[1]

Identifying Factors of Success and Failure in European IST – related National/ Regional Developments (TIGERS ESTO project)

Case Study for Greece

Effie Amanatidou
Tonia Damvakeraki

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ATLANTIS CONSULTING S.A.

[1] Greece in the Information Society 2002

CONTENTS

Introduction

When did the Greek Information Society emerge? What has been done to promote the idea that IS developments are a challenge and a possibility for future welfare and prosperity? What are the difficulties / problems that stand on the way of progressing into a full fledged IS? What are the issues that need to be tackled in order to become a "peer" amongst the rest of the IST developed EU countries?

This report[2] answers the above questions by presenting historical evidence, by explaining the statistics in depth and by identifying - with information provided by distinguished experts - the most important socio-economic and IST-related factors that explain the situation of the current IST development in Greece.

The study is based on bibliographical and statistical review (from national, EU and international sources) as well as Internet search, articles, study reviews and on interviews with Greek IST experts, economists, academics, government representatives, and journalists.

The first section features Greece's performance measured by common key indicators, along with a description of the situation they represent. Interesting issues emerge concerning factors affecting the IS development in the country falling however outside the IS-specific sphere. The degree of urbanisation and the morphology of the country coupled with the ageing population hinder the even distribution and inclusion of all in IS development. The 'dualism' characterising the structure of the economy, with some dynamic high-tech enterprises alongside mostly traditional, technology-laggard, industries, is affecting the diffusion of and investment in new technologies. On the other hand, the increasing importance of the tourism sector for the Greek economy along with the banking, insurance and real estate services gives positive signals for a sector to target in order to have a high impact of IS development in the Greek economy.

The key indicators however describe only a part of the picture of socio-economic development in Greece. The second section examines the wider socio-economic and cultural environment in relation to IS developments and reveals other factors affecting IS development again not being IS-related like education, language, labour and social mobility.

After analysing the wider socio-economic and cultural environment and its influence on IS development, the current IST-related conditions and factors as well as hurdles are examined, thus complementing the picture of IS development in Greece.

In the fourth section, the policy responses towards IS development are examined since they are substantial factors influencing future course of IS visions in the country.

Finally, conclusions are presented in the last section.

[2] The present report was prepared by ATLANTIS Consulting S.A. as a contribution to the ESTO TIGERS project. Comments in preparing the report and previous deliverables were also provided by Ken Guy (Wise Guys Ltd.)

1. ***Key Indicators for the IST in Greece***

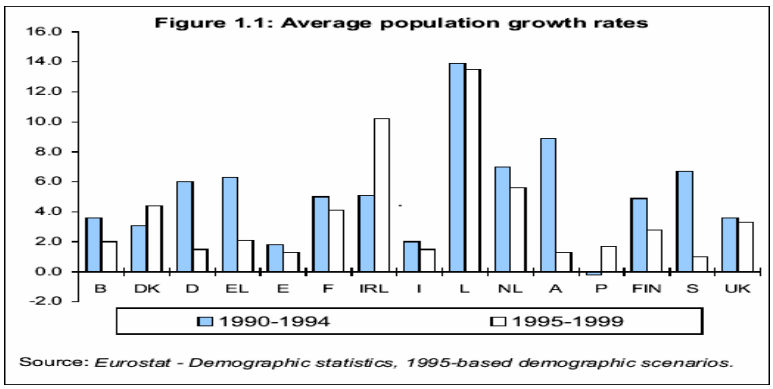
This section presents Greece's figures for certain key indicators, relating directly or indirectly to the IST development, which were decided to be common in all the five case studies. The situation that the indicators present is described shortly after the table and first attempts are made to make hypothesis in order to identify its influence on IST development in Greece.

Greece	Dimension	1998	2000-2001
Population		10,259,900	10,964,000
Population density	Inhabitants*1000/ square km	0,077	0,083
Degree of Urbanisation	% of inhabitants living in cities, source world bank : world development indicators	≈45%	>60,1%
GDP/capita (in real market prices)	In euros *1000	10,058	11,923
Unemployment rate	In % of labour force	10,76%	10,2%
National Debt/GDP	Ratio	108.7%	99.7%
Date of birth of the nation	Year	1913 (Greece established its current borders)	
EU accession	Year	1981	
% of employment in Agriculture (and fisheries and farming)	As a % of total employment	15.8%	14.37%
% of employment in Industry (manufacturing, mining, electricity/ gas, constructions)	Idem	20,56%	20,51%
% of employment in (market + non market) Services	Idem	52.8%	54.93%
Ranking in UNHD index		23rd	
ISI Ranking in other index	Rank	25th	
% Of employment in the ICT sector (services as well as manufacturing)	As a % of total employment	2%	2,5% (1999)
% Of population (15+ - 65) having access to Internet technologies		1.97%	13,21%
ICT value added % in GVA		5% (1995)	4.5% (1999)

Greece's current boarders were established in 1913 after the Balkan War. Greece became EU member in 1981. In 2000 it also became a member in the European Monetary Union, after meeting all the necessary pre-conditions set by the EU. Geographically, Greece is a peripheral country of the European Union, in its south-eastern edge, with a total size of 131,957.413 square kilometres.

Greece presents one of the highest population growth rate decreases in the EU (after Austria and Sweden). The average population growth rate dropped to 2% in 1999 from 6% in 1994 and the density of the population only increased from 77

people per square km in 1998 to 83 people per square km in 2001[3]. The population in 1998 was about 10,259,900 people while in the latest census in 2001 it was 10,964,000 people. This is relatively a small increase for a ten-years period. What is not indicated in these numbers is the number of immigrant that came to Greece as refugees since the beginning of the 90's from the neighbouring countries (Albania, Former Yugoslavia, Bulgaria, Russia, Ukraine, etc) which has denatured the structure of the population.



The population is also growing old. According to EUROSTAT, in 1999, 16.9% of the total population in Greece was over 65 years old and this percentage rose to almost up to 19% according to the 2001 Census.

The degree of urbanisation, according to the National Statistics Service, in 1995 was more than 45%. Based on the same source this percentage grew to 60,1% in 2001. It is a fact that more than half of the population of the country lives in Athens (around 5 million people) and Thessaloniki (around 1,2 million). There is also a large percentage that lives in other, smaller urban centres, but it is clear that the countryside is being abandoned.

The low population growth and the increasing ageing population play a role for IST development in the country if we consider that it is mainly the new generations that are more attracted to new and innovative technologies. It is very difficult to expand ICT technologies to the elder population. According to the EUROBAROMETER survey (2000) the age groups above 55 years old have a very small tendency in using the Internet and the new technologies.

The high degree of urbanisation, on the other hand, may facilitate high impact of IST development efforts in these areas provided that high-quality infrastructure and services are also at place. However, if we consider that around 34% of the total population (based on the 1991 census) lives in disadvantaged areas[4], which occupy above 75% of the Greek land, where suitable infrastructure and services are hard to provide and the income is below 75% of the country average, then the possibility for the IST development to be homogeneous and reach high levels becomes limited.

The GDP per capita (in real market terms) rose from 10,058 EURO in 1998 to 11,923 in 2001[5]. Since 1995 the GDP growth rate has been steadily higher than the EU average. Real GDP growth during the period 1995-2001 for Greece was

[3] Ref. "Greece in Numbers 2001"National Statistics Office
[4] Based on EU Directive 81/645 or 268/75 and modifications till 1992 disadvantaged areas include mountainous areas, areas with income lower than 75% of the national average, island areas and border areas.
[5] Source: National Statistical Office 2002

3,5% which was similar to the cases of Portugal (3,4%) and Spain (3,7%). However, in absolute terms GDP per capita in Greece remains the lowest in the EU, similar to Portugal and Spain. Additionally, GDP per capita in terms of PPPs is also at the lowest level. This combined with the fact that the cost of "ICT goods" is at the same level with the rest of the EU countries, makes such goods more expensive for Greek people to afford.

Concerning labour productivity the average annual growth for the period 1995-2001 was also above EU average and similar to Portugal (2,7% and 2,9% respectively), while for Spain it was 0,9%.

Table II.2: Growth of real GDP in EU Member States, US and Japan in 1975-2001

(average annual growth in per cent, ranked accor ding to per formance in 1995 – 2001)

	1975-1985	1985-1990	1990-1995	1995-2001
Ireland	3.5	4.6	4.7	9.1
Luxembourg	2.4	6.4	5.4	6.1
Finland	2.9	3.3	-0.7	4.9
Netherlands	1.9	3.1	2.1	3.7
Spain	1.6	4.5	1.5	3.7
Greece	2.1	1.2	1.2	3.5
Portugal	3.0	5.5	1.8	3.4
Sweden	1.5	2.3	0.6	2.9
United Kingdom	1.9	3.3	1.6	2.8
Belgium	2.1	3.1	1.5	2.8
Denmark	2.1	1.3	2.0	2.6
Austria	2.4	3.2	2.0	2.5
France	2.4	3.3	1.1	2.5
Italy	3.0	2.9	1.3	2.0
Germany	2.2	3.4	2.0	1.8
EU-15	2.3	3.2	1.5	2.6
United States	3.4	3.2	2.4	3.9
Japan	3.8	5.2	1.5	1.1

Source: Commission services.

Table II.4 : Labour productivity in EU Member States, US and Japan in 1975-2001

(average annual growth of GDP/employed person in per cent, ranked accor ding to performance in 1995-2001)

	1975-1985	1985-1990	1990-1995	1995-2001	Labour productivity in 2001 (US=100)
Ireland	3.5	3.5	2.7	3.9	87
Luxembourg	2.3	5.0	4.9	3.4	145
Portugal	3.3	4.4	2.3	2.9	48
Finland	2.4	3.0	3.2	2.9	76
Greece	1.0	0.5	0.7	2.7	59
Austria	2.3	2.5	1.9	1.9	70
Sweden	1.0	1.2	2.8	1.9	67
Belgium	2.5	2.1	1.7	1.6	92
United Kingdom	2.2	1.5	2.5	1.6	72
Denmark	1.6	1.2	2.5	1.5	76
France	2.3	2.2	1.2	1.3	78
Germany	2.0	2.0	2.3	1.2	71
Netherlands	1.4	0.8	1.0	1.0	72
Italy	2.2	2.0	2.0	0.9	82
Spain	3.2	1.2	2.0	0.9	65
EU-15	**2.2**	**1.8**	**2.0**	**1.3**	**73**
United States	1.2	1.2	1.5	2.5	100
Japan	2.9	4.1	0.8	1.1	67

Note: Growth rates were calculated on the basis of GDP at constant 1995 prices and national cur rencies, while the 2001pr oductivity levels are based on GDP at current market prices and PPS.

Source: Commission services.

Based on these two important economic indicators, it can be concluded that the Greek economy is developing fast with growth rates above EU average, starting however from quite low positions in relation to the other EU Member States.

In parallel, inflation in Greece, after decades at 2-digit level, has now a trend around 3% - although the introduction of Euro in the economy in the last few months has resulted in a tendency for an increase around 4% - which is a very encouraging push for the domestic products' competitiveness. Long-term fiscal deficits have been converted into surpluses, which is a very significant push for the de-escalation of the public sector debts. Similarly, inflation for Spain and Portugal is stable around a trend of 2% and 2,8% respectively since they were together with Greece in the effort to achieve convergence to the European Monetary Union.

The National Debt as a percentage of the GDP, after a significant increase from 87,9% in 1992 to 111,3 in 1996, started decreasing gradually and in 2001 dropped to 99,7%[6]. Greece is now at a steadily improving course as the projections for 2002 and 2003 are 97,8% and 95,1% respectively.

The high development rates, have also led to an increase of employment although in this area significant scope for improvement remains. Unemployment in Greece has decreased the last couple of years (10.2% in 2001 and 9,6% in 2002) but its percentage remains one of the highest in the EU together with Spain (10,6% in 2001 and 9,5% in 2002), while in Portugal the rates are much lower (4,1% in 2001 and 5% in 2002)[7].

However, it is very important to stress that although unemployment was high the last eight years in Greece, mainly due to the financial purification of the public sector, the real income of the households was raised significantly (increase of the real salaries – about 3% annually for the last 5 years)[8].

[6] Source: "Eurostat – European Commission Economic Data Pocketbook"
[7] Ibid.
[8] Source: Greece in the Information Society 2002

Table II.5: Employment and labour productivity growth, 1995-2001

		Employment growth		
		< average	Close to average	> average
Labour productivity growth	< average		Italy	Spain
	Close to average	Germany Japan	Belgium UK Denmark France	Netherlands
	> average	Greece Portugal Austria	US Sweden	Ireland Finland Luxembourg

Note: On both axes, countries are compared to the average annual growth rate in EU-15 in 1995-2001. Total employment growth in the Member States ranged from 0.4 per cent to 5.1 per cent p.a. The category 'close to average' includes countries with a growth rate of +/-0.4 p.p. around the EU average of 1.2 per cent.
Labour productivity growth ranged from 0.9 per cent to 3.9 per cent p.a. among the Member States. The category 'close to average' includes countries with a growth rate of +/-0.3 p.p. around the EU average of 1.3 per cent.

Source : Commission services.

In 1998, 15.8% of the active workforce was occupied in agriculture, farming and fisheries. In 2002 this number dropped to 14,37% and it keeps decreasing. People appear to be discontent with the insecurity that accompanies the agricultural occupations. Besides, more and more young people claim that they prefer the industry and services sector and leave the countryside for a “better” life.

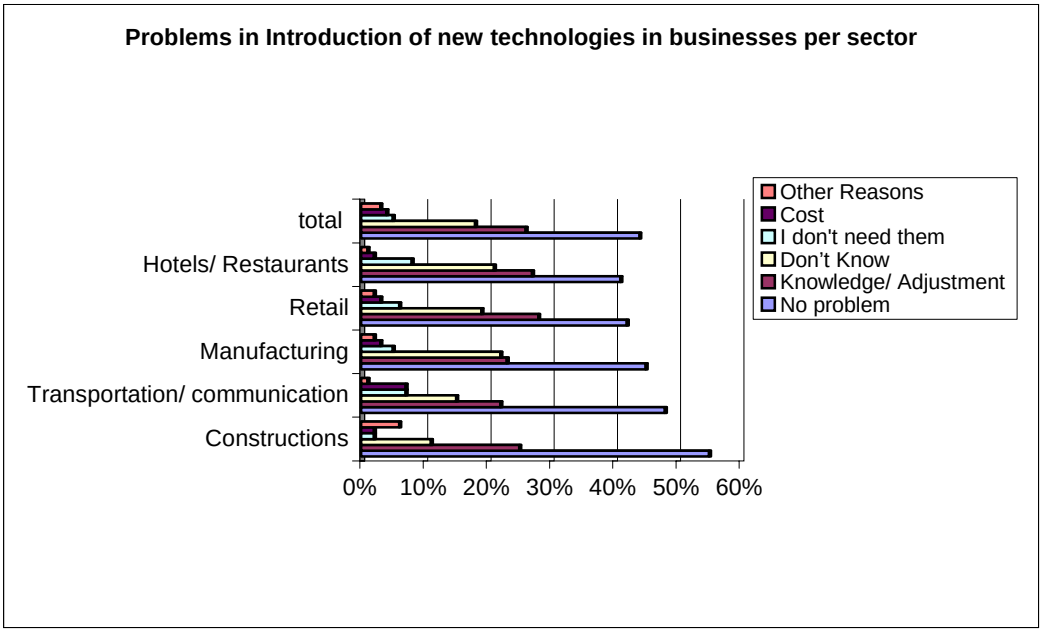
Employment in industry (manufacturing, mining, electricity/ gas, constructions) was 20,56% in 1998 and remains stable in 2001. In Greece, the industrial sector has not grown significantly over the years. It is mainly traditional, occupied by textiles, foods and beverages. There are few high-tech industrial units with little expenditure in new technologies and re-training of their personnel.

On the other hand, more than half of the total active workforce (52,6%) was employed in services (trade, restaurants and hotels, transportation, warehousing and communications, banking, insurance, real estate, other services) in 1998 while in 2001 the percentage rose even higher (54,93%) with the main increase noted in trade, restaurants and hotels (21,28%) and in banking, insurance and real estate (7,36%).

	1998		2001	
	Employees in numbers	%	Employees in numbers	%
Agriculture, Farming and Fisheries	704200	15,84%	627000	14,37%
Mining	18300	0,41%	17800	0,41%
Manufacturing	578000	13,00%	557400	12,78%
Electricity, Gas	35300	0,79%	34300	0,79%
Constructions, Civil Works	282300	6,35%	284800	6,53%
Trade, Restaurants, Hotels	916900	20,63%	928200	21,28%
Transportation, Warehousing, Communications	244800	5,51%	250000	5,73%
Banking, Insurance, Real Estate	290500	6,53%	320900	7,36%
Other Services	896700	20,17%	897100	20,57%

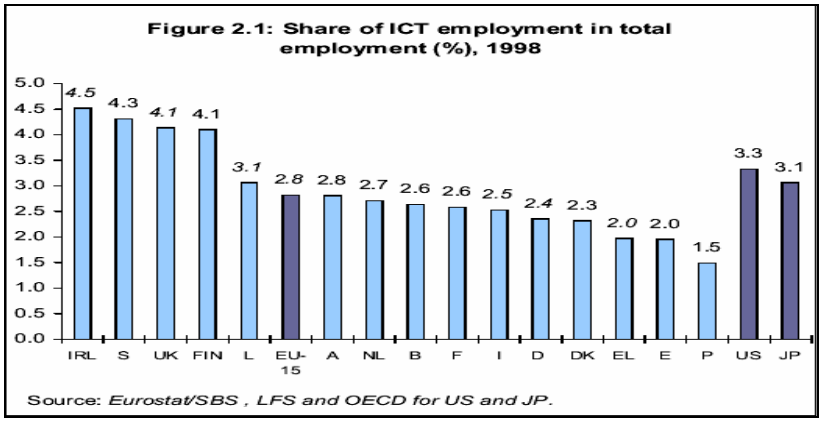
Employed	3967000	89,24%	3917500	89,81%
Unemployed	478500	10,76%	444700	10,19%
Total Workforce	4445500	100%	4362200	100%

The services sector is increasingly important for the Greek economy in terms of employment especially due to the tourism sector. Thus, it may be considered the sector to address and introduce new technologies in achieving a high impact of IST development in the economy. However, it is actually these sectors that present the most problems in introducing new technologies. These problems mainly relate to lack of knowledge and difficulties in adjusting to them and less to lack of necessity for them or acquisition costs.[9] Additionally, whether these sectors should have priority over others in IS development needs to take into consideration the seasonal character of the tourism sector. Actions to broaden its development are crucial. Nevertheless, it seems an area worthy of investigating.

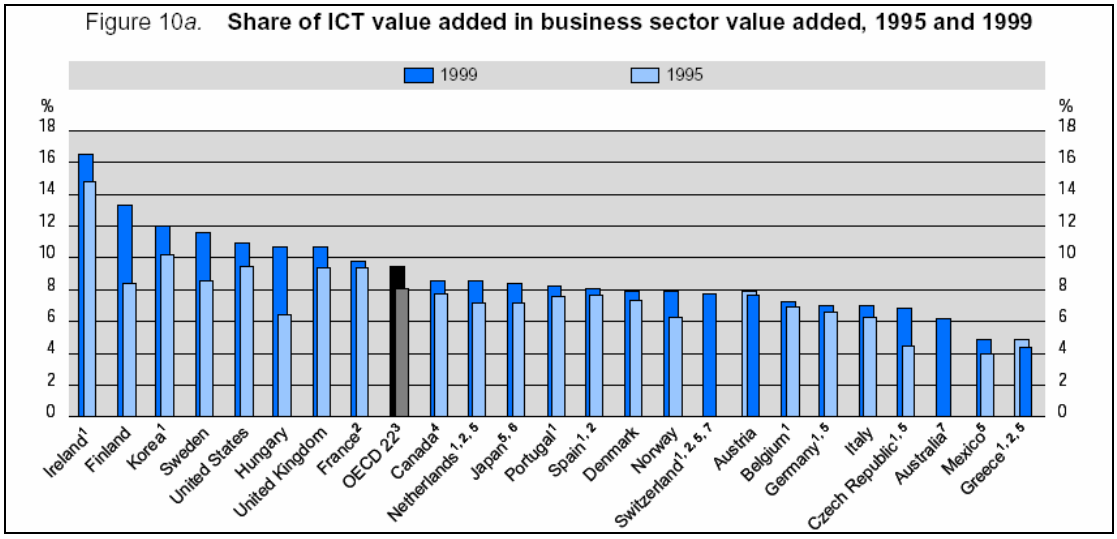


The percentage of employment in the ICT sector in relation to the total employment was around 2% in 1998 while in 1999 it rose to around 2.5% (as an average of the ICT employment in manufacturing and in services). However, the share of ICT employment in total employment in Greece still remains among the lowest in the EU. ICT employment in Greece consists mainly of employment in telecommunications services and in other ICT manufacturing than computer and office machinery. The increase in ICT employment can be partly attributed to the creation of several IT companies such as Internet providers and mobile telephony services.

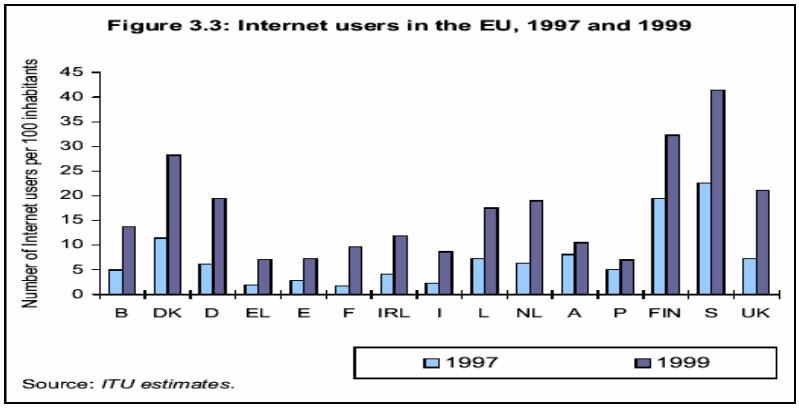
[9] Ref. "Greece in Numbers 2001" National Statistics Agency



According to OECD the total ICT value added in the business sector in 1995 was about 5% while in 1999 it dropped at about 4,5%. This decrease mainly occurred in the ICT services value added, which from 1995 to 1999 presented a negative variation (-0,9%).



The percentage of the population (15-64 years old) having access to the Internet technologies was 1,97% in 1997 while in 2001 the respective percentage reached 13,21%.[10] This growth was achieved mainly due to the improved infrastructures, the digitisation of all telephone lines and also the creation of many access points (many of which are free of charge).



[10] Source: Greece in the Information Society 2002

According to the United Nations Human Development Report, Greece in 1999, ranked 23rd among 162 countries as far as technology achievements, investment in technology creation, and diffusion of technology (in agriculture and manufacturing as well as in Information and Communications).[11]

The above analysis of the key indicators (common for all five case studies) shows that IS development in Greece is taking place at a slow pace, but in a fast improving economy, which is however characterised by some of the lower figures (in absolute terms) in comparison with the rest of the EU Member States.

From this first analysis certain hypothesis can be made about the factors influencing IS development in Greece.

The degree of urbanisation and the country's morphology can be considered as a factor influencing IS development. The high urbanisation reveals potential for significant IS development impact in these areas if supported by another factor, i.e high-quality ICT infrastructure and services. On the other hand, the fact that most of the rest of the population lives in disadvantaged areas (mountainous, island or border areas and areas of low income) limits the degree that IS can be developed as well as the homogeneity of IS development in the whole country. The low income, characterising these areas, as compared to the national average, and the high costs of providing ICT infrastructure and services in remote mountainous and island areas deter the even distribution of IS development. In tackling the regional disparities the regional authorities play a major role. The regional authorities' role in comparison with the role played by the central administration in IS development is examined in section 2.

The ageing population of the country is another factor hindering IS development if we consider that it is mainly the new generations that are attracted to new technologies and ICT use.

The structure of the economy in terms of sectors is also a factor influencing IS development. The Greek economy is characterized by a 'dualism' with a thin sector of dynamic high-technology intensive companies alongside traditional, technology-laggards sectors. It is mostly based on traditional sectors of production such as agriculture and fisheries, while the "heavy industrial sector" is also represented by traditional industries such as textiles. This affects the percentage of diffusion of the new technologies in the processing industry as well as the research and investment in new technologies.

On the other hand, the increasing importance of the 'trade, restaurants and hotels' and 'banking, insurance and real estate' sectors reveals potential for IS development and high impact in the economy. But first the problems faced by these sectors for introducing new technologies have to be tackled, which may be the reason for the limited ICT added value in services. In addition, the fact that these problems mainly relate to lack of knowledge and difficulties in adjusting to them reveals the central role of education and training.

[11] The Human Development Index measures the overall achievements in a country in three basic dimensions of human development — *longevity, knowledge and a decent standard of living*. It is measured by life expectancy, educational attainment (adult literacy and combined primary, secondary and tertiary enrolment) and adjusted income per capita in purchasing power parity (PPP) US dollars. The HDI is a summary, not a comprehensive measure of human development. As a result of refinements in the HDI methodology over time and changes in data series, the HDI should not be compared across editions of the *Human Development Report*.

The key indicators show part of the picture of IS development, describing the wider economic environment where efforts for IS development take place, but explaining the situation to a limited degree. Therefore, we feel that other aspects of the wider socio-economic environment need to be examined like research and innovation performance, education as well as certain social and cultural features characterising the wider environment. These additional elements are analysed in the following section.

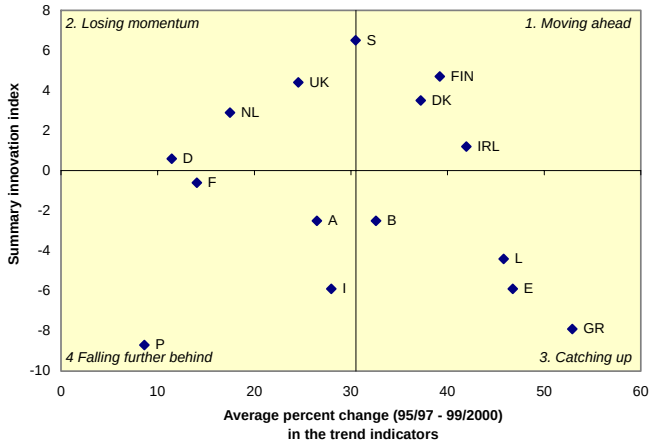
2. ***Other Economic and Social Conditions***

Research and Innovation Performance

The hypothesis tested here is if and how does overall performance in research and innovation in Greece affects IS development.

Concerning innovation performance, the 2001 Innovation Scoreboard places Greece and Spain in the 'catching up' phase of development and Portugal in 'falling further behind'. Based on a trend analysis of past years Greece appears among the EU leaders in public R&D levels, in high-tech venture capital and in ICT market share in GDP. Spain is among the EU leaders in business R&D levels, high-tech EPO patents, high-tech USPTO patents and ICT market shares in GDP.

Fig. 1 Overall country trends by innovation index



The major strengths as presented in the 2001 Innovation Scoreboard are for Spain finance of innovation and new-to-market products while the weaknesses are noted in the still low levels of public and business R&D, high-tech patenting and Internet access. Greece presents similar strengths (innovation finance) and weaknesses (also including limited presence of innovative SMEs in the economy). The major strengths for Portugal on the other hand are ICT expenditure and product innovation while the weaknesses also lie in the areas of public and business R&D, innovative SMEs and high-tech patenting and also in education. As far as major trends are concerned Greece is characterised by increasing public R&D and ICT investments but also by declining business R&D. Portugal by increasing R&D but limited improvement of trend indicators. Spain on the other hand is characterised by increasing business R&D and USPTO patenting.

Despite the positive trends and progress in the specific indicators in the past years the cohesion countries are still in the last positions as compared to the other EU Member States and quite far from the EU average in most innovation indicators:

INNOVATION SCOREBOARD 2001	**YEAR**	**E**	**GR**	**P**
Human Resources				
1.1 S&T graduates / 20-29 year old population	99	≅		-
1.2 % economically active pop. with 3rd level education	00	≅	**-**	**-**
1.3 % working pop. in life-long learning	00	-	-	-
1.4 % employment in high-tech manufacturing	99	-	**-**	**-**
1.5 % employment in high-tech services	99	-	-	-

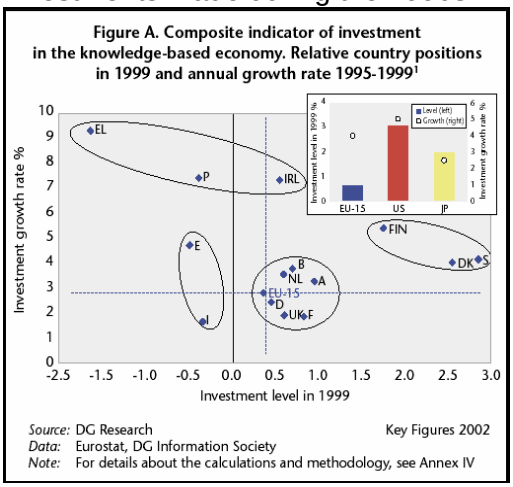
Knowledge Creation				
2.1 Public R&D funding / GDP	99	-	-	-
2.2 Business expenditure R&D/GDP	99	-	-	-
2.3 EPO high-tech patents/pop	99	-	-	-
2.4 USPTO high-tech patents/pop	98	-	-	-
Transmission and application of knowledge				
3.1 % SMEs innovating in-house	96	-	-	-
3.2 % SMEs in co-operative innovation	96	-	-	-
3.3 % innovation expenditure / total sales	96	-	-	-
Innovation Finance, output and markets				
4.1 % venture capital/GDP	00	-	-	-
4.2 % new capital / GDP	99	+	+	
4.3 % new-to-market products/total sales	96	+		≅
4.4 Home internet access	00	-	-	-
4.5 % ICT markets/GDP	00	≅	≅	≅
4.6 Change 1993-1997 high tech/value added	97	-		

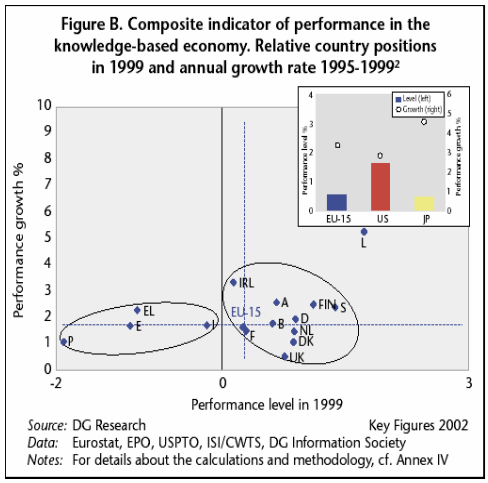
'-' means below 20% of EU mean
'≅' around EU average
'+' means above 20% of EU mean
Source: 2001 Innovation Scoreboard (Annex 4)

The weaknesses facing the cohesion countries were also noted in the 2001 Enterprise Policy Indicators: limited business and government expenditure and number of high-tech patents for Spain; the same for Greece along with weakness in human capital (education, training and computers in schools). All the above for Portugal complemented by weakness in access to finance (stock market capitalisation, new listed companies, and total venture capital).

Investment and Performance in a Knowledge-based economy

Although being the country with the lowest investment levels in the knowledge-based economy[12] in 1999, Greece presents the highest investment growth rate together with Portugal and Ireland. Being also among the countries with the lowest performance levels in the knowledge-based economy[13] in 1999 (together with Spain, Italy and Portugal) Greece presents the highest performance growth (similar to Austria, Finland and Sweden) as a result of the strong efforts and investments made during the 1990s.





[12] The indicator of investment in the knowledge-based economy is a composite indicator consisting of the following sub-indicators: a) total R&D expenditure per capita, b) number of researchers per capita, c) new S&T PhDs per capita, d) total education spending per capita, e) life-long learning, f) e-government, and g) gross fixed capital formation (excluding construction).

[13] The indicator of performance in the knowledge-based economy is a composite indicator consisting of the following sub-indicators: a) GDP per hours worked, b) European and US patents per capita, c) scientific publications per capita, d) e-commerce, and e) schooling success rate.

In general, Greece presents a positive course with some of the higher growth rates in all related benchmarking indicators starting however from the lowest places in relation to the other EU Member States[14].

From the above-mentioned country's weaknesses, the ones that affect directly the IS development is the still limited Internet access as well as the weaknesses in human capital: education, training and computers in schools. [15]

On the other hand, it has to be noted that the still low but growing levels of high-tech venture capital in Greece, which affects directly the IS development by supporting the creation of high-tech start ups, are mostly spent on biotechnology and health-related research. [16]

The limited presence of innovative SMEs in the Greek economy may form another reason for targeting the tourism and services sectors in IS development, which in turn requires tackling of the problems they face in introducing new technologies. As these problems primarily concern knowledge and adjustment difficulties, the role of education and training is again revealed.

Therefore it is important to examine the role of education and how it affects the IS development in Greece. Along with this hypothesis we believe it is also important to test if the language factor and specific cultural aspects of the population play an important role, as they seem to affect adaptability to change and research and innovation performance. These elements were mainly examined during interviews with people from all involved fields (policy makers, researchers, academics, industry, media) and were also based on available data, literature and related articles. Internet access and computers in schools are analysed in the following section along with all the other IST-specific indicators.

Educational System – Setting goals and priorities

Education is one of the most important factors that affect a country's development and progress. During the last decade, there has been a perpetual reform in the structure and the content of the educational system in Greece. Throughout these years there have been many changes, which however present limited continuation or coherence.

Furthermore, there is limited link to the market needs. The system is not clear of what the requirements of the market are and how they should be dealt with. As one interviewee put it, "...*We keep on "producing" professions for which there is no demand in the market"* (high-skill unemployment).

In relation to IS development education is characterised by the following deficits:

- There is reluctance – from the educationists - when it comes to receiving extra training in order to overcome the barriers for using new technologies.
- In certain technical high schools (secondary level) there are tutors that have acquired IT knowledge and IT training skills empirically and not through the relevant tertiary education.

In addition, not much attention has been paid to the needs for training in Information and Communication technologies, especially in tertiary education.

[14] European Commission, DG Research, Key Figures 2002

[15] Additionally, the rest of the weaknesses (still low levels of R&D intensity, limited high-tech patenting and presence of innovative SMEs in the economy) and the low position in many non IST-related indicators may also affect the IS development indirectly since these indicators present high figures in the IS-advanced countries. However, further research is needed to develop and examine any arguments relating to IS development.

[16] Ref: Greece in the Information Society 2002.

There are few experts with relevant teaching experience to undertake the courses taught there. Therefore, in general, professors who come from different disciplines (applied mathematics, applied physics, etc.) are performing the teaching of these courses.

Nevertheless, it has to be noted that significant efforts were made all through the '90s for ICT integration in primary and secondary schools. Special ICT courses and ICT labs were established first in secondary schools and the integration now continues to the primary schools with courses for enhancing the teachers' ICT skills. Significant efforts were also needed to reverse the initial reluctance and unwillingness of teachers to participate in these courses. The use of ICT in education is analytically presented in the following section.

In parallel, it is worth mentioning that progress has been made concerning the average years of total education of the population. In 1960 the average years of education were 4,6. In 1980 they increased to 6,6. Recent data indicates that in 1999 the average number of years of education were 8,5[17] (primary and secondary education adds up to 9 years in total).

Additionally, since 1980 the rate of participation in tertiary education has grown significantly: from 17% in 1980 to 47% in 1997[18], while the rate of the population that has attained at least upper secondary education was 71% between the ages 25 –34 in 1999[19].

Another thing that might be considered as encouraging concerning the development of an IS in the country is the creation (in early 90s) of the National Network for Research and Technology (EDET) for Universities and Research Centres. Since the mid-90s, a number of Institutes, research centres and universities started to develop and exploit new technologies. The people involved were researchers, students and professors, all with a young, innovative, and adoptive spirit. They created a network that put online all universities and research centres in order for researchers to be in contact and exchange ideas and views. This way an infrastructure and a culture started being built. This culture is now the accelerator that will help introduce the new technologies to the broad public.

The Language Factor

Knowledge of English plays an important role in the diffusion of IT and use of the Internet. Only 54% of the students were taught English (in school), which is the main language for ICT use.[20] The EU average for the same time period was 90% while the respective percentage for the IS-advanced but non-English speaking countries was close to 100%.

[17] Ref. "BARRO-LEE 2000"
[18] Ref. "World Development Index 1997"
[19] Ref. OECD 2000
[20] Ref: Eurostat 1999 as quoted in "Greece in the Information Society 2002"

Table 1.4: Foreign languages learnt by pupils

	EU-15 [1]	B (f)	B (vl)	DK	D	EL	E	F	IRL	I	L	NL	A	P	FIN	S	UK	US	JP
Average number of foreign languages [2], 1996/97																			
Primary education	**0.4**	0.4	0.3	0.3	0.1	0.5	0.7	0.4	-	0.4	1.8	0.2	0.6	1.0	0.8	0.7	:	:	:
Secondary education	**1.3**	1.4	1.9	2.0	1.2	1.5	1.2	1.6	1.0	1.1	2.9	1.2	1.2	1.0	2.5	1.7	:	:	:
Foreign languages chosen by students in general secondary education (%), 1997																			
English	**90.0**	63.0	71.0	100.0	94.0	54.0	96.0	95.0	.	76.0	77.0	94.0	98.0	75.0	99.0	100.0	:	:	:
French	**22.0**	2.0	95.0	15.0	24.0	46.0	23.0	.	70.0	34.0	98.0	12.0	13.0	24.0	13.0	21.0	:	:	:
German	**10.0**	5.0	24.0	76.0	.	5.0	1.0	26.0	25.0	3.0	98.0	14.0	.	0.0	1.0	44.0	:	:	:

(1) Average of available data only; (2) Data refer to foreign languages studied by each pupil in 1996/97 as opposed to those studied throughout their schooling.

Notes: B (f) french-speaking Community which includes German speaking community, B (vl) Flemish-speaking community. F, A :1997/98, F including students from technological education. IRL: Full time only. NL, P: 1995/96. S: ISCED 2 general and vocational only. Source: *Eurostat - UOE (Unesco-OECD-Eurostat) questionnaire on education statistics - 2000.*

Table 1.5: World's online population by language (%)

	English	Non-English	European (Non-English)	German	Spanish	French	Italian	Portuguese	Scandinavian (Total)	Dutch	Total Asian
March 2001	**47.5**	**52.5**	28.9	6.1	4.5	3.7	3.1	2.5	2.2	2.1	23.5

Source: *http://www.euromktg.com/globstats/index.php3.*

Cultural Aspects of the population

National culture, defined by Hofstede (1991) as the collective software of mind, which distinguishes the members of one group or category of people from another, explains sufficiently how a society behaves, how it perceives the future and how it considers the relationship between its members. According to Hofstede (1984), societies that are characterized by low social mobility and static environment usually do not rest on technological change for their economic growth. On the other hand, societies with high social mobility are characterized by their belief on systems and organizations and invest in new technologies (goods or processes) when the system fails to solve problems. [21]

The cultural aspects of the population in any country can play a crucial role to the way people anticipate and react to changes, reforms, innovation, new technologies, and consequently affect the development in Information and Communication Technologies. Greeks, although adaptive, appear to be more traditional than other European Nations; they tend to be risk averse and they react conservatively and suspiciously against new technologies and developments, even though the younger generations have proven to be more innovation adaptive in relation to the older ones[22].

This reluctance to change is also found in the public services, where a large number of civil servants face the courses taught in order to make them accustomed to the use of computers or other ICT equipment with certain unwillingness. Some interviewees mentioned the 'life-time' employment status of the civil servants in this case as a disincentive to learn new things and improve their working conditions.

In parallel, the Power Distance Index (PDI) can also help in understanding how culture affects the innovation aspects of a population.[23] Both low and high PDI countries have hierarchies but they mean something else. In high PDI societies people are the first to blame for anything wrong in the system whereas in low PDI societies the system is to be blamed. In fact in high PDI societies change in the system means change in top management of organizations or government

[21] Ref. "The Impact of patent protection, economy openness and national culture on R& D investment: a cross-country empirical investigation" – Nikos C. Varsakelis, Research Policy, September 2000

[22] Ibid.

[23] PDI is a measure of the interpersonal power or influence between the superior and subordinates perceived by the subordinate. According to Hofstede, power distance defines a general societal norm, a value system shared by the majority in the middle classes in the society. The PDI norm deals with the desirability or undesirability of inequality and of dependence or interdependence of society.

services. So, we can conclude that the higher the PDI is the higher the adjustment cost.

Organizations or government services in low PDI societies are oriented towards the implementation of new processes in order to change the system. The low PDI societies invest more on R&D when they want to overcome the problems. As a conclusion we may say that the lower the PDI of a country is, the higher the R&D investment intensity. Indeed, being characterised by high PDI, Greece, Spain and Portugal have very low RTD intensities, and very few patents.[24]

RTD intensity and investment in technology and knowledge also seem to be affected by social mobility. Hofstede states that the social mobility and the mobility of the middle class are stronger in low PDI societies than in high PDI. A key variable for this mobility and development is technology, since people need to invest in technical skills and knowledge in order to improve their status. Societies with high PDI are characterised by low social mobility and hence the need for personal and societal investment in technology and knowledge is low. [25]

The above evidence suggest that the deficits of the education system, the knowledge of the English language as well as the cultural aspects in terms of social mobility and reaction to changes, reforms, innovation, and new technologies, also affect the development of IS in Greece.

Before examining the IST-related indicators in the following section, it is worth going back to the regional disparities to see how they have affected IS development in Greece so far and examine if the regional authorities abilities for intervention play a role in the development of IS in Greece.

Peripheral Disparities and Regional Authorities

Greece is a country with great geographical diversification. Thus, it is natural for the development course of the regions to be characterized by complexity and incongruity. Without overlooking the fact that there are a lot of common characteristics, the Greek regions can be divided in three categories[26]:

1. In the first category Attica and Central Macedonia are included, which include the two large urban centres of the country. These regions are characterized by demographic dynamism, relatively high rate of unemployment, relatively high standard of living in comparison with the average of the country and they gather the largest part of the decision making centres for the largest economic units in the manufacturing and services sector as well as the most of the educated and experienced work force.
2. In the second category regions like Crete and the South Aegean are included and to a smaller degree the Ionian Islands that present dynamism in the development of tourism. These regions are characterized by low rates of unemployment, relatively high and growing standard of living, dynamic and fast developing sectors of economic activity and gradual improvement of the economic structure. However, it is important to take measures to ensure the continuation of this progress and to prevent regression effects due to the instability of tourism.
3. In the third category all the remaining regions (Epirus, Continental Greece, Western Macedonia, Western Greece, Peloponisos, South Aegean, Eastern

[24] Ref. "The Impact of patent protection, economy openness and national culture on R& D investment: a cross-country empirical investigation" – Nikos C. Varsakelis, Research Policy, September 2000
[25] Ibid.
[26] Source: Greek Centre for Programming and Economic Research

Macedonia – Thrace and Thessaly) are included which are characterized to a small or larger degree by a relatively low productivity of the primary sector, lower living standard, insufficient presence or even absence of dynamic development sectors and by limited potential for the local entrepreneurs to undertake serious economic initiatives.

On the other hand, the introduction and strengthening of the Regional Administration and Local Government in Greece has a very short history, and the current situation can only be considered a transitional one still facing resistances related to radical restructuring. The upgrading of the regions to administrative units took place in 1994 (Law 2218/94) while only in 1997 (Law 2503/97) the role of the 'region' was re-defined as a decentralized administration unit, aiming to contribute to the national planning and programming and the implementation of economic and cultural development policies.

The morphology of the country and the consequent uneven distribution of socio-economic development combined with the still weak regional administration and local government to take initiatives for local development affect negatively the balanced ICT development in Greece. The peripheral cities and especially the islands also have to face major problems regarding the poor quality and the high costs of the services provided due to the haulage cost and the still limited competition in the national ICT market.

On the other hand, the high centralisation of the national government's services and of the decision centres in industry and services mainly in Athens and Thessaloniki has made a large part of the population move from the peripheries to the big urban centres (better infrastructures, better services, more investments, better paid jobs, higher living standards, etc.).

The trend to move to large urban centres still continues although to a smaller degree than in the past. There is clear reduction of the regional inequalities in the tourism and health sector, as well as in basic 'living conditions' indicators (consumption of electricity, bank accounts, private cars and telecommunications). However, the *"vicious cycle"* hindering the even distribution of not only ICT but also socio-economic development in the country still needs serious attention.

According to the above, one might have expected Athens and Thessaloniki to be growth poles for the Information Society. The fact that this has happened to a still limited extent suggests that there are also other factors at play that hinder IS development even at the country's most developed areas. These factors are the lack of the right kind of players within the urban conurbations – large IT Firms, significant number of dynamic / innovative SMEs, forward looking municipal authorities, lack of innovative ideas, lack of daring entrepreneurs. Thus we may conclude that there is a link between the weaknesses in Greece related to innovative performance and entrepreneurship and the IS development.[27]

The examination of the wider socio-economic environment where IS development takes place in Greece revealed several non IS-related factors affecting this development:

- The degree of urbanisation and country's morphology;
- The still 'weak' regional authorities;
- The still low but increasing family incomes and GDP;
- The problem of the ageing population;

[27] Interviewees' views.

- The dualism in the structure of the economy;
- The deficits in the education system;
- The limited knowledge of the English language;
- The low social mobility and cultural aspects forming a certain attitude towards changes, reforms, innovation, and new technologies.

It is now worthwhile to analyse the specific performance in IST-related indicators that may reveal additional factors of success and failure, thus completing the whole picture of the current situation.

4. IST related Conditions[28]

Total Expenditure in ICT

Information and Telecommunications Technologies have been significantly developed in Greece the past few years. The total expenditure in information and telecommunication technologies as a percentage of the GDP is almost in convergence with the EU average (1,5% of the GDP). However, ICT expenditure per inhabitant is still a small proportion of the GDP (¼ of the EU average). It is encouraging though that it is increasing faster than the EU average since the 2001 crisis.

Telecommunications can be considered as the backbone for ICT development. Therefore, before studying specific ICT indicators it is worth examining the telecommunications market in Greece and the costs and quality of telecommunications infrastructure and services.

Telecommunications Market in Greece

The telecommunications market in Greece has steadily growing tendencies and holds the most important role in ICT sector in Greece, by representing 75% of the ICT market, while in the EU it represents 50%. The per capita expenditure in telecommunications is almost at the same level with the EU average. The recent liberalisation of the sector has transformed the market by increasing the number of new enterprises (as a percentage of the GDP, they are above the EU average) and has led to substantial cost reductions and to further improvements in the quality and range of services offered. The cost of services for consumers is relatively low but for the private sector they still remain relatively high.

The liberalisation of the national market combined with the intense global competition in mobile telephony has resulted in a significant increase of mobile telephones in Greece. Mobile telephony penetration in Greece was close to the EU average in 2000, and is characterised by a fast growing market with further margins for growth as costs decline further. The number of mobile phones per 100 inhabitants presented one of the highest increases in Greece since 1995 together with France, Spain and Belgium.

Table 3.4: Mobile phone penetration

	EU-15	B	DK	D	EL	E	F	IRL	I	L	NL	A	P	FIN	S	UK	US	JP
Mobile phone subscriptions (in 1 000)																		
1995	**21 160**	235	822	3 750	273	944	1 024	158	3 925	27	513	347	341	1 039	2 025	5 736	33 786	11 712
1997	**52 663**	974	1 444	8 170	938	4 338	5 817	533	11 734	67	1 717	1 160	1 507	2 162	3 169	8 933	55 312	38 254
1998	**90 145**	1 756	1 931	13 925	2 057	7 051	11 210	946	20 489	131	3 351	2 293	3 076	2 947	4 108	14 874	69 209	47 285
1999	**150 580**	3 193	2 628	23 470	3 904	12 300	21 434	1 655	30 296	209	6 900	4 206	4 672	3 364	5 165	27 185	86 047	56 849
2000 [1]	**235 209**	5 610	3 511	48 145	5 932	24 289	29 681	2 398	42 246	296	9 917	6 120	6 665	3 767	6 575	40 057	112 000	59 417
Mobile phones per 100 inhabitants																		
1995	**5.7**	2.3	15.8	4.6	2.6	2.4	1.8	4.4	6.9	6.6	3.3	4.3	3.4	20.4	23.0	9.8	12.9	9.3
1997	**14.1**	9.6	27.4	10.0	8.9	11.0	9.9	14.6	20.4	16.1	11.0	14.4	15.2	42.1	35.8	15.2	20.8	30.7
1998	**24.1**	17.2	36.5	17.0	19.6	17.9	19.1	25.6	35.6	30.8	21.4	28.4	30.9	57.3	46.4	25.2	25.7	37.5
1999	**39.1**	31.3	49.9	28.6	31.4	31.2	36.3	37.5	52.6	48.7	43.8	52.5	46.8	66.8	57.9	40.4	31.7	45.0
2000	**62.6**	54.8	65.9	58.6	56.2	61.6	50.5	63.5	73.2	67.9	62.5	75.6	66.7	72.8	74.2	67.2	40.9	47.0
Mobile phone subscriptions: % digital																		
1999	**96.0**	100.0	96.0	99.0	100.0	94.0	100.0	90.0	90.0	100.0	100.0	95.0	100.0	100.0	94.0	98.0	40.0	100.0

(1) 2000 data for Germany, France, Portugal: national regulatory bodies and operators, other countries: Mobile Communications.

Source: *ITU (year-end figures).*

[28]The data presented in this section are drawn from the "White Paper: Greece in the Information Society: Strategy and Actions" 1999.

Telephone charges

In September 2000, telephone charges at pick time were equal to the EU average, while off peak time charges exceeded the EU average, being among the highest in the EU after Portugal and Luxemburg. Nonetheless, both figures have been dropping during the past years; the peak time charges presented a decrease close to the EU average and the off peak time charges presented one of the highest decreases in the EU after Germany, Austria and the UK and similarly to Ireland.

Table 4.4: Monthly basket of local telephone[1] residential charges (US PPP) in households, 1998 and September 2000

	EU-15	B	DK	D	EL	E	F	IRL	I	L	NL	A	P	FIN	S	UK	US	JP
20 hours/Month with discount plan																		
Peak, 1998	**64**	98	54	68	60	42	72	80	42	73	63	100	61	23	48	70	40	52
Off-Peak, 1998	**46**	47	32	68	60	42	48	51	36	53	40	64	46	20	37	46	40	52
Peak, September 2000	**42**	52	31	34	42	46	34	54	32	59	50	45	47	30	35	41	21	35
Off-Peak, September 2000	**32**	36	31	34	37	28	34	31	26	38	35	32	46	28	24	27	21	35
Change 1998-2000 (%)																		
Peak	-34	-47	-44	-50	-30	8	-53	-33	-24	-20	-20	-55	-23	5	-26	-42	-46	-31
Off-Peak	-30	-23	-4	-50	-39	-33	-30	-39	-26	-29	-12	-49	-1	40	-34	-42	-46	-31

(1) Public switched telephone network (PSTN).
Source: *OECD Communications Outlook 2001.*

Quality and range of telecommunications infrastructure and services

Recently the quality and range of telecommunications infrastructure and services in Greece have improved considerably. The proportion of digitisation of the network has increased to 95% in urban centres and 74% for the country as a whole. The density of telephone connections in Greece is close to the EU average, while the telephone lines are 100% digitised and ISDN connections are steadily increasing starting however from the lowest level.

Table 3.5: ISDN lines

	EU-15	B	DK	D	EL	E	F	IRL	I	L	NL	A	P	FIN	S	UK	US	JP
EU penetration rate of ISDN channels [1]																		
1997	:	1	3	9	0	1	4	1	2	8	5	3	2	8	2	2	:	:
1998	:	2	6	12	0	1	5	2	3	14	10	5	3	10	4	3	:	:
1999	**8**	3	12	16	1	2	6	5	7	20	15	9	5	15	7	5	:	:
% ISDN channels / total number of lines																		
1997	**6**	2	4	14	0	1	5	2	2	10	8	5	3	8	2	3	:	:
1998	**7**	3	6	17	0	2	6	4	4	13	12	7	4	9	4	4	:	:
1999	**9**	4	10	19	1	3	7	6	7	17	14	9	6	11	6	5	:	:

(1) Penetration rate of ISDN channels per 100 inhabitants: channels permitting the use of the Internet and keeping the telephone line free simultaneously. Source: *ESIS (Nov. 2000).*

Table 3.6: Top 10 ISPs ranked by subscribers, September 2000

	AOL (US)	T-Online (D)	EarthLink (US)	Nifty (JP)	Juno (US)	Chollian (KR)	Terra (E)	Tin-it (I)	Hitel (KR)	Unitel (KR)
Number of subscribers (Mio)	24.6	7.0	4.6	4.0	3.7	3.7	3.5	3.5	3.4	3.4

Source: *ITU, 2001 adapted from company reports.*

It seems however that the cost reductions and improved telecommunications infrastructure and services have been an accelerating factor more for mobile telephony and less for Internet access and use.

Internet penetration in households

Internet penetration prerequisites the existence of a PC in a household. According to a Eurostat Survey in April 2000 (as quoted in “Greece in the Information Society 2002”) only 19% of the households used a PC, while

according to national sources[29], in 2001 this percentage rose to 25%. Despite the increase since 2000, the rate remains low especially in comparison to the EU average (45%). In Spain the rate for 2000 was 39% and in Portugal 25%. The encouraging fact about this indicator is that there is a high market propensity given also the steadily increasing family incomes along with the availability of consumer loans during the past few years and of advantageous 'package' deals offered to university students for buying basic electrical and electronic equipment (including PCs).

In terms of Internet penetration, in October 2000, the proportion of the Greek households having an Internet connection was the lowest in the EU (11.7%). In Spain the households having Internet connection were 15.7% and in Portugal 18.1%. However, during the period March 1999 – October 2000 Greece presented the fifth highest increase rate after Austria, Portugal, France and Ireland.

Table 4.2: Internet connections in households

	EU-15	B	DK	D	EL	E	F	IRL	I	L	NL	A	P	FIN	S	UK	US [1]	JP
Households having an Internet connection (%)																		
March 1999 [2]	**8.3**	8.2	24.6	7.1	2.9	5.0	3.9	8.4	6.1	14.0	19.6	6.8	3.4	17.2	39.6	10.7	:	:
April 2000	**18.0**	20.0	45.0	14.0	6.0	10.0	13.0	17.0	19.0	27.0	46.0	17.0	8.0	28.0	48.0	24.0	38.0	:
October 2000 [2]	**28.4**	29.2	51.6	27.1	11.7	15.7	19.0	35.5	23.7	36.3	54.8	38.0	18.1	43.5	53.8	40.9	41.5	:
Households using an Internet connection (%)																		
April 2000	**15.0**	15.0	41.0	11.0	5.0	7.0	11.0	14.0	14.0	18.0	42.0	16.0	7.0	23.0	43.0	22.0	:	:
Households having an ISDN line (%)																		
April 2000	**5.0**	4.0	9.0	12.0	0.0	1.0	2.0	1.0	3.0	12.0	13.0	8.0	1.0	6.0	4.0	4.0	:	:
Households using an ISDN line (%)																		
April 2000	**1.0**	1.0	1.0	2.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	:	:

(1) August 2000; (2) Eurobarometer 50.1, March 1999 and Flash Eurobarometer 88 "Internet et le grand public", October 2000.
Source: *Eurobarometer 53, Spring 2000*.

Indeed, Greeks use the Internet mostly at work and Internet cafes, rather than their own homes, with a frequency corresponding to the EU average. It is also true, as shown above, that the average Internet user in Greece pays more than the average European for access to the Internet, due to the still high, but rapidly decreasing, costs in a still developing market. The still high off-peak time charges may be one of the reasons for the still limited access and use of Internet.

On the other hand, the moderate charges during peak time and the decreasing trends of both figures (peak and off peak time charges) may be the reasons for the high growth rates in access and use of Internet. It is encouraging that although the percentage of Internet users in Greece remains low as compared to EU average (at similar levels with Portugal) it presents a high increasing rate[30].

Nevertheless, Internet use is not affected only by costs of PCs or Internet access charges. It is interesting to test the hypothesis that the type of on-line services provided and the types of needs the users try to cover also affect IS development.

The average Internet user in Greece is young (18-24), with high monthly income and lives in an urban centre. Online services are mainly used by most Internet users in order to find information and make online queries. E-mail and online newsletters are the most often used online services while online transactions

[29] Greece in the Information Society 2002
[30] Source: EUROBAROMETER 2000

account for a small fraction of Internet services. Intention to pay seems to be highest for medical services, while in 2001, the most often used categories for information search were tourism and medicine.

Since the main reason for using the Internet is the retrieval of information, the limited knowledge of English plays a significant role. However, this obstacle is being gradually removed with the increasing volume of information and WEB sites in Greek especially concerning news and local tourism.

On the other hand, the fact that the categories for information search are mainly tourism and medicine forms another reason for giving priority to the tourism sector in IS development.

In parallel the types of public services provided through the Internet also affect Internet use. The transactions with the public sector are quite positive. Almost one in two users of the Internet have visited government websites, a figure corresponding to the European average. Government online services are growing rapidly while recent research by the European Commission ranks services relating to taxation as the most complete online public services in Greece[31].

However, the types of services provided through the Internet also include private services and it is true that Internet penetration in businesses and e-commerce activities are still quite limited in Greece. Making additional services available and addressing the needs of a wider age group of people is of major importance.

Internet penetration in businesses

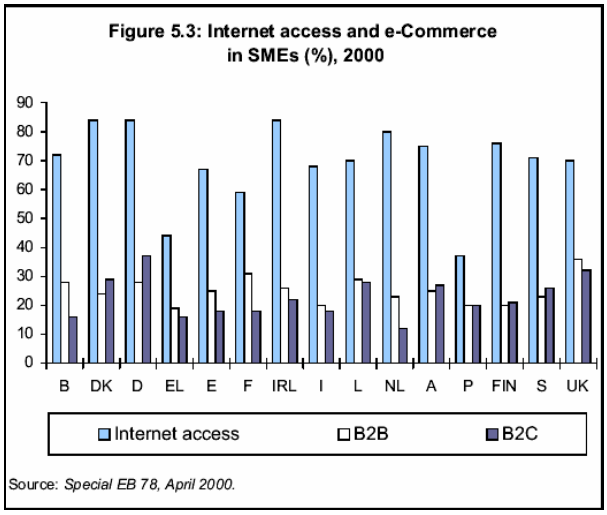
Internet penetration prerequisites the existence of PCs. Use of PCs in employment in Greece is still at a low level (25%) in relation to the EU average (45%) and there are significant variations according to the size, the sector and the activities of the enterprises. In Spain and in Portugal, the use of PCs in employment is closer to the EU average (35% and 30% respectively).

In line with the limited use of PCs in employment, Internet access by Greek enterprises was the lowest (32%) in the EU in 1999 but presented an increase rate of 28% similar to the EU average between 1998-1999. In Spain the percentage of enterprises having Internet access was 46% with a growth rate around 44%, while in Portugal the figures were 47% and 47% respectively.

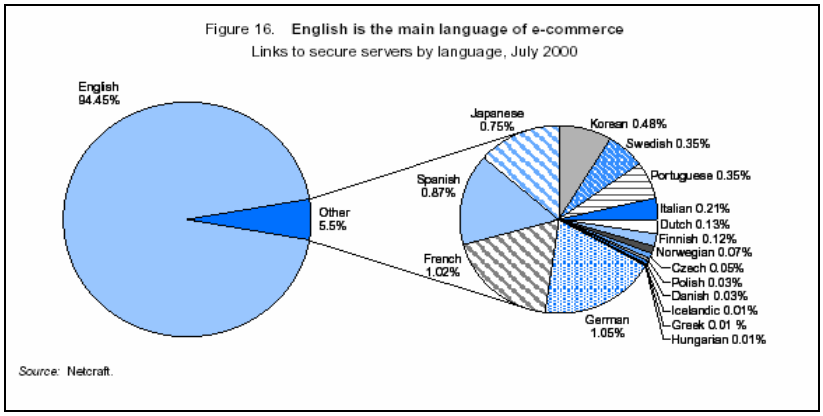
E-commerce in SMEs

In Greece, only a small number of SMEs use e-commerce for purchase and a slightly larger percentage (approximately 5%) for sales. The respective rates for Spain and Portugal are similar (5% and 3% respectively). B2B and B2C activities in SMEs are limited in several European countries. B2B in Greek SMEs presented one of the lowest figures in 2000 comparable to Italy and Portugal, while B2C was even lower, but above Netherlands, and similar to Belgium, Spain, France, Italy, and Portugal.

[31] However, one of the important problems faced (mentioned by an interviewee) in order to implement the Information Society Strategy, especially in the Public Sector, is the fact that not all of the official, public records and documentation in Greece as well as the necessary public documents of every day use for the citizen yet exist in a digitised form. A specific example refers to the creation of the Centers for Serving the Citizens (KEKs), which are authorized to issue certificates of all kinds and elaborate the transactions of the citizens with the public sector. Despite the good intentions, there is inefficient planning and lack of all the necessary elements in order to succeed in their main goal (there are no electronic signatures of the respective authorities for each Public service, no electronic stamps, most official documents not in electronic form).



The main benefit expected from e-commerce by Greek enterprises is better access to customers while the most important hurdles for entrepreneurial activity via the Internet are expensive equipment, the inefficient legal framework, the lack of suitability of products and services, the small number of potential customers and the language used.



On the other hand, infrastructure for e-commerce has improved. The percentage of secure web servers presented the highest growth rate in the EU between 1998-2001 (twice than the EU average) but still remains the lowest in the EU and far from the EU average together with Portugal, Italy and Spain.

Table 5.1: Number of secure servers

	EU-15	B	DK	D	EL	E	F	IRL	I	L	NL	A	P	FIN	S	UK	US	JP
Number of secure servers																		
July 1998	**3 004**	52	44	492	8	239	222	56	167	11	127	98	27	68	145	714	14 674	429
February 1999	**4 676**	117	73	1 083	30	367	449	65	306	18	245	187	51	128	298	1 259	24 532	962
March 2000	**10 914**	240	210	2 835	69	619	1 058	177	619	37	462	344	89	281	631	3 243	47 056	1 946
July 2000	**16 588**	268	289	3 761	87	759	1 297	245	795	44	541	447	116	343	811	4 404	65 565	2 900
Growth of the number of secure servers (%)																		
July 2000/ July 1998	**452**	415	557	664	988	218	484	338	376	300	326	356	330	404	459	517	347	576
Number of secure servers per 1 million of inhabitants																		
July 1998	**8**	5	8	6	1	6	4	15	3	26	8	12	3	13	16	12	55	3
February 1999	**13**	11	14	13	3	9	8	18	5	42	16	23	5	25	34	21	90	8
March 2000	**29**	24	40	35	7	16	18	48	11	87	29	42	9	54	71	55	170	15
July 2000	**44**	26	54	46	8	19	22	65	14	101	34	55	12	66	92	74	239	23

Source: *Netcraft, OECD.*

Despite the limited on-line commercial transactions, use of Internet shows increasing trends, which are also reflected by the increase in IP addresses and Internet hosts. Hosting stations have increased from 0,1 per 100 inhabitants in 1995 to 1,3 per 100 inhabitants in 2001. In fact, Greece, together with Italy, Spain and Portugal, presented one of the highest increases in Internet hosts during 1995-2001. Nevertheless, the respective figures for all these countries remain below the EU average in 2001.

Table 3.2: Internet hosts

	EU-15	B	DK	D	EL	E	F	IRL	I	L	NL	A	P	FIN	S	UK	US	JP
									Number of Internet hosts [1] (in 1 000)									
1995	**1 894**	31	51	474	8	51	151	13	75	2	172	53	12	216	145	440	6 055	269
1996	**3 063**	65	107	620	17	113	239	27	148	4	271	89	24	314	238	719	10 113	734
1997	**4 652**	107	169	1 132	28	196	355	40	254	5	391	108	42	487	349	988	20 624	1 169
1998	**6 417**	209	298	1 450	50	307	511	56	387	8	626	173	56	460	379	1 449	30 489	1 688
1999	**8 488**	339	338	1 635	75	470	1 233	64	302	10	959	263	78	462	523	1 739	53 167	2 637
2000	**10 193**	300	327	2 006	111	356	1 118	111	976	12	1 523	483	63	533	596	1 678	80 558	4 641
2001	**11 363**	329	378	2 373	141	450	1 161	123	873	13	1 889	536	113	733	572	1 678	:	:
									Internet hosts per 100 inhabitants									
1995	**0.5**	0.3	1.0	0.6	0.1	0.1	0.3	0.4	0.1	0.5	1.1	0.7	0.1	4.2	1.6	0.8	2.3	0.2
1996	**0.8**	0.6	2.0	0.8	0.2	0.3	0.4	0.7	0.3	0.9	1.7	1.1	0.2	6.1	2.7	1.2	3.8	0.6
1997	**1.2**	1.1	3.2	1.4	0.3	0.5	0.6	1.1	0.4	1.1	2.5	1.3	0.4	9.5	3.9	1.7	7.7	0.9
1998	**1.7**	2.0	5.6	1.8	0.5	0.8	0.9	1.5	0.7	1.8	4.0	2.1	0.6	8.9	4.3	2.5	11.3	1.3
1999	**2.3**	3.3	6.4	2.0	0.7	1.2	2.1	1.7	0.5	2.2	6.1	3.2	0.8	8.9	5.9	2.9	19.6	2.1
2000	**2.7**	2.9	6.1	2.4	1.1	0.9	1.9	2.9	1.7	2.7	9.6	6.0	0.6	10.3	6.7	2.8	29.4	3.7
2001	**3.0**	3.2	7.1	2.9	1.3	1.1	2.0	3.2	1.5	2.9	11.8	6.6	1.1	14.1	6.4	2.8	:	:

(1) The source for USA and JP is ISC. For USA they include country code Top Level Domains (TLDs) and generic TLDs eg .com

Source: RIPE. Figures refer to EU for end of the year, except for 2001; March figures. RIPE figures on hosts account for country code Top Level Domains (TLDs) only. Generic TLDs like .com, .org, etc. are not counted as part of EU-15 domains.

The use of IT in households and in businesses is also directly affected by the use of IT in education. If people get acquainted with IT and their respective capabilities from the early years at school they may be more positive in introducing IT in their every-day lives and they may even be the 'pushing' mechanism for greater integration of IT in the private and public sectors. Indeed, the use of ICT in education in Greece is still low however growing fast and comprising one of the major policy priorities.

Use of ICT in education

As far as secondary education, IT courses have been taught since the mid-80s at 85% of the country's high schools, but the instruction periods and textbooks took some time to reach a satisfactory level. Furthermore, PC laboratories were established, and this has significantly improved the relationship of students with computer use (both in secondary and primary education).

According to Eurostat, in 2001 there was an analogy of 1,5 computers per 100 pupils in primary education and 6 per 100 pupils in secondary education. In Spain there were 6,9 computers per 100 pupils in primary education while in secondary education the computers per 100 pupils were 7,4. Respectively in Portugal there were 3,8 computers per 100 pupils in primary and 5,7 computers per 100 pupils in secondary education.

According to the same source, in 1999, only 1% of the primary education schools and 18% of secondary education were connected to the Internet. Respectively in Spain the rates were 80% and 90%, while in Portugal, 42% and 100%. Based on the information published by the Ministry of Education, in 2002, all schools in secondary education have access to the Internet.

Table 6.3: Schools with Internet connection

	EU-15	B	DK	D	EL	E	F	IRL	I	L	NL	A	P	FIN	S	UK	US	JP
Computers per 100 pupils at primary and secondary school level (%) [1]																		
Primary	**6.8**	9.0	23.5	4.3	1.5	6.9	6.4	8.6	4.5	45.8	11.9	9.3	3.8	13.4	10.1	8.5	:	:
Secondary	**11.3**	12.4	66.9	7.1	6.0	7.4	10.5	12.1	11.1	16.0	11.0	11.7	5.7	14.8	23.1	15.5	:	:
Schools linked to Internet (beginning of academic year 1999-2000) (%) [2]																		
Primary	**59**	70	94	56	1	80	30	80	75	25	38	63	42	90	57	86	97 [3]	:
Secondary	**89**	95	100	81	18	95	84	90	90	100	86	100	100	95	99	98	100 [3]	:
Computers connected to the Internet per 100 pupils at primary and secondary school level (%) [1]																		
Primary	**2.8**	2.7	11.3	1.6	0.7	2.6	2.1	2.7	1.7	17.7	2.8	1.4	1.1	9.2	6.6	3.9	:	:
Secondary	**6.4**	6.4	30.0	4.4	1.7	3.3	4.6	6.1	5.2	14.9	5.4	8.8	2.5	13.6	20.9	10.6	:	:

(1) eEurope 2002 based on Eurobarometers Flash 94 "Headteachers" of June 2001.
(2) ESDIS, February 2001 (Ministries for Education).
(3) National Center for Education Statistics, 2001.

In Universities and Technical Colleges, IT applications and networks have been developed to support education and research, and these cover a proportion of more than 1/3 of the 300.000 members of the academic community. With the implementation of the university network (GU-net), interconnection and direct international communication possibilities have upgraded and extended to all the institutions (18 universities and 14 technical colleges), through the addition of high-speed lines that provide advanced digital telephone services and access to world-wide sources of information. These were implemented via the backbone network of the National Network for Research and Technology (EDET) and international connections in the context of the EU projects TEN-34 and TEN-155[32].

In addition, we should not forget the deficits in the education system mentioned in the previous section.

The examination of the wider socio-economic environment as well as of the IST-specific environment and indicators have revealed a number of factors that affected the IST development in Greece:

- The degree of urbanisation and country's morphology;
- The still 'weak' regional authorities;
- The still low but increasing family incomes and GDP;
- The problem of the ageing population;
- The dualism in the structure of the economy;
- The deficits in the orientation of the education system and in ICT education;
- The limited knowledge of the English language;
- The cultural aspects forming a certain attitude towards innovation and change

- The fast growing telecommunications market;
- The fast decreasing telephone charges;
- The continuously improving quality and range of the telecommunications infrastructure and services;
- The still low e-commerce activities but improving e-commerce infrastructure;
- The increasing use of ICT in education and ICT courses.

To complete the picture the policy responses over the years should also be examined both for identifying any additional factors and also for examining if efforts are made to tackle the issues identified above. As shown in the next section, limited efficiency and experience of the public sector in programme administration and implementation as well as specific characteristics such as fragmentation or weakness in maintaining the "integrated" character that the information systems usually have, seem to have played a major role in the development of IS in Greece.

[32] Source: Greece in the Information Society 2002

4. Policy responses

The Greek government has made efforts to exploit ICT and IS advances in both previous Community Support Frameworks. Apart from the improved telecommunications infrastructure, the first CSF (1989-1994) approached the IS as a means to improve the computerization and automation of the public service. A programme under the name "Kleisthenis" was adopted, providing opportunities for purchase of equipment and training in all public and semi-public authorities. These efforts however were of limited success. There was low absorption and efficiency - the lower of the whole first CSF. The most important factors for the limited success were mainly internal organizational matters and the inefficiency of the public sector in the administration and implementation. [33]

During the 1994-1999 programming period telecommunications infrastructure further improved and reached satisfactory levels for the first time while mobile telephony grew rapidly. The programmes of the second CSF had a higher absorption and were considered overall more successful than those of the first. However IS policies were fragmented and composed of specific measures within sectoral programmes. This, in combination with the lack of coordination (each ministry or secretariat managed its own programme without any exchange of views, resulting to the lack of synergies) resulted in several duplications, overlapping and gaps.[34]

In more detail, according to the ex post evaluation of the IS related programmes and actions of the 2nd CSF, the implementation suffered specific problems[35] like: fragmentation, delays mainly in the beginning of the projects, uneven development of projects, weakness in the execution of innovative interventions, legal and organizational barriers, little experience of the bodies responsible for designing, monitoring and managing the projects, weakness in maintaining the "integrated" character that the information systems usually have, underestimation of the need for human resources training and weakness in the operation on the mechanisms for monitoring the projects.

The most successful of the broad applications under the second CSF was the TAXIS net service, which offered the possibility for electronic submission and clearance initially of access to certificates, then VAT and finally tax revenue declarations. The service was reviewed and accepted as a European best practice model in 60 out of 282 proposals submitted in the framework of the monitoring of the e-Europe actions.

The relatively limited success of the first programming period in terms of applications led the Greek government to the decision to put together all the elements of previous national programmes, which needed/envisaged the enhancement of the IS, into one new sectoral programme called the Operational Programme for the Information Society (OPIS). This programme includes practically all the IS elements of the previous programmes plus some new ones and tries to coordinate them in the framework of the e-Europe logic. The underlying approach is that as the IS becomes a key priority for the competitiveness of the Greek economy and its social cohesion; it should have a vision and a common tool for coordinating, monitoring and supporting individual

[33] Source: Technopolis Report – Case Study: Greek National Operational Programme for the Information Society (OPIS)
[34] Ibid.
[35] Source: Ex Ante Evaluation of the OPIS (http://www.infosoc.gr/news/1/docs/ex-ante-engl.doc or http://www.infosoc.gr/news/1/docs/OPISch5.doc)

activities with synergetic effects. The Operational Programme for the Information Society (OPIS) might be considered as the most ambitious and innovative programme in the 3rd CSF and the largest programme of its kind in Europe[36]. The ambition in the Operational Programme is obvious from both short-term as well as long-term goals set. The overall aim is to reach a level of IS development by 2006 that will place Greece at the same ranking as the rest of the IS developed countries in Europe. Additionally, it is very important to stress the fact that this programme (with a budget of 3 billion Euros) is the first attempt ever in Greece to put together horizontally a plethora of objectives and actions that will help develop an Information Society.

This programme, OPIS'[37], is the main policy instrument for developing the Information Society in Greece in the following years and was created in order to coordinate and activate a series of actions to this end. The actions included are particularly wide ranging and cover the fields of education and culture, citizens and quality of life, growth and employment, and communications. Important institutional activities take place in parallel with and in addition to the Operational Programme's intervention axes. New organisations were created and old ones were put into a new perspective, emphasising on the new process and the need for coordination and synergies.

The two general strategic objectives of the OPIS for the period 2000-2006 are[38]:

The first general objective falls under the heading "Citizens and quality of life". This relates to improvement in the quality of life for the average citizen by actions in a range of critical sectors such as public administration, health, transport and the environment. Intervention in these sectors will improve the services offered through integrated information and communications systems.

The second objective falls under the heading of "Economic development and human resources". This relates to the creation of conditions appropriate for supporting a process of economic and social development in which technology and knowledge are the main instruments for increasing productivity and competitiveness, incomes, employment and the skills of the labour force. It includes developing telecommunications infrastructure, supporting economic mechanisms and employment by adopting the most of new technologies, creating an education and training system adapted to the needs of the 21st century, and promoting Greek culture.

To achieve the above general aims, the OPIS sets a series of special objectives:

1. Education and Culture: Equipping, networking, training teachers and preparing digital material for the creation of an educational system for the 21st century, and using new technologies for the documentation and promotion of Greek culture. (With 15% allocation of the total budget)
2. Citizens and quality of life: Using ICTs for improved services to the public in critical sectors of the public administration, and improving of the quality of life through the introduction of new technologies in the areas of health and welfare, the environment and transport. (With funding 31% of the total budget)
3. The Digital Economy and Employment: Creating conditions for conversion to the new "economy", through the promotion of e-commerce, e-business and

[36] Source: Technopolis Report – Case Study: Greek National Operational Programme for the Information Society (OPIS)
[37] The Operational Programme was essentially the materialization of the strategy and actions proposed in the 1997 government document "White Paper – Greece in the Information Society, Strategy and Actions".
[38] Source: OPIS – Greece in the Information Society 2002 (www.infosoc.gr)

research and its relationship to production, skills upgrading, employment and tele-work. (With funding 32% of the total budget)

4. Telecommunications: Supporting the market liberalisation process and developing telecommunications infrastructure in remote areas for the provision of advanced services at low cost and points of access to the IS for the public. (With 20% allocation of the total budget)

OPIS seems to be addressing all the important issues hindering IS development in Greece: IT in education, use of ICT by the public, use of ICT in businesses, further development of the telecommunications market and improvement of the telecommunications infrastructure in remote areas.

OPIS also addresses the uneven distribution of IS development because of the peripheral disparities within the country, by asking for the first time all the regions to include elements for the enhancement of the IS in their Regional Operational Programmes. The priority areas and regional budgets are subject to decision in each region. The regional programmes are monitored by the Regional Monitoring Committees but the use of funds for the IS is subject to scrutiny by the OPIS Special Secretariat and Management Authority[39] to assure compatibility with national targets and avoidance of overlapping and duplication.

The quality of the description of the IS activities and measures in the Regional Operational Programmes Complements varies. As a result one may say that while the regions complied with the central guideline to design IS applications, their skills and resources to do so were in most of the cases totally inadequate. The importance of work on the knowledge based society and e-business are priorities in all regions, while cheaper faster Internet, youth participation and research networks are correctly neglected, as being national and not regional priorities. At the same time one can see that some regions have clear priorities and decide to totally neglect areas irrelevant for their development, while in other regions most e-Europe priorities are considered as important, indicating a reluctance or inability to make choices.

The result of the Programme Complements was judged unsatisfactory[40] for the OPIS Secretariat and in an effort to get better coordination and more efficient implementation the national administration has funded each region with 130000 Euro to produce a detailed business plan for the IS components of their programme. These business plans are in the process of being submitted and their quality varies. The plans include in general a good outline of the current situation but fail to take a proactive role, consult the regions based on international experiences and link well the current situation with priorities and measures. The process is still ongoing.

The improved design and integrated activities of the OPIS in addition to the positive wider economic environment and the positive trends in most IST development indicators create an optimistic background for the development of Information Society in Greece and especially for the achievement of the specific targets set under the programme:

[39] The OPIS Secretariat and Management Authority was created in order to ensure that there wouldn't be any lack of quality and coordination for the implementation of the programme as in the previous CSFs.
[40] Source: Technopolis Report – Case Study: Greek National Operational Programme for the Information Society (OPIS)

INDICATORS	STARTING POINT	VALUE AT STARTING POINT	OBJECTIVE 2006
Internet Users per 100 inhabitants	2000	5	50
No of pupils per PC	2000	51	10
% of schools connected to the Internet	2000	5	100
No of PCs per 100 civil servants	2000	15	50
% of health centres connected	2000	0	100
% of SMEs doing e-commerce	2000	?	15
% of population covered by systems of frequencies spectrum control	2000	5	80
% Increase of employment posts in the IS domain	2000	48,750	80, 000
IS expenditure as % of GDP	2000	4,1	6,2

Additionally the priorities and aims of the OPIS are compatible with the more general priority policies at the EU, national and regional levels:[41]

- In accordance with the general framework of European employment policy and the policy of the Greek National Employment Action Plan, increasing employment, skills and equality of rights represent central objectives of the programme. These are pursued through a variety of actions aimed at increasing entrepreneurship, the creation of new jobs, the upgrade of skills, and the inclusion of disadvantaged groups in the labour market.
- The emphasis of the protection of the environment is evident in a series of actions of the OPIS. The OP includes actions related to the use of management systems for the environment and transport, with direct positive consequences for the environment. In parallel, actions for e-commerce, tele-work and/or the use of new technologies for production contribute to the creation of a model of economic development compatible with “sustainable development”.
- Production and diffusion of new technologies throughout society reduces social exclusion and provides increased potential for employment and for serving people with special needs. The promotion of tele-work helps disadvantaged groups become part of the workforce. It also promotes equality between men and women, both by increasing the number of jobs in the service sector and by improving opportunities for education, information and civil participation.
- IS activities have marked regional and local dimension and are compatible with EU and national policies for decentralisation. The aim is to create conditions for a more active participation of all regions of the country in global economic activity. This is achieved by increasing the scope of the regions in designing their own IS actions, and by formulating a plan for each area that concentrates on reducing isolation, accentuating local features, supporting infrastructure and improving the quality of life.

[41] Source: OPIS – Greece in the Information Society 2002 (www.infosoc.gr)

5. Conclusions at case study level

IS development in Greece started later than in most of the other EU Member States. The first and second CSF had a major contribution in building the telecommunications infrastructure, in computerising the public services and in developing mobile telephony in the country. However, the success could have been much greater if these efforts were not hindered by internal organizational matters like limited experience of the public sector in the administration and implementation, lack of coordination, delays, etc.

The current situation, comparable to Portugal and Spain and characterised by some of the lowest figures in IS-related indicators is, however, supported by some of the highest growth rates.

Identification of factors of success and failure needs information and data covering as wide time periods as possible. Due to the recent development of IS in Greece some indicators cover only a short period of time (1-2 years). Keeping that in mind, a number of hypotheses have been made and tested according to the available data and information. Nevertheless, it should be stressed that to produce safe conclusions these hypotheses should also be tested in the near future and particularly in 2006 since implementation of the OPIS is expected to change the situation radically.

The factors that have been identified to influence the development of IS development in Greece are both directly related to IS as well as indirectly belonging to the wider socio-economic and cultural environment that IS development takes place.

Information Society is taking place within an economic environment marked by high growth rates, low inflation and interest rates, and the elimination of public sector deficits. Since 1995 the GDP growth rate has been higher than the EU average. In 2002 Greece's economy is considered to be the fastest growing economy in the European Union.

High development rates led to an increase of employment. Unemployment in Greece has decreased the last couple of years but it remains one of the highest in the EU – zone. Despite that, the real income of the households was increased but the GDP in terms of PPPs show that it is still more expensive for Greek people to buy ICT goods.

Although real salaries were increased, the labour cost per unit has been steadily decreasing, with labour productivity growing fast, approaching the absolute levels of other developed economies, a fact undoubtedly related to the major increase of investments over recent years. Labour productivity growth in Greece in 2002 is expected to be one of the highest in EU.

Overall expenditure in ICTs, as a percentage of the GDP, is almost in convergence with the EU average. It is encouraging that GDP expenditure per inhabitant is also increasing faster than the EU average since 2001. Additionally the range, the quality and cost of telecommunications infrastructure and services in Greece have improved considerably. The proportion of digitisation of the network has increased mainly in urban centres but also in the country as a whole, while the quality of services is improving steadily. However, the cost of services for the private sector remains high, whereas for consumers it is low. The rapid completion of the liberalisation process has also lead to substantial cost reductions and to further improvements in the quality and range of services offered. Telephone connections in Greece are close to the EU average, while

ISDN connections are steadily increasing and all telephone lines are digitised. In addition, mobile telephony penetration in Greece is in line with the EU average, supported by a fast growing market.

Great potential for the increased use of ICTs also exists in the public administration, schools and workplaces, and at present this potential has not been fully realised. Despite the considerable effort and capital expended, the public administration in Greece is still characterised by a small number of installed IT systems, most of which are management systems available for administrative information and services offered to the public. An increasing number of employees have access to e-mail. Considerable efforts have been made to upgrade the skills of the labour force by means of further training programmes, but these do not fully meet the new needs that are appearing in the IS.

The picture relating to the use of the Internet for transactions with the public sector is quite positive. Almost one in two users of the Internet have visited government websites, a figure corresponding to the European average. Government online services are growing rapidly while recent research by the European Commission ranks services relating to taxation (TAXIS-net) as the most complete online public services in Greece.

The increase of information technology services provision in Greece is about the same level as in the rest of the EU countries and the market for software products appears to be very dynamic. The telecommunications market is also characterised by fast growing trends and considerable dynamic.

In relation to infrastructure for the Internet, hosting stations increased significantly (70%) for the period 1998-2000, while a major increase has also been noted in unique IP addresses as well as websites. Online transactions continue to account for a small fraction of Internet services, with e-mail and online newsletters being the most often used online services. According to recent figures, about 13% of the population in Greece now have access to the Internet (2001) but the number of users is increasing annually. As for the development of e-commerce, Greece is lagging in the creation of appropriate infrastructure with an average number of secure Web servers much lower than the EU average.

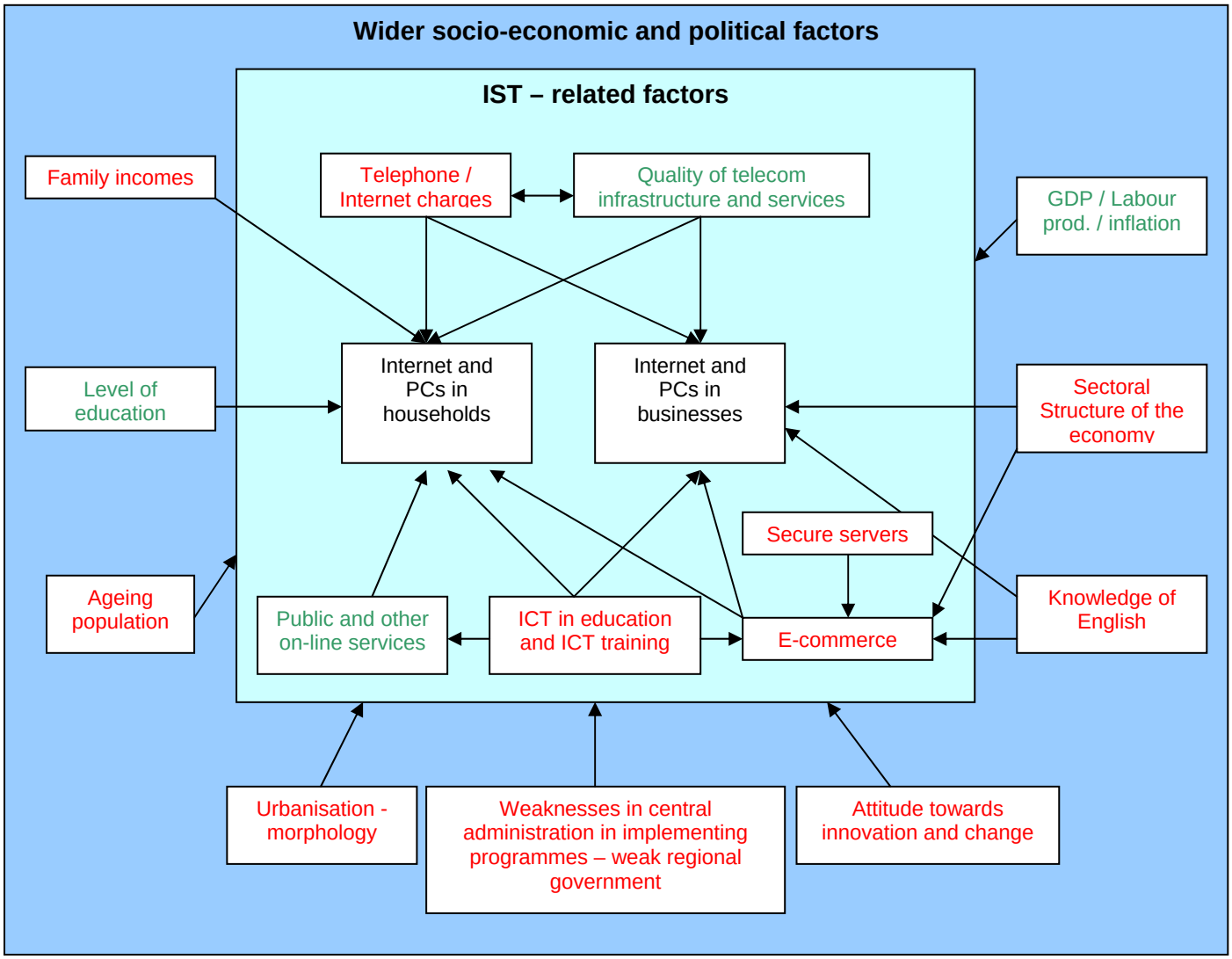
The educational system is being transformed gradually by the introduction of new ICTs. In secondary education, information technology has been taught since the mid-80s at most of the country's high schools, but the instruction periods, textbooks and laboratories have taken some time to become sufficient. The average number of pupils per PC is decreasing at both levels (primary and secondary) but is still high, while access to the Internet has now reached 100% at secondary level. In Universities and Technical Colleges, IT applications and networks have been developed to support education and research, and these cover a proportion of more than 1/3 of the academic community.

However, the cost of Internet access and use (connectivity) is more expensive in relation to other European countries. This is mainly due to the developing market and the limited competition in Internet providing services as well as the low income per capita in relation to the EU average. Nevertheless, the development of some new business initiatives focused on new technologies, research work at universities and the steady and more widespread acceptance of many new technologies by consumers are signs of a new dynamic. On the other hand, there is a small proportion of trained personnel among the total workforce and limited development in new types of work, such as tele-work.

In addition there are some other factors considered important for the development of IS in the country which are not directly related to the IS.

- Educational System: the lack of linkage of education with the market's needs, the reluctance of educationists in embracing the new technologies, the lack of ICT specialists as teachers.
- Low birth rate and ageing population: the tendency for older people to use new technologies and the Internet is limited.
- Cultural aspects of the population forming a certain attitude towards creativity, innovation and change.
- Language: only 54% of the students were taught English (at school), which is the main language for ICT use as well as for the most of the sites available on the Internet.
- Peripheral Disparities: the morphology of the country as well as the still weak regional authorities affects the uniform development of IT across the country.
- The 'dualism' in the structure of the economy, with some dynamic high-tech enterprises alongside mostly technology-laggard, industries, is affecting the diffusion of and investment in new technologies. On the other hand, the increasing importance of the tourism sector for the Greek economy along with the banking, insurance and real estate services gives positive signals for a sector to target in order to have a high impact in IS development. Whether these sectors should have priority over others needs to take into consideration issues like the seasonal character of tourism. Nevertheless, it seems an area worthy of investigating.

The factors identified above can be presented in the following picture along with the interconnections among them. Without overlooking the significant improving trends noted in the recent years, an attempt is made to categorise the factors that seem to have affected IS development in Greece till now as of 'having facilitated' (green fonts), and as of 'having hindered IS development' (red fonts).



In conclusion, Greece is starting from a very low position and the gap to fill in concerning the development of IS is significant in comparison to the other EU member states. However, the improved design and integrated approach of the OPIS, the positive actions taken to improve implementation and increase its effectiveness as well as the positive wider economic environment and the improving trends in the factors affecting the IS development in Greece noted in the past years, give encouraging signals and create optimism in achieving the targets set.

Annex I: Examples of IS related National and Regional Programmes and initiatives

The past few years there have been many programmes implemented or are under way at National or regional level directly or indirectly related to the IS development. Some indicative examples of such programmes are:

1. "Politeia" (related with the public administration reform)
2. "Kleisthenis" (related with the public administration modernization through technical, organizational and educational interventions)
3. "Syzefxis" (related with the creation of the national public administration network and aims at the creation of a uniform technical and operational communication environment for public services with other public services and with citizens and firms)
4. "Ariadne" (related to the e-version citizen guide, 1464 call centre, Asterias project for the promotion of IS development in the islands, the creation of One-Stop Shops and e-forms, the simplification of administrative procedures, etc)
5. "Odyssey" (related with teacher training in ICT)

These Programmes were implemented under the 2nd CSF and as mentioned in the case study, although some were judged as successful, others failed to deliver completely the goals set.

The Ministry of Development and the General Secretariat for Research and Technology, in the framework of the Operational Programme for the Information Society have launched two initiatives for the submission of proposals for R&D as well as Demonstration Projects for "e-business" or "e-learning". The main purpose of these initiatives is to support research associations (enterprises, educational institutes, research centres or other bodies) for the development of innovative (technologically) products and services for e-business and e-learning.

Another initiative by the Ministry of Development is the programme Go Digital under the Operational Programme for Competitiveness Programme. The main aim of this initiative is to help about 50,000 SMEs become familiar with the digital economy, to help them exploit the potential and opportunities through the Internet and more generally, to motivate entrepreneurs in using the new technologies in the Information Society. The programme is under implementation for the period 2000-2003 with a total budget of EUR 117,4 million.

In parallel, the European Regional Development Fund - RISI I Programme (Regional Information Society Initiative) (1994-1999), funded two projects for the Greek regions: one with the title RISE (Regional Information Society Strategy for Epirus) implemented by the region of Epirus and the other with the title ATHINA (Regional Information Society Strategy for the region of Attica).

The main challenge for RISE was to cause a transition in the regional development planning process:

- From start-up position of very low awareness about Information Society encompassing the whole of the private and public sector of the region with very few exceptions of ICT consultants and specialists in the academic institutions of the region and managers of a few enterprises among the larger SMEs of the region;
- To the position it finds itself now where there is considerable awareness and understanding of what Information Society means for all facets of regional development, which is hared among a substantial, and critical, portion of the

private and the public sector of the region and a concrete strategy and plan of practical action, which is owned by the key regional actors together with the necessary funds, for undertaking an integrated Information Society intervention in the region over the substantial planning period (2000-2006).

The central obstacle of this transition was the very low start-up position of the region and the resulting difficulties in attracting people without direct experience of ICT services to become interested in Information Society, make an informed contribution at the level of policy as well as at the level of practical actions, and in the case of politicians commit resources to Information Society actions. There was no single solution for dealing with this obstacle but a combination of means: analytical work at user level which produced tangible trust relations, between the key regional development actors-politicians- and the RISE team of specialists; a background of prior work in regional development; and last but not least, gestation time.

The position the region finds itself now is another start-up position in the regional development process proper, i.e. with respect to implementation of the Regional Strategy and Action Plan. The challenge that the region faces nor is to close or minimise its distance and gap from the rest of Greece and the EU and cause a transition from its very low present position, in terms of actual take-up and usage of ICT services, to a position of a full participation of the region in the Information Society and its exploitation for the economic and social development planning approach, including effective monitoring, review and evaluation procedures, and a substantial improvement over established development planning and management practice.

As far as the ATHINA project is concerned, it had four principle aims:

- Advise regional and local authorities and other public and private sector bodies in issues pertaining to the Information Society
- Contribute to the consensus building process, coordinated by the European Commission, together with our European partners
- Act as a catalyst for the accelerated development of Attica's and Greece's Information Society
- Inform and educate about its possibilities to the widest possible extent

Under this project a comprehensive analysis of the current situation in the region of Attica was achieved with regards to the Information Society. The analysis included financial, legal, public policy, and application issues. The ATHINA project is currently working towards the establishment of a comprehensive Strategy Plan for the region of Attica, focusing on "mature" projects and organisational reform.

Under the RISI II programme, another project was funded with the title TEMeTeN (Towards a European Medical and Teleworking Network). This was a project for the creation of a network and more than one countries were involved (Greece, Italy, Spain, Finland). The two Greek regions that took part in the project were the regions of Crete and Epirus.

The project TEMeTeN aimed at improving the quality of health care at regional level in normal and emergency situations for residents and visitors of Crete, and also reducing the cost due to unnecessary repatriations. Another important objective was to equip "Resort Offices" to help improve the attractiveness of the regions involved.

Although RIS projects are focused on a single region, form the outset, significant emphasis has been placed on widening the perspective of regional stakeholders when developing their strategies and action plans. In this respect, the RIS- RITTS Network, funded by DGXIII/D (Innovation Programme), has facilitated the exchange of experience, carried out benchmarking activities and supported thematic sub-groups of RIS-RITTS regions (industrial, urban, tourism, etc.)

Finally under the European Regional Development Fund Innovative Actions programme adopted by the European Commission on January 2001, 13 programmes were approved for implementation for all 13 regions of the country: Western Greece, West Macedonia, Thessaly, South Aegean, Peloponneses, Northern Aegean, Ionian Islands, Epirus, Eastern Macedonia–Thrace, Crete, Continental Greece, Central Macedonia, and finally Attica. This programme has a long-term character (2000-2006) and the projects for the 13 Greek regions are still under implementation.

"Western Greece Region Objective 1 Programme": the European Commission approved for the period 2000-2006 an operational programme for the region of Western Greece. The programme represents and overall amount of EUR 781,4 million, of which EUR 478,45 million (65% of the total budget) will be financed by European Union's Structural Funds. Main priorities of the programme are:

- Enhancing and valorisation of the region's positions as the country's western gateway
- Cultural and Tourist development – deriving maximum benefit from the Games 2004
- Restructuring and expanding the region's industrial base and promote innovation
- Improving urban infrastructure –enhancing the quality of life
- Maintaining employment and specialisation of human resources
- Sustainable rural development
- Technical assistance

"West Macedonia Objective 1 Programme": the European Commission has approved an economic and social development programme for the Greek region of West Macedonia. The total cost of the programme amounts to around EUR 581 million. Out of that amount, the European Structural Funds will provide EUR 372 million. Main priorities of the programme are:

- Greater opportunities for job creation and the reduction of unemployment
- Improved trans-European networks linking the Region's productive centres
- Upgrading of the urban areas
- The restructuring of the trades in crisis in the total economy and support for export initiatives to new markets
- Sustainable development of rural areas
- Integrated development of mountain areas and areas near lakes
- Technical assistance

"Thessaly Objective 1 Programme": the European Commission has approved a programme for the development of the Region of Thessaly for the period 2000-2006, which involves Community Support Funds nearly EUR 563,38 million. The European funding will attract a further EUR 187,79 million in investment from the public sector and EUR 177,66 million from the private sector creating total resources of EUR 928,66 million. The main priorities of the programme are:

- Productive environment
- Integrated rural development
- Quality of life
- Exploitation of the Region's central geographic position and promotion of the region's as "network junction"
- Human resources
- Technical assistance

"South Aegean Objective 1 Programme": the Commission has approved a regional development programme worth almost EUR 609,51 million for the South Aegean islands. Of that amount, EUR 372,21 million will be financed by the EU Structural Funds, with the remainder coming from the public and private sectors (EUR 22,07 million and EUR 113,21 million respectively). The main actions of the programme are:

- Alleviating the problems caused by the region's insular nature –basic infrastructures
- Environmental protection and management of natural resources
- Monitoring and redirecting the development of tourism
- Strengthening and upgrading dynamic island centres
- Rural and economic development of those islands with low development potential
- Technical assistance

"Peloponneses Objective 1 Programme": the Commission has approved an economic and social development programme for the Peloponneses region for the period 2000-2006. Funding for the programme amounts to almost EUR 698,69 million, of which EUR 457,19 million come from the EU Structural Funds. The private and public sector will contribute EUR 89,09 million and EUR 152,41 million respectively. The main priorities are:

- Exploiting the region's immediate vicinity to the metropolitan region of Attica.
- Sustainable rural development
- Strengthening and improvement of tourism
- Improvement of urban and semi-urban centres
- Support and development in the field of human resources
- Technical assistance

"Northern Aegean Objective 1 Programme": the European Commission has approved a regional development programme for the Greek region of the Northern Aegean. This programme for a total amount of EUR 547,905 million over a total period of seven years (2000-2006) will be financed by Community assistance of EUR 361,59 million, with EUR 120,53 million form the public sector investment and EUR 65,78 million by the private sector. The main priorities of the programme are:

- Reversal of demographic contraction and of the marginalisation of the economy of the islands through the use of new technology and local advantages
- Urban development
- Diversification of the economy of the islands and reinforcement of competitiveness through the use of the information society and the development of innovation
- Support of agricultural development –rural development
- Technical assistance

"Ionian Islands Objective 1 Programme": the Commission has approved a programme of economic and social development of the region of the Ionian Islands in Greece for the period 2000-2006. It provides the total amount of EUR 375,14 million for financial assistance. Of this sum, EUR 244,68 million (65% of the total budget) will be sourced through the European Union's Structural Funds. Public money will account for EUR 81,56 million of the programme, with the private sector contributing a further EUR 48,9 million. The main priorities of the programme are:

- Infrastructure investment to improve quality, quality and supply in the tourist sector
- Protecting and developing the environment
- Reducing development disparities between regions
- Improving and safeguarding urban and semi-urban areas
- Combating unemployment
- Developing and protecting the smallest islands
- Technical assistance

"Epirus Objective 1 Programme": the European Commission has approved an economic and social development programme for the Greek region of Epirus for the period 2000-2006. The programme will receive the financial volume of approximately EUR 680,07 million, of which EUR 435,98 million of the total budget will come from the EU's Structural

Funds. The public and private sectors will supply the remainder. The main priorities of the programme are:

- Providing infrastructures and support for private investment aimed at promoting the role of the region and encouraging innovation
- Enhancing the value of urban areas, providing environmental and social amenities and implementing integrated measures
- Underpinning the tourism sector and protecting and enhancing the various natural and cultural resources
- Ensuring sustainable development for rural, mountain and less favoured areas
- Developing human resources
- Technical assistance

"Eastern Macedonia-Thrace Objective 1 Programme": the European Commission has approved a regional development programme for the Greek region of Eastern Macedonia – Thrace, which is lagging behind in its development. The total cost of the programme amounts around EUR 1,1 billion, of which European Structural Funds will provide 733,4 million. The main priorities are:

- Rural development
- Innovation and competitiveness
- Exploitation of the geographical position of the region
- Urban development
- Reduction of intra-regional social disparities and development of human resources
- Technical assistance

"Crete Objective 1 Programme": the Commission has approved an economic and social development programme for the Greek region of Crete, for the period 2000-2006. The cost of the programme will be about EUR 730,31 million, with EUR 67,74 million (64% of the total budget) which come from the EU Structural Funds. Main priorities of the programme are:

- Strengthening the region's role as a technological development regional centre, moving innovation forward and strengthening competitiveness
- Safeguarding the environment and narrowing the disparities between coastal and interior regions
- Promoting the region's gateway in the context of international transport networks
- Improving business activity and enhancing living conditions in major urban centres
- Developing mountain and rural areas
- Creating jobs –promoting equal opportunities
- Technical assistance

"Continental Greece Region Objective 1 Programme": the European Commission has approved fro the Greek region of Continental Greece ("Sterea Ellada") for the period 2000-2006. The programme resources amount to around EUR 873,11 million. From that amount, the Structural Funds of the EU will provide EUR 532,61 million. Main priorities of the programme are the following:

- Reduction of intra-regional differences with emphasis in mountainous areas
- Environmental protection, increase in value and rational management resources, improvement of cultural and historical advantages and of the tourist promotion
- Basic and social infrastructure and the reinforcement of the development of urban centres
- Reinforcement and modernisation of the enterprise sector: establishment of links to the local economy
- Human resources
- Technical assistance

"Central Macedonia Objective 1 Programme": the European Commission has approved a development programme for the Greek region of Central Macedonia. This programme has a total financial volume of approximately EUR 1,460 million, of which EUR 903,4 million will come from the European Union's Structural Funds. The public and private sectors will supply the remainder. The main priorities of this programme are:

- Support for private investment to promote Thessalonica's role as a metropolitan centre
- Protection and development of the environment
- Reduction of intra-regional disparities
- Encouragement of innovation and entrepreneurial spirit
- Alleviation of unemployment
- Development of the upland, the interior and the less favoured areas
- Technical assistance

"Attica Objective 1 Programme": the European Commission has approved a regional development programme for the Greek region of Attica for the period of 2000-2006. The programme represents a volume of nearly EUR 1,534 million, of which EUR 1,119, 96 million (i.e. 73% of the whole amount) comes from the European Union's Structural Funds. The public and the private sectors will finance the remainder (EUR 327,47 million and EUR 71,9 million respectively). The main priorities of the programme are:

- Strengthening of the international role of the capital
- Improvement of the quality of life and the environment
- Alleviation of unemployment and social exclusion
- Reduction of the disparities within the region
- Rehabilitation of the sites affected by the earthquake of the 7th of September 1999
- Technical assistance

OPIS

The European Commission has approved a major development programme in Greece for the period 2000-2006, entitled the Operational Programme "Information Society". This programme involves Community support for all the Greek regions within the framework of "Objective 1" (regions lagging behind their development. The total budget of the programme is around EUR 2,8 billion and the Community assistance amounts to 1,7billion (approximately 8% of the total assistance granted to Greece under the Third Community Support Framework). Action Priorities:

- Education and Culture
- Services to citizens and improvement of the quality of life
- Employment and the digital economy
- Communications Technical assistance

"Competitiveness", Objective 1 Programme

The European Commission has approved the Operational Programme "Competitiveness", a major development programme in Greece for the period of 2000-2006. This programme involves Community support for all the Greek regions within the Objective 1 framework (regions lagging behind in their development). Community assistance amounts to 1,97 billion Euros, approximately 9% of the total Community Support Framework (CSF) for Greece, and is expected to mobilise a total investment worth more than 6 billion Euros including public and private funding. Action Priorities:

- Improving and simplifying the business environment
- Supporting the creation of new businesses
- Strengthening the quality-orientated, sustainable competitiveness of businesses and their participation in the changing global market
- Improving the research and technology transfer and its relation to business needs
- Upgrading, diversifying and promoting Greek tourism
- Securing the energy supply and promoting energy market liberalisation
- Energy and sustainable development
- Upgrading human resources
- Technical assistance

The Politeia Programme

The "Politeia Programme" was set up in May 2000 and outlines the general direction of the on-going public administration reform. This framework is completed by the Operational Programmes "Management by Results" and "Evaluation and Performance Indicators". The Politeia Programme as presented and implemented to date covers the policy principles and basic actions that have been developed for the transformation of the public administration (and local government) in Greece. Law 28800/2001 concerns the mechanisms for implementing and monitoring this policy and for evaluating its application.

The second CSF Operational Programme "Kleisthenis"

The Kleisthenis Operational Programme for the Public Administration was implemented in the framework of the 2nd Community Support Framework. The main objective of this programme was to create the conditions for continual modernization of the administration through technical, organizational and educational interventions. The programme had a total budget of 96.4 million drachmas for the period 1994-1999, and financed:

The public administration network -SYZEFXIS

The "Syzefxis" project relates to the creation of the national public administration network and aims at the creation of a uniform technical and operational communication environment for public services with other public services and with citizens and firms. The Informatics development Service of the Ministry of the Interior, Public Administration and Decentralization is implementing the project in the Framework of the "Kleisthenis" program. After the completion of the first pilot phase of the project (connecting certain ministries and regions), its full implementation will start in 2002.

The Ariadne Programme

In the light of the need for e-government actions, many parallel initiatives have been grouped together in this program: these include the electronic version of the Citizen Guide, the 1464 call centre, the "Asterias" program, the creation of One-Stop Shops and e-forms, the simplification of administrative procedures, etc. The "Ariadne" programme is designed to improve communications with the public and the quality of service the citizen receives from the country's public services. It signals the collaboration between the central public administration and local government authorities, and will be implemented through both central and decentralized actions. The citizen will be able to access administrative information and data (e.g. e-forms) in the following ways:

- By telephone
- Via the Internet
- Through service infrastructure on the local level

These structural, providing a total of about 1000 service points, have already begun to be set up in local government authorities across Greece. These 1000 citizen service points will also be public Internet access points.

Teacher training Programmes

Primary Education

In primary education, actions relating to ICT training have included the "Uniformity of Diplomas" project, in which about 5000 teachers received training, the pilot project "Isle of the Phaeacians", which was part of the "Odyssey" programme and involved 15 primary schools, and the pilot project "All-day School", in which 560 teachers received in-school training in the 28 all-day schools.

Secondary Education

Teacher Training programmes were developed in the framework of the "Odyssey" Project, while the seminars conducted by the Ministry of Education's Regional Training Centers provided training in the use of computers and office applications to about 3000 educationists.
Within the framework of the "Odyssey" programme, three of Greece's universities (The National Kapodistria University of Athens, the Aristotle University of Thessaloniki and the University of Macedonia) developed one-year post-graduate programmes to train educationists in aspects of the introduction of ICT in education, preparing them for Ministry of Education senior staff training positions in this sector. A total of 120 cadres have been trained in this way, and are already being used in training.

The e-learning initiative

The initiative "e-learning: thinking the education of tomorrow" was approved by the European Commission on 24 May 2000. This initiative, following the conclusions of the Lisbon European Council, presented the principles, goals and lines of actions of e-Learning, which is defined as the "use of new multimedia and Internet technologies for improving the quality of learning and facilitating access to resources and services, as well as exchanges and distance collaboration". The e-Learning initiative received a very favourable response from the Ministers for Education and from the Feira European Council in June 2000.

Greek Open Source Software Initiatives

The Greek initiative for Open Source Software/ OSS is designed to promote the use of OSS in Greece (http://www.open-source.gr). This initiative is primarily addressed in those involved in primary, secondary and post-secondary education (pupils, students and teachers). The advantages of OSS go beyond no-cost acquisition and upgrading, and may be summed up in four points:
- The availability of the source code ensures the possibility of adapting it to the needs of the user as required
- The source code can be studied, thus improving collective technical knowledge
- The fact that open source user permits allow free modification of the software contributes to the creation of better quality software
- The philosophy of the open source movement is closer to the spirit of collaboration and study for the achievement of better results, an attitude inseparable form the educational process

The initiative that has been developed in this direction has already launched endeavours to translate popular software products into Greek in an attempt to create a fully user-friendly working environment. The basic parameters for the selection of software for translation are its user-friendliness, operational stability, ease of learning and ease of adaptation to it. In addition, international examples of the application of OSS in education are being studied so as to benefit from international experience and achieve optimum results.

ANNEX II: List of Interviewees

1. Ioannis Kaloghrou, Special Secretary for the OPIS
2. Ioannis Karabasis, Director of the Information Society S.A.
3. Sofia Korogiannaki, Researcher, author of the reviews for the Regional Business Plans
4. Evagelos Kratsas, Editor of the PC Master Magazine
5. Vasilios Laopodis, EU Official detached to the General Secretariat for Research and Technology (Ministry of Development
6. Dimitrios Mardas, General Secretary of Commerce, Ministry of Development
7. Marie Panopoulou, PhD Research Fellow, Center of Planning and economic research
8. Vasilios Tsakalos, PHD, JRC PRAXIS, Co-ordinator
9. Nicolaos Varsakelis, PhD, Adjunct Professor of Economics in the Aristotle University of Thessaloniki

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