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Current State of Informatics in Central, Eastern and Southern Europe: The IT STAR Experience

Plamen Nedkov (with contributions from Balint Domolki, Giulio Occhini, and Niko Schlamberger)

This article on the current state of informatics[1] in Central, Eastern and Southern Europe is based on the activities and experience of leading computer societies, representatives of academia, government, industry and civil society, as witnessed within the format of IT STAR[2], the Regional Information and Communication Technologies (ICT) Association in Central, Eastern and Southern Europe (CESE)[3]. While the article is only a "panorama shot" of the actual state of informatics in the region it provides many references to related proceedings and other sources of information for the interested reader.

Keywords: Central Eastern and Southern Europe, CEPIS, ECDL, EUCIP, IFIP, IT Education, IT Penetration, IT Star, Godollo, Research, R&D.

1 Introduction

As an introduction, we start with an anecdote which was narrated during a recent IT STAR event: There are three computer societies whose offices are on the same street. As part of its marketing strategy, the first society, with global operations, decides to install a huge display panel over its entrance with the words "The Best Society in the World". The effect is that the second society with European operations responds with a "The Best Society on the Continent" sign flickering on its billboard. The third society, poor as a church mouse, orders a doormat with "Welcome to the Best Society on this Street". The Street is supposed to represent the ICT scene in CESE and the three societies are IFIP, CEPIS and IT STAR.

To have a broader view on international activities, as perceived by the national professional societies in the CESE region, it might be helpful to briefly examine their participation in these three societies.

The "keyword" for IFIP is **technical work**. The region has given IFIP two Presidents, several Vice-Presidents and Technical Committee Chairs, one Executive Director and other officers. It has organised 3 World Computer Congresses and many other technical events. With regard to technical work, the CESE region's interests seem to gravitate around IFIP's Technical Committees (TCs): TC 1 "Foundations of Computer Science" (the first two TC chairs being from CESE); TC 2 "Software: Theory and Practice"; a traditionally strong participation in TC 3 on "Education", TC 6 "Communication Systems" and TC 7 "System Modelling and Optimisation"; TC 8 on "Information Systems"; and in some areas of computer systems technology, security, and society. The CESE region is represented in all IFIP TCs.

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The "keyword" for CEPIS is **professionalism**. Two CEPIS Presidents have come from the CESE region so far: one in the mid-90s during a period that was crucial for introducing the ECDL across Europe, and the current president. The incoming President comes from the region as well. With respect to participation, ECDL has been so motivat-

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[1] Considered in its entirety (scientific discipline, professional activity and Information and Communication Technologies applications in society).
[2] <http://www.itstar.eu>.
[3] Primary (but not exclusive) IT STAR membership region.

	IT Spending/GDP in %	IT Spending per capita in EUR	Number of PCs per 100 population
EU	2.74	614	31
EU 15	2.75	747	35
Austria	2.81	826	41
Bulgaria	1.95	54	7
Czech R.	3.01	257	20
Estonia	2.88	171	n/a
Greece	1.12	190	16
Hungary	2.45	192	15
Italy	1.75	430	26
Latvia	2.29	102	n/a
Lithuania	1.66	86	n/a
Poland	2.36	122	14
Romania	1.90	46	7
Slovakia	2.34	149	14
Slovenia	2.14	297	29

Table 1: IT Penetration by Country, 2005. Sources: EITO, IDC, OECD.

ing that it would not be an overstatement to say that some of the biggest ECDL success stories stem from CESE. The current priorities in this respect appear to be to extend the portfolio of products in ICT skills and certification by introducing repackaged and new services, i.e. initiatives by Hungary for "ECDL Select" and the e-Guardian (ECDL Foundation Endorsed Partner Programme from Lithuania). There is also the European Certification of Informatics Professionals (EUCIP) [1] as a model to define and measure ICT Skills at a higher professional level, with Italy as its main champion. Furthermore, there are many other CEPIS programmes and initiatives, such as the Task Force and position paper on University Education and the ICT Industry, in which representatives of the region have provided leadership.

The "keyword" for IT STAR is **partnership**. IT STAR does not collect membership fees. The great majority of its member societies (currently 14, but soon to increase) are also members of CEPIS and IFIP. The usefulness of IT STAR to its membership is that it focuses on Information Society issues as they relate to the CESE region, but within a European and a global context. In doing so, it builds on existing experience and connections between national ICT professionals and organisations but also involves stakeholders coming from academia, government, industry and civil society. IT STAR provides a forum to members and participants from 3 "old" European Union (EU) member states, 8 "new" EU members and 3 countries aspiring for EU membership.

To complete the "international contacts" topic it is essential to say that both government and professional organisations hold the EU and its network of ICT related institutions and activities as top priority. Since 2003, IT STAR has been monitoring the participation and progress of the region in the EU Framework programmes [2] and in other activities and programmes of the EU institutions, and has debated aspects related to the current state of informatics during its series of conferences[4].

