2. Framing New Member States and Candidate Countries Information Society Insights*

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Introduction

Objectives and scope of this paper

One year after the EU accession in May 2004, the ten New Member States (in the sequel: NMS) passed through a challenging transition period, touching upon the information society (IS) as well. During the same time, three Candidate Countries (in the sequel: CC) continued their preparations to the accession, driven additionally by the successful 2004 enlargement. This development, although expected, had been earlier just an optimistic scenario, and its realisation gave an impulse to plan next steps in European integration.

A report devoted to the above issues has been prepared for FISTERA (Foresight of Information Society Technologies in European Research Era), as part of its members' activities. FISTERA is a network of twenty organisations, including six Core Partners, led by the Institute for Prospective Technological Studies (IPTS) – Directorate General Joint Research Centre in Seville. The aims of the underlying report were to catch elements of new trends, processes, and phenomena and describe those aspects and activities, which were considered in less detail in previous studies performed for the Commission, rather than to present a complete image of the Information Society current status and trends in all NMS & CC. It should moreover assist in finding these topics, aspects and areas, which are worth further, more penetrative studies. To know the basic information,

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background and indicators of the IS in the NMS & CC, the reader is referred to a series of FISTERA country reports (fistera.jrc.es/pages/enlargement) where one can also find two recent (2005) specialised studies on IS in Poland and Romania.

The present paper contains a summary of the above FISTERA report findings. The main objective of this paper is thus to compile and aggregate information from New Member States and Candidate Countries on IST foresight.

Specifically, we have attempted to respond to the following questions:

- What are the commonalities and differences of Research & Development (R&D) strategies, innovation strategies, foresight exercises in the different countries;
- Self-perception of New Member States and Candidate Countries on their respective status to the Information Society / Knowledge-Based Society (in the sequel referred to as IS and KBS, respectively);
- Future IST (Information Society Technologies) scenarios in the NMS and CC. This may include issues like changing societal patterns (migration, labour reserve pool, skills, etc.), key ICT applications as listed in the FISTERA IST Challenges and Drivers report (a.o. eLearning, eGoverment, etc.).

The economic and political integration within the EU is accompanied by a more global process, namely by the integration of Information Societies around the world, specifically, by the falling telecommunication prices, exchange of information through the internet and access to web information sources worldwide. The study confirms the obvious, but not commonly accepted fact that the rapid development of the such attributes of the IS corresponding to the above trends, such as the internet access, growing availability of e-government services, and content growth on the web is stable, durable and sustainable in all NMS & CC, while the observed rates of growth for most of the indicators are higher than in EU-15.

Methodology

The paper mainly compile and aggregate the existing knowledge. We have updated and enhanced the information in the existing country reports with relevant information on the IST developments in the NMS&CC.

The data sources which have been reviewed include:

- Existing reports financed by the Commission,
- reports from foresight exercises in NMS & CC,
- bibliographic and web information sources,
- research institutions reports and project databases,
- official statistical data on the IST-related R&D, industries and education

- the information from IST industrial companies, mainly reports from the publicly listed companies.

Specifically, previous research work carried out in FISTERA will be added to the sources of data to be reviewed. The recent country reports for Poland [Skulimowski, 2005] and Romania [Zamfirescu, Filip and Barbat, 2005], synthesis of national foresight studies in NMS& CCs as for instance in Czech Republic and Hungary, other reports produced in FISTERA, such as the report of the IT STAR – FISTERA Workshop on "ICT and the Eastern European Dimension" held in Prague in October 2004 and other studies presented to the European Commission.

Among various possible approaches to this type of prospective study, we decided to select first the particular aspects to focus, to comply with the FISTERA goals on one hand and to present most salient IST-related events and trends which occurred in NMS shortly before and after the EU accession. This approach was moreover justified by the existence of a series of comprehensive studies[1] presenting the background of the IS in all thirteen (as of 2005) NMS & CC.

The present study shall moreover contribute new insights to the questions which arose after the 2004' EU accession of ten countries and were not studied in detail within the Enlargement Futures and other Commission's projects. These include the following problems:

- how is the present state of the information society in NMS&CC from the points of view of its development capacity, and human resources;
- what are the scenarios for the convergence of the IS in these countries in the enlarged EU in the future until 2020, including the catch-up phenomena.

While preparing this report we have used the following sources of information:

- Legal acts and officially approved governmental documents and strategies,
- Working documents and presentations of the Ministries of Science and Information Technology, Ministries of Economy and other appropriate governmental institution in NMS&CC,
- Reports from National Foresight Programmes (wherever exist),
- Statistical data supplied by the Eurostat and national Statistical Offices,
- Publications in professional journals and IT sections of some of the relevant newspapers,
- Interviews and written opinions of IST experts and decision-makers,
- Information gathered at conferences, workshops and seminars,
- Other reports and studies, prepared by the organisations such as EITO, WEF, CapGemini and others,
- Web sites and documents published by IST companies and industrial associations.

[1] fiste.jrc.es/publications.

- Web sites and documents published by IST-related research institutions, universities and other higher learning establishments, learned societies and associations.

Overcoming the 'statistics trap'

The variety of aspects of the idea of *Information Society* makes it difficult to provide a description that is clear, unambiguous and concise. Hence it follows numerous attempts to find a quantitative description in form of a synthetic indicator, or a set of such indicators. There are manifold dangers related to such description:

a) the statistical data the indicators base on are not reliable,

b) the methodology of statistical measurement or a definition of measured variables change without noting this in statistical reports, or these changes is not noticed by the authors of synthetic indicators,

c) important aspects of IS are not included in the indicators, but this cannot be verified since the detailed description of the indicators' construction is not provided,

d) the indicators aggregate different aspects of IS using arbitrarily selected weights – by the well-known (cf. *e.g.* Skulimowski, 1996) scalarisation property of multicriteria decision analysis, all (convex) solutions can be achieved by manipulating the weights; this is often intentionally used to obtain a pre-defined ranking by suitably choosing the weights,

e) indicators rarely catch the 'human factors' of the IS, such as a potential to a sudden mobilisation of efforts of a nation or its driving forces towards progress in education, research or entrepreneurship.

As an example may serve the percentage of households with internet access reported in eEurope+ final report: the results of research show there a drastic decline of households with an internet access in the Czech Republic from 37 to 27% just between June and December 2003. Slovenia shows at the same time the decline from 42 to 39% that raises questions regarding the trustworthiness of data and the methodology. Similar problems occur with seemingly awkward values of digital readiness index [WEF, 2004] and other synthetic indicators, when the underlying methodology and/or the data gathered cannot be verified.

This is why in present study we avoid using aggregates as a base to draw conclusions – although many of them are produced and published *e.g.* by UNO agencies, World Bank, eEurope+, WEF and others. Consequently, various third-party country rankings that all base on indicators, if provided in this study, should be regarded merely as supplementary information.

Scope and structure of the paper

The underlying report covers all ten New Member States [accession in 2004] of the EU (Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia) and three Candidate Countries: Bulgaria, Romania [both expect accession in 2007] and Turkey [accession negotiations will start in October 2005]. The volume, quality and availability of information about above countries is not uniform, so – although the countries are surveyed according to the same template, their presentation does not have a uniform degree of specificity. The information available in the existing country reports is compiled, and – wherever possible – updated. The relevant information on the IST foresight is included.

There is just one common feature of the thirteen countries analysed in the present study: they have either recently joined the EU, or are officially approved as Candidate Countries to join the EU in the short or a middle-time perspective. Therefore the interest in the development of the Information Society in those countries extends to the IS in the enlarged Europe as the whole, as the pan-European IS cohesion is regarded as just a question of time, driven additionally by globalisation processes.

On the other hand, the NMS&CC have passed very different ways to the EU, shown in Table 1, which influences their attitudes towards IS.

Table 1

NMS, CC and potential CC – countries taken into account in this study are in the bold border, CEE NMS&CC – in the shaded area

Relation to the EU	Post-communist countries			Other
	COMECON	Former Soviet Republics	Former Yugoslav Republics	Mediterranean
NMS	Czech Republic, Hungary, Poland, Slovakia	Estonia, Latvia, Lithuania	Slovenia	Cyprus, Malta
CC	Bulgaria, Romania	–	–	Turkey
Potential further CC until 2020	Albania (in COMECON until 1968)	Belarus, Georgia, Moldova, Ukraine	Croatia, FYROM (Macedonia), Montenegro	Israel

The former GDR (DDR), which is not explicitly covered by this report, is a special case of the COMECON country, as it joined the EU by merging with the FRG in 1990. The 'New Federal States' are not regarded as a NMS, although they share many common features and problems with the post-communist NMS. Yet, the cohesion of the GDR with the remaining states of Germany is thoroughly studied by the NMS policy makers and also taken into account in the present

report, to avoid failed public investments that happened there, but also to elicit cases of successful IS/IST development.

The paper consists of an analytic part, including a synthesis summary of the full report[2], which contain the overview of three relevant IT applications, the SWOTC (with Challenges as a complement to Opportunities and Threats) and priority analyses, potential scenarios for the NMS&CC, and recommendations to the decision-makers; a characterisation of the IST in NMS &CC in the global context, SWOTC analysis for the ICT sector and for the R&D on IST, which describes three basic scenarios for the future. The comparative analysis of the NMS &CC includes a.o.:

1. The difference analysis among EU-15, NMS, and CC; between the NMSs, including a characterisation of IST infrastructure, IST industries, national R&D strategies, National Foresight Programmes, R&D capacities and strategies of major R&D institutions, and overall trends which influence the development of the knowledge society in the NMS & CC.

2. Scenarios for the Europe-wide integration of knowledge societies, IST indicators convergence in EU-25+CC. and the development of the Knowledge Society. This section will report scenario analyses provided in other reports as well as it will include an own scenario analysis and validation.

3. A dynamical (caught at different time frames) SWOT(C) analysis of the R&D sector in NMS.

4. A conclusion section providing a discussion of chances, challenges, and threats and policy recommendations based thereon.

The latter two parts have a more speculative character, whereas the data gathered are used to assess the future development and give a present synthetic characteristics of the IS and the IST in the NMS&CC. When analysing the technological development of IS, we referred to the novel approach to monitor technological development and the IST foresight developed by FISTERA, namely to the Technology Trajectories approach (cf. FISTERA Summary, 2004). What follows, IS technology clusters have been investigated from the point of view of their functionality, while a single technology can allow to implement numerous functions, and different technologies can compete offering the same functionality(ies). This approach has been combined with a dynamic SWOTC analysis and multi-level scenario building, where the future events critical to define a scenario have been subdivided into exo- and endogenous (from the point of view of a country). Then some dynamism, represented by the evolution rules has been applied and the different levels of scenarios have been merged to produce a selection of three most salient ones.

Beyond that, the last part includes general conclusions and recommendations for further research. This final section analyses the findings contained in the report

[2] The full report, incl. the country surveys are available at fistera.jrc.es.

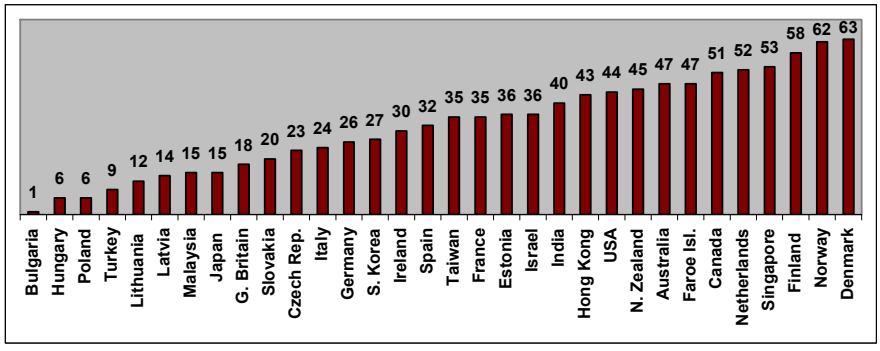
from the point of view of the decision-maker. The resulting recommendations to the decision-makers, presented in the final part , benefit from the whole set of information gathered and analysed in this report.

Summarising, the report contains original analyses based on the recent data, expert surveys, and recent policy documents, including those which emerged in the recent time as a result of EU accession of NMS or adoption of acquis in case of CCs. The resulting concise report should help updating the current state and future trends of the national R&D policies in NMS&CC, focused on IST and on the scenarios for the development of the knowledge society. The report catches generally the situation and data available until December 31, 2004, although we tried to include the updates of most relevant issues and events which arose after the above date until June 30, 2005.

Prospects of relevant IST applications in NMS&CC: e-government, e-learning, e-health

General indicators of e-government services' in NMS & CC

The study of e-government services in European countries published by Taylor Nelson Sofres in November 2003 yields the shares of the adult population using e-government services during last 12 months before the survey (TNS, 2003, cf. Fig. 1). The study is a longitudinal one, so the dynamics of change can also be grasped when referring to the previous studies (TNS 2001, 2002).



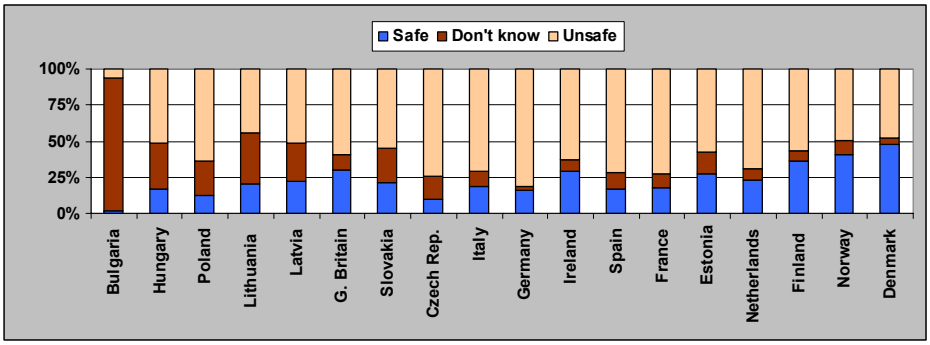
Source: www.tnsofres.com

Figure 1. Percentage share of citizens using e-government services in selected countries, including 7 NMS and 2 CC in 2003 (in % of adult population).

As we have indicated in the last section, the above data should be confronted with other indicators as the research methodology is quite clear (many respondents may be unaware of the fact that they have used an e-government service without

studying a detailed list of such services; the P&BF inquiry performed in Poland shows that citizens using local e-government functionalities, such as applying for driving license, do not classify it as e-government; the latter in the common sense is associated to e-voting, e-tax declarations, etc.). Nevertheless, the study confirms that among all NMS & CC Estonia is a leader in e-government, while the CC: Bulgaria and Romania (the latter not covered by the TNS study) are lagging behind.

An important factor affecting the use of e-government negatively is the lack of sufficient security of electronic data transmission and storage, or – at least – a subjective feeling of such discomfort motivated by past negative experience. Results of a study of these matters are shown in Fig. 2.



Source: www.tnsofres.com

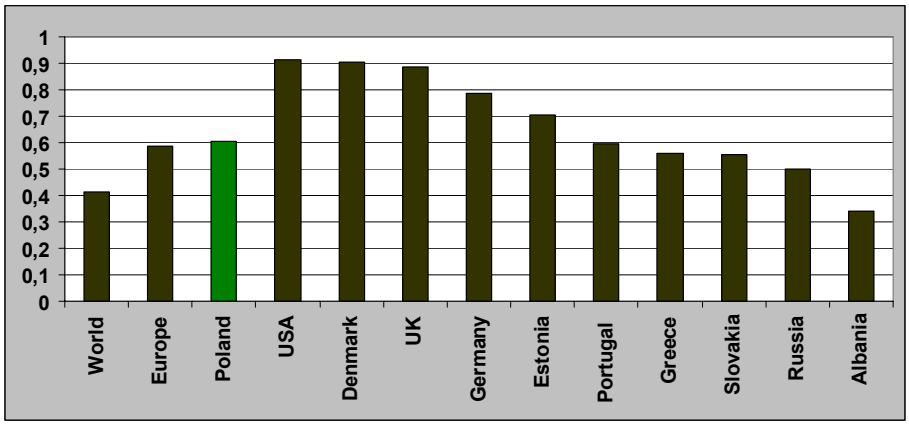
Figure 2. The Perception of E-Government safety in selected European countries including 7 NMS and 1 CC (2003 – in %)

Another indicator describing the availability of e-government services is the e-Government Readiness Index, constructed by Department of Economic and Social Affairs of the UN (2004). The index reflects both capacity and willingness of the country to use e-government services. The E-government Readiness Index is composed of three sub-indices:

- Web Measure Index (indicates the advancement of e-government services on the basis of the quantitative analysis of the web sites content).
- Telecommunications Infrastructure Index (based on 6 infrastructural indicators, such as the number of PC's per 1000 persons, internet users per 1000 persons),
- Human Capital Index (measuring the basic indicators of education process).

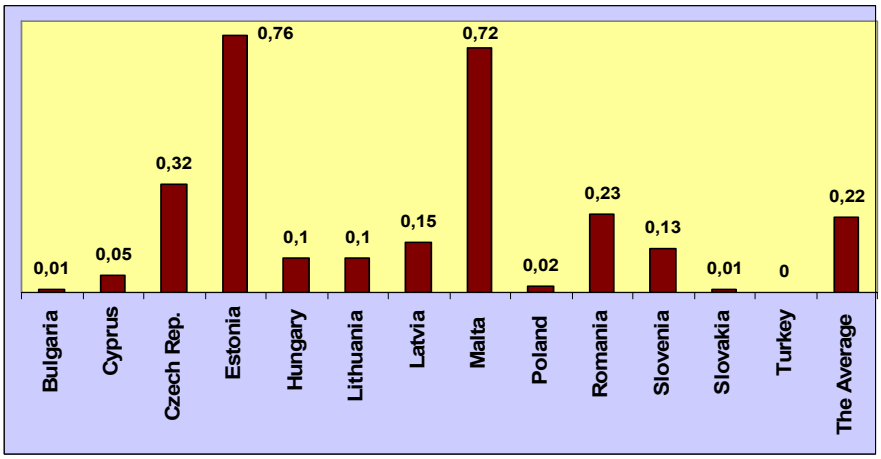
According to the above quoted UN report published in 2004, Estonia occupies the best rank among the NMS & CC and is ranked 20th in the world (191

countries taken into account) in terms of E-government Readiness Index, (cf. Fig. 3).



Source: Global E-Government Readiness Report 2004. Towards Access for Opportunity. UN Department of Economic and Social Affairs, New York, www.unpan.org/egovernment4.asp
Figure 3. E-government Readiness Index in selected countries (among them 3 NMS, 2004).

Low standard of the infrastructure is the major obstacle on the way towards more advanced application of the ICT in G2C and G2B functions. Investments in the infrastructure, especially the availability of public internet access points assuring a reliable and secure communication, is a necessary, however insufficient condition, to introduce advanced e-government functions, such as e-voting.



Source: www.mnii.gov.pl
Figure 4. Number of Internet Public Access Points (IPAPs) *per* 1000 inhabitants, in the selected NMS&CC (2003) [commercial access points (internet cafes) are not counted!].

It is worth stressing that that business oriented services (G2B) are advancing much faster and more comprehensively than services targeted at individual citizens (G2C), which is a general trend visible in all NMS&CC. The average result of online sophistication in the surveyed countries was 77% for G2B services and only 57% for G2C services. Such results seem to reflect both, the better financial capacity and substantial readiness of the business sector to adapt IST as well as the priorities set by national IST development policies. They underline the necessity of the entrepreneurship stimulation and the growth of business efficiency; while citizen oriented policies still remain lagged.

The electronic service delivery is an important but not the only one aspect of the e-government. If the e-government is considered to be a part of electronic democracy, a means to encourage civic engagement in political processes, crucial aspect of it is the problem of electronic political participation. It can be defined as the composition of three basic types of functions: e-information, e-consultation and e-decision making, and refers to all interactive tools available to citizens, which are aimed at providing information, opinions and especially feed-back information from citizens , NGOs, etc. to decision-makers on each level of the political process.

Low ranking of NMS &CC in the above and other (*e.g.* UNDP) rankings can be the result of lack of cohesive strategy on including online consultation as well as discussion fora, feed-back on specific policies and other tools of that kind to the activity of political bodies at various levels.

Prospects for e-government development in NMS&CC

The projection of the prospects of the information society in NMS at large, and the e-government services in particular, in the middle range perspective is optimistic in all NMS&CC. In the IS/KBS development policies the stress is put on, firstly – prioritisation of various aspects of public life in the context of IS functionalities, and secondly – on the problem of ICT infrastructure as a factor shaping the overall framework of the IS. The national IS strategies in the NMS and CC indicate the following priority areas:

- E-government;
- E-democracy (the enhanced civic participation in public life);
- Employment policy in the information society;
- E-science (the ICT infrastructure in the research institutions);
- E-health (the implementation of ICT in the health care system);
- E-learning;
- E-transport;
- E-tourism.

In the context of the ICT infrastructure, the satiation of basic needs is expected before 2015, varying from country to country, with Estonia and Czech

Republic performing best. It is assumed that till that moment the following parameters will characterize the status of the ICT availability in NMS&CC:

- The majority of households will have the broadband access to the Internet
- Availability of the high speed connection (10 Mbps) for 10% to 20% of metropolitan areas inhabitants'
- WiFi and WiMax standards will be available in significant parts of metropolitan areas.

Regarding economic availability of the ICT infrastructure, it is assumed that the marginal share of adult population using the Internet will be about 85-90% in 2020 (higher in most industrialised NMS, lower in countries with large rural population like Poland, Romania and Turkey) and that this penetration will be reached mainly using the mobile technologies, like 3G and 4G. It should result in the Internet penetration comparable with current level of the TV penetration.

It is stressed that at the moment most of the NMS and all CC are significantly lagged with respect to the ICT infrastructure standards, compared with the average level of the EU-25. Thus, reversing that situation demands not only the growth of the ICT infrastructure investments but surpassing the average ICT investment rate in European countries.

A survey of the e-learning state-of-the-art and perspectives in selected NMS

Below we survey some most salient e-education programmes and projects in all NMS & CC, quoting occasionally figures characterising the state of e-learning in these countries.

Czech Republic

In the CEE10 Czech Republic still has the highest number of computers with internet access in secondary schools, but only about 30% internet users are in age category 16-24 years.

Internet for schools. This project was approved by the government in 2000 with the aim to provide Internet connection to all school in the Czech Republic. However, administrative and financial problems have hindered its proper implementation. The initial plan assumed that the project would cost the state around EUR 234 million in the first four years. Teacher training would cost EUR 63 million, and EUR 25 million. Was earmarked for an educational portal from which all schools could download educational programmes for free. None of these projects has been completed yet. The largest portion of the money – over EUR 141 million – went to the project's general contractor, the consortium Český Telecom – AutoCont, for supplying the Internet connection and the computer hardware respectively. In 2002 each of the roughly 6500 elementary and secondary schools in the Czech Republic was supposed to have at least one computer with Internet access. By 2004 Internet has been accessible at more than half of them (3620

schools). The Ministry of Education also runs a number of projects that should improve the IT infrastructure, provide educational software and increase IT literacy of teachers.

IT Literacy Programme. The new Ministry of Informatics started a new national IT education programme on February 4th, 2003 with subsidized courses in computer literacy offered by Intel. The aim of the project is to enable all those who are interested to learn the basics of using a computer, and basic orientation on Internet. The two-hours intensive courses have been designed so that even people who have not yet come into contact with computers would be able to follow them. The number of participants is limited to ten per course, so that individual attention can be paid to each participant. Organizers expect that approximately 30 000 people have taken part in the courses in 2003. Besides the courses for beginners, the Ministry of Informatics and Intel will also organize courses for advanced users, who have had some basic experience with computers, but have no practical experience with Internet.

Estonia

Tiger Leap Programme. The importance of digital literacy is best expressed in Estonia's R&D strategic paper "Knowledge-based Estonia" that identifies ICT as a key area for success. The national Tiger Leap Program for computerisation of Estonian schools, launched in 1996 by President Meri, started the ICT revolution in education if not in the whole society. To accomplish educational objectives of e-Estonia, the Tiger Leap Foundation was established in 1997. In 1997–2000, besides the state financing (10,5 MEUR), the program was supported by local governments and the private sector. All this helped to bring computers into education and made IT popular among children, creating a positive spill-over effect also to their homes. Success of the Tiger Leap Program was a precondition for continuing the program. The program for changing Estonian schools into 'information society schools' was continued under the name of Tiger Leap Plus Program. The goals of this program (ICT in Estonian schools in 2001–2005) are in accordance with the educational objectives of eEurope and are focused on four priorities:

- ICT competence – development of the competence of graduates of each school level, of teachers and officials in the field of education by means of up-to-date curricula, advanced training courses and study aids;
- virtual learning – production of electronic study aids and educational software in Estonian, support to virtual collaboration of teachers, advanced training and exchange of experience, creation of virtual upper secondary school, legalisation of virtual learning;
- sustainable development of infrastructure – constant upgrading of ICT hardware and software in schools, securing high-quality Internet connections and technical support to schools in co-operation with school owners;

• collaboration of all parties involved: the state, local governments, schools, parents and organisations; elaboration and implementation of principles and different co-operation forms.

Tiger University Program. For the purpose of guaranteeing the sustainable development of ICT sector in Estonia, a National ICT Program for Higher Education (The Tiger University Program) was approved by the Estonian Government in January 2002. The Tiger University Program goals in 2002–2004 were:

• support for the development of the ICT infrastructure at higher educational establishments;

• support for the development of ICT academic staff and degree courses' infrastructure.

The Tiger University Program is administered by the Estonian Information Technology Foundation. EITF set up a private IT College to support the ICT education at other higher educational establishments. The IT College gives a three-year applied higher education, which combines both IT and telecommunications. The Ministry of Education supports the IT College and in the first years the state covers a large part of the costs.

Hungary

In the recent time *e-learning* is becoming a very important element of adult education. Apart from educating employees of SMEs indifferent skills (*e.g.* ECDL), there are successful projects for civil servants in different branches of public administration, courts, etc. and also at large companies like the Hungarian Railways. Research on the methodological aspects of e/learning is going on at several universities.

Sulinet programme. The use of IST in the education can be assessed from two viewpoints. The first is the use of IST infrastructure, PC and internet penetration rates, and the quality of IT education in the different levels of education, and the participation of inhabitants in lifelong learning. This section deals with the first aspect, but also shows some figures of the quality of IT education. The level of connectivity is one of the strengths of Hungarian information society74. In the 1980s, a programme (IF programme) was launched to install an electronic network to connect different tertiary institutions and research institutions to each other, and this process was boosted in 1992 with the NIIF-Hungarnet (National Information Infrastructure Programme). Next, in 2000 the connection of HBONE (Hungarian Research and Educational Backbone Network) to the GEANT (European Research and Educational Network) was brought about. For the primary and secondary education, a program called Sulinet was started to equip most of the schools with internet connected PCs, and as a result, both the number of connected schools and PCs with internet access available for education is high. The HBONE access network is Budapest based, and consists of several

"propeller wings" connecting the regional centres to Budapest. The minimum bandwidth is 512 kbps and the highest is 10 Gbps. There is a separate network for governmental use parallel to the HBONE network. Almost all tertiary education institutions are connected to the internet. As a result of the Sulinet program (educational network for primary and secondary schools) 99% of secondary schools are connected to the internet with at least an analogue modem, and 20% of primary schools as well.

Websites and internet use in education. 38% of all primary and secondary schools have a website (43% if we take the connected schools into account). 75% of the websites have a direct contacting opportunity, but only 17% have teaching material online on a regular basis. The use of internet as source of information, communication and searching for scholarship opportunities is very common among the teachers of tertiary level education. 80% of universities use the internet for administrative tasks, and 32% for assessing the students.

Latvia

Computerization of Latvian schools started just a couple of years ago. 92% of secondary schools have at least one computer class and 65% of secondary schools have Internet access. Some schools have better equipment in result of co-operation or pilot projects. In general, provision of ICT in schools (including professional capacity of teachers) is uneven. The situation is going to improve (even in the current situation when economy of public finances is set as a priority) as the government has allocated some money for computerisation of basic education institutions. The law on education envisages that computer science is compulsory subject in all Latvian schools beginning with the school year 2003/2004. State universities and research institutions have access to University based network LANET and use Internet free of charge for research purposes.

Lithuania

In Lithuania, according to official figures and Eurostat, 45% of the population (25–64 years) has a tertiary education (one of the highest in the world). However, in terms of digital literacy, Lithuania scores only 0.4 against 0.8 for EU 15 (SIBIS, 2003A). Also, in the eEurope+ sample, the share of those with tertiary education (16–64 years) is only 18%.

Lithuania has the lowest percentage of computers in secondary education connected to the Internet. However, 40% of Lithuanian Internet users are in the age category 16-24 years and 82% among them are accessing Internet at the place of education (eEurope+, June 2003).

Malta

In 2000 it was decided that there should be Internet access in all primary and secondary schools. The project is already complete. It has proven to be particularly

expensive because of the cost of networking in schools. The Ministry of Education claims that, while it has invested substantially in hardware in schools, IT human resources are limited in supply and since government salaries are according to pay-scales that are fixed across the board and it is not possible to IT teachers to negotiate a higher salary than teachers of other subjects, it cannot compete with the private sector in attracting the required resources. Thus, with one personal computer (PC) for every seven students, Maltese government schools boast the highest PC per student ratio in Europe and all students have Internet access, their own e-mail address and their own personal webspace, but apparently there are not enough IT teachers available. This is partly because, due to lack of foresight and proactive planning, the University did not offer IT to undergraduates pursuing teaching careers before it was actually introduced in schools. Government is trying to bridge the gap by sponsoring undergraduate teachers who have an aptitude for IT for a parttime diploma in the subject and providing IT training for teachers after-hours, but funds to finance online resources and e-learning projects are limited.

Poland

E-learning – The Polish Internet Library (PIL). The idea of PIL has been described in the policy document "Development of Information Technology – Modern Poland" in April 2001. The objectives of PIL can be stated as follows:

- to grant an equal access opportunity to publications for the inhabitants of rural areas, and other areas distant from academic and cultural centres,
- to provide students, schoolpeople and scientists with universal access to books and publications that are not commonly available.
- to give an opportunity to Polish expatriates worldwide to keep in touch with the country's tradition, culture and scientific achievements.

In August 2002 this project has been endowed by the Council of the Ministers with an initial grant of 750 thousand of PLN. The project is implemented by the MNiI itself, specifically, the responsible unit is the Department of the Information Society. The database software system for PIL has been developed by the AGH University of Science and Technology, Kraków. The formal inauguration of PIL took place on December 21, 2002. At present, www.pbi.edu.pl offers more then 23 000 titles, mainly school manuals and Polish classical literature. The are usually scanned documents available as *.pdf files. New publications are constantly being added to the collection. In the future PIL will include all Polish academic publications, publications for the blind, sheet music, maps, paintings, photographs and other graphics, scientific and documentary films, and Polish scientific periodicals. PIL will also document the Polish culture, including the museum resources, theatre performances etc. The resources of PIL can be used free of charge. It is planned that PIL will become in future an element of a Europe-wide large scale cooperative information system empowered by an advanced cooperative infrastructure for digital libraries.

Slovakia

INFOVEK & SANET2. In the education sector exceptionally strong growth in PC shipments was observed in the last several years, mainly due to both continuing and newly-launched government initiatives to provide basic IT infrastructure and the Internet access to schools. The first project, concerned IT in education, was INFOVEK. The aim of this project was to prepare the young generation in Slovakia for life in the information society of 21st century, to create the preconditions for young Slovaks to be competitive on the forming global labour. The largest project in year 2004 was "Computers for Schools", which significantly accelerated the PC penetration in schools and increased the Internet penetration throughout Slovakia.

In 2001, the Government accepted the SANET2 project, which aim was to build up a high-speed network for the Slovak academic and research community in the area of science, research and education and making possible access to information in the EU and Slovakia and support the new specialist services e.g. computer conferencing, medical consulting centers.

Slovenia

The Internet is used in 97% of primary, 100% of secondary and 100% of higher education institutions. ARNES, the Academic and Research Network of Slovenia, provides free Internet access to all educational and research institutions. Since 1994, the Ministry for Education has been supporting program RO (Computer and Information Literacy in Slovenian schools) that provided Internet access to all primary and secondary schools and also educates teachers and pupils on ICT. E-learning in SME sector is less developed as there is no systematic approach and no particular institution that takes care of the subject. The result is that e-learning is mainly left to the understanding of employers and to the perceived need of e-literacy and skills by employees.

Computer Literacy Education. Already in 1994 the Ministry of Education launched a six-years programme Computer Literacy Education to stimulate the use of computers in schools through providing finance and training. Overall, this programme was successful as it provided the additional finance to schools to buy computers and enabled the pupils to acquire basic computer knowledge. However, deficiencies remain and refer to availability of infrastructure (PCs, high-speed Internet access) and to deficient knowledge and skills of teachers to use ICT in the education process to a larger extent. Phase II of the programme named Information Literacy Education is currently being discussed and will integrate the activities of the Ministry of Education, Science and Sport and the Ministry of the Information Society, the local authorities and schools. Major initiatives to be implemented include: Slovenian network for education (SNE), computerisation of the educational structures, improving ICT education and training of educational staff, stimulating research and development related to ICT use in the schools, etc (ICT in

education, 2003). Another action undertaken jointly by the two Ministries refers to eSchools.

eSchool Project. Within the framework of Project named eSchool, undertaken by the Ministry of Information Society in co-operation with the Ministry of Education, Science and Sport, the doors of the first four eSchools in Slovenia have opened in October 2001. E-schools are regular primary or secondary schools, however their use of ICT is much broader than in other schools, owing to better infrastructure and equipment. In 2001 and 2002 both ministries spent approximately EUR 590 000 on equipping the eSchools with hardware, software and Internet access. Each of the eSchools has local area network, wide area network (usually via leased lines), server, 11 computers, laser printer, colour printer, scanner and the related software. The main objective of this project is to ensure free access to Internet to students and teachers, as well as to broader public, since the eSchools are included into the network of freely accessible public ePoints with the aim of teaching the people to live with IS. In eSchools, users can communicate electronically and use other eServices, irrespective of their computer skills as mentors provide help and instructions on how to use the ICT. The activities (especially education, group work, discussion, workshops, etc) in the e-school are prepared by the schools themselves or in co-operation with the local authorities and companies. Non-school users mainly use eSchools to search for information on Internet, to work with the documents, for educational purposes, for mail service. So far, there are 25 non-school users per day on average in eSchool.

Perspectives of e-learning in NMS&CC

Obviously, the dissemination of e-government services and e-learning tools and methodology strongly depends on availability of affordable high-speed internet connections. Entrepreneurs sceptically evaluate the hitherto government IT policy, specifically internet development in NMS&CC. They point out several fields that government could act in:

- decrease VAT for ISP (Value Added Tax for Internet Service Providers),
- support promotion of internet, a.o. by dedicated programmes,
- improve intellectual property law, especially that related to the web.

Another key issue in governmental policy is an attitude to support modern teaching and learning media in public education system and dedicated to SMEs via entrepreneurship support programmes. The government actions targeted at SMEs will be supplemented by general actions related to the:

- telecommunication infrastructure development (teleinformation networks, wired, wireless, satellite data transfer and other new telecommunication technologies),
- support for inexpensive access to extended telecommunication services,
- telecommunication and media market liberalisation.

The reduction of internet access costs which should be a result of the latter is the key issue. This is to be achieved by an increased competition in the telecommunication sector as well as by offering access to teleinformation nets through alternative infrastructures, such as cable TV, wireless access, energetic lines, UMTS, broadband nets, IP version 6. Necessary legal regulations and a more peremptorily activity of the Antimonopoly Authorities in disputes with the dominating telecoms could contribute to an improvement of this situation. Positive stimuli will come also from amendments of existing law concerned with electronic crimes and new law will be created to assure high security internet connections. "ePoland" strategy assumes close European co-operation in the above matters.

General E-learning prospects

The world trends in e-education development are very optimistic. This is one of the fastest developing sectors of new technology in US. According to IDC research, e-learning market value in the USA will increase to $18 milliards (billion) in 2005, taking into account products corporations only. European market have reached $4 milliards in 2004. The share of e-learning in whole US educational sector have reached 65% in 2004, compared to 23% in 2000. Modernisation of educational programmes, provide schools of all levels with computer systems connected to internet, train teachers, create multimedia information centres and educational content database (portals, electronic libraries, educational content servers). Stimulation of internet usage for e-learning will be accomplished a.o. by following activities:

- national culture promotion through internet,
- tele-information on countryside,
- introduction of electronic signature and electronic payment tools.

Human resources managers see growing interest in education based on IT technology. In their opinion most companies are watching development of e-learning systems trying to fit them to their needs. These companies would like to implement systems, which allow using all advantages of e-learning.

We estimate that e-learning market value will grow at the rate of 50–70% during next 3–5 years. In a short time e-learning has evolved not be just fashionable novelty, but it will become an important element of the emerging e-economy.

In NMS countries more people use internet at schools and universities compared to the "old EU".

Summary: IST infrastructure and e-application development scenarios until 2020

Before passing to the IS scenario building in the next Chapter, we have to determine how the above mentioned application interplay with selected factors and drivers of the IS development. Basic quantitative indicators refer mostly to the percentage of population having certain skills, equipment, or using certain e-services. They try also to describe the frequency or intensity of using IST in this or another way. These indicators may be useful to define a partial image of an IS/KBS. In the forthcoming scenario analysis, which is one of the main goals of this study, it is important to know whether and when the basic indicators in the NMS&CC reach the average EU level, and which of them will perform best. These in turn, as well as the poorly performing indices and a list of most competitive IST-related industries, will define an input to the subsequent SWOTC analysis.

To sum up the above characteristics of e-services in NMS&CC, in Table 2 below we have identified the dynamic mechanisms relating most relevant e-services and technologies to external drivers. All that, combined with the trends and relations analysed in the next Chapter, will help building adequate scenarios for the future IS/KBS in NMS&CC.

Table 2

Dependence of selected e-services and consumer information technologies on major IS factors in NMS&CC

Dependence Service/technology	**IT-skills dependence**	**GDP (welfare) – dependence**	**FDI-dependence**	**Policy/legal system dependence**
Mobile phones	–	weakly	strongly	weakly
e-health	weakly	diversified dependence	weakly	strongly
e-government	medium	weakly	–	strongly
e-learning	medium	–	–	medium
e-commerce	medium	strongly	weakly	weakly
e-advertising	weakly	medium	weakly	weakly
e-banking and brokerage	medium	medium	medium	weakly
e-entertainment	diversified dependence	diversified dependence	–	weakly
Digital TV	–	medium	weakly	medium
Hot spots	medium	medium	–	weakly

Source: PBF (2005)

Of course, all services strongly depend on i-accessibility and infrastructure.

IS Prospects in NMS&CC until 2020: a Synthesis

In this Chapter we will first explore the short portraits of IS in thirteen NMS & CC, as well as the analysis of IST applications contained in the previous Chapter, to elicit the similarities, differences between the NMSs and CC as compared to EU-25 and EU-15. We will take into account the IST infrastructure, IST industries, national R&D strategies, National Foresight Programmes, R&D capacities and strategies of major R&D institutions, and overall trends which influence the development of the knowledge society in the NMS & CC. Then, a dynamical SWOT (caught at different time frames and complemented by the Challenges section – SWOTC) analysis of the IS in NMS&CC will be derived from individual country's IS SWOTC analyses. Finally, we will elaborate the scenarios for the integration of knowledge societies, convergence of IST indicators to (at least) the EU-25 average. and the development of the European Knowledge Society, with all its potential diversities. We will apply the information about the development of e-services and e-government in the NMS & CC, which we have described in the previous Chapter.

IS major elements, drivers and processes

Motivated by the overall NMS circumstances, in another study (Skulimowski, 2005) we have defined major elements of an Information Society. First let us define the subject of this analysis: following the previous chapters it will be the IS in each of the countries analysed and at large, consisting of:

1. The population and its structure according to age, sex, education, welfare, relation to the labour market, professional background, psychological characteristics influencing the attitudes towards IT and innovation in general;
2. IT (and overall) education system;
3. R&D sector producing and consuming IT;
4. IT sector (industry and services);
5. Legal system and policies governing the production, trade, supply, and use of IT as well as migration and social policies influencing the IST HR development and availability;
6. IT at use by the population and the industry, including the IT infrastructure, consumer IT and telecommunications
7. Relations to the other sectors of economy: their IST absorption capacity, overall GDP growth and sustainability of country's economical system,

8. Relations to the outer IS & IT world: close EU neighbours, EU-25, most relevant IT non-EU foreign partners, and global IS society.

Among the other approaches to characterise the IS, Bogdanowicz *et al.* (2004) present another approach, listing ten factors that explain positioning of countries and regions in terms of Information Society developments in Europe:

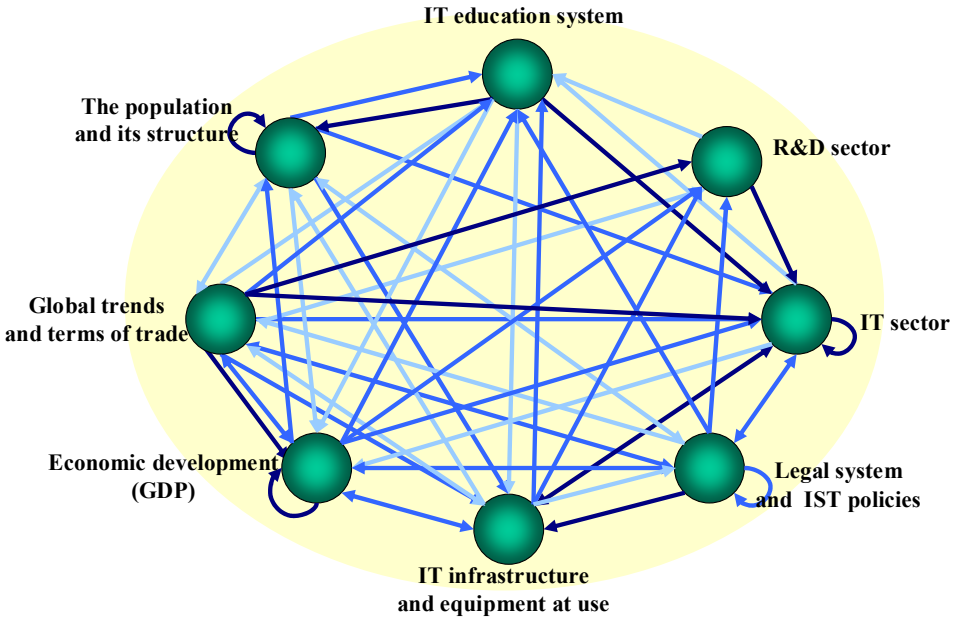
A. Growth, Macro Economic Stability & Public Finances
B. Structural changes in the economy and the role of ICT
C. The role of FDI and other financing tools
D. Corporate Sector and ICT industry
E. Holistic, committed and co-opetitive IS policies
F. Privatisation, regulation and their related institutional settings
G. EU coordination, benchmarking and policies
H. The Changing Consumption patterns
I. Education, Awareness, Literacy, Capabilities, ICT Skills
J. Creative use of essential intangible assets.

It is worth noticing that despite of different formulation and priorities, the factors ADEGI, marked in bold, correspond, in fact, to the above elements 1–8, while the others can be derived therefrom.

The main idea behind the above characteristics of elements of an IS to apply the knowledge about trends and drivers to study the relations between the IS elements in a dynamic setting. We will admit an assumption that they can be described as processes, *e.g.* the learning process, involving the education sector, but defining the educational features of the population and supplying an input to the R&D and industry sectors. While the relations and processes seem to be common for all modern societies, including the NMS&CC, their efficiency may vary strongly from country to country. A list of interrelations between these drivers and processes, with their brief characteristics, common for all NMS&CC, is given in Skulimowski (2005). The relations listed there are represented in form of an impact graph below. Only direct dependences, *i.e.* those which show immediately or within one modelling steps are marked. The indirect dependences may be obtained after multiplying the impact matrix associated to the directed graph below.

The structural impact analysis, supplemented by the analysis of technological trends and SWOTC will allow us to proceed on to the scenario generation.

To follow with a more penetrative scenario analysis, let us list in Table 3 those global trends in the social and technological developments that may considerably affect the NMS and CC.



Source: Skulimowski (2005a)

Figure 5. The relations between the elements of NMS&CC IS until 2020 represented as an impact graph: dark grey arrows denote the strong direct dependences, medium grey the mean ones, and the light grey – the weak direct dependences

Table 3

Global IS&IT trends that affect NMS&CC

Trend description	**Global effects**	**Impact on NMS&CC**	**Specific impact characterisation on different NMS&CC**
1	2	3	4
Decreasing prices of electronic components	Decreasing hardware prices worldwide	Easier access to components for assembling and services; harder access to eventual production of components	No impact diversity as no NMS&CC is a considerable producer of components
Decreasing hardware prices	Better affordability of hardware; Consumer and office hardware production remains dominated by Far East producers	The mass hardware production is no more profitable in richer NMS Growing dependence on foreign suppliers due to low-level of domestic production in the EU. It is easier to bridge the digital divide gap	The production of IT-based end-user goods, first in Slovenia, Czech Republic, then in other NMS will be endangered due to the rising labour costs; CC may benefit in middle term from the same process

Table 3

(continued)

1	2	3	4
The software lifetime becomes shorter or stable on a low level	Higher demand for IT training and e-learning, needs to replace hardware when installing new software versions; persisting high earnings of popular software producers	More difficult to bridge the digital divide gap due to a higher complicacy of new software versions; persisting infavourable terms of trade in IST for all NMS	Users in poorer NMS&CC increasingly use older versions of Windows, MS Office etc., or even old DOS software (*e.g.* in book-keeping); The IT training market In the NMS benefitting from the structural funds (ESF) flourishes due to a generous inflow of EU HRD funds
Laptops and PDAs replace desktops; Plasma and LCD replace CRT	Assembling industry becomes more concentrated worldwide	Small assembling enterprises may become endangered when laptops and PDAs (that are harder to be assembled without a specialised know-how) dominate the market	Companies assembling the desktops in some countries (Poland, Turkey) will get in trouble or be forced to change the profile of activity within 3 to 5 years
IT services are outsourced to low salary countries	Increased welfare in India, Bangladesh, Russia; decreased employment in developed countries	After a sharp rise of such services in all CEE NMS, *e.g.* in big companies clearing or book-keeping centres, one can expect a middle-term (10–15 years) decline	The service centres opened by retail networks, airlines etc. will be kept in NMS longer term only if a more profound ties between those companies and local clients are kept; There will be an inflow of such FDI in CC in 5 to 15 years
Infavourable demographic trends in Europe (touching upon all NMS, Bulgaria and Romania)	Ageing societies, increased demand for health care services; increased migrations from outside of the EU will cause an increased multiculturalism of EU societies	The migration – which was a neglected phenomenon so far – comes to richer NMS with the need to accept multiculturalism. Growing demand for multicultural content production	The decline of the birth rate seem to follow either altered aspiration of families in most of the NMS, especially in those that re-converted to the market economy or a relative poverty feeling. It may be easier reverted in the second case along with the economic progress
Higher average educational level of EU societies	Easier to bridge the digital divide, more services available only or predominantly on the web	This trend and its consequences influence all NMS and cause a sustainable demand for adult education	Some of the private tertiary learning establishments will not sustain the growing competition

Table 3

(continued)

1	2	3	4
Growing sophistication of AI-based systems allows to gradually replace translators, people responsible for monitoring etc.	This trend will accelerate in 2015–2020 resulting in job losses in some professions	There will be a push to apply sophisticated systems especially in health care, sometimes exceeding the financial capacities of NMS&CC healthcare systems	Emerging application create chances for Czech, Hungarian and Polish AI-based IST industry, with opportunities for other NMS&CC; a focus area for AI applications, such as e-health may be pre-selected
Relatively more spending on e-entertainment and publicity	Growing importance in terms of creating jobs and sales share of electronic media industry in developed countries;	Europe forced to adjust its policies to avoid staying behind these trends. A more systematic policy promoting content development, e-promotion of cultural heritage, support to innovative e-media companies will be required at the national level in NMS & CC as well	A challenge to the domestic e-media industries: they may grow if they adopt clever development strategies backed by suitable legislation and policies
Growing role of biotechnology in the supply of pharmaceutics, cosmetics, bio-fuels etc.	Countries which developed biotechnology will gain in their relative position on the global market	Poland, Bulgaria, Hungary, Slovenia shall avoid lags in pharmaceutical industry production and other biotechnology-based products	A great bio-fuels production capacity (a combination of favourable climatic conditions and arable land per citizen) in Poland, