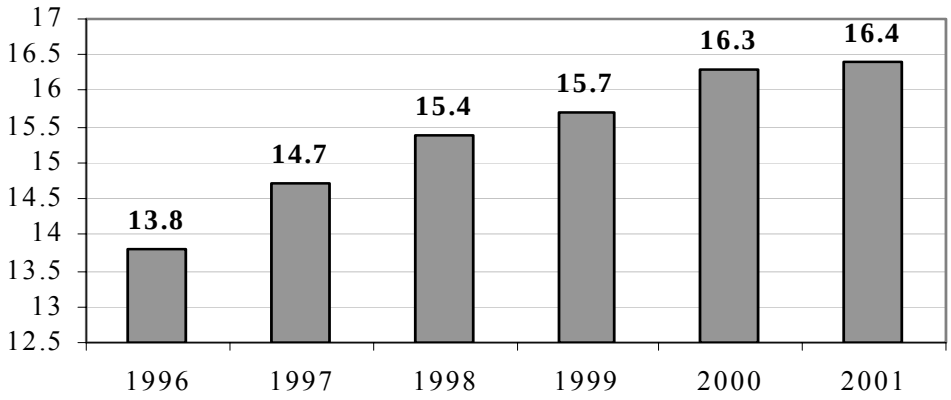
The total of around 2% ranked Romania on the last position in Europe (compared with 9-newly associated countries average of 5.4% and EU-15 average of 13%)
On the other hand, 66% of Romanians were interested in at least one type of teleworking (home-based, mobile or self employed)[336], and 16% considered their job feasible for alternating home-base telework (which is low comparing with 31% EU average but is higher than most of the candidate countries[337]) and 9% of the employed population has the possibility of tele-cooperation.

These data suggest that there is a high potential for teleworking and that that this activity may increase once the ICT penetration rates increase. Teleworking represents an opportunity for reducing the agriculture-oriented employment in rural areas and also for exporting labour (with a more reduced risk for brain drain than the temporary migration for work), especially taking into account the cheap work force of Romania.

The Work Force Survey in Households-AMIGO shows that the share of part-time employees has constantly increased since 1996, reaching 16.4% in 2001[338], value considerably higher relative to the other candidate countries. However, the value is not high compared with other developed countries, but here the motivations are different. As nearly all the part time employees are rural residents, self-employed or unpaid family workers, and looking for a permanent job. In Romania, part-time work represents another alternative to unemployment (see Chapter A) and it is not a choice (Stănculescu and Beerevoescu (2003))(see graph E3.).

[335] excludes Lithuania
[336] higher than the 64% of 10-newly associated countries average, and equal with EU average
[337] Newly associated countries average was established at 14%, with only Estonia, Slovenia and Slovakia registering higher rates
[338] Data for 2002 (NIS (2003g)) is 11.4% but it is not comparable due to methodological change.

Graph I3.: The share of part-time workers in total employment



Data source: Households labour force survey- (AMIGO), 1996-2001.

More than half of the part-time workers are women, female part-time work representing 18.4 percent in 2001 of their total employment, which is significantly higher than in other candidate countries (e.g. 0.5 percent in Bulgaria) but much lower than in the Western countries. The female share in the part-time employment has followed a slightly downward trend between 1990 and 2001, unlike in the other CEE countries (except for Bulgaria). Men in part-time work represented 14.7 percent of total employment in 2001, a share substantially higher than in the OECD countries[339].

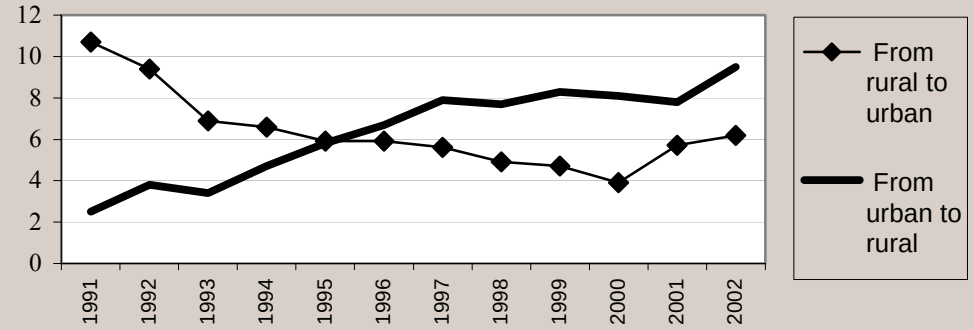
I.3. Migration

I.3.1. Internal migration

Before 1990, internal migration was controlled by a restrictive and centralised communist policy. Subsequently, as the mechanisms of the market economy were put in place, migration was liberalised and professional mobility increased. The continuous increase in urban unemployment and land privatisation caused, for the first time in 1997, the urban-rural flow to overcome the migration from countryside to cities, the former registering a rate 7‰ inhab. and the latter 6.5‰. This is a worrying process because the main economic activity in rural areas remained agriculture, already overstaffed, and dominated by subsistence agriculture (see Graph I4.).

[339] NIS (2002g) and Raboaca 2000 for international figures.

Graph I4.: Internal migration betwen rural and urban (rates per 1000 inhabitants)



Source: Authors' calculations using NIS (2003a)

As to the structure of the population, the greatest residential mobility is recorded among youths between 20 and 29 years.

The main reasons for internal migration are not connected to work, but more to family reasons (70% of total internal migration in 2000, as against 15% for work change).(NIS (2002d).

I.3.2. External migration

The transformations taking place in the politico-social system in Romania and the right to free circulation of persons triggered the propensity to go abroad after 1990. In 1990 96 700 persons emigrated, meaning 4.2‰ of the population. Since then, the external migration decreased continuously, reaching 0.5‰ of the total population in 2001 (i.e. 9 210 persons).(NIS (2002d)). On the other hand, the statistical data refer only to the persons declaring their intention to leave permanently the country, and it is difficult to assess the total number of persons who are in fact not intending to return, which is probably much higher.

The main destinations for Romanian permanent migrants are the USA, Canada (together covering 44% of migrants in 2001) and EU (38% in the same year).

Regarding the structure of emigration by nationalities, the National Institute of Statistics shows that the greatest part of emigrants (91% in 2001) have Romanian nationality, followed by Hungarians (6.5%), indicating that the migration flow is following the population structure[340]

Unfortunately, most of the emigrants (legal or simply not returning) have a high level of education and qualification (OSF (2002)), so we are facing a brain drain process. In the case of the students leaving for studies abroad, or of persons leaving for work, their return depends on the level of domestic wages.

By 2003 approximately 10% of the adult population had worked temporary in another country, their number being double than the one registered in 2001. The motivation is clear, as the average

[340] According to Census carried out in 2002, Hungarians represents the biggest minority in Romania with 6.6% of population.

income of the persons with the experience of working abroad is EUR 265, compare with a general level of EUR 100. The demographic profile of the work migrant is: man, age 15-44, graduating secondary education, work qualification and from an urban area.[341]

Starting from July 2001, the Romanian Government approved the income tax exception for the software developers, which, in about an year had as effect an average increase of 40% of the personnel engaged in these activities. The personal migration decreased during this period from 15% to 2% and were registered numerous cases of Romanian specialists who came back after few years spent abroad. The number of ICT specialists working in the private sector has increased during the last two years with 82%.[342]

In 2001, 14% of the 18-60 years emigrants were under 25 years. The main reasons for the youth leaving the country are the difficulties to find a job[343], the low level of salaries and lack of perspective for future development[344].

In spite of a wave of migration in 1991 and 1992, fewer scientists than anticipated have left the academic institutions in the Central and Eastern European Countries, including from Romania.[345] Some of the consequences of external migration have also been shown to be beneficial to those home institutions the overwhelming majority have joined organisations in the West, but kept contacts with their former colleagues. This has opened channels of communication between the two scientific communities. The major factor influencing external migration was the instability caused by profound social and economic change.[346]

I.4. Mobility

As a result of the significant changes in the occupational structure of Romania, in 1989-1999, over 40 percent of the employees changed either the place of work (20 percent once and 8 percent at least twice) or their occupation (22 percent once and 5 percent al least twice) or both. Out of those employed in 1990, one in every four experienced a situation of unemployment at least once, one every ten were made redundant and further eleven percent chose early retirement, especially those willing to change their residency (most often from urban to rural areas), and one in every hundred persons faced all three forms of experiences. Occupational mobility has been considerably more accentuated (almost double) in the urban areas, and it is probable that it will continue, if we take into account the current economic structure of Romania by economic sectors and branches, which is considerably different from that of EU countries (NIS (2002d)).

Out of the population over 18 years old, 25 to 35 percent of the total group accumulated between 2 and 4 occupational positions until 2001 (Stănculescu and Berevoiescu (2003)).

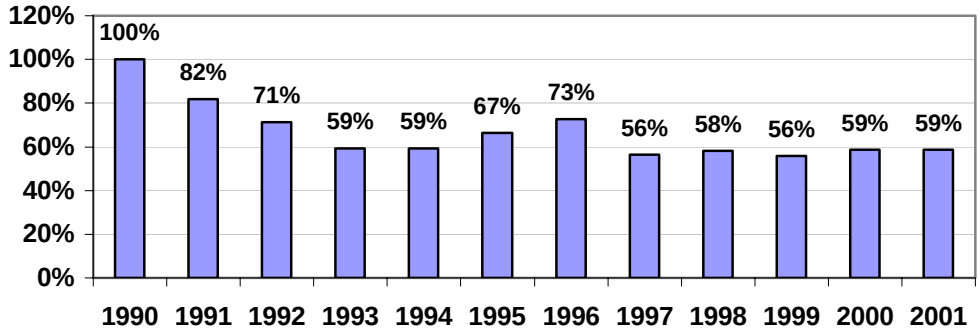
[341] http://www.italiaromania.com/primapag3.html
[342] Communications and Information Technology Report -ROMANIA, February 2003.
[343] See the average period for finding the first permanent job in NIS (2002e).
[344] Declaration of Andrei Marga, Romania's former education minister, who has studied the brain-drain phenomenon in the region. (Radio Free Europe, http://www. rferl.org)
[345] Surveying the Brain Drain from Eastern Europe (leaflet from COST project (A2-1993) called "Migration-European Integration and Labour Force Brain-Drain")
[346] idem

The relatively high occupational mobility (measured by the number of jobs changed by a person), together with the low level of internal migration due to work change (as shown in the previous section), depicts an image of a geographically fragmented labour market (meaning that a person is not looking and can not find a job in another town). There are several factors, which can explain this situation. First, on the side of the labour supply, low internal migration is rooted in the cultural pattern (close connection with the family and old friends) and the low level of income (the low financial autonomy makes a relocation very difficult, and also increases the need for keeping close with the relatives). Second, on the side of the labour demand, the custom of non-formal selection process, which is still functioning in Romania, makes finding a job in another city unlikely.

I.5. Changes in income distribution

NIS (2002f) evaluates that the household's income diminished as a result of employment reduction, macro-stabilisation policy and inflation. A decisive influence for the drop in real income had the real wages reduction. Thus, the real average wage index (1990=100) has decreased dramatically over the period 1991 to 1993, reaching values below 60% in 1993, with little variation until 2001. In 2001, the real wage represented 61.5% of 1990 wage earnings, marking a slight improvement from 58.6% in 2000 (see Graph I5).

Graph I5.: Indices of real wage (1990=100%)



Source: NIS (2003a)

Real social insurance pension represented in 2001 only 49.8% of the 1990 level in real terms, the financial state of large parts of the pensioners being extremely precarious, many of them earning below the minimal decent income.

In total income (see Table I1.), the salary earnings represented less than 46.4% in 2002 (with a slow tendency of improvement), the other sources being the income from social allowances and the equivalent of product consumption from own resources (most of it representing agricultural products).

Table I1.: Structure of households' income

	2000	2001	2002
Wages	36.3	44.9	46.4
Own account activity	3.6	3.2	2.5
Sales of goods	4.6	4	4.4
Social protection	20.2	19.5	19.6
The equivalent value of consumption of agricultural products	31.2	24.7	22.7
Other	4.1	3.7	4.4

Source: NIS (2004a)

The still high share of the equivalent value of consumption of agricultural products is a consequence of the low level of total income and is reflecting again the role of agriculture as a last resort solution. The intensity of this phenomenon is reflected also by the fact that this share is quite high also for the last decile of income (7.4% in 2001 (NIS (2003a))). The equivalent of agriculture products has a significant proportion also for employees: 12% of their total income in 2002 (reducing from 18% in 1996, but after a minimum of 12% in 2001 (NIS (2003a))). This situation is reflected by the high poverty level (see Chapter A).

I.6. Changes in consumption pattern

Because of the declining households' income, consumption expenditure diminished, while a change in structure was taking place. The average total consumption expenditure made by a household in 1999 covered only 74.3% of the expenditure made in 1995. Of course, the reduction affected less the food consumption (reducing to 87.3% of its 1995 value), than the non-food goods and services (reducing to 65% each in the same interval) (NIS (2002f). As a result, the low level of income is reflected in a large share of food and beverages in total consumption (see Table I2.).

Table I2.: Structure households' consumption in 2002 (%)

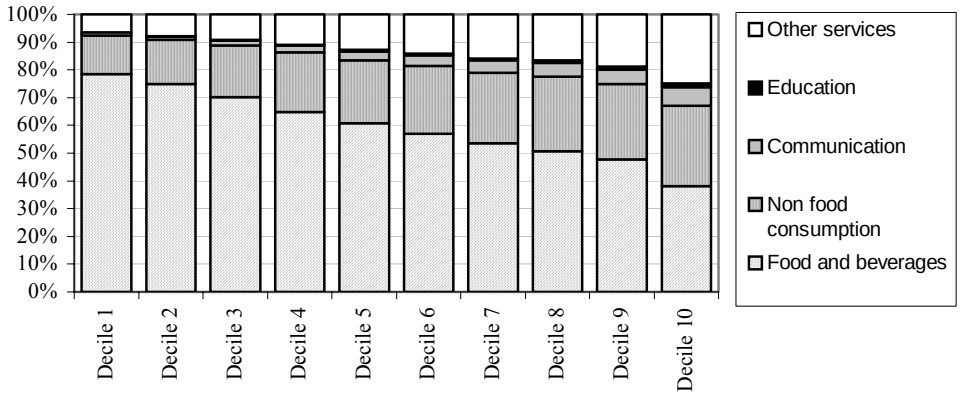
	Total	Urban	Rural
Food and beverages	55.8	49.3	67.2
Non food consumption	23.9	26.8	18.6
Communication	4	5.3	1.7
Education	0.7	0.9	0.3
Other services	15.6	17.7	12.2

Source: Authors' calculations using NIS (2003e)

The structure of consumption followed different patterns in urban and rural areas since 1995. Thus the structure was more similar at the beginning of this period, when the weigh of food and beverages consumption was 59 % in rural areas and 62% in the urban ones.

The higher is the income of a household, the lower is the share of food expenditure, although it remains important even for the highest decile. This trend was valid throughout the period 1995 to 2002 (see Graph I6.).

Graph I6.: Households consumption structure in 2002 by income deciles (%)



Source: Authors' calculations using (NIS (2003e))

Education and communication have not only small shares in consumption (0.7% and 4% in 2002), but also the highest dispersion by deciles (registering values more than 6 times higher in the last decile than in the first one), reflecting their perception as the most dispensable.

For all the social categories (employees, farmers, unemployed, and pensioners), the share of food consumption is the highest and exhibits an increasing trend, except for the employee category, which is the richest group. In the case of employees, the reduction in the share of food consumption was compensated by an increase in the share of service consumption.

The level of food consumption[347] in terms of daily caloric consumption per person is 2476 kcal per person and 78.7 g proteins. However, the share of food of animal origin in total food consumed per person is very low relative to the nutrition needs (21.6% of total caloric consumption in 2002). The fresh meat consumption of only 2.3 kg per month in 2002 (2.2 kg in 2001) is below the standards of the developed countries, and shows to be highly dependent of income (more than double in decile 10 than in the first decile).

The consumption of cereals ensures almost half of the caloric consumption, bread representing 29% of it.

I.7. Cultural patterns

During the communist period, Romania experienced a forced industrialisation process, a process that gave no consideration to the social and cultural aspects, especially in the rural areas, were the majority of population was located (in 1948 three quarters of population). After losing their land by collectivisation, many peasants relocated to large industrial cities. Under the pressure of the communist propaganda, their culture was even more altered. Nonetheless, in the rural areas the tradition remained vivid, especially due to its religious fundamentals. There are still considerable differences between the mentalities of the rural and urban population. As a large part of the rural

[347] Source: Authors' calculations using NIS (2003e)

population is still providing for their living through their own agriculture production, their connection to the market rules remains week.

The centralised system affected also the organisation of ICT activities, both on the production and the utilisation side. This situation had some disadvantages (such as the disequilibrium between the number of ICT specialists and the companies' demand for them), but equally some advantages (such as the accumulation of several clusters, including few faculties and some companies). Nevertheless, the policy pursued in the field allowed Romania to be the first country in Eastern Europe to build first generation computers (1957-CIFA, 1961-MECIPT, 1962-DACICC). The industry started in the early 70's, by manufacturing both hardware (mini/micro-computers, computer peripherals mainly for domestic consumption, and to a small degree, for export) and software products. Despite its isolation, Romania's IT industry was based on Western technology: the minicomputers/computer peripherals were produced under French and U.S. licenses (Honeywell Bull C11, DEC PDP/11 and VAX11/730, and Control Data). With access to components from South-East Asia and additional local innovation, the first Romanian microcomputers (Felix M18-M118 series) were produced in the 80s representing a "catch-up" with Western technology"(Pascu (2003)). However the IT was not available in companies but only in specialised centres. The strategy for developing the information society should take into account that in Romania the IT tradition is one of the professionals. This means that the push can be achieved from the ICT industry.

A study regarding the managerial culture in Romania as compared with 12 other countries (Caragea and Jinaru (1996), (1998)) showed that the managerial view in Romania is closer to the so-called *Latin entrepreneurial model,* model with two main features: 1) the entrepreneur considers himself the advocate of fundamental rules, that he nonetheless tends to follow selectively, easily accepting exceptions; and 2) managers are considering themselves better prepared than the employees. The study showed also that most of the managers consider that the co-operation between managers is to be preferred to competition (fact that suggests a low development of competition culture).

The main entertainment for Romanians is watching television: 93% of the population above 7 years old (NIS (2001c)); the news are the most watched program only for 30% of the population, as against 88.9% in EU. The main reasons for this are the low living standard and limited alternatives for spending free time, given that more than half of the population lives in the rural areas, where entertainment is limited.

However, reading news is not so popular, placing Romania on the last position among candidate countries in point of segment of the population reading news daily (Gallup (2001)).

I.8. The role of NGO's

A survey made in 2000 (Dakova *et al.*) revealed that in Romania there were 27 000 NGOs but only 2000 of them were active. The most numerous are cultural/leisure organisations, followed by social welfare agencies. "Education, teaching and research" is the third field of activity with 16% (see Table I3.).

Table I3.: The fields of activity of NGOs

Field of activity	Share
Culture and leisure	26%
Social services	18%
Education, teaching, research	16%
Health	8%
Human rights	7%
Environment	5%
Economic and social development	5%
Professional and business associations	4%
International cooperation	3%
Philanthropy and volunteerism	3%
Religion	3%
Other	2%

Source: 1999 Directory of Foundations and Associations

Overall, the public is mostly aware of NGOs working in the social welfare field. The popular image of a strong NGO sector in Bucharest and Transylvania mirrored by a weaker sector in the East and South disguises many innovative and successful NGO activities within the latter regions. A survey made in September 2002 by The Institute for Marketing and Social Analyse (IMAS) shows that 26.7% of the Romanian population trusts NGOs.

There are no recent figures for sources of funding for the sector – which has experienced a crisis in the last two years, with drastic reductions in foreign support (Dakova *et al*).

There are more NGOs in developed counties and in urban areas (86%, more of half of them in the counties capitals) (FDSC (2001)). The distribution of NGOs over the eight geographical regions is also uneven (see Table I4.).

Table I4.: Distribution of NGOs at county level

Region	Number of NGOs per 1000 inhabitants
Bucharest	2.0
North-West	0.9
South-East	0.4
South-East	0.7
South-West	0.6
West	1.1
North-West	2.2
Center	1.5
Total	**1.1**

Source: FDSC (2001)

I. Conclusions

Romania is faced with the almost exclusive agricultural orientation of the rural areas, where a large part of population lives. This phenomenon is connected with the persistence of the subsistence agriculture, large part-time employment and a general low level of income.
But the level of income is close to subsistence also for large parts of the urban population, situation directly affecting not only the ICT penetration rates, but also the demand for education. For most of the Romanians the level of financial resources maintain *bread* and *broadband* as real choice.

SWOT

Strengths • Relative active NGOs; • Relatively large number of NGOs in education, teaching and research field; • The tradition in the IT profession;	Weaknesses • Extremely high share of agriculture in total employment. • High share of non-optional part-timers. • Low share of employment in medium-high and high-tech manufacturing • Relatively reduced geographical mobility of work force. • Low revenues; non-sophisticated model of consumption bases on goods of first necessity, incl. non-traded on the market. • Very low level of expenses for education and communication; • Low share of teleworkers in total population; concentration of teleworking in few fields.
Opportunities • Relatively high interest in teleworking. • The temporary work migration may improve the market culture.	Threats • High risk for the rural areas to fail out • of the market economy; the rural employment structure represent a major risk for deepen urban-rural digital gap. • The low living standard may affect the propensity for accepting the IST cultural dimension; • Brain drain;

IS SWOT ANALYSIS

1. As agriculture is an economic sector usually characterised by low ICT penetration rates, these rates are expected to maintain low in the rural areas (mostly agriculture oriented). This represents a major risk for the urban-rural digital divide.
2. The low revenue results in a consumption model based on goods of first necessity limiting the expenses for education and communication and the acquisition of computers. At this level, income represents a major risk for digital divide.

3. Relatively reduced geographical mobility of work force may affect also the mobility of ICT labour-force. Moreover, it is very unlikely to attract ICT specialists in rural areas.
4. Although the number of teleworkers is very small, given the relative high interest in teleworking, this type of occupation may increase, thus improving the use of human potential (including from rural areas), in the same time opening the opportunity for domestic based labour export.

DIAGNOSIS OF FACTORS AND IMPACTS IN THE INFORMATION SOCIETY IN ROMANIA

Romania is the second largest country in the region, after Poland, in terms of size, population and market, holding a significant potential for becoming an important regional player. The build-up of the IS in Romania is a political priority and important efforts are made during last years to succeed in this goal. However, the process is highly complex and under influences from various determinant factors. Following the World Bank framework, embraced by most analyses, this diagnosis is structured around the four essential pillars namely:

1. Economic environment
2. Human capital
3. Research Development and Innovation
4. ICT field (treated from the demand and the supply sides and also from the point of view of policies introduced)

1. The economic environment

The main particular feature of the growth dynamics of Romanian economy during the last decade is the occurrence of the two-phased transitional recessions. This reflects the gradualist approach and the stop-and-go policies, as periods of acceleration of reforms alternated with periods of stagnation or even trend reversals. With the resulting rather slow restructuring process, the Romanian economy has been having a belated recovery, starting 2001. Until then the Romanian GDP per capita decreased year by year, dropping to a quarter of that of the EU-15.

The causes for such a long and hesitating transition are complex and not fully understood. Romania's communist regime was part of a regional system, but had some peculiarities specific to this country only. The most important of these peculiarities were: the strong centralisation of the economy, the ambition of self-sufficiency, the heavy industrial structure based on cheap energy imports, the irrational efforts for rapid repayment of the external debts during 1980s, and the chaotic spatial distribution of economic activities. The heritage of the Romanian–type of communism impacted clearly on the developments during transition by making the correction of the distortions in output and investment extremely difficult, not only on account of the magnitude of these distortions, but also of the local political factors, social structure and mentalities.

Among the most important factors manifested during the transition period was the hesitation in the clarification of property rights, especially in the corporate sectors (including the delayed privatisation), coupled with a tolerance of non-market behaviour manifested by the big state owned enterprises. By the end of the decade, the private sector was overwhelmingly preponderant in the SME sector, but it had remained below average in the large and very large enterprises. It was only in 2002 that the private sector became preponderant in Romanian companies' equity structure. Hence, the private sector became very important for the competitive environment. Nevertheless, it still shares with the state the influence on the internal market as a factor of alignment of industrial networks.

The reasons for such a delay are connected with the major stakeholders such as the managers of state-owned companies and trade unions in the large state enterprises, and the state bureaucracy successfully opposing structural reforms. To these adds the fear of rising social pressure, partially

based on real concerns regarding the limited potential for job-creation in the existing mono-industrial regions. Unfortunately, this strategy has resulted into prolonging the disease, as chronically under-performing enterprises have been sustained by the state through implicit or explicit subsidisation. Acting based on other rules that the market ones encouraged corruption and reduced the responsibility of the managers. Meanwhile, most of these large companies deteriorated their capital before being privatised, and the human resources were underused. Soon the level of poverty reached an alarming level, putting additional pressure towards maintaining subsidised prices for basic goods as well as for energy, and consequently for not privatising the suppliers of these products/services.

The policy response to this pressure oscillated between strategies of alleviating the social cost of transition through postponing the reforms, and gradual, albeit hesitating liberalisation processes, that met, at least until 2000, only limited success in reshaping the un-restructured economy. The early opening of the external trade (before restructuring of the economy) and the exposure to external competition in the context of low revenues, unstable macroeconomic (incl. legal, institutional) framework, credit crunch, outdated technology and availability of high and medium skilled labour force, with very limited entrepreneurial skills favoured the cost-seeking risk-adverse investment.

Lax monetary policy, easy financing for state enterprises and subsidies granted for social protection contributed to creating a framework of soft budget constraints.

The complex consequences of soft budget constraints were felt at the level of the entire economy, resulting also in large financial disorder such as bankruptcy of some banks (which in fact served for financing this sector) and increasing arrears.

The weak business environment conditions, alongside with the instability of legislation, bureaucracy and lack of entrepreneurship culture generally affected the level of competition, which slowed down the speed of change. Two vicious circles emerged. First, the low attractiveness for FDI aggravated the under-capitalisation, which was already critical since the communist period. Secondly, the laid off employees could not be absorbed into the labour force as no other competing firms had emerged.

It the same time, on the background of a very weak job creation and lack of concern for rural development, the retrocession of agricultural fields in the form of microscopic plots, unsuitable for efficient and cost-effective agriculture, has created the premises subsistence agriculture to become the main coping strategy for households affected by the longer-term unemployment, who are now captive in a low revenues – low market consumption model. The high share of self-consumption hinders the functioning of the market rules, particularly in the rural areas.

The small towns were equally affected, already or potentially, as most of them have a mono-industrial structure and low urbanisation effects, failing to offer their inhabitants real employment alternatives after the collapse of the underlying industry. Therefore while the regional disparities seem currently low in Romania, an increase in the regional disparities might be expected, as the market forces actually tend to reshape the regional profiles.

Thus, given the weak voice of the private sector, including FDI, the drivers of economic change remained during the last decade the international institutions, like IMF, WB and the perspectives of European integration. Important changes took place, especially under the pressure the EU accession roadmap, and particularly over the last years. Thus, the state sector gradually

diminished and more financial discipline has been put in place. Since 2001, the improved business environment boosted the investors' confidence and an important gain in productivity has been registered. Also, some of the technologically intensive branches (in particular plastics, pharmaceuticals, but also electronics and office machines) have recently recovered through various mechanisms, from FDI inflows to effects of various economic policies, showing hope for further development.

Nevertheless, the 2003 Regular Report of the European Commission, although underlying the Romania's progress during the last years, did not confirm the country's "market economy status". The integration was postponed beyond 2004. However, the market economy conditions in Romania were confirmed by the integration into NATO. Finalising the imposition of the market rules is now the major challenge. Without this, Romania will not be able to improve its competitiveness position, still very low, despite the impressive productivity gains in the non-agricultural sectors. Under the assumption of an adequate response of the macroeconomic policy mix to the above-mentioned challenges, official estimates point towards a rather sustained rate of growth in the next four years (at an average rate of 5.2%), and EU accession in 2007, giving hopes for real convergence in a foreseeable horizon.

2. The human capital

The above-mentioned weak job creation resulted also in large discouragement of those loosing their jobs or in the difficult transition from school to work. Thus, the restructuring process did not bring about high unemployment rates but rather decreasing participation rates and underemployment, mainly in the overstaffed, subsistence agriculture.

The under-utilisation of labour is reflected also in the increasing skills mismatch. Although the unemployment rates for the persons with higher education is not high, in 2002 a rough calculation proves that only 80% of the active persons had a job corresponding to their level of educational attainment. This rises questions on the ability of higher education to provide the skills required on the local market, but mostly shows that in absence of an efficient enterprise (and consequent job) creation policy, the supply-push from the labour market does not suffice for the local development, fuelling rather the brain-drain.

Unemployment remains high in the former mono-industrial regions, situation aggravated by the weak geographical mobility within the labour market, both because of the intrinsic rigidity of population (partially explained by the characteristics of the housing market) and of the availability of non-registered jobs. Quite oppositely, the subsistence agricultural activities cover an important share of hidden unemployment, as well as the still non-restructured enterprises.

The level of poverty and the deep urban-rural gap regarding income are probably the main social problems in Romania, but their solution resides only in continuing the economic recovery.

The analysis of ICT skills reveals a contrasting picture: an island of very good ICT specialists in a sea of population with low computer literacy. At a first glance this would suggest that on medium term Romania have the premises to rely on a supply-push from a competitive ICT industry than on large use of ICT. But this also means that the ICT industry can take very little advantage from the relatively large potential domestic market, therefore it needs to develop capabilities to become competitive at the international standards, which in turn requires investment and a functional innovation system, well connected to international trends, which is difficult to achieve, especially with the low level of FDI and competition from the MNCs subsidiaries located in Romania.

In a broader context, the whole human capital in Romania is strongly polarised, first on skills (consider for instance the good quality engineers combined with the low share of population with tertiary education), and then on income. Given that one third of population is below the poverty line, it becomes clear that income level plays an important role in behaviour.

Building the information society in Romania has to have certain levels beyond which the inclusion of certain categories becomes extremely difficult, especially of the rural agriculture oriented population. It is not only the financial mobility that needs upgrading, but also the mentalities and openness for appropriation of technology. These gaps call for large investments and a more concentrated policy on universal access to ICT.

It is only recently that the first efforts in this direction have been made, through the new launched project of building telecentres in rural areas and the law proposed by the Government to support the poor youth to buy computers.

But probably the larger support for upgrading the general ICT skills comes from education, which indeed made a huge progress in the last years in this direction. Romania succeeded to raise the endowment of higher education institutions and secondary education at or above the candidate countries standards. However, the life-long training is lagging behind in its ability to contribute to upgrading the computer skills of population and this disequilibrium may result in the increase of digital divide between generations.

Regarding the general quality of education, we have also a contrasting picture: good theoretical-based education and weak practical skills. Thus, Romania is quoted very high for the quality of math education, managing to ensure generations of Olympics, but simultaneously the practical ability is very weak.

Finally, the entire advantage of the technological skills is, to a large extent, crossed out by the inherited lack of entrepreneurial culture. The entrepreneurial component of the educational programmes was generally neglected.

However, the good mobility for students and researchers is contributing to changing mentalities towards a more market orientation of knowledge.

The existing high technical specialists are also confronted with a non-responsive job demand, as the high tech industry is underdeveloped, and the number of employees in the research field constantly decreased while wages remained low. For the moment, the outsourcing model, which is predominant in the emerging software industry, is ensuring wages relatively high in the ICT field compared with the country average. But it is very likely that, unless this industry succeeds its upgrading to international competitiveness, that brain drain will be consistent on medium and long term. This risk of brain drain is becoming more and more real, as in EU there is an increasing demand for both ICT specialists and researchers.

From a more general perspective, the ICT specialists are becoming an essential part of the embryo of the middle class, in a country with high levels of poverty and an HDI very low relative to the European area.

For the moment the internal demand for ICT specialists is not significantly higher than the supply, but this situation is very likely to change dramatically, both because of the booming software industry and of the increasing ICT penetration rates, also given that the total number of ICT specialists is not high as a share of population. However, this situation is not reflected in the

structure of tertiary education, where economic and legal studies continue to have huge shares, while ICT is only slightly increasing. This is due to the incapacity of the Ministry of Education and Research (MER) to speculate the math comparative advantage and to provide for the potential education demand a clear vision regarding both the labour market and the future of the information society.

The number of Internet users per 100 inhabitants is close to the candidate countries' average (which represents one third of EU average) and rapidly increasing. However, a certain immaturity in the security issue can be noticed, as the abuse of personal information is more than double than in candidate countries, on the background of very low ICT precautions. The anti-virus production is an example of a niche that made Romanian production successfully enter into the international market, despite the low demand on the internal one.

3. Research, Development and Innovation

According to most recent OECD studies (OECD (2003b)), the econometric analysis confirms the general importance for growth of R&D activity, using a standard proxy for technological progress, multi-factor productivity growth[348]. The same studies suggest that ICT is very important for innovation. The effect of ICT is threefold: the ICT use is increasing the efficiency of innovation process; the embodiment of ICT in the productive capital became a major component of innovation; technological progress in the ICT industry itself. This trend is expected to continue as innovative ICT-based businesses and markets are still at an early stage of development and further changes may be expected in the future.

Unfortunately, in Romania the R&D is not a consistent factor for growth, as it is not connected with industry and, at the same time, the ICT is not playing an important role in this direction as of yet.

The causes for the Romanian research system not becoming an innovation one are multiple and include: severe under-financing from all the sources - state budget, companies, venture capital; lack of awareness and innovation management skills from the companies; the weak entrepreneurial culture; the non-market orientation of the state research units; the lack of policy commitment in building a market for knowledge.

Besides being very low, the resources from the state budget for R&D (only recently called RDI) have not been properly allotted, in the sense of opening a learning process for both the companies and the research units. The lack of transparency and commitment for the efficiency of the results was far from developing a real competition.

However, the first steps in this direction have been made by specifying the eligibility criterion for the units competing for state budget resources (but which is still functional only for the infrastructure units). Also, the recent MER decision of financing only the projects finalising with a patent request is expected to encourage innovation-oriented research.

[348] Estimates of multi-factor productivity (MFP) are obtained as the residual output growth once the weighted contributions of changes in capital and labour inputs are accounted for.

Given the current rather artificial structure of the research system, it is very likely that competition will induce a profound reconfiguration, a selection of real competitive research units, and consistent redistribution of scientific personnel.

But probably the deepest crisis of innovation is taking place at the companies' level. Their propensity for innovating decreased, as their targeted expenses show, and also they reduced the share of new and improved products in total production in the period 1996-2000 (the most recent data available).

Following Porter's model (WEF (2004a)), with the three stages of economic competitiveness (factor-driven, investment-driven and innovation-driven), we can assess that the Romanian companies did not manage to reach the level of competing based on innovation. Although there are exceptions, most of the companies are lacking not only awareness regarding the importance of innovation for their competitiveness, but also they are missing the necessary skills. Innovation requires specific skills (as for instance seeing the market opportunities in correlation with technological evolutions, identifying the available technical solutions, evaluating the cost-benefits ratio, properly evaluating the risks, identifying the resources needed, stressing the role of ICT and high-skilled employees, etc.) that are to be gained by the employees, the managers or embedded in the organisation of the company.

The learning process did not start from the state or from the market. As the market push in this direction is generally connected with a certain level of competition, it can be stated that the level of propensity for innovation is reflecting the general functionality of the free-competition based market economy.

Moreover, the recent approaches (Cowan and de Paal (2000)) show that innovation means more than research, being often a simple recombination of technical or organizational solutions, as reaction to market opportunities. Large access to information offered by ICT should play here a very important role.

In the last years, the share of resources allocated for ICT in RDI system increased, but there is a larger need for an integrated vision of ICT and innovation as pillars of the information society. ICT is not yet playing an important role in building the knowledge market. Internet based transparency for both the potential for innovation and for the results should be ensured in order to increase the efficiency of resources allocated and, at the same time, to stimulate the recovery of the lost connection between research and industry.

The attitude towards innovation also reflects the weak capacity of valuing knowledge at the companies' level. That's why the push for ICT and innovation should come together.

Recent measures regarding innovation are oriented towards the infrastructure, especially towards the development of industrial, technological, scientific and software parks. Although important steps in this direction have been made, the budget allocated remains low and the general approach is still more oriented towards basic facilities, like ensuring space. Although Romania has an average relative position in this respect at international level[349], in front of more advantaged transition countries as Poland, Slovakia, Hungary, Czech Republic, Malta, the

[349] According to WEF (2004a), in terms of cluster development, Romania ranks in 2003 48/102.

underdevelopment of innovation infrastructure hinders the further formation of technological clusters, crucially important in the development of the ICT industries.

Intellectual property protection is fully compliant with the EU practices and with the most recent international regulations in this field, but there are still measures to be taken for ensuring full real protection. Nevertheless, although the effective implementation of IPR regulations reduced substantially the piracy rates and the abuse of property rights, the culture of IPR in the business environment is still lacking.

The ICT field is the most innovative part and its importance was acknowledged by the share of budgetary resources allocated for innovation. However, as the innovative dimension of the software production has not been established, these activities are not competing for these resources. This is particularly worrying as the software industry is in danger to be captured by the outsourcing model, and an internal support for the creative part would very likely make a difference.

4. ICT

The analysis of this field is based on three perspectives: from the demand side (including here the ICT penetration rates and domestic market), from the supply side (with the domestic industries of equipment, software, IT services and content) and from the viewpoint of policies implemented. From the very beginning, it should be mentioned that the demand and the supply sides are only partially correlated. There are elements of the supply, like communication or IT services, that by excellence are addressing the domestic market, but this is not the case for most of the software industry. However, the more global part of the ICT industry is not only playing an important role for economic growth (OECD (2003b)) but most likely that it has also a certain spill-over effect for the ICT use, being known that ICT industry is in itself the largest consumer of its own products. Additionally, this industry is increasing domestic competition on the supply of ICT, thus stimulating the demand both because of cost reductions and of the specific niches it creates.

4.1. The demand side of ICT

Regarding both the penetration rates and the ICT market, Romania is much behind the other candidate and accession countries, at almost all the indicators. Relatively comparable values are for cable penetration rates and the number of computers and Internet connections in households (but still under the average of these countries) and in educational institutions.
Among the factors that are determining the demand for ICT we mention:

- Awareness
- Access (infrastructure)
- Affordability
- Skills
- Content supply

As the underlying factors are different for IT and communications, the pattern and the analysis should be different for communications and IT.

4.1.1. Fixed and mobile telephony

In Romania, the penetration rates for fixed and mobile telephony are much below the average for candidate countries (around two thirds for both indicators). Nevertheless, given the existing level

of poverty, the fact that at the beginning of 2004 one in three Romanians had a mobile phone is quite a miracle, reflecting a niche of openness for technological appropriation at the individual level.

For the households, statistical data show huge disparities for these penetration rates on several dimensions: rural-urban, level of education and income. However, as all these are strongly inter-correlated in Romania, it can be stated that affordability is the key factor of the communication penetration rates. The supporting arguments are that, at least for the mobile communications, the infrastructure in rural areas is to a large extend already existing and that the skills required by the use of mobile telephony are generally not dependent of the education level.

The low price is the driving force for the relatively high penetration rates of CATV. Here the rural-urban gap is partially explainable by the different infrastructure access.

In conclusion, in the case of communications, the awareness is already achieved, the access is good or improving, but the cost issue is still there.

4.1.2. Computers and Internet access

The pattern for IT demand is different for the three types of actors: public sector, business and households.

The **public sector,** including here the administration, public education and research, proved very active over the last years. Given its increased awareness, it became the driver of the IT demand.

The most spectacular increase is that of the ICT penetration rates in secondary education, increasing for times in 2001-2003 and currently positioning Romania second among the candidate countries.

In the **enterprise sector** Internet access and web sites are half of candidate countries average. As it is improbable that cost is a major constraint for companies, except for SMEs and at least for basic use, it seems that awareness and training are the main constraints.

The awareness issue in itself can be analysed on several dimensions, as it ranges from basic knowledge about the expected value added of ICT use, to the understanding of the role this technology should play in the activity of a company. As the still small market for software applications shows, in Romania IT is rarely embedded in integrated information systems. In fact, there is a vicious circle between the above-mentioned low level of sophistication in IT use and clear connection with productivity.

The lack of awareness on this dimension is correlated with the type of organisation and management in general, which is not information or knowledge oriented. This immaturity has also been proven by companies' low interest for innovating, as well as by the relatively low level of firm-level technology appropriation[350].

The low level of sophistication could be also correlated with the lack of information management specialists. Given that in Romania ICT tradition is one of technicians, the high level of ICT skills are not necessarily correlated with management skills. This is mostly affecting the smaller companies, which do not afford complete solutions for information management, available now on the market.

[350] According to WEF (2004), in terms of firm-level technology appropriation, Romania ranks in 2003 65/102.

The same type of organisation prevents larger use of teleworking, although as the SIBIS survey shows, Romania's position in what regards the level of teleworking is below the potential one.

For **households** the IT penetration rates are also dependent on skills and awareness, but here the affordability comes first, as the cost of a PC relative to average income is more than twice that of the acceding and candidate countries. The number of computers per 100 inhabitants is correspondingly smaller than in acceding and candidate countries but reflecting only partially the income gap, which is even larger, situation that suggests a good openness for adopting the IT.

Thus, the recent measures meant to offer financial support for computer acquisitions for pupils and students from the poor families are expected to have a high impact on the ICT penetration in poorer families, especially if they will be accompanied by other measures to stimulate the ICT use.

The low income of the population, and the non-sophisticated model of consumption bases on goods of primary necessity, including self-consumption, which remains the main barrier for increasing penetration rates, impose the creation of fast spreading alternatives for public access to the integrated communication services telecommunication for a large number of people. In this field, government's commitment is also visible and the first practical solutions started to be implemented. According to eEurope+, the number of public access points grew significantly since 2001, as in 2003 it become larger than the acceding and candidate countries average. Moreover, the new programs for creating telecentres in rural areas will expand considerably the number of public access points and at the same time this initiative is considering the possibility of ensuring basic tutorial programs (explaining how to mail, how to search etc).

The arguments for government's support of home and public use of IT should be connected with citizenship and the positive spill-over effects for the economy in the form of skills (use and e-content appropriation) and spill-over of use. It is likely that at the existing low level of life-long training, home computer often represent a learning instrument. In fact, according to a recent survey (OSF (2003)), 30% of the respondents with computer skills have learned to use the computer at home, matching the share of those learning these abilities in school, and doubling the share of persons acquiring computing skills through dedicated training.

A specific characteristic of ICT is a closer connection between its uses in different locations (home, office, education units etc). When compared with acceding and candidate countries average, the Romanian Internet users are more concentrated on one type of access, situation that is mostly explainable by access or affordability.

The relative position to acceding and candidate countries average regarding the internet access in households is worse than for enterprises, fact that can be explained considering the relative higher share of computer use for entertainment but also by the cost. The costs of Internet are higher than acceding and candidate countries average and this is a major constraint for larger use of Internet at home.

4.2. ICT domestic supply

4.2.1. Communications supply

In what regards communications, Romania has an infrastructure based on a variety of interoperable technological solutions, which provides the basis for a solid further development of

this sector in all regions. This sector, and noticeably the telephony, is among the very few dominated by the FDIs.

The government's commitment for stimulating the development of a fully liberalized telecommunication market, focused on the creation of an advanced regulatory framework in the field of telecommunications in a relatively short period of time, started showing its first visible effects, both on prices and on competition.

The regulatory framework is fully compliant with the new aquis (2002) in telecommunications and the institutional framework for enforcing it is functional. Also the legal framework in the fields of network security, users' protection and antifraud is well designed.

For the **fixed telephony**, the liberalisation of the market since 2003 attracted an impressive number of alternative providers. Following their potential competitive pressure as well as the effectiveness of the NARC regulatory measures, the incumbent provider, which has a private majority shareholder, already announced a 20 percent cut in prices. In conclusion, in the field of fixed telephony the private initiative is active and now it is only a competition policy issue.

For the **mobile telephony** supply, the competition is already well established but not also the relative position of the main providers, as compared with the other acceding and candidate countries the number of mobile connections is rather low. Hence, the mobile companies are very active and the geographical coverage is good or increasing. Unfortunately the competition did not result in lowering the charges for the calls terminating in fixed network, although fixed to mobile charges are the lowest in acceding and candidate countries. Generally it can be stated that the competition is more image oriented than cost oriented, situation that is not addressing the major constraint in increasing the number of mobile users, namely the income. The aspect of technological appropriation, which is still lacking for a large part of population, is also neglected.

As **cable suppliers** oriented their strategy on price (very often with lower costs for pensioners), they managed to attract a significant share of households since 1999. To their success contributed also the development of media, providing a large number of television channels. The market has still growth potential, as the coverage in rural areas is relatively low.

The activism of the cable companies has not been yet translated into a push for using the cable for **broadband**. The limited use of cable for broadband can be explained also by the general level of income, or by the relatively low costs of dial-up, but it is a fact that Internet providers did not develop large awareness programs.

4.2.2. IT local industry

Inside the local IT industry, there are different patterns of development for software and electronic equipment industries.

Largely based on the very good human resources, the **software industry** found its way and gained an already acknowledged competitiveness. Now, with fast increasing production, employment and exports this industry is among the most flourishing ones of the whole economy. Besides expanding, it is currently in the face of a qualitative leap, as some of the companies are trying to escape the outsourcing model, which is still prevailing. Some major success stories, especially in anti-virus field, suggest that this is possible, but it will probably be very difficult for most of the companies, especially as no specific policy measures are addressing the issue.

The prevalence of the outsourcing model makes the market incapable of offering a more promising horizon for increasing incomes of IT specialists over their career. This makes the most gifted specialists become tempted to emigrate after finishing their "training period" in domestic companies. However, it should be mentioned that for the moment the companies involved in outsourcing have higher profitability than the average industry, they generate more value added and they have higher productivity.

Another restriction for the launch of autonomous projects is given by the low number of software companies with ISO9000 certificate and the absence of CMM certificates.

However, most analysts offer spectacular prospects for the Romanian software industry and they generally associate it with a certain specialisation.

Since its first results emerged, the software industry is getting much attention at the policy decision level. Hence, the forthcoming software parks and the lower income tax for software developers are indeed supporting the small companies in this field.

The enforcement of intellectual property protection, and consequently the diminishing software piracy registered over the last years are undoubtedly helping software companies. However, one should take into account that, given the underdeveloped domestic market, these companies are mostly competing on the international market. For this reason, considering the mentioned outsourcing model, the major challenge is connected with the availability of capital, which is vital for starting autonomous projects.

The **hardware** industry did not follow the same success line as the software industry. Although the human resources were generally available, the lack of investments made the difference. On the background of low inflows of foreign direct investments, the hardware industry made no exception and this situation made most of the existing electronic companies loose their momentum. The new companies are mostly oriented towards the domestic demand and their contribution to the value added of the products is very low.

The hardware industry, including communication equipment, is not benefiting from so much attention at policy level as the software industry, although the risk for brain drain is very high, especially from the old large companies. Moreover, in the IT strategy, the hardware industry is not including important branches of electronic components, which are generally ensuring larger value added.

It should be mentioned also that the hardware industry can not rely on collaboration with other high-tech industries, given the general low level of his branches in Romania. Thus, a major direction of development based on incorporating IT in different products is not yet feasible.

For the time being, the local hardware industry itself is nevertheless one of the most competitive in Romania[351]. Local suppliers are widening their portfolio of activities and rely mostly on the internal demand. Given the low level of revenues, they typically provide average quality hardware at affordable prices, while the representatives of the multinational companies address the upper deciles of the market. These business strategies might prove unsustainable in the longer run, especially giving the decreasing investments, as well as the effect of the competition from the MNC, resulting in a decreasing market share of Romanian companies until 2000. It might be

[351] Hardware producing branches are among the very few with increasing profitability every year since 1998 (Mereuta *et al.* (2003)).

the case that the recovery of share of Romanian hardware industry on the local market in 2001 is a trend shift rather than a conjectural development, especially given the continuation of the concentration process.

In point of structure, the decline in imports of more processed goods during the later years, with a parallel increase in imports of parts and components reflects a competitiveness gain of local producers on the internal ICT market.

4.2.3 IT services

IT services[352] should represent the bridge between ICT industry and the domestic market, as these are mostly acting locally. These companies might also play an important educational role in increasing the sophistication of the systems implemented.

Unfortunately, according to EITO (2003), the estimated share of IT services in total Romanian IT market is 20%, much below the 48% level registered in EU-15. This is reflecting both the immaturity of the demand (or more probable very small sophisticated demand, as we suspect a divide) and the still underdeveloped supply. Important international providers are present in Romania but they are mostly addressing high-class companies. However, in the last years, the share of domestic providers in the market of integrated applications for companies is increasing. Moreover, it is appreciated that, by leveraging national competitive advantages, the Romanian IT industry has the potential to becoming the leading regional supplier of Internet-based services, specialised software and contract manufacturing by 2010 (WTO/UNCTAD (2003)).

4.2.4 Content

Between the development of e-content and the Internet penetration rates there is a general correspondence. Unfortunately, it is only recently that the spill-over effect emerged in Romania, having as breaking point the eGovernment, as, by now, the market push for sites or eServices has been very low.

Thus, the number of **Internet hosts** per 100 inhabitants is far from the acceding and candidate countries average, the situation being similar for *ro.* domains. This is opening an important limitation in Internet use, namely the language barrier. However, the industry of web design shows some recent increase of its competitiveness.

As mentioned before, the most important steps have been made in **eGovernment** where MCIT co-ordinated most of the projects, some of them representing real success stories (as e-procurement).

Both the delayed regulation of ePayments and the lack of critical mass of Internet users, determined a very slow emergence of market **eServices**. The *eCommerce* and *eBanking* are almost absent, not to speak about other forms of e-business. However, after the introduction of the legal framework in the fields of network security, users' protection and antifraud recently several banks announced the launch of eBanking services. Also, the expected increase in card payments and the extension of e-procurement to B2B will contribute to the development of eCommerce.

[352] According to EITO (2003), the IT services include consulting, implementation, operations management and support services.

4.3. ICT policy framework

Until 2001, an obsolete vision on developing the field of ICT and IS led to many hesitations and incoherence of both designing and implementing of IS policies. One major factor which amplified the ineffectiveness of the IS policies between 1990 and 2000 was the instability of the strategic vision and the lack of commitment in the strategic action. The institutional instability is another major negative factor which had, and could have in the future, a negative impact especially on the innovation and development policies and through these on the IS policies.

Even if the situation generally changed after 2000, the strategic and implementation commitment belongs almost exclusively to dedicated bodies, mainly MCIT. The most obvious hesitations, representing a major threat for a complete success of IS policies, come from MER (especially in what RDI is concerned) but also from the lack of involvement of MET or NASMEC's low participation in implementing these policies. As a result, the efficiency of using the potential of ITC development as an *engine for the development of the Romanian society* might be diminished. To this adds the issue of interconnecting the IS and innovation policies at national, regional and local levels.

The evaluation of the results of the IS policy should thus start with 2000, and should take into account the shortness of the period. In this context it can be stated that these policies have reached the target for the first stage, at a level that contradicts the initial scepticism of a large share of Romanians. The fact that many of these results have clear, tangible effects on every-day life brought about an increased awareness of the population relative to the major importance of IST for the development of the entire society. Moreover, the prejudice of an important part of population viewing IS as a utopian concept was largely eliminated.

The creation of the necessary regulatory framework was, and continues to be, one of the main action lines of the IS Policies, but in this context we can notice also the potential threat of an abusive reliance on the administrative-methods of promoting the use of IST by mandatory measures.

The strategic vision of a *Government promoter and catalyst for IST development* proved to have been a wise decision, especially on the background of lack of action during 1990-2000 period, that had discouraged both the industry and the possible beneficiaries (institutional or not) from showing initiative in creating the right environment (info-infrastructures and legal environment) for the development of IS. Without this contribution, the development of IS based exclusively on the expectancy that market mechanisms would bring about the appropriate conditions, would have been delayed and would have undoubtedly heightened the regional and e-divide disparities.

Although the role of the private-public partnership in the policy action was better understood, and some signs of progress in this direction are already visible, there is still a tendency to view asymmetrically the communication channels between the Private and Public poles. The initiatives coming from the private pole and more particularly from NGOs or civil society's initiative groups have low chances of finding audience among authorities. Strengthening the mechanisms for involving the civil society in developing a vision and implementing components of the strategic action is an essential, critical element for not only promoting, but also stimulating, and thus proving the strength of the strategic concept on which NSNEIIS was based.

In what the spill-over effects of IS policies already put into practice are concerned, it should be noted that their main beneficiary seems to have been the anti-corruption fight in the field of

public acquisitions and (as expected), for the public workers behind wickets that the population is facing directly and most often. The success of e-procurement in this respect has accelerated the emergence of a concept of anti-corruption fight using electronic means that even obtained a legal expression. This concept tends to become one of the main drivers of the eGovernment and eAdministration aspects of NSNEIIS, being in line with that of using the potential for ICT development as an *engine for the development of the Romanian society,* as corruption is a major break against this development.

The policies used so far proved their efficiency in what concerns the eGovernment component and in the areas where MCIT has sufficient decision-making power or manages to co-operate efficiently with other institutions. (e.g. with MER for the increased use of IT in education, or with MAI for administering the eAdministration given the institutional problems that arose due to governmental restructuring). The spreading of the initiative in implementing and refining IS policies by adapting them to the local and regional background did not occur yet, as the capacity of the relevant public actors to engage in such a process is questionable.

IS General SWOT

Strengths	Weaknesses
• Increasing number of computers and Internet connections in public sectors as: administration, education and research. • Consistent eGovernment programs. • High quality of IT specialists; • Fiscal incentive for employing ICT specialists. • The relatively large population offering a large internal market. • Booming software industry. • Telecommunications liberalisation and private initiative, including although mostly recent, active FDI in the field.	• Low number of computers and Internet connections, both in the corporate sector and in households, associated low level of public access • Very low e-business (commerce, banking, web pages) • Low share of population with computer skills. Low life-long training, and very limited computer training after basic formation period. • Labour market information is very weak and unable to support career information profiles (no private universities in ICT). • Unfavourable structure for ICT use: large agriculture employment, low share of tertiary education graduates. • Low level of income prevents faster increase of ICT in households. • Although ICT research is more developed it suffers from the general crisis of innovation. • Low number of fixed and mobiles lines.
Opportunities	**Threats**
• Sustainable growth trend beginning with 2000 • Public access points might compensate for low Internet in households. • High CATV penetration in urban areas, favouring future broadband connection (currently very low) • Stimulates the use of cards for expanding the ePayments • Expand e-procurement for private sector might effectively stimulate the eCommerce • Turn the Romanian niche in anti-viruses products for enhance the local eCommerce security • Stimulating larger investment in hardware industry may have good results due to the software success • Emerging IT specific incubators	• Unless structural change, large groups remain outside IS (urban-rural gap is the most probable) • Unless public access is consistently insured the risk of deepening the digital divide is important especially the income based one; • The low living standard may affect the propensity for accepting the IST cultural dimension; • Unless computer training becomes more spread, the eServices will meet a small market. • Lose the momentum for hardware industry. • Brain drain for the best hardware specialists.

SCENARIOS FOR FURTHER DEVELOPMENT

The scenarios logic

Regarding the prospective macroeconomic framework, the fundamental assumption of the scenarios is an unambiguous implementation of structural reforms, which would support the Romanian economy in becoming a sound, market-functional one. The necessary actions are clearly included in the governmental programme, as well as in the agreements concluded by Romania with the International Monetary Fund, the World Bank, and the European Union, finalising privatisation and restructuring programmes, ensuring the coherence and stability of the legislation, strengthening the financial discipline, improving the corporate governance, the reforming the public administration, fighting more efficiently against corruption. The concrete commitment in implementation will reflect in the intervals in which relevant macroeconomic indicators will lie. In principle it is considered that the speed of reforms is directly associated with the economic progress (Dobrescu *et al.* (2004)).

Indicators	Average yearly rate of growth, 2004/2010
GDP, constant prices	4.45% to 5.25%
Domestic absorption, constant prices	4.35% to 5.21%
Final consumption, constant prices	4.24% to 4.99%
Investment, constant prices	8.04% to 8.07%
Export of goods and services	5.49% to 6.76%
Import of goods and services	7.01% to 7.02%
GDP deflator	1.54% to 2.51%
CPI	1.57% to 2.55%
Labour productivity, constant prices	4.27% to 4.92%
Rate of unemployment	5.75%* to 7.32%*
Rate of budgetary deficit to GDP	-3.09%* to -3.15%*
Rate of current account to GDP	-5.55%* to – 6.94%*

*- forecasted values for 2010 (Dobrescu (2004)).

The scenarios are constructed as alternative trajectories of development of IS within the general framework of the macroeconomic development, based on the known pro-cyclical features of the IS domain. This does not imply nevertheless that the feed-back from the IS to the general economy if neglected, as most of the potential effects, especially those related to the impact on administrative reforms and competitiveness, are embedded in the design of the macroeconomic developments.

From all the indicators of the IS, we have selected those that represent the critical dimensions of the development of IS in Romania. These indicators are called here IS descriptors.

The three scenarios are developed staring from the type of push. Thus we have Government push, market driven and, finally, the inertial one.

For each IS descriptor, two zones are presented: the action lines and the consequences. Therefore, specific and targeted policies are embedded in the design of the scenario.

IS descriptor	Government push	Market driven	Inertial
Number of students	Effective support for private universities, both financial and of image. Higher share of budgetary funding for education.	- The private universities develop distinct profiles from the state ones. - The emergence of companies-universities partnerships and availability of specific credits for higher education.	Low level of financing for education and targeted on state universities.
	Substantial increase in the number of students.	Correlation with the general economic recovery and income constraints.	The state education will reach a maximum and the private will develop slowly.
Share of S&T and ICT education	- Providing a coherent vision regarding the future of job demand and of the information society. - Increase the state ICT education and larger support for the private one.	- Private universities succeed in attracting potential students (by providing better curricula, better education facilities etc). - The development of high-tech industries.	- Lost connection between the education demand and the job opportunities after graduation. - Private universities are not credible in ensuring good S&T education.
	Reorient some of the potential students towards S&T education.	Increased demand for S&T and ICT higher education.	The potential students will increase demand for S&T related education only after the industrial recovery, creating a critical time lag.
Quality of secondary education	More practical oriented curricula.	Partnership of companies at local level	- Good theoretical skills but weak practical ones.
	Increased practical skills	Stronger correlation of skills and future jobs.	Protracted formation of technical specialists after graduating the secondary education.
Entrepreneurship	- Ensure competition and market economy. - Include entrepreneurship in education curricula. - Support for researchers to open business.	- Larger venture capital. - Functional business incubators. - Development of professional associations.	- Low entrepreneurship culture and skills.

	Shift largely in behaviour and skills.	Larger entrepreneurship enabled by a supportive infrastructure.	The economy is missing the fast reaction factor in taking the economic opportunities, thus reducing the speed of change.
Life-long training (LLT)	- Enforcement of legal obligation of providing LLT. - Ensure the transparency of the certified system of LLT.	- The companies become aware of the role of LLT.	- LLT continue to be mostly self-directed.
	Increase of general level of LLT.	Larger LLT paid by the companies. Human skills become more valued as an asset.	LLT remain underdeveloped.
Innovation intensity	- Increase state budget for RDI and ensure a real competition for these resources - Restructuring the RD system into innovation centres - Continue development of innovation infrastructure.	- Companies gaining awareness are starting the learning process in order to innovate. - Implication of the private sector in conceiving and constructing innovation systems at central and local level. - The availability of venture capital.	- RDI expenses are insufficient for ensuring the orientation of companies towards innovation based competitiveness. - The state budget resources for RDI are inefficiently used.
	- The research system becomes an integrated part of the innovation one. - The emergence of venture capital is stimulated.	- Innovation becomes an essential part of the competitiveness strategy of the companies.	- Maintaining cut between industry and research. - Researchers brain drain.
E-literacy	- Continue ICT programs in education and administration. - Assistance provided in telecenters.	- LLT in companies. Self directed training based on larger IT penetration rates in enterprises and in households.	- The e-literacy is reflecting the low level of computer and Internet penetration rates
	- ICT skills ensured for the young generation. - Good ICT skills in administration. - Basic Internet use skills ensured for a part of population.	- Computer skills become integrated part of most job skills.	- The e-literacy is slowly increasing and the digital divide is getting deeper, especially on the age dimension.

Rural-urban and regional IS disparities	- The introduction of telecentres in rural areas. - Rural development. - Separation of subsistence and market agriculture. - - The elaboration consistent regional IS Strategies harmonised with the National Strategies for IS and innovation. Ensuring resources for their implementation.	-Non-agriculture related activities in rural areas. -Migration to urban. - Regional public-private partnerships.	- Rural areas dominated by subsistence agriculture and retro migration.
	- Public access points represent the main IS vector on short term, supported by the rural development on medium and long term.	- Higher impact of job related IT training and access on reducing the rural-urban digital divide	- IS will emerge and develop with priority in the urban areas.
Fixed and mobile telephony penetration rates	- Ensure competition. - Supervise interoperability of networks.	- Competition results in price cuts. - Reduced costs of interoperability of networks.	- Cost is representing an important constraint.
	-The penetration rates are converging to the ACC average.	- Consistent increase of the penetration rates, due to the increased affordability - Fast increasing number of fixed lines as result of reduced prices.	- The penetration rates are only slowly increasing. The driver remains the awareness gain.
Broadband access	- Introduce broadband in education units, administration and research.	Larger activism of the Internet cable providers. These are reducing prices in order to compensate by quantity.	Broadband is still seen as having a marginal utility. The broadband providers have a rather passive offer.
	- The acknowledged advantages of high speed Internet are stimulating larger use.	- Broadband becomes a real alternative for dial-up, thus it increases significantly both in enterprises and in households.	- Broadband is increasing slowly and mostly in the enterprise sector.

IT penetration rates in enterprise sector	- Awareness programs for managers. - Continue eGovernment programs. - The development of ePayment.	- Gained awareness at companies' level regarding the role of IT. - The general recovery of the Romanian companies.	The number of computers and Internet connections per 100 employees is extremely low. Low share of IT investments in total investments.
	- Increasing IT penetration rates stimulated mostly by the opportunities of external interactions.	- Fast increasing IT penetration rates, oriented towards increased productivity.	- Most of the companies will adopt IT very late.
Sophistication of IT use in enterprises	-The introduction of the education profile of "information system specialist".	-Development of IT services. -Adoption of information management.	- Immaturity of ICT market. - IT awareness and skills are oriented towards basic use.
	- A shift from technical approach to IT to a more business oriented.	- Deeper integration of IT in the activity of the companies.	- Sophisticated IT systems will be introduced only by a small number of companies.
IT penetration rates in households	- Incentives for computer acquisitions. - Maintain the consumer credit facilities.	- More companies are adopting teleworking. - Development of eServices. - E-mail becomes a popular way of communication.	The penetration rates are strongly dependent of the income level. Entertainment and self directed teaching are the main drivers.
	-Fast increasing number of computers in households.	IT becomes part of the social and economic interactions.	The penetration rates will increase slowly and the income digital gap will deepen.
Competitiveness of the software industry	- Continue developing software parks. - Promoting the Romanian software industry at the international scale. - Open access of the creative software companies to RDI state financing. - Stimulate the ICT education.	- Larger finance for autonomous projects. - Improved skills for acting on the global market.	- The rate of new companies creation remains high.

	-The Romanian software industry is expanding and its results are attracting larger international collaborations.	-More companies are escaping the outsourcing model. - Romania becomes an important software producer.	- Romanian industry continues to increase but based mostly on outsourcing. - Moderate brain drain and brain drift
Competitiveness of the hardware industry	- Clustering policy: developing industrial and technological parks.	- Massive investments, especially FDI.	- The old Romanian companies continue to loose their market share. - The new companies are mostly concentrated in the final stage of the production chain.
	- Some of the Romanian companies are consolidating and increasing their market share.	- The hardware industry is replicating the success of the software one.	- Brain drain and brain drift for the IT specialists not absorbed by the software industry.
eCommerce and eBanking	- The proposed extension of e-procurement to b2b. - Ensuring the security of ePayments. - Active measures to encourage the use of credit cards for ePayments.	- The banks and commercial companies are taking their chances in creating the market for their eServices.	- The vicious circle between low penetration rates and eService offer is maintained.
	- Fast increase of e payments and the emergence of eCommerce.	- Both the supply and the demand for these services are expanding fast.	-Neither eCommerce nor eBanking are reaching their critical mass.

References

ADE (2003): Innovation policy in seven candidate countries: the challenges. Innovation policy profile: Romania

Adela Rogojinaru (coord.) (2001): Feasibility study on the continuation and extension of the structural reform of the Vocational Education and Training (VET) within the Educational System of Romania. MER, Bucharest.

Associated Press (2003): Romania is new world nexus of cyber crime, http://www.computercops.us

Bîrzea, C. (2001): Modernising VET System in Romania. Ministry of Education and Research.

Bogdan, A. (2003): De ce ocolesc investitorii România?. Adevarul No: 6th August

Brainbench (2002): Global IT IQ Report, http:/www.brainbench.com

Bratu, I. (1998): The experience of Reforms in Romania. Romanian Economic Research Observer, 11-12 Croitoru, L. (2003): Politicile macroeconomice şi restructurarea întreprinderilor (Macroeconomic Policies and Enterprise Restructuring). Rentrop & Straton, Bucharest

Budina, N., De Menil, G., Maliszewski, W., Ţurlea, G. (2001): Money, inflation and output in Romania, 1993-1999. CEROPE Working Paper, http://www.cerope.org

Business Digest (2002): Major Companies of Romania, 2002.

Business Review Capital (2003): Lumea in 2004 (the World in 2004)

Caragea A. (2004): 10 intrebari critice de pus strategilor romani din domeniul CDI (10 critical questions for the Romanian managers from R&D&I), http://www.noema.info

Caragea, A. and Jinaru, A. (1996): Study regarding the managerial culture in Romania. FIMAN Foundation

Caragea, A. and Jinaru, A. (1998): Study regarding the managerial culture in Romania. FIMAN Foundation

Caragea, A., Jinaru, A., Munteanu, F. (2003), Why is Venture an Imperative for Romania?. Paper presented at Binary Venture Capital Forum. Bucharest, 26 September 2003, http://www.noema.info

Ciupagea, C. (2001): Economic and Econometric Models for Romania. Ed. IEM, Bucharest

Ciupagea, C., Ţurlea, G. (2003): Romania. LINK Project Spring Meeting, www.chass.utoronto.ca/link

Coalition Tech 21 (2002): SPIRIT2 Project – Background Study: Promoting a New Image of the Romanian IT industry abroad, http://www.anis.ro

Cowan, R and van de Paal, G. (2000): Innovation Policy in a Knowledge-Based Economy, A MERIT study commissioned by the European Commission.

Croitoru, L., Russu, C., Târhoacă, C. (2002): Romania's industrial policy in light of EU accession, European Institute of Romania, www.ier.ro

Dăianu, D., (1999): Tranformarea ca proces real (Transformation as a real process). IRLI, Bucharest

Dakova, V., Dreossi, B., Hyatt, J., Socolovschi, A. (2000): Review of Romanian NGO sector.

Dobrescu, E., (1999): Macromodels of the Romanian transition economy (1999 version). Project LINK Fall Meeting, Athens, Greece

Dobrescu, E., (2003): Tranziţia în România: Abordări Econometrice (Romanian Transition: Econometric Approaches). Ed. Economică, Bucharest

Dobrescu, E. (2004): Possible Evolutions of the Romanian Economy (macromodels estimations). Working Paper for Romanian Long-term Development Strategy

Dobrescu, E, Ciupagea, C., Turlea, G. (2004): Romania – Country Report for the UN LINK Project, http://www.chass.utoronto.ca/link

Drăgănescu, Mihai (2001): Societatea Informationala si a Cunoasterii - Vectorii Societatii Cunoasterii (Information Society and Knowledge Society – Vectors of Knowledge Society). Societatea Informationala Societatea Cunoasterii. Eds. Filip, F. Expert, Bucharest

Dragulanescu N., Broche L., Rizescu A. (2002): The Impact of Transposing EU Quality Systems on Selected Romanian Industrial Sectors, European Institute of Romania. www.ier.ro

EC (2003a): Regular Report on Romania's progress towards accession.

EC (2003b): European Trend Chart on Innovation, Country Report – Romania, http://trendchart.cordis.lu

EC (2003c): European Trend Chart on Innovation, Innovation Scoreboard, http://trendchart.cordis.lu

EC (2003d): Proposal for a Regulation of the European Parliament and of the Council "Establishing the European Network and Information Security Agency, COM(2003) 63 final

EC (2004): eEurope+ 2003 Progress Report.

EITO (2003): European Information Technology Observatory

EURSTAT (2003a): Regional GDP per capita in the EU and candidate countries in 2000

EURSTAT (2003b): General Statistics no. 131

EURSTAT (2003C), Information society statistics –Data for candidate countries, http://Europa.eu.int/comm/EURstat/Public/datashop/print-product/EN?catalogue=EURstat&product=KS-NP-02-017-__-N-EN&mode=download

EURSTAT (2004): Structural Indicators.

FDSC (2001): Geographical Distribution of NGOs.

Gallup (2003): Public Opinion Barometer

Harvard eReadiness Report (1999), http://ro-gateway.ro/node/185754/hardsoft

Hornianski, Nicoleta (2003): Evaluarea competitivitatii principalelor sectoare industriale din România (Evaluation of competitivity of industrial sectors in Romania). Manuscript, Chamber of Commerce and Industry Twinning Program on Competitiveness. Bucharest.

Iancu, A., (1997): Sistemul instituțional şi transformarea acestuia (Institutional system and its transformation). Oeconomica, 2

IBM (2003a): 3rd Report on Monitoring of EU Candidate Countries (Telecommunication Services Sector).

IBM (2003b): 4th Report on Monitoring of EU Candidate Countries (Telecommunication Services Sector).

IMF (2001): Selected Issues and Statistical Appendix, http://www.oecd.org

IOM (2003): European report on quality indicators of lifelong learning, 2002, http://www.italiaromania.com/primapag3.html

Jinaru A. (2003). The Venture Imperative Initiative, Paper presented at Binary Venture Capital Forum. Bucharest, 26 September 2003, http://www.noema.info

Jinaru, A., Caragea, A., Turlea, G. (2002): New Economy in Romania in view of Integration. European Institute in Romania, www.ier.ro

Landersman M., (2000): Narrowing the Structural Gap: Structural Change in the Transition Economies, 1989 to 1999. Eastern Enlargement, the Sooner the Better? Eds. Svenn Arndt, Heinz Heindler and Dominick Salvatore. Austrian Federal Ministry of Economic Affairs and Labour, Vienna

MCIT (2002): The policy, strategy and performance document for 2003 and projections for 2004-2006

MCIT (2004): Activity Report – 2003. http://www.mcti.ro

MDP (2001): National Development Plan 2002-2005.

MDP (2002): Report on activity in the disadvantaged areas.

MER (2002a): Medium term strategic orientations of the R&D and Innovation activities

MER (2002b): Report on research, development and innovation policy 2001

MER (2002c): The Reform of the Compulsory Education System in Romania, working document

MER (2003): Report on Research, Development, and Innovation, 2001-2002

Mercury Research (2002): Emerging Segments in the Information Technology and Communications Market - Romania – Business to Business Syndicated Survey by Mercury Research – Research Wave 2002, http://ro-gateway.ro/node/185754/ipen

Mereuta C, Turlea G., Oncescu C., (2003): Romania 2007. Finmedia, Bucharest

MIE (2003): National Development Plan 2004-2006

Munteanu (2003): Provocarile stiintei complexitatii – Cercetarea resursa primara a Cogno-Economiei" – paper presented at the conference "CNR-UNESCO – CSC 2003 " 20 March 2003. Forthcoming in "CNR-UNESCO – CSC – Conferintele anului 2003.

Muşat&Asociatii (2003): Doing Business in Romania - 5th Edition. Bucharest

NARC (2004): Activity Report 2003, http://www.anrc.ro

National Anti-Poverty Commission (2002): Report on poverty. www.caspis.ro

NBR (2003): Annual Report 2002. http://www.bnro.ro

NIS (1996): Statistical Yearbook 1995

NIS (1999): Research-Development and technological innovation–Statistical Series

NIS (2000): Tranziţia de la şcoală la muncă (Transition from school to work)

NIS (2001a): Characteristics of vocational training in Romania

NIS (2001b): Information Society Indicators

NIS (2001c): Survey ACOVI

NIS (2001d): Research –Development Statistical Series

NIS (2002a): Information Society Indicators

NIS (2002b): The high school education at the end of the year 2001/2002

NIS (2002c): The Activity of commercial banks

NIS (2002d): Social Trends

NIS (2002e): From education to work

NIS (2002f): The Family and the Child in Romania

NIS (2003a): Statistical Yearbook 2002

NIS (2003b): CANSTAT Bulletin no. 2

NIS (2003c): Statistică teritorială (Regional Statistics)

NIS (2003d): Higher education at the beginning of the year 2002-2003

NIS (2003e): Coordinates of life quality in Romania. The population income and consumption in 2002NIS (2003f): Characteristics of Lifelong Training, National Institute of Statistics. 2003

NIS (2003g): Households Labour Force Survey (AMIGO) 2002

NIS (2004a): Statistical Yearbook 2003

NIS (2004b): PIB –ul in 2003 – date provizionale (GDP in 2003 – provisional data), http://www.insse.ro

NIS (2004c): Research, development and innovation in 2001-2002

NIS (2004d): Industrial, scientific and technological parks

OBG (2003), Emerging Romania 2003. http://www.oxfordbusinessgroup.com

OECD (1998): Romania: Economic Assessment, http://www.oecd.org

OECD (2000): Knowledge and Skills for Life - First results from PISA 2000, OECD and LITERACY SKILLS FOR THE WORLD OF TOMORROW- FURTHER RESULTS FROM PISA 2000. ADDENDUM WITH DATA FOR ROMANIA. www.oecd.org

OECD (2003a): Romania: Economic Assessment. http://www.oecd.org

OECD (2003b): Sources of Economic Growth in OECD Countries. http://www1.oecd.org/publications/e-book/1103011E.PDF

OSF (2002): Public Opinion Barometer, www.osf.ro

OSF (2003): Public Opinion Barometer, www.osf.ro

OSIM (2003): Annual Report 2002. http://www.osim.ro

Pascu, C. (2003): Insights into the ICT Industry in Romania. Mimeo. IPTS

Pierre Audoin Consultants (PAC) GmbH (2003): Offshore Romania 2003 - Analysis of the Offshore Industry for Software Development and IT services in Romania.

Pitic Traian, in Privatisation Trends in Romania Opportunities for Foreign Investors – APSO Business Digest

RITI (2003): Discussion paper on Electronic Commerce in Romania. http://www.riti-internews.ro

Romanian Government (2003a): Pre-Accession Economic Programme – 2003. http://www.gov.ro

Romanian Government (2003b): Romania, your business partner. http://www.gov.ro

Sădeanu, A., Niculescu, C., Apostol, D. (2002): Trust, the best capital NATO can offer. InvestRomania, winter 2002/2003

SIBIS (2003a): Country Report Romania. www.sibis-eu.org

SIBIS (2003b): Measuring the Information Society in the EU, the EU Accession Countries, Switzerland and the US. www.sibis-eu.org

Stănculescu, M. and Berevoiescu, I., (2002), Households, work and flexibility.

Țurlea, G., (1998): The role of labour market institutions in natural rate of unemployment formation – the case of Romania. Oeconomica, 2

Țurlea, G., Caragea, A., Gheorghiu, R. (2003): Knowledge Economy in Romania. Evaluation of recent developments, Bottlenecks. Policy recommendations. Resource Centre for Knowledge Economy, Mimeo

UNCTAD/WTO (2002): International Market Prospects for Information and Communications Technology Industries from Romania. Country Export Potential Profile. Background Paper, International Trade Centre, Bucharest

UNDP (2003): Human Development Report 2003, www.undp.org A Decade Later: Understanding the Transition Process in Romania -National Human Development Report, 2001-2002.

Velea, S., Botnariuc, P. (2002): Education Reform in Romania during the last 12 years. Working Paper for the Summer University, CEU, Hungary Education Policy Course, July 1-12

Vandemeulebroucke, V. - INAISE (the International Association of Investors in the Social Economy www.inaise.org): Ethic financing and social investment. Paper presented at Binary Venture Capital Forum. Bucharest, 26 September 2003, http://www.noema.info

Vuici (2003b): IT Industry in Romania –2002. ITC, Bucharest

Vuici, M. (2003a): Offshore software outsourcing – Romania's position among developing and transitional countries. Paper presented at International Outsourcing Conference. Bucharest, April 9

WB (2003): Public Policies and Career Development: A Framework for the Design of Career Information, Guidance and Counselling Services in Developing Countries. Country Report Romania

WEF (2004a): Global Competitiveness Report 2003-2004. Oxford University Press, New York

WEF (2004b): Global Information Technology Report 2003-2004. Oxford University Press, New York

World Bank (2002): Romania - Poverty Assessment, www.worldbank.org

ANNEX - TABLE OF CONTENTS

A. NATIONAL AND REGIONAL ECONOMY

Table A1.: Gross Domestic Product - real grows rates, nominal level and PPS

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
GDP, real growth rates in %	% y-o-y	-12.9	-8.8	1.5	3.9	7.1	3.9	-6.1	-4.8	-1.2	1.8	5.3	4.9	4.9
GDP, in EUR (millions), current prices	EUR (million)		15 073	22 649.45	25 302.32	27 433.06	28 196.33	31 260.44	37 420.05	33 489.47	40 104.14	44 343.62	46 560.8	50 754.8
GDP per capita	PPS, EU15=100					27.94	28.77	26.51	24.64	23.85	23.45	23.94	22.31	27.00

Source: Statistical Yearbook of Romania; for GDP per capita - Eurostat, General Statistics, March 2003

Table A2.: Supply side of growth: contribution - changes in major sectors of production (agriculture, industry, services)

	Unit	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Industry	% in total value added	40.5	37.9	38.3	33.8	36.2	32.9	33.2	30.9	26.3	24.8	25.2	25.8
Construction	% in total value added	5.4	4.3	4.8	5.2	6.5	6.6	6.5	5.2	5.1	5.0	5.0	5.0
Agriculture	% in total value added	21.8	18.9	19.0	21.0	19.9	19.8	19.2	18.0	14.4	13.3	11.1	13.4
Services	% in total value added	34.6	41.0	42.5	44.3	41.4	43.8	43.2	46.5	55.7	58.4	59.8	57.3
Adjusted for imputed output of banking services	% in total value added	-2.3	-2.1	-4.7	-4.2	-4.0	-3.0	-2.0	-0.5	-1.5	-1.5	-1.1	-1.5

Source: Statistical Yearbook of Romania, 2002

Table A3.: Demand side of growth

	unit	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Households consumption	%	65.9	60.8	62.7	63.7	63.5	67.6	69.4	74.1	83.2	83.1	79.0	79.9	3.0
Governmental consumption	%	13.3	15.1	14.3	12.3	13.8	13.7	13.1	12.3	7.1	5.7	6.9	6.3	2.1
Gross fixed capital formation	%	19.8	14.4	19.2	17.9	20.3	21.4	23.0	21.2	18.2	17.7	18.9	19.0	8.3
Inventory change	%	10.5	13.6	12.2	11.0	4.5	2.9	2.9	-0.5	-0.4	-1.6	0.8	2.9	19.8
Net export	%	-9.5	-3.9	-8.4	-5.0	-2.1	-5.6	-8.4	-7.1	-8	-4.8	-5.7	-8.1	-24.8

Source: Statistical Yearbook of Romania, 2002

Table A4.: Changes in cross border capital flows

	Unit/year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Financial account balance	EUR (million)		1 001.3	1 515.8	1 180.2	382.7	1 388.9	2 584.0	1 125.4	3 020.8	485.7	1 098.4	1 601.1	2 519.2
	USD (million)	3 449	872	1 167	1 014	322	1 074	2 062	997	2 684	457	1 194	1 499	2 382

Source: National Bank of Romania, Annual Report, 1996 - 2003

Table A5.: Annual FDI in Romania

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002. Ist semester	TOTAL
No. of companies registered	5 541	11 798	10 581	11 050	3 313	3 522	5 153	8 652	7 203	8 533	6 683	3 113	85 142
Equity capital in EUR million	801.41	415.96	369.45	762.96	217.49	421.57	322.81	625.37	875.59	930.59	943.86	-	6 687.05
Equity capital in US$ million	920.25	540.29	430.01	906.81	281.26	528.28	364.38	703.84	930.56	856.08	845.32	-	7 316.10

Source: Chamber of Commerce and Industry. Foreign Investments in Romania

Table A6.: Changes in employment

	Region	unit	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Rate of unemployment		%	8.4	10.4	10.9	9.5	6.6	8.9	10.4	11.8	10.5	8.8	8.4
Rate of unemployment - by region	NE	%	16.4	14.9	16.4	13.7	10.0	12.2	13.9	14.9	13.2		
	SE	%	11.9	11.9	11.9	10.6	5.3	9.4	11.7	13.2	11.4		
	S	%	9.9	9.2	9.9	9.0	5.4	8.0	10.1	11.8	10.4		
	SV	%	12.6	11.2	11.0	9.9	5.7	10.8	10.9	11.7	11.6		
	V	%	9.2	8.8	9.2	7.5	8.6	8.3	10.6	12.6	10.4		
	NV	%	10.1	9.8	10.1	8.6	7.6	8.1	8.8	10.0	8.5		
	C	%	10.0	9.0	10.0	9.1	7.7	8.7	10.2	11.0	10.3		
	BUCH	%	5.7	6.0	5.7	5.1	4.7	5.4	4.4	6.9	5.8		

Source: Romanian Statistical Yearbook, Employment Household Survey (AMIGO) (for ILO unemployment); National Institute for Statistics

Table A7.: Labour market basic data according with the ILO methodology: unemployment

	2000	2001	2002
NE	6.8	5.9	7.7
SE	8.6	7.8	10.5
S	7.5	6.7	9.7
SV	5.6	5.5	6.7
V	6.6	5.6	7.2
NV	7.2	6.6	7.6
Center	7.3	6.5	8.3
Bucharest	7	8.4	8.7

Source: Households Survey, AMIGO, 2003, INS, various issues

Table A8.: Employment, unemployment and inactive persons, by regions, according to ILO methodology Part A

	1997			1998			1999			2000			2001		
	Employment	Unemployment	Inactive pers.	Employment	Unemployment	Inactive pers.	Employment	Unemployment	Inactive pers.	Employment	Unemployment	Inactive pers.	Employment	Unemployment	Inactive pers.
Total	49.1	3.1	47.8	48.2	3.2	48.6	48.0	3.5	48.5	47.9	3.7	48.4	47.7	3.4	48.9
NE	50.9	4.4	44.7	49.9	4.3	45.8	50.3	4.0	45.7	50.6	3.7	45.7	50.7	3.2	46.1
SE	46.4	3.2	50.4	46.2	3.2	50.6	45.2	3.7	51.1	45.6	4.3	50.1	44.8	3.8	51.4
S	50.3	3.6	46.1	49.7	3.3	47.0	49.1	3.8	47.1	49.3	4.0	46.7	49.2	3.5	47.3
SV	54.7	2.3	43.0	54.0	2.8	43.2	53.8	2.8	43.4	54.0	3.2	42.8	54.7	3.2	42.1
V	48.4	2.6	49.0	46.8	3.2	50.0	47.1	3.4	49.5	46.7	3.3	50.0	46.0	2.7	51.3
NV	50.8	2.3	46.9	49.1	2.9	48.0	48.0	3.6	48.4	47.5	3.7	48.8	48.5	3.4	48.1
Center	46.1	2.8	51.1	44.3	2.9	52.8	44.0	3.5	52.5	44.0	3.5	52.5	44.0	3.1	52.9
Buch	43.6	2.7	53.7	44.0	2.9	53.1	45.1	2.6	52.3	44.0	3.3	52.7	41.6	3.8	54.6

Source: Households Survey, AMIGO, 2003, INS

Table A8.: Employment, unemployment and inactive persons, by regions, according to ILO methodology Part B

	2002		
	Employment	Unemployment	Inactive pers.
Total	42.3	3.9	53.8
NE	43.8	3.6	52.6
SE	40.4	4.7	54.9
S	42.6	4.7	52.7
SV	46.1	3.4	50.5
V	41.2	3.2	55.6
NV	42.2	3.5	54.3
Center	40.3	3.7	56.0
Buch.	41.4	4.0	54.6

Sourse: 2003 Census, General Results

Table A9.: Structure of number of employees in the manufacturing sector Part A

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
C – Mining and quarrying	-	-	-	-	-	-	-	-	-	-	-	-	-
D – Manufacturing	-	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
15 - Food products and beverages	-	7.5	8.0	8.6	9.8	10.1	10.5	10.2	10.5	11.2	11.3	10.8	10.2
16 - Tobacco products	-	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.3	0.2	0.3	0.3
17 – Textiles	-	12.0	12.3	11.7	10.5	9.1	8.4	8.8	7.8	6.7	6.1	6.1	5.8
18 - Wearing apparel; dressing and dyeing of fur	-	7.5	7.6	7.3	7.7	8.6	8.6	9.5	8.9	12.8	14.4	16.7	16.6
19 - Tanning and dressing of leather; mfr. of related articles	-	3.7	3.9	3.7	3.7	4.0	3.8	3.9	4.1	4.4	4.6	5.4	5.3
20 – Wood and products of wood and cork	-	2.7	2.7	3.2	3.1	3.4	3.5	3.1	3.4	4.2	4.6	4.5	4.1
21 – Paper and paper products	-	1.2	1.2	1.3	1.2	1.2	1.2	1.3	1.3	1.2	1.1	1.1	1.1

Table A9.: Structure of number of employees in the manufacturing sector Part B

22 - Publishing, printing and reproduction of recorded media	-	0.8	0.7	0.9	1.2	1.2	1.0	1.0	1.0	1.7	1.2	1.3	1.5
23 - Coke and refined petroleum products	-	1.0	1.0	1.1	1.4	1.5	1.6	1.6	1.9	1.4	1.4	1.4	1.3
24 - Chemicals and chemical products	-	5.3	4.9	5.5	5.8	5.9	5.7	5.9	6.5	4.9	5.0	4.7	4.7
25 – Rubber and plastic products	-	2.5	2.4	2.5	2.1	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.2
26 - Other non-metallic mineral products	-	5.1	5.9	5.5	5.3	5.6	5.6	5.5	5.8	5.5	5.5	5.4	4.9
27 - Basic metals	-	5.0	5.4	6.2	6.3	6.8	6.7	6.9	7.2	6.8	6.4	6.1	6.2
28 - Fabricated metal products, excl. mach. & equip.	-	5.5	5.8	6.4	5.9	5.6	5.6	5.1	5.4	5.7	5.2	4.4	4.4
29 - Machinery and equipment	-	17.5	18.1	15.8	15.1	14.9	14.7	13.6	12.5	10.9	11.0	9.6	11.2
30 - Office, accounting and computing machinery	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
31 - Electrical machinery and apparatus	-	3.7	3.3	3.3	3.3	3.1	3.4	3.4	3.3	2.9	3.0	3.3	3.3
32 - Radio, TV & communication equip. & apparatus	-	1.2	1.0	1.0	1.0	1.0	0.8	0.7	0.8	0.8	0.6	0.7	0.9
33 – Medical, precision & optical instruments, watches & clocks	-	1.4	1.4	1.4	1.0	1.1	0.9	0.8	0.9	0.9	0.7	0.9	0.9
34 - Motor vehicles, trailers and semi-trailers	-	4.7	4.1	4.2	4.2	4.1	4.8	4.9	4.9	4.7	4.8	4.6	4.5
35 - Other transport equipment	-	5.3	4.1	4.1	4.2	3.8	3.4	4.0	4.0	3.8	4.0	3.9	3.9
36 - Furniture; manufacturing n.e.c.	-	5.9	5.7	5.7	6.3	6.2	6.4	6.9	6.3	6.5	6.1	6.1	6.3
37 – Recycling	-	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.7	0.5	0.4	0.5	0.4
E - Electricity, gas and water supply	-	-	-	-	-	-	-	-	-	-	-	-	-

Source: WIIW Industrial Database

Table A10.: Software and services workforce (employees+self-employed)

	1997	**1998**	**1999**	**2000**	**2001**	**2002**
Total employment	7348	9213	9988	13095	16530	18700

Source: M. Vuici "Offshore software outsourcing – Romania's position among developing and transitional countries", paper presented at International outsourcing conference, Bucharest, April 2003

Table A11.: Labour market basic data according with the ILO methodology: unemployment

	2000	2001	2002
NE	6.8	5.9	7.7
SE	8.6	7.8	10.5
S	7.5	6.7	9.7
SV	5.6	5.5	6.7
V	6.6	5.6	7.2
NV	7.2	6.6	7.6
Center	7.3	6.5	8.3
Bucharest	7	8.4	8.7

Source: Households Survey, AMIGO, 2003, INS, various issues

Table A12.: changes in labour supply - participation ratio

	unit	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Active population ((employment from the labour surveys+ILO unemployment) / (total population over 15 years))	%	na	na	na	63.9	na	64.8	64.8	63.6	63.4	63.2
Active population (employment from the labour force balance + unemployment)/working age population	%	72.3	75.1	73.8	73.6	68.5	65.4	64.6	64.2	62.4	62.8

Source: Employment Household Survey (AMIGO), National Institute for Statistics

Table A13.: Changes in unemployment structure (ILO methodology) (%)

2001/2000	2002/2001
87%	131%
91%	135%
89%	142%
98%	122%
85%	129%
92%	115%
89%	128%
120%	104%

Source: Employment Household Survey (AMIGO), National Institute for Statistics

Table A14.: Changes in labour productivity

	unit	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Changes in labour productivity in manufacturing	**%, y-o-y**	-18.8	-12.1	7.3	10.2	21.6	4.6	-1.4	-5.6	7.3	17.3	11.5	14.6

Source: WIIW data base

Table A15.: ICT foreign trade

		1999			2000			2001			2002		
NACE	unit	**imp**	**exp**	**trade balance**	**imp**	**exp**	**trade balance**	**imp**	**exp**	**trade balance**	**imp**	**exp**	**trade balance**
Office equipment (NACE 300.1)	thou. EUR	317 47	971	-30 775	50 540	1 506	-49 035	44 045	3 573	-404 72	50 075	1 708	-48 367
Computers and other information processing equipment (NACE 300.2)	thou. EUR	222 029	97 255	-124 774	282 436	141 056	-141 380	341 758	85 386	-256 372	374 003	20 043	-353 960
Insulated wires and cables (NACE 313)	thou. EUR	92 791	13 068	-79 722	114 341	26 182	-88 159	186 581	61 909	-124 672	208 415	113 856	-94 559
Electronic valves and tubes and other electronic components (NACE 321)	thou. EUR	159 901	5 621	-154 280	530 407	62 179	-468 228	305 841	60 579	-245 261	449 464	46 106	-403 358
Television and radio transmitters and apparatus for line telephony and line telegraphy (NACE 322)	thou. EUR	226 092	27 134	-198 958	436 662	186 908	-249 754	458 405	318 862	-139 543	394 354	231 051	-163 303
Television and radio receivers, sound or video recording or reproducing apparatus and associated goods (NACE 323)	thou. EUR	92 931	8 067	-84 864	158 438	179 220	20 782	167 332	66 702	-100 630	175 875	287 476	111 601
Optical instruments and photographic equipment (NACE 332)	thou. EUR	127 296	16 184	-111 111	177 854	19 662	-158 192	208 869	28 401	-180 468	237 724	34 092	-203 632

Source: NIS data base

B. NATIONAL AND REGIONAL IS POLICIES

Table B1.: Costs of calls in Romania as compared with candidate countries Part A

	Euro-cents			Euro-cents/PPP	
	RO	EU average	RO position in ACC	RO	RO position in ACC
Standard monthly line rental charge of fixed incumbent operator for residential users	346	1420	11/11		
Low-level monthly line rental charge of fixed incumbent operator for residential users	358	1420	7/8		
Monthly line rental charge of fixed incumbent operator for residential users	545	1420	9/13	1532	6/13
Monthly line rental charge of fixed incumbent operator for business users	491	1419	12/13	1380	8/13
Price of incumbent fixed operators for a 3-minute local call	9.94	13.5	8/13	27.93	3/13
Price of alternative fixed operators for a 3-minute local call	7.14	13.5	6/6	20.07	3/6
Price of fixed incumbent operators for a 10-minute local call	29.81	38.9	7/13	83.76	6/13
Price of alternative fixed operators for a 10-minute local call	23.08	38.9	5/6	66.88	3/6
Price of fixed incumbent operator for a 3-minute long-distance call	23.85	32.9	8/12	67.03	7/12
Price of alternative fixed operators for a 3-minute long-distance call	17.85	32.9	8/9	50.16	7/9
Price of fixed incumbent operators for a 10-minute long-distance call	79.49	100.4	9/12	223.37	7/12
Price of alternative fixed operators for a 10-minute long-distance call	59.5	100.4	8/9	167.2	6/8
Price of fixed incumbent for a 3-minute fixed-to-mobile call	53.55	0	12/13	150.5	7/13
Price of the fixed incumbent for a 10-minute international call to a near country	3.21	2.12	6/13	903	3/13

Table B1.: Costs of calls in Romania as compared with candidate countries Part B

Price of the alternative fixed operators for a 10-minute international call to a near country	1.31	2.12	5/10	368	3/11
Fixed-to-Fixed interconnection charges for call termination on fixed network of incumbent operator – local level	1.15	0.62	5/8		
Fixed-to-Fixed interconnection charges for call termination on fixed network of incumbent operator – single transit	2.14	0.96	3/9		
Fixed-to-Fixed interconnection charges for call termination on fixed network of incumbent operator – double transit	2.55	1.66	4/9		
Mobile-to-Fixed interconnection charges for calls from mobile network terminated in the network of the fixed incumbent operator – local level	1.15	0.62	4/7		
Mobile-to-Fixed interconnection charges for calls from the mobile network terminated in the network of the fixed incumbent operator – single transit	2.14	0.96	4/9		
Mobile-to-Fixed interconnection charges for calls from the mobile network terminated in the network of the fixed incumbent operator – double transit	2.55	1.66	5/10		
Fixed-to-mobile interconnection charges	9.64	17.45	10/11		

Source: IBM, 4th Report on Monitoring of EU Candidate Countries (Telecommunication Services Sector) 2003

C. INDUSTRIAL DEVELOPMENT AND COMPETITIVENESS

Table C1.: Structure of industrial production Part A

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Mining and quarring	0.09	0.09	0.08	0.07	0.07	0.07	0.07	0.08	0.07	0.05	0.06	0.06	0.05
Manufacturing	0.86	0.84	0.82	0.85	0.80	0.81	0.82	0.79	0.79	0.74	0.79	0.80	0.78
15 - Food products and beverages	0.14	0.15	0.15	0.19	0.16	0.16	0.17	0.16	0.18	0.14	0.16	0.14	0.13
16 - Tobacco products	0.01	0.01	0.00	0.01	0.00	0.00	0.01	0.01	0.02	0.02	0.01	0.02	0.01
17 - Textiles	0.07	0.07	0.05	0.04	0.03	0.04	0.03	0.03	0.02	0.02	0.02	0.02	0.02
18 - Wearing apparel; dressing and dyeing of fur	0.04	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.04	0.03	0.04	0.04
19 - Tanning and dressing of leather; mfr. of related articles	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02
20 - Wood and products of wood and cork	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.03
21 - Paper and paper products	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
22 - Publishing, printing and reproduction of recorded media	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01
23 - Coke and refined petroleum products	0.07	0.07	0.07	0.09	0.08	0.07	0.06	0.08	0.06	0.08	0.10	0.11	0.11
24 - Chemicals and chemical products	0.07	0.08	0.09	0.07	0.07	0.08	0.08	0.07	0.06	0.06	0.07	0.06	0.06
25 - Rubber and plastic products	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
26 - Other non-metallic mineral products	0.04	0.04	0.04	0.03	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03
27 - Basic metals	0.09	0.10	0.11	0.09	0.09	0.10	0.10	0.12	0.10	0.09	0.11	0.13	0.12

Table C1.: Structure of industrial production Part B

28 - Fabricated metal products, excl. mach. & equip.	0.04	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.03
29 - Machinery and equipment	0.09	0.08	0.08	0.06	0.05	0.06	0.06	0.05	0.04	0.04	0.04	0.04	0.04
30 - Office, accounting and computing machinery	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31 - Electrical machinery and apparatus	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
32 - Radio, TV & communication equip. & apparatus	0.01	0.01	0.00	0.04	0.03	0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.01
33 – Medical, precision & optical instruments, watches & clocks	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
34 – Motor vehicles, trailers and semi-trailers	0.04	0.04	0.03	0.03	0.03	0.03	0.04	0.03	0.04	0.04	0.02	0.03	0.03
35 – Other transport equipment	0.02	0.02	0.03	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
36 – Furniture; manufacturing n.e.c.	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.03
37 – Recycling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
E – Electricity, gas and water supply	**0.05**	**0.08**	**0.11**	**0.09**	**0.13**	**0.12**	**0.11**	**0.13**	**0.14**	**0.20**	**0.15**	**0.15**	**0.17**

Source: WIIW data base

*Table C2: Industrial value added by regions**

Industrial value added by regions, bill. ROL, curr. prices	1995	1996	1997	1998**	1999**	2000**
NE	2 936.5	4 550.5	9 747.9	12 054.0	15 955.6	25 577.0
SE	2 826.7	4 321.9	9 033.7	13 943.1	15 250.1	25 547.9
S	3 889.0	5 602.1	11 376.3	14 971.1	18 543.7	30 733.1
SW	2 536.0	3 543.5	8 218.0	10 521.7	14 895.7	24 697.6
W	2 226.4	3 134.6	6 934.1	8 217.7	12 231.4	20 738.4
NW	2 646.3	3 939.9	8 744.1	11 852.4	15 071.2	23 728.2
C	3 417.0	5 903.8	12 843.4	16 027.9	20 668.2	33 535.4
BUCHAREST	3 114.0	4 986.7	10 910.8	15 137.8	22 289.7	34 499.7

*) including electric and thermal energy, gas and water
**) According to ESA 1979 methodology
Source: Romanian Statistical Yearbook

Table C3.: Industrial value added by regions, mill EUR

	1995	1996	1997	1998*	1999*	2000*
NE	1 116.7	1 178.0	1 204.8	1 206.7	979.1	1 281.7
SE	1 075.0	1 118.8	1 116.5	1 395.8	935.8	1 280.2
S	1 479.0	1 450.2	1 406.1	1 498.7	1 138.0	1 540.1
SW	964.4	917.3	1015.7	1 053.3	914.1	1 237.6
W	846.7	811.5	857.0	822.7	750.6	1 039.2
NW	1 006.4	1 019.9	1 080.7	1 186.5	924.9	1 189.0
C	1 299.5	1 528.3	1 587.4	1 604.5	1 268.3	1 680.5
BUCH	1 184.3	1 290.9	1 348.5	1 515.4	1 367.8	1 728.8

*) According to ESA 1979 methodology
Source: Romanian Statistical Yearbook

Table C4.: Services, mill.EURO Part A

Retail*, by group of goods, mill. EURO, curr. prices	1995	1996	1997	1998	1999	2000	2001
Food goods	3 180.40	3 143.78	3 549.89	5 169.58	4 169.01	4 774.73	4 998.87
Non-food goods	3 637.67	4 398.26	4 858.35	7 395.18	5 657.98	5 927.40	6 038.86
Wholesale, mill. EURO, curr. Prices	10 647.15	10 918.78	11 693.25	12 888.48	13 085.83	18 577.68	21 082.24
Sale*, maintenance and repair of motor vehicles and motorcycles; retail of fuels, mill. ROL, curr. prices	2 468.61	2 553.81	2 866.81	4 112.95	3 519.46	4 132.84	4 085.57
Market services rendered to the population, mill. EUR, curr. Prices	1 209.20	1 214.09	1 160.02	1 438.98	1 387.67	1 804.09	1 756.25
Hotels and restaurants	272.14	280.27	274.71	288.61	239.67	296.24	324.97
Other accomodation types	18.81	10.00	6.23	8.73	8.02	7.18	9.20
Restaurants	195.99	200.14	194.01	238.53	199.86	251.74	288.17
Coffee shops, bars, canteens and other units of food preparation	248.37	214.25	183.92	226.14	166.49	285.39	211.95
Travel agencies	133.93	111.53	88.46	121.15	139.85	215.00	213.06
Renting personal and household goods	1.31	1.03	3.37	2.56	1.64	7.90	15.22
Photo, translation, secretariat	10.02	11.83	20.08	19.93	29.05	24.91	38.00
Production, distribution and projection of cinema movies and video movies	14.56	19.00	19.38	25.13	25.47	45.85	50.44
Radio and TV activities	45.27	50.47	60.27	125.39	183.14	235.18	199.86
Art and shows activities	19.49	8.24	8.96	10.21	16.66	14.31	30.30
Press agencies, libraries, museums, botanic gardens and zoos	3.19	4.83	5.69	6.63	4.66	8.89	6.21
Sport and recreative activities	158.93	159.50	185.36	240.30	273.99	293.58	246.05
Other activities of services	87.18	143.02	109.58	125.67	99.18	117.93	122.81
Market services rendered to the economic units, mill. EUR, curr. Prices	1 076.00	1 014.30	1 096.43	1 717.91	1 787.08	2 808.41	4 032.03
Real estate of which:	-	-	-	-	385.09	561.97	715.54
Management of buldings based on tariffs or contract (rent)	-	-	-	-	39.77	37.27	39.60

Table C4.: Services, mill.EURO Part B

Rental of machinery and equipment without operator	-	-	-	-	72.45	252.39	232.57
Informatics and related activities	-	-	-	-	147.29	268.16	406.07
Juridical activities, accounting and auditing	-	-	-	-	153.11	254.61	370.77
Architecture, engineering and other technical consulting	-	-	-	-	269.73	315.51	424.43
Advertising	-	-	-	-	256.89	345.56	500.24
Draining and removal of garbage, salubrity and other similar activities	-	-	-	-	129.19	166.02	207.95
Other services	-	-	-	-	373.32	644.21	1 174.45
Transport, post and telecommunication services, mill. EURO, curr. prices	3 110.13	3 588.23	3 956.23	5 092.93	5 155.54	6 295.89	6 940.19
Transport	-	-	-	-	3 275.18	3 871.29	4 350.87
Land transport, of which:	-	-	-	-	2 078.60	2 448.11	2 765.51
Railway transport	-	-	-	-	831.85	1 142.76	1 159.47
Water transport	-	-	-	-	144.48	139.72	141.02
Air transport	-	-	-	-	169.60	188.23	227.77
Pipe-line transport	-	-	-	-	319.74	345.17	422.69
Other transport services	-	-	-	-	562.76	750.06	793.88
Post and telecommunication	-	-	-	-	1 880.36	2 424.60	2 589.32
Mail and courier	-	-	-	-	131.94	144.27	163.24
Telephony, telegraphy, data transmission	-	-	-	-	1 569.11	2 074.24	2 191.38
Radiocommunications	-	-	-	-	179.31	206.09	234.70

Source: Romanian Statistical Yearbook, National Institute for Statistics

Table C5 : Changes in the structure of retail trade, percentage

	1995	1996	1997	1998	1999	2000	2001
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Food goods	46.6	41.7	42.2	41.1	42.4	44.6	45.3
Non-food goods	53.4	58.3	57.8	58.9	57.6	55.4	54.7

Source: Romanian Statistical Yearbook, National Institute for Statistics

Table C6.: Changes in the structure of market services to population, percentage

	1995	1996	1997	1998	1999	2000	2001
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Hotels and restaurants	22.5	23.1	23.7	20.1	17.3	16.4	18.5
Other accomodation types	1.6	0.8	0.5	0.6	0.6	0.4	0.5
Restaurants	16.2	16.5	16.7	16.6	14.4	14.0	16.4
Coffee shops, bars, canteens and other units of food preparation	20.5	17.6	15.9	15.7	12.0	15.8	12.1
Travel agencies	11.1	9.2	7.6	8.4	10.1	11.9	12.1
Renting personal and household goods	0.1	0.1	0.3	0.2	0.1	0.4	0.9
Photo, translation, secretariat	0.8	1.0	1.7	1.4	2.1	1.4	2.2
Production, distribution and projection of cinema movies and video movies	1.2	1.6	1.7	1.7	1.8	2.5	2.9
Radio and TV activities	3.7	4.2	5.2	8.7	13.2	13.0	11.4
Art and shows activities	1.6	0.7	0.8	0.7	1.2	0.8	1.7
Press agencies, libraries, museums, botanic gardens and zoos	0.3	0.4	0.5	0.5	0.3	0.5	0.4
Sport and recreative activities	13.1	13.1	16.0	16.7	19.7	16.3	14.0
Other activities of services	7.2	11.8	9.4	8.7	7.1	6.5	7.0

Table C6.: Changes in the structure of market services to businesses, percentage

	1999	2000	2001
Total	100	100	100
Real estate of which:	21.5	20.0	17.7
Management of buildings based on tariffs or contract (rent)	2.2	1.3	1.0
Rental of machinery and equipment without operator	4.1	9.0	5.8
Informatics and related activities	8.2	9.5	10.1
Juridical activities, accounting and auditing	8.6	9.1	9.2
Architecture, engineering and other technical consulting	15.1	11.2	10.5
Advertising	14.4	12.3	12.4
Draining and removal of garbage, salubrity and other similar activities	7.2	5.9	5.2
Other services	20.9	22.9	29.1
Transport, post and telecommunication services, mill. ROL, curr. prices	100	100	100
Transport	63.5	61.5	62.7
Land transport, of which:	40.3	38.9	39.8
Railway transport	16.1	18.2	16.7
Water transport	2.8	2.2	2.0
Air transport	3.3	3.0	3.3
Pipe-line transport	6.2	5.5	6.1
Other transport services	10.9	11.9	11.4
Post and telecommunication	36.5	38.5	37.3
Mail and courier	2.6	2.3	2.4
Telephony, telegraphy, data transmission	30.4	32.9	31.6
Radiocommunications	3.5	3.3	3.4

Source: Romanian Statistical Yearbook, National Institute for Statistics

Table C7.: ICT Production in Romania (million EURO)

	1997	1998	1999	2000	2001
Computing equipment Data transmission equipment	225	198	218	400	460
Semiconductors					
Telecommunications equipment.	407	510	440	515	570
Other components / subsets	429	531	402	632	711
Office equipment	14	17	15	16	24
Measurement and control devices	88	81	81	122	132
Software and ICT services	50	60	100	150	200
Total	**1220**	**1410**	**1270**	**1850**	**2119**

Source: Ministry of Industry and Resources, 2001

Table C8.: changes in investment

	unit	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Current value	bil.ROL	168	314	889	2 822	8 005	12 995	20 945	44 135	60 515	83 948	124 987	204 195	292 606
	mil. EUR		3 576.1	2 221.4	3 189.9	4 069.2	4 942.2	5 422.2	5 454.8	6 058.0	5 151.6	6 263.2	7 845.5	9 361.84
Indices	%, 1990=100	100	74.2	73.4	79.6	100.6	111.4	114.9	108.7	104.2	98.1	101.5	111.2	194.2

Source: Romanian Statistical Yearbook, National Institute for Statistics; CANSTAT, 2003, NIS

E. INFORMATION SOCIETY TECHNOLOGIES (IST) PENETRATION

Table E1.: IT indicators by regions (2001)

	Economic and financial sector				Public administration		
	Share of enterprises connected to Internet in total no. of enterprises by region	No. of PCs	Share of no. of PCs connected to Internet, %	ITC professionals (persons)	No. of PCs	Share of no. of PCs connected to Internet, %	ITC professionals (persons)
Total	6.1	324 685	28.9	56 597	98 434	36.9	6 988
NE	5.7	27 265	33.9	6 398	16 217	42.2	1 291
SE	4.2	23 065	30.8	3 231	11 630	24.4	774
S	5.5	25 568	18.3	4 456	10 440	28.8	948
SW	3.2	14 631	20.3	2 766	8 380	28.8	1 011
W	7.6	21 133	27.1	5 156	9 434	31.9	476
NW	5.7	29 348	24.7	6 679	14 334	46.2	605
Center	5.7	29 225	26.2	7 310	11 434	33.5	926
Bucharest	8.9	154 450	31.9	20 601	16 565	47.0	957

Source: 'Informatii statistice ', National Institute for Statistics, 2001

Table E2.: Number of PCs in high schools

	Total	**of which net connection:**	**Number of schools with internet connections**	**Number of PCs with Internet connections**
2001-2002, of which:	23 344	13 974	811	
Urban	21 936	13 349	763	
Rural	1 408	625	48	
2002-2003, of which:	31 451	18 906	999	14 264
Urban	29 280	18 222	929	13 987
Rural	2 171	684	70	277

Source: Higher education at the beginning of the year 2002-2003, NIS, 2003

F. INSTITUTIONAL CAPACITIES AND REGULATORY BACKGROUND

Table F1.: NRAC - Decisions regarding the designation of the telecommunications operators with significant power Part A

/ date of entry into force	On the designation as having significant power
801/2003 19.09.2003	**Romtelecom** – in the market for the full or shared access to the twisted metallic pair local loop for the purpose of providing broadband electronic communication services and publicly available telephony services at fixed locations.
802/'03 19.09.2003	**Romtelecom** – on the market of Leased Lines-Terminal
142/2002 18.12.2002.	**Romtelecom" –** in the market for the access to the public fixed telephony networks for the purpose of call origination, termination and transit
126; 125; 124; 123 / 2003; 24.03.2003	On the interconnection with the public mobile telephony network operated by **Telemobil**(Zapp) **/ Cosmorom / Orange / Mobifon** (Connex) for the purpose of call termination .
146; 145; 144; 143 /2002 18.12.2002	Power in the market for the access to the mobile telephony network operated by **Telemobil**(Zapp) **/ Cosmorom / Orange / Mobifon** (Connex) ,for the purpose of call termination
NRAC: Decisions	
1351//2003 11.11.2003	On the conditions and procedure for the designation of the universal service providers in the field of postal services
1334//2003 4.11.2003	On granting procedure for the usage rights of the national and international signaling points codes
1333//2003	On the general authorization regime for the provision of electronic communications networks and services
1332/2003 10.11.2003	Reporting Several Statistical Data by the Electronic Communications Networks and Services Providers
1331/2003 10.11.2003	On the establishment of the procedure for the resolution of disputes within the competence of **NRAC**
141/2002 17.01.2003	On the application and granting procedure regardingthe licenses for the use of the numbering resources

Table F1.: NRAC - Decisions regarding the designation of the telecommunications operators with significant power Part B

140/2002 15.01.2003	On the approval of the National Numbering Plan
138/2002 15.01.2003	On the imposition of some minimum requirements for the provision of the publicly available electronic communications services
137/2002 16.12.2002	On the approval of the Regulation for conducting market analyses and determining the significant market power – publication: O.J. no.916/16.12.2002; entry into force:
136/2002 16.12.2002	For the approval of the Regulation on the identification of the relevant markets within the electronic communications sector

Source: Authors' compilations based on data from NRAC web site http://.anrc.ro

G. EDUCATIONAL SECTOR AND LABOUR FORCE SUPPLY

Table G1.: Expenditure for Research-Development Activity, by Execution Sector and Financing Source

	-million ROL current prices-						
	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
TOTAL	**768 349**	**1 465 004**	**1 833 389**	**2195 810**	**2 962 046**	**4 593 429**	**5 743 861**
Entreprises sector	**564 817**	**1 192 210**	**1 406 739**	**1 633 443**	**2 056 097**	**2 830 304**	**3 461 509**
Government sector	**177 896**	**231 038**	**342 976**	**407 600**	**557 358**	**1 243 434**	**1 388 367**
Higher education sector	**25 636**	**41 756**	**83 674**	**154 767**	**348 591**	**519 691**	**893 985**
Domestic funds	25 535	41 490	75 622	146 702	276 422	319 782	
Public funds	17 715	28 598	61 921	106 933	108 111	246 237	190 341
Economic units	4 154	7 666	10 240	25 811	22 623	31 385	49 829
Higher education units	121	246	463	265	18	3 996	
Non-profit associations	24	NA	NA	NA	27	530	465
Own sources	3 481	4 949	2 401	6 120	120 024	12 988	
Other funds	40	31	597	7 573	25 619	24 646	
External funds	101	266	8 052	8 065	72 169	199 909	147 279

Source: Research-Development (Statistical series), NIS, 2001; Romanian Statistical Yearbook, National Institute for Statistics

Table G2.: Weight of total research-development expenditure in GDP- % -

	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
	0.71	0.58	0.49	0.41	0.37	0.39	0.38
Enterprises sector - % in GDP	0.52	0.47	0.38	0.30	0.26	0.24	0.23
Government sector - % in GDP	0.17	0.09	0.09	0.08	0.07	0.11	0.09
Higher education sector - % in GDP	0.02	0.02	0.02	0.03	0.04	0.04	0.06

Source: Research-Development (Statistical series), NIS, 2001; Romanian Statistical Yearbook, National Institute for Statistics, 2002

Table G3.: Expenditure for R&D activity by financing sources - mill. EURO, curr. prices

	1996	1997	1998	1999	2000	2001	2002
Total	**198.90**	**181.07**	**183.54**	**134.75**	**148.43**	**176.49**	**183.78**
Domestic funds, from:	**193.62**	**175.76**	**180.35**	**131.44**	**141.16**	**162.02**	**170.83**
Public funds	**109.14**	76.77	97.10	62.88	60.56	75.82	
Economic units	45.12	30.84	24.67	25.90	25.88	29.10	
Higher education units	0.37	2.74	5.21	0.07	0.43	0.73	
Non-profit associations	0.53	0.00	-	-	0.21	0.02	
Own sources	32.89	59.85	50.37	36.14	49.35	51.44	
Other funds	5.56	5.57	2.99	6.45	4.74	4.91	
External funds	**5.29**	**5.31**	**3.19**	**3.31**	**7.27**	**14.47**	**12.95**
Enterprises sector	**146.22**	**147.35**	**140.83**	**100.24**	**103.03**	**108.74**	**110.75**
Domestic funds, from:	**141.67**	**143.12**	**138.85**	**98.29**	**100.59**	**104.40**	**105.17**
Public funds	66.77	50.66	61.29	37.86	35.02	33.73	36.50
Economic units	39.13	26.79	21.53	21.77	21.35	18.20	
Higher education units	0.33	2.70	5.16	0.05	0.40	0.55	
Non-profit associations	0.52	0.00	-	-	0.20	-	
Own sources	29.64	58.38	48.63	35.24	42.71	50.37	
Other funds	5.28	4.59	2.24	3.36	0.92	1.54	
External funds	**4.54**	**4.23**	**1.97**	**1.95**	**2.44**	**4.35**	**5.58**
Government sector	**46.05**	**28.56**	**34.33**	**25.01**	**27.93**	**47.77**	**44.42**
Domestic funds, from:	**45.33**	**27.51**	**33.93**	**24.15**	**26.72**	**45.33**	**41.77**
Public funds	37.78	22.57	29.61	18.46	20.13	32.63	35.02
Economic units	4.92	3.10	2.12	2.54	3.40	9.69	
Higher education units	0.00	0.01	0.01	0.01	0.03	0.02	
Non-profit associations	0.00	-	-	-	0.01	0.00	
Own sources	2.35	0.86	1.50	0.53	0.62	0.57	
Other funds	0.27	0.97	0.69	2.62	2.53	2.42	
External funds	**0.72**	**1.04**	**0.41**	**0.86**	**1.21**	**2.44**	**2.65**

Source: Romanian Statistical Yearbook, 2003

Table G4.: High-school enrolment

High-school enrolment	1996/1997		2001/2002	
	Number of pupils	Per 100 persons 15-18 years old	Number of pupils	Per 100 persons 15-18 years old
Theoretical	**316 685**	**24.4**	**345 549**	**26.3**
Technological	**361 399**	**27.9**	**312 994**	**23.8**
Industrial	241 634	18.6	202 802	15.4
Agriculture	48 086	3.7	21 898	1.7
Forestry	3 997	0.3	8 885	0.7
Agro-montain	NA		1 970	0.1
Veterinary	NA		6 479	0.5
Economy, administration and services	67 682	5.2	70 960	5.4
Other	**55 652**	**4.3**	**52 120**	**4.0**
Sports	11 805	0.9	12 617	1.0
Arts	8 907	0.7	11 205	0.9
Pedagogy	17 928	1.4	12 610	1.0
Military	3 444	0.3	1 903	0.1
Theology	12 846	1.0	12 707	1.0
Special	722	0.1	1 078	0.1
Total	**733 736**	**56.5**	**710 663**	**54.0**

Source: NIS, High-School Education at the Begining of the Year, 2003

Table G5.: Vocational education at secondary level

	1996/1997		2001/2002	
	Number of pupils	**Per 100 persons 15-18 years old**	**Number of pupils**	**Per 100 persons 15-18 years old**
Vocational schools (including special ones)	**193 643**	**14.9**	**192 038**	**14.6**
Engineering	26 108	2.0	24 780	1.9
Electrotechnics and electronics	8 657	0.7	11 318	0.9
Mine	3 672	0.3	1 495	0.1
Oil	3 302	0.3	2 555	0.2
Metallurgy	2 075	0.2	1 040	0.1
Energy	3 880	0.3	2 805	0.2
Industrial chemistry	3 927	0.3	3 294	0.2
Construction materials	1 823	0.1	1 222	0.1
Mounting construction	17 335	1.3	14 675	1.1
Wood explitation and processing	13 252	1.0	10 419	0.8
Transport	40 465	3.1	44 456	3.4
Post and telecommunications	1 274	0.1	1 754	0.1
Food industry	6 640	0.5	7 939	0.6
Light industry	19 606	1.5	21 872	1.7
Poligraphy	450	0.0	427	0.03
Water management	246	0.0	332	0.03
Agriculture	10 390	0.8	9 365	0.7
Forestry	739	0.1	1 747	0.1
Trade	3 822	0.3	5 127	0.4
Public catering	10 331	0.8	13 696	1.0
Small-sized industry and rendering services	15 990	1.2	11 564	0.9
Other industrial activities	299	0.02	172	0.01

Source: NIS, High-School Education at the Begining of the Year, 2003

Table G6.: Apprenticeship schools enrolment

	1996/1997		2001/2002	
	Number of pupils	Per 100 persons 15-18 years old	Number of pupils	Per 100 persons 15-18 years old
Apprenticeship schools	**53 596**	**4.1**	**60 309**	**4.59**
Industry	23 907	1.8	25 381	1.93
Small sized industry	20 748	1.6	22 619	1.72
Services for population	7 404	0.6	10 242	0.78
Activities in agriculture	1 537	0.1	2 067	0.16

Sourse: NIS, Secondary Education at the Begining of the Year, 2003

Table G7.: Post high schools enrolment Part A

Post high schools (including special ones)	1996/1997	2001/2002
	Number of students	Number of students
Total	**57 199**	**65 193**
Engineering	1 190	287
Electrotechnics and electronics	1 277	430
Mines	291	12
Oil	44	16
Geology	27	23
Metallurgy	424	40
Energy	515	156
Industrial chemistry	858	50
Architecture, arrangement and mounting constructions	1 521	677
Wood exploitation and processing	313	191
Transport	91	630
Post and telecommunications	998	1 651

Table G8.: Post high schools enrolment Part B

Food industry	827	1 375
Light industry	1 015	758
Agriculture	2 091	454
Sylviculture	801	2 122
Water management	90	241
Trade	1 417	732
Finances, accountancy, administrative	10 099	15 224
Tourism	1 115	1 108
Handicraft cooperation	1 258	932
Informatics	1 476	3 346
Metrology	91	85
Sanitary	26 315	33 059
Culture	249	296
Education	1 510	364
Others	1 296	893

Sourse: NIS, Higher Education at the Begining of the Year, 2003

Table G9.: Foremen schools enrolment Part A

	1996/1997	**2001/2002**
	Number of students	**Number of students**
Foremen schools	**16 322**	**7 492**
Engineering	4 668	1 583
Electronics and electrotechnics	1 441	513
Mines	1 986	488
Oil	507	415
Metallurgy	607	266
Energy	1 770	1 491

Table G10.: Foremen schools enrolment Part B

Industrial chemistry	1 026	276
Construction materials	63	59
Mounting construction	753	533
Wood exploitation and processing	960	297
Transport	1 327	1 176
Food industry	127	-
Light industry	378	344
Agriculture	380	51
Others	329	-

Source: NIS, Secondary Education at the Begining of the Year, 2003

Table G11.: Students enrolled in Higher Education (state owned), By Group Of Specializations Part A

Higher Education (state owned), By Group Of Specializations		
	1996/1997	**2001/2002**
Students enrolled – total	**354 488**	**582 221**
Technical	**95 792**	**149 521**
Industry	**63 968**	**95 377**
Mining	860	743
Petroleum-Geology	1 287	1 102
Electric power and electrotechnics	27 218	54 955
Metallurgy and engineering	25 439	23 183
Chemical technology	3 836	6 577
Wood and building materials industry	1 258	1 206
Light industry	1 840	3 232
Food industry	2 230	4 379
Transport and telecommunications	**3 407**	**2 233**
Architecture and construction	**10 409**	**17 419**

Table G12.: Students enrolled in Higher Education (state owned), By Group Of Specializations Part B

Agriculture (veterinary medicine included)	**10 761**	**24 401**
Agriculture	7 565	20 057
Veterinary medicine	3 196	4 344
Sylviculture	**1 392**	**2 497**
Other specializations	5 855	7 594
Medicine and pharmacy	**32 714**	**32 823**
Human medicine (Stomatology included)	29 868	28 887
Pharmacy	2 846	3 936
Economics	87 472	146 110
Juridical	48 268	69 124
University-pedagogy	**83 430**	**175 684**
Philology (Journalism included)	21 112	41 402
History-Philosophy (Theology included)	18 137	28 409
Geography	4 417	9 447
Biology	4 117	6 586
Chemistry	4 222	3 523
Mathematics-Physics	13 737	17 339
Pedagogy (Socio-psycho-pedagogy included)	10 698	36 060
Physical education	6 990	15 122
Political and administrative sciences	NA	17 796
Artistic	**6 812**	**8 959**
Fine and decorative arts	2 905	3 424
Drama and cinematography (coregraphy included)	1 227	1 628
Music	2 680	3 907

Sourse: NIS, Higher Education at the Begining of the Year, 2003

Table G13.: Students enrolled in private education

	2001/2002
Students enrolled in private education	**146 815**
Technical	6 175
Industry	562
Electric energy and electrotechnics	532
Metalurgy and machine buildings	30
Architecture and construction	274
Agriculture	5 282
Agriculture	5 037
Veterinary medicine	245
Sylviculture	57
Medicine and pharmacy	1 711
Human medicine (Stomatology included)	1 711
Economics	62 653
Juridical	43 124
University-pedagogy	31 750
Philology (Journalism included)	6 865
History-Philosophy (Teology included)	4 527
Geography	1 211
Biology	571
Mathematics-Physics	707
Pedagogy (Socio-psycho-pedagogy included)	10 671
Physical education	2 959
Political and administrative sciences	4 239
Artistic	1 402
Fine and decorative arts	366
Drama and cinematography	450
Music	586

Source: NIS, Higher Education at the Begining of the Year, 2003

H. NATIONAL AND REGIONAL DEMOGRAPHIC DATA AND PROSPECTIVE

Table H1.: Age distribution (number of persons)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
0-14 years	23.57%	22.98%	22.39%	21.74%	21.13%	20.48%	19.90%	19.41%	19.11%	18.77%	18.27%	17.76%	17.34%
15-64 years	66.03%	66.32%	66.50%	66.85%	67.18%	67.53%	67.85%	68.03%	68.07%	68.20%	68.43%	68.53%	68.61%
65 and over	10.40%	10.69%	11.12%	11.40%	11.69%	12.00%	12.25%	12.56%	12.82%	13.04%	13.31%	13.48%	14.04%

Source. National Institute of Statistics. Romanian Statistic Yearbook. 2003

Table H2.: Age distribution, in %

													Year
	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
0-4 years	7.78%	7.45%	6.85%	6.36%	5.92%	5.42%	5.35%	5.22%	5.17%	5.11%	5.10%	5.06%	5.02%
5-9 years	7.32%	7.17%	7.30%	7.53%	7.69%	7.70%	7.34%	6.85%	6.37%	5.93%	5.43%	5.34%	5.22%
10-14 years	8.47%	8.37%	8.24%	7.85%	7.52%	7.36%	7.21%	7.33%	7.57%	7.74%	7.73%	7.36%	7.10%
15-19 years	8.10%	8.13%	8.51%	8.72%	8.75%	8.66%	8.54%	8.28%	7.90%	7.58%	7.41%	7.24%	7.56%
20-24 years	8.51%	9.01%	9.01%	8.19%	7.97%	8.03%	8.25%	8.54%	8.76%	8.81%	8.72%	8.58%	8.04%
25-29 years	6.01%	5.80%	5.63%	6.83%	7.58%	8.20%	8.70%	8.98%	8.18%	7.98%	8.05%	8.27%	7.95%
30-34 years	7.36%	7.08%	6.63%	6.25%	5.97%	5.75%	5.54%	5.60%	6.80%	7.56%	8.19%	8.68%	8.96%
35-39 years	7.41%	7.51%	7.53%	7.53%	7.49%	7.18%	6.90%	6.57%	6.21%	5.94%	5.73%	5.52%	5.59%
40-44 years	6.19%	6.55%	6.84%	7.13%	7.11%	7.24%	7.34%	7.43%	7.43%	7.41%	7.11%	6.82%	6.55%
45-49 years	5.16%	5.16%	5.20%	5.31%	5.63%	6.08%	6.43%	6.69%	6.97%	6.97%	7.10%	7.20%	7.36%
50-54 years	6.21%	5.94%	5.75%	5.47%	5.24%	4.97%	4.99%	5.02%	5.13%	5.45%	5.89%	6.23%	6.58%
55-59 years	5.83%	5.84%	5.94%	5.94%	5.95%	5.94%	5.67%	5.45%	5.18%	4.98%	4.73%	4.74%	4.87%
60-64 years	5.25%	5.30%	5.46%	5.48%	5.48%	5.47%	5.49%	5.49%	5.49%	5.51%	5.50%	5.25%	5.15%
65-69 years	4.23%	4.40%	4.55%	4.63%	4.69%	4.75%	4.80%	4.86%	4.88%	4.88%	4.88%	4.90%	4.98%
70-74 years	2.10%	2.29%	2.63%	3.10%	3.41%	3.56%	3.71%	3.79%	3.86%	3.91%	3.98%	4.03%	4.13%
75-79 years	2.30%	2.16%	1.95%	1.62%	1.51%	1.58%	1.72%	1.98%	2.32%	2.54%	2.67%	2.76%	2.89%
80-84 years	1.22%	1.27%	1.35%	1.39%	1.39%	1.39%	1.29%	1.16%	0.96%	0.91%	0.98%	0.98%	1.28%
85 and over	0.55%	0.57%	0.63%	0.66%	0.69%	0.72%	0.73%	0.76%	0.79%	0.79%	0.81%	0.81%	0.76%

Source: National Institute of Statistics, Romanian Statistic Yearbook, 2003

Table H3.: Population growth rate

Year	Population (July 1)	Population growth rate	Year	Birth per 1000 inhabitants	Death per 1000 inhabitants	Natural increase
1990	23 206 720		1990	13.6	10.6	3.0
1991	23 185 084	-0.09%	1991	11.9	10.9	1.0
1992	22 788 969	-1.71%	1992	11.4	11.6	-0.2
1993	22 755 260	-0.15%	1993	11.0	11.6	-0.6
1994	22 730 622	-0.11%	1994	10.9	11.7	-0.8
1995	22 680 951	-0.22%	1995	10.4	12.0	-1.6
1996	22 607 620	-0.32%	1996	10.2	12.7	-2.5
1997	22 545 925	-0.27%	1997	10.5	12.4	-1.9
1998	22 502 803	-0.19%	1998	10.5	12.0	-1.5
1999	22 458 022	-0.20%	1999	10.4	11.8	-1.4
2000	22 435 205	-0.10%	2000	10.5	11.4	-0.9
2001	22 408 393	-0.12%	2001	9.80	11.6	-1.8
2002	21 794 793	-2.74%	2002	9.65	12.4	-2.8

Source: National Institute of Statistics, Romanian Statistic Yearbook, 2003

I. CULTURAL AND SOCIOLOGICAL ASPECTS

Table I1.: Structure of urban and rural internal migration flows due to permanent residence change, ratio per 1000 inhabitants

	Romania	EU
1989		8.3
1990	33.9	2.8
1991	11.3	2.9
1992	12.9	3.7
1993	10.6	2.9
1994	11.7	2.1
1995	12.8	2.2
1996	13	2
1997	13.4	1.4
1998	12.3	1.2
1999	12.3	Na
2000	10.9	Na
2001	12.7	
2002	14.7	

Source: NIS, Romanian Statistical Yearbook, 2003; EUROSTAT Data

Table I2.: Average life expectancy Part A

Years	Average life expectancy
1989-1991	69.78
1990-1992	69.52
1991-1993	69.48
1992-1994	69.40
1993-1995	69.50

Table I2.: Average life expectancy Part B

1994-1996	68.95
1995-1997	69.24
1996-1998	69.74
1997-1999	70.53
1998-2000	71.19
1999-2001	71.25
2000-2002	71.25

Source: NIS, Romanian Statistical Yearbook, 2003

Table I3.: Indices of real salary earnings (100%=1990)

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Indices	1	0.817	0.713	0.594	0.594	0.665	0.727	0.563	0.582	0.56	0.586	0.586	0.623

Source: The Income and the consumption of the Households, NIS, 2003

Table I4.: Structure of money income of households, in %

	2000	**2001**	**2002**
Salaries, premiums, benefits	53.4%	60.3%	70.20%
Own- account activity income	5.3%	3.2%	2.50%
Income from sales of goods, buildings, lands	6.7%	5.4%	4.40%
Income from social protection allowances	29.7%	26.2%	19.60%
Other income	4.9%	4.9%	3.30%

Source: National Institute of Statistics, 2002; The Income and the consumption of the Households, NIS, 2003

Table I5.: Total expenditure of households

	2000	2001	2000	2001	2000	2001	2000	20001	2000	2001
	Total Households		Employees		Farmers		Unemployed		Retired	
	ROL, monthly per household									
Total Expenditure	**3 292 306**	**5 165 214**	**4 462 025**	**7 057 635**	**3 142 446**	**4 321 478**	**2 794 710**	**4 078 647**	**2 769 172**	**4 183 900**
	percentage									
Money expenditure	68.4	75.0	83.3	86.9	39.7	42.4	67.9	72.2	60.5	68.0
Purchasing consumed food and beverages	22.0	23.5	25.0	24.3	12.5	15.2	27.2	28.6	20.2	23.4
Purchasing non-food goods	17.0	17.1	19.1	19.1	13.8	12.8	15.6	15.6	15.3	15.3
Payment of services	14.3	15.1	16.4	17.1	6.7	5.4	14.6	15.9	13.8	14.3
Purchasing animals, poultry, fodder, buildings, lands	1.2	1.1	0.6	0.6	1.6	1.6	0.7	0.7	1.7	1.7
Taxes, fees, contributions, dues	6.1	13.3	12.5	21.5	1	1.9	3.7	7.6	2.2	7.6
Equivalent value of agricultural products consumption from own resources	31.6	25.0	16.7	13.1	60.3	57.6	32.1	27.8	39.5	32.0

Source: NIS, Romanian Statistical Yearbook, 2002

Table I6.: Exchange rate

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
USD	76.47	307.95	760.01	1655.09	2033.28	3082.6	7167.94	8875.55	15332.92	21692.74	29060.86	33055.46	33200.07
EURO	87.81	400.00	884.6	1967.14	2629.51	3862.9	8090.92	9989.25	16295.57	19955.75	26026.89	31255.25	37555.87

Source: National Bank of Romania, 2004