In the same vein, there are programmes and activities of the specialised United Nations (UN) agencies with a mandate in the Information Society domain, for example UNESCO[5] and the International Telecommunications Union.

2 Information Society

Comparisons could be made between the accelerated rate of absorption of ICT in south-eastern Europe since 2000 and the same process that started in the mid-90s in Western Europe. At the start of this process, most experts were rather pessimistic about the Information Society take-up in Eastern Europe. It turned out that due to a number of circumstances related to the EU enlargement process, the period

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[4]ICT and the Eastern European Dimension, Prague, 2004 (jointly with FISTERA–IPTS/JRC-EC); R&D in ICT in Central, Eastern and Southern Europe, Bratislava, 2006; Universities and the ICT Industry, Genzano di Roma, 2007; National Information Society Experiences, Godollo, 2008.
[5] CESE is traditionally active in the Medium and Biannual plan and program activities related to ICT. It assisted the establishment of UNESCO's Intergovernmental Informatics Programme in 1985, which is now incorporated in the "Information for All" Intergovernmental Program, currently chaired by a representative of the region.

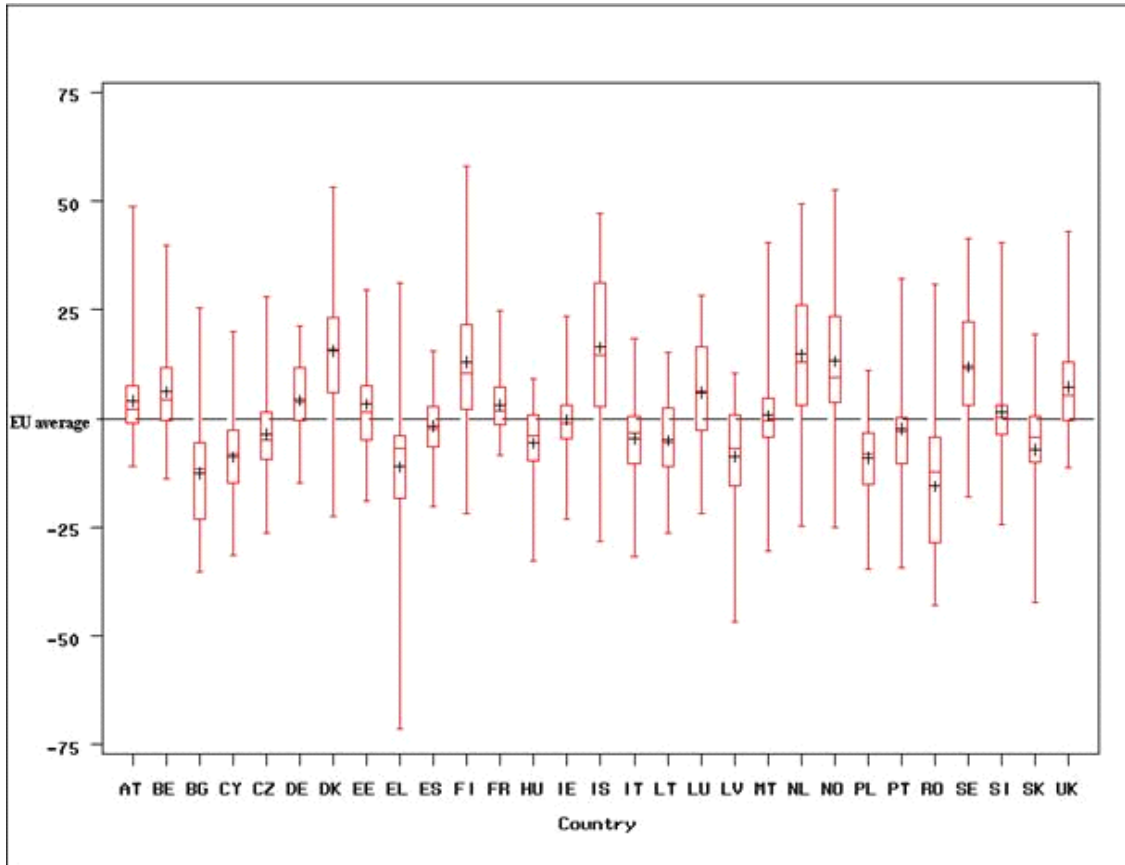**Figure 1:** Countries Performance Relative to the EU Average. Source: Commission services <http://ec.europa.eu/information_society/eeurope/i2010/infso_today/index_en.htm>.
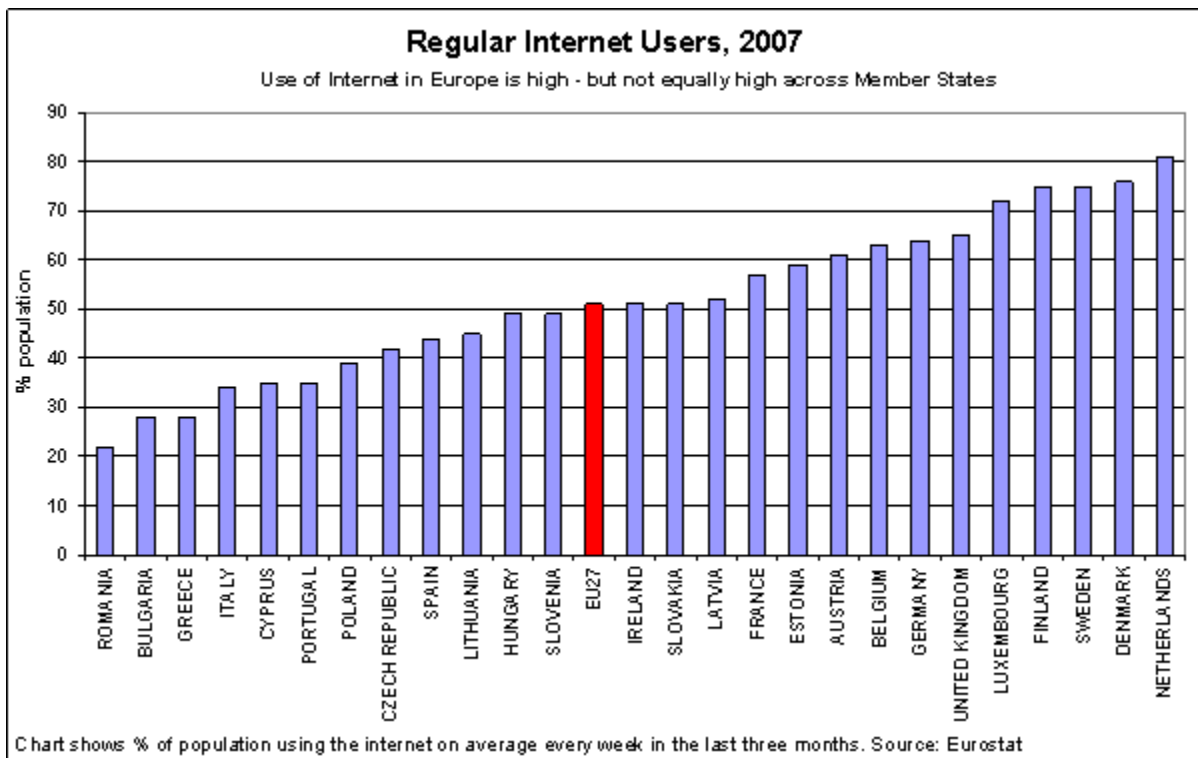

Figure 2: ICT Usage in Households and by Individuals, 2007. Source: Community Survey of ICT Usage in Households and by Individuals, 2007, Eurostat.

2003-2005 was of a relatively rapid catch-up in terms of IS Indicators. In some areas, Central and Eastern Europe (CEE) is performing better than some southern EU Member States such as Greece, Portugal and Spain [3].

The CEE region has a series of comparative advantages such as a traditionally good educational system, relatively well-qualified workforce and ICT specialists, a developed research infrastructure, acute interest on the part of the younger generation in ICT, lower labour costs and other.

The principal guiding document for Information Society (IS) development is the EU policy framework "i2010 - A European Information Society for growth and employment". The European i2010 policies serve as guiding principles to all EU Member States in the region and the annual evaluations positively influence national IS developments. The availability of EU structural funds in support of national IS projects is another important aspect which is especially appreciated by the new EU Member States.

All IT STAR countries have established a **principal strategy** that is supported by a framework of laws and regulations covering various aspects related to education, e-governance, industry, commerce and others, although their quality and their ability to adapt to changing circumstances is often questionable. The notion of the Information Society remains unclear for a large part of the population and indeed, there is no simple definition of what "Information Society" actually means[6] [4]. This is compounded by the fact that measuring the processes and the generic phenomena of the Information Society has serious handicaps. It is essential for governments to carry out comprehensive and honest public relations activities related to the Information Society and the knowledge economy since after all, the awareness of the public is critical.

With regard to IT penetration we selected the Table 1 [5].

Figure 1 [6] shows how the countries are performing relative to the EU average on 52 Information Society indicators taken together. All EU countries have strengths and weaknesses with indicators both above and below the EU average. There are three groups of countries: most advanced, for which the box lies entirely above the line, least developed, for which the box lies entirely below the line and the rest with values distributed above and below the EU average.

Figure 2 [6] shows ICT Usage in Households and by Individuals as a percentage of the overall population.

The table and graphs are certainly indicative, however, in assessing IS development, technological and macro-economic indicators should be carefully matched with other "softer" socially oriented indicators reflecting cultural tradition and workforce specifics. A study [7] made available

at the 3rd IT STAR Workshop in Godollo (Hungary) argues that "frog-leaping" cannot be achieved by simply introducing more e-services and technology, that social environments have their own rationale, accelerators and breaks and the effect of transferring technological solutions from one country to another will be different depending on the social environment. A one-sided approach might lead to inadequate policies followed by questionable measures and investments.

3 Individual Country Assessments

The following short excerpts related to individual country assessments for the new EU members plus Austria, Greece and Italy are cited from Preparing Europe's digital future i2010 Mid-term Review [6]:

■ **Austria:** "*The information society at large (connectivity, ICT usage by households, enterprises and governments) is more developed than on average in the EU. However, Austria is not one of the frontrunners, except for e-government services, for which Austria has been leading developments in the EU consistently in recent years*".

■ **Bulgaria:** "*The benchmarking results make it clear that the information society in Bulgaria is at a relatively early stage of development. However, there are some strengths, such as the adoption of broadband by Internet users, and signs that Bulgaria is leapfrogging outdated technologies to catch up with its new partners in the EU*".

■ **Cyprus:** "*Cyprus is among the lowest placed in the ranking of most information society indicators but efforts in developing e-government services and a business environment relatively favourable to ICT investment, are laying the foundations for further development, in particular with a good e-skills base*".

■ **Czech Republic:** "*The information society in the Czech Republic is still lagging behind in comparison to general developments in the EU, and for most of the benchmarking indicators it is below the EU average. However, there are signs that this may be evening out with strong progress in e-government, rapid adoption of broadband by Internet users, and a business environment relatively favourable to ICT investment and with a good e-skills base in particular*".

■ **Estonia:** "*Estonia is well advanced in the information society, with many benchmarking indicators significantly above the EU average, notably in the area of broadband connectivity, households' Internet usage and e-government services. However, the take-up of ICTs by businesses does not keep pace with these positive developments*".

■ **Greece:** "*Strong policy commitment, notably the National Digital Strategy (2006-2013), has lead to a stable improvement of most benchmarking indicators. However, despite this, the information society in Greece is still lagging behind in comparison to general developments in the EU*".

■ **Hungary:** "*The information society in Hungary is still lagging behind in comparison with the general developments in the EU, with most of the benchmarking indica-

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[6]The Slovenian Society INFORMATIKA (SSI) has proposed a definition. Interestingly, if SSI's definition is adopted as a measuring stick, most countries in the region would not qualify as information societies.

tors below the EU average. However, there are signs that this may be evening out with strong progress in developing e-government services and increases in the number of regular Internet users. The national e-Inclusion programme launched in 2007 aims to raise awareness and skills in digital technologies and should further consolidate growth. The strength of the ICT sector and the good base in e-skills in the country are also strategic assets for future development".

■ **Italy:** "*Italy presents a mixed picture on information society developments. Italy is amongst the leading countries in terms of quality and availability of e-Government services but still below EU average for fixed connectivity, digital skills of the population and use of Internet by households".*

■ **Latvia:** "*The information society in Latvia is still lagging behind in comparison with the general developments in the EU with most of the benchmarking indicators below the EU average. However, a good skills base and wide dissemination of Internet usage in the population are laying the foundations for further development".*

■ **Lithuania:** "*Lithuania lags behind with many aspects of information society development, with most of the benchmarking indicators below the EU average. However, fast progression in Internet usage by households and intensive e-commerce activities are laying the foundations for further developments".*

■ **Malta:** "*Malta is well advanced in information society, with many benchmarking indicators significantly above the EU average".*

■ **Poland:** "*The information society in Poland is still only developing slowly and for all benchmarking indicators Poland is close to the bottom of the EU ranking".*

■ **Romania:** "*The information society is at a very early stage of development in Romania which is close to the bottom of the EU rankings for nearly all benchmarking indicators: connectivity, ICT usage by households, enterprise and government".*

■ **Slovakia:** "*The information society in Slovakia is still lagging behind in comparison to general developments in the EU with most of the benchmarking indicators below the EU average. However, Slovakia has strategic advantages for future developments: a strong ICT sector, a general high level of adoption of Internet by the population, and one of the fastest growth rates of regular Internet use. The slow development of broadband, however, remains a constraint".*

■ **Slovenia:** "*Slovenia is well advanced in the information society: many benchmarking indicators are significantly above the EU average, with a leading position for e-government services and significant increases in the last three years in ICT investment by firms".*

4 The Role of Government

Governments in the region have a responsibility to provide a clear vision of their understanding of IS and on that basis to seek multi-stakeholder partnerships on IS strategies and policies. There is a need for better horizontal coor-

dination (between ministries and governmental agencies) and vertical coordination (within the sectors) on matters related to the Information Society. It is essential to have strong collaboration among government departments, academia, the business/application communities and civil society in extending the available products and services by combining and using the respective strengths and resources of all stakeholders. A particular information society-related responsibility of governments is to reduce digital illiteracy so as to include, or maintain, the active population in the labour market, and to assist the social inclusion of vulnerable population groups.

5 Education

A negative tendency in the 90s and the early 2000s was the slow but progressive decline of the educational system in most of Eastern Europe. There were many factors for this, mainly having to do with under-financing. Despite the problems, education remains high in the set of values of the population. An example of how competitive informatics education and training at the level of secondary schools was, and continues to be, is the organisation and results of national teams from the region in competitions of the International Olympiad in Informatics [8]. In some IT STAR countries there is a worrying trend of increasing the number of social sciences students at the expense of lower interest to study technical disciplines.

In 2007, IT STAR organised UNICTRY 07 [9] in Genzano di Roma (Italy) which provided a useful forum for a debate on universities and ICT education in the context of relations with the ICT industry. Along with the representatives of academia, strong input came from industry and, on the basis of the proceedings, a number of important conclusions and recommendations were made, as reflected in the following paragraphs.

All countries are involved in creating a Higher Education Area known as the Bologna Process. The next Ministerial (Anniversary) Conference will convene in Budapest and Vienna in March 2010 to consider an independent assessment report and a "Budapest-Vienna Declaration". This process is of convergence and comparability of university study programmes leading to an intensive exchange of experience and knowledge. There are important accomplishments but also weaknesses as experienced in a number of EU states, among them Austria, Bulgaria, Hungary, Italy, Romania and other. Further consideration at the national level would be important and IT STAR has recommended to its member societies to be actively involved in the discussion. In November 2009, IT STAR will provide a forum in Rome on *ICT Skills, Education and Certification: the Multi-Stakeholder Partnership*. The timing is appropriate and extends the possibility to academic and professional organisations as well as representatives of government and industry in the region to contribute to the assessment of the Bologna process.

The CESE region experiences a need for stronger collaboration between informatics departments and business/

application communities. There is also the need for strong engagement in multi-stakeholder partnership projects as the combination of governmental support, academic knowledge and business motivation positively influences the emergence of new products and services and increased competitiveness. Cooperation between universities and industry in defining competence profiles is essential to supply the labour market with professionals capable of satisfying industrial needs but also able to benefit from technological evolution.

The fact that user IT ignorance represents a major obstacle in successfully implementing and operating innovative IT solutions in business and public administration is generally underestimated. Consequently, a highly recognised and vendor neutral IT literacy programme, such as ECDL, is important in order to attain the goals of the i2010 strategy.

A few remarks with respect to ECDL: From the 8.72 million ECDL/ICDL Skill Cards issued internationally by the end of 2008, 6.67 million cards were issued in Europe and 2.04 million in the rest of the world. Within the EU, for the same reporting period there are 0.72 million cards in the new EU Member States and 5.95 million in the EU-15. On that basis and also accounting for other reported information (over 1.5 million ECDL skill cards in Italy alone) we could safely assume that approximately 3 million Skill cards are issued so far in the CESE region.

Figure 3 provides another perspective of the ECDL distribution by regions in Europe.

With respect to professional certifications there is a need to integrate new programmes and tools for the certification of professional competence, for example the European Certification for the Informatics Professional (EUCIP) programme, into university computer science courses. Respectively, industry recognition of ICT certifications is critical to support diffusion of certifications within universities. In this regard, the European Committee for Standardization/ Standardization body for the Information Society (CEN/ ISSS) Workshop on ICT-Skills and the European e-Competence Framework [10][11] could play a more prominent role, though until recently the participation of CEE representatives in CEN's Workshop on ICT Skills was negligible.

Governments have an important role and responsibility in supporting public universities and other higher education and research institutions and in promoting ICT-competences at all levels. Public awareness is critical and the further introduction of credible and internationally accepted ICT certification programmes would make it possible to successfully raise qualifications and implement new processes and ICT tools.

6 Research

The CEE countries have a legacy of well-trained ICT specialists, researchers and educators. However, in order to maintain and improve the quality of research, similar to education, sufficient financing is of absolute importance. Research is seriously under-funded which in turn has led to a significant "brain-drain" towards western research institutes, as well as from academia to the private sector.

In November 2006, IT STAR held a specialised Workshop on Research and Development (R&D) in ICT in Central and Eastern Europe [12] and the conclusions show that most of the IT STAR countries are seriously behind the Lisbon objective of the Gross Expenditure on Research and Development (GERD) reaching 3% of Gross Domestic Product (GDP). Additionally, the structure of GERD is far from ideal: most of its funding comes from government sources and much less from the business sector, therefore, establishing strong connections between academia and industry is an imperative objective in all countries.

Big multinational companies play an important role in the economies of the countries of the CESE region. There are efforts to diversify the involvement of multinationals to orient pure commerce and simple manufacturing towards more knowledge-intensive activities and this could lead to the establishment of high-level research centres in some of the CESE countries.

The internal structure of R&D activities was also considered during the Bratislava workshop. The importance of "curiosity driven" fundamental research was emphasised and this is also supported by the actions of the new European Research Council. On the other side, the research community should recognise complex software development tasks involving the application of innovative technologies as valuable results. The organisation, coordination and financing of R&D activities present a challenge for CESE countries. Measures need to be considered to help regional participation in projects within EU framework programmes (FPs), as these are the main financial tools through which the European Union supports research and development activities. FPs provide important mechanisms and sources for funding research. Unfortunately, the participation figures in previous FPs and in FP7 provide a mixed picture with some countries being seriously underrepresented *vis-à-vis* their R&D potential.

Figure 4 [12] illustrates the success rates of EU members (2006) in FP 6 - Information Society Technologies (IST).

7 R&D in the ICT Sector

With regard to ICT R&D expenditures, there is a huge disparity between Western (and in particular Northern EU members) and the new Member States (but also true for Italy and Greece), which show very low absolute levels and contribute to about 0.8% of the EU total ICT Business Expenditure on R&D (BERD) [13]. In the IT Equipment Sector most of the R&D in the Eastern EU members comes from foreign direct investment. In the Computer Services and Software sub-sector, the differences in R&D intensity and total BERD between Western and Eastern EU members appear not as large in proportion to the rest of the ICT Sector, which suggests that Software R&D could help establish a stronger R&D capacity in the region and in Europe as a whole.

8 Economics

**Total
ECDL Indexes distribution in Europe**
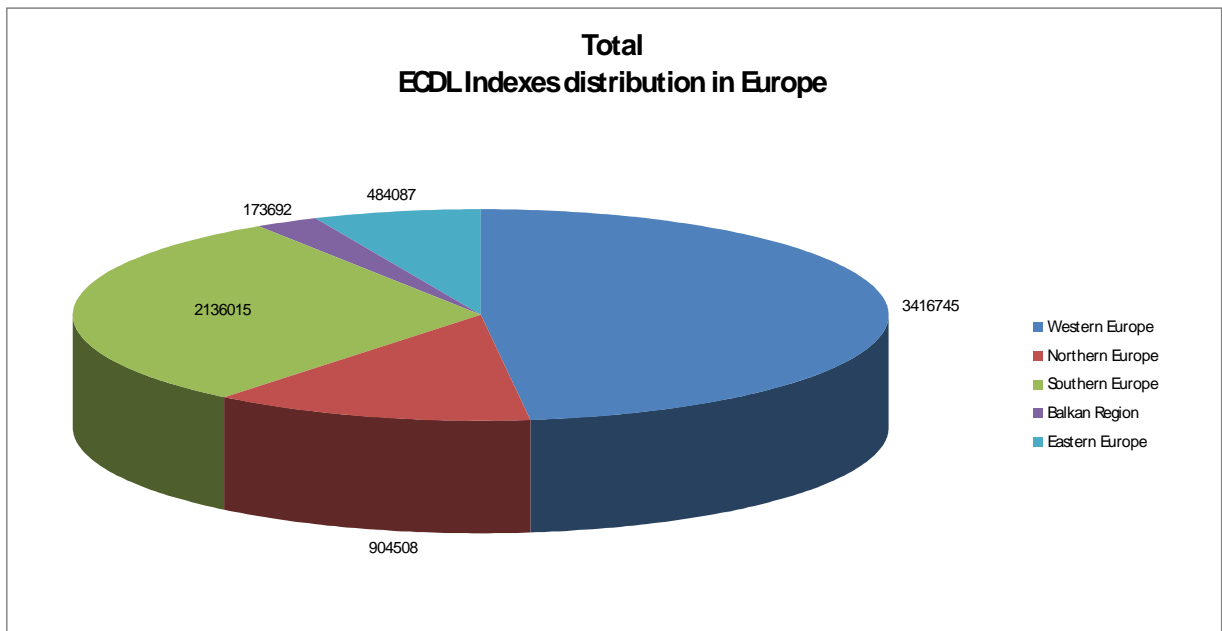
Figure 3: ECDL Distributions by Regions in Europe[7] . Source: ECDL Foundation.

[7] Western Europe: UK, IRL, GE, CH, AT, LUX, NL; Northern Europe: DK, SE, NO, FI, IS Southern Europe: ESP, IT, GR, MT, CYP, PO, TU; Eastern Europe: PL, HU, CZ, SLK, UKR, LIT, LAT, EST; Balkan Region: CRO, BiH, KOS, RO, BG, SI.

Submitted and successful participation and success rates in IST programme of 6th European Framework Programme, January 2006

Figure 4: Success Rates of EU Members in IST, 2006. Source: ICT (bmvit Austria 2006 – Presidency of the EU)

Figure 5: ICT Usage by Enterprises, 2007 [6][8] .Source: Data refer to all the enterprises, excluding the financial sector. Source: Community Survey of ICT usage by Enterprises, 2007, Eurostat.
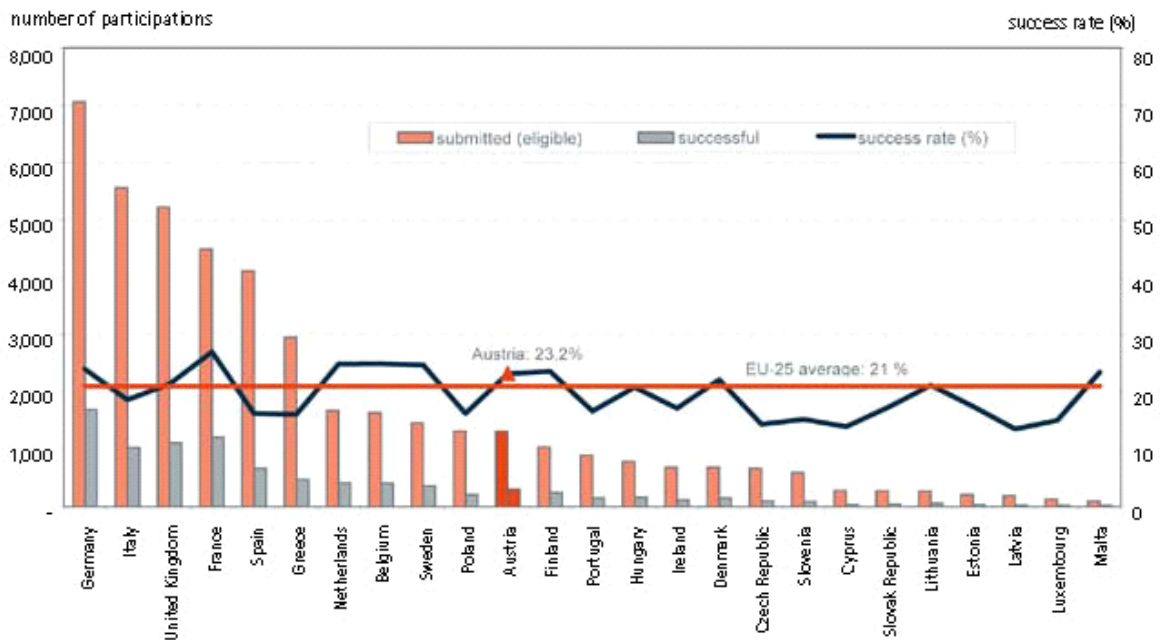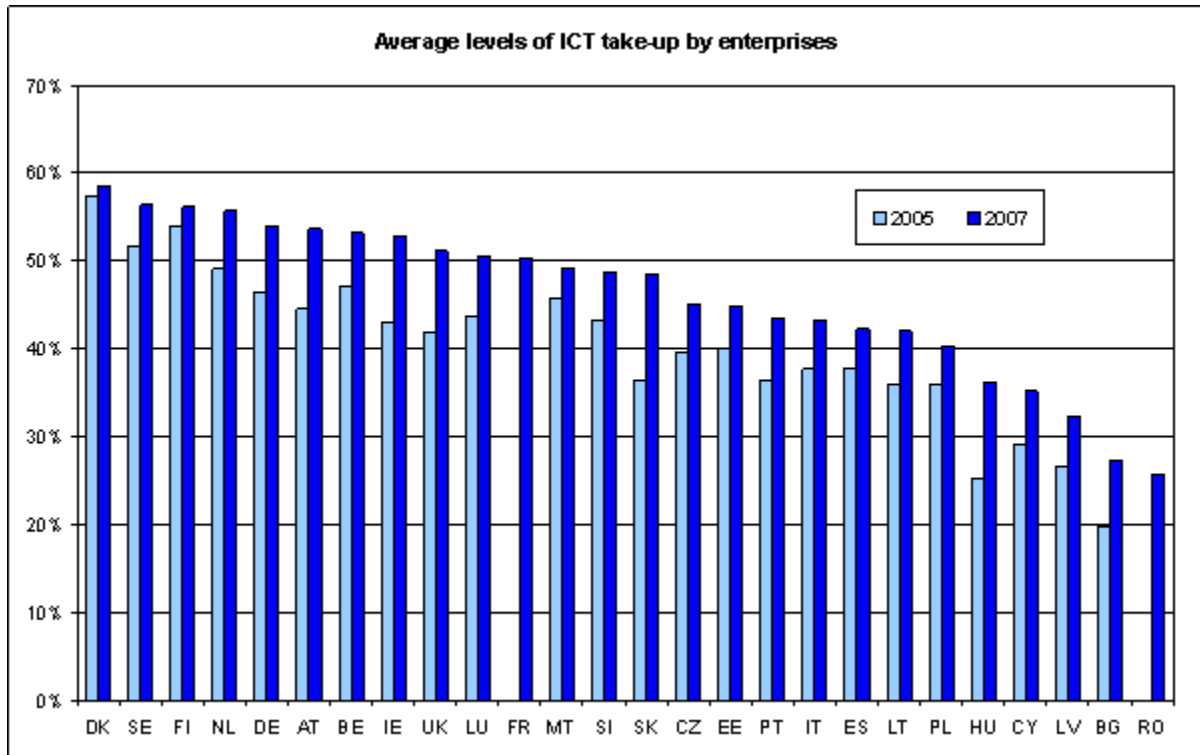
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[8] Data refer to all the enterprises, excluding the financial sector.

Strengths	Weaknesses
- Traditionally good education system. - Steady improvement of broadband infrastructure. - Growing content in national languages. - High potential of IT services exports. - National policies support e-Learning. - Availability of modern IST.	- Recent slow-down of economic development. - Lack of national (private and governmental) capital for large IST investments. - Lack of adequate policies and coordination of IST sector developments. - Demographic problems, brain-drain, digital divide.
Opportunities	**Threats**
- EU accession facilitates foreign investments in IST and contributes to workforce mobility, which in turn increases the attraction of these countries. - Niches for small specialized IST companies to meet needs across the EU. - European Regional Development Fund and Structural Fund subventions could increase competitiveness of Small and Medium Enterprises (SMEs).	- Political and economic recession in the EU. - Aging population. - Competition of South-East Asia cheap software and outsourcing of services. - Development of a "subvention" mentality which could hamper entrepreneurship.

Figure 6: SWOT Analysis of Factors for the Development of the Information Society in the Majority of New EU-Member States.

The economy of the region as in the rest of Europe is in a recession. Until 2008, the economic development of the 10 new CEE EU-members was increasing at a rate higher than that of the EU-15. Hopefully the current recession will be short-lived and these countries will soon reach a previously projected target annual growth of around 5%. Such a scenario would require a continued strong performance to catch up with the West. The ICT sector in most CEE countries has a steadily growing share of the generated GDP and the trade balance, and presents a lucrative market for foreign investment and for outsourcing activities.

The ICT integration in business processes varies greatly among countries. Slovenia's business sector is probably best equipped, but even there ICT is not sufficiently exploited in making companies more competitive (see Figure 5).

A valuable asset of most countries in the region is a relatively well-trained workforce in different fields of ICT that are available (for the time being) at lower costs than in more developed countries. How to make the best use of this asset by various outsourcing and "near sourcing" schemes, how to fight "brain-drain", on the one hand, and the competition of even lower income regions (India, China etc.) on the other, are problems that are confronted by all IT STAR member countries.

The big picture of the international ICT industry displays the cryptic slogan "Think Locally, Act Globally". If we consider the global processes and "critical mass" issue, ICT opportunities for the CEE region have far better chances of increasing within the EU format [14].

9 Conclusions

Obviously, some of the existing problems related to the Information Society in the region will disappear as economies expand and the living standards improve. However, this statement should not necessarily bring comfort to the political elite in the region as the new "info-culture" is rapidly changing the basic philosophy and practice of societal organisation. Governments, in cooperation with civil society and industry, need to be well equipped to monitor and manage the processes. Their most valuable resource is a well-educated and well-motivated population, sustained by a robust system of education and research. If these are not available they risk remaining in a position of continuously catching up.

In conclusion we offer the Strengths, Weakness, Opportunities and Threats (SWOT) analysis of factors, common for the majority **of new EU-Member States**, based on previous studies prepared for FISTERA (Figure 6) [15].

To exploit our strengths we feel that the new EU Member States and those aspiring to EU membership should concentrate on developing content in their national languages, on actively supporting the study of technical disciplines, and on investing in the ICT skills of their respective populations. In the process, EU funds and various kinds of financial support can be exploited, which is important, as any activity and change of orientation will necessarily require substantial financing. The issues that need to be compensated for are: the recession, unclear policies and demographic problems, all of which need special attention by the governments and demand actions to neutralize or overcome particular problematic areas. A revision of national Information Strategies would be most advisable, to be followed by realistic action plans with mandatory elements such as timeframes, finances, entities in charge, and deliverables. In this regard, IT STAR will continue to provide a forum for a regional and international exchange of experience.

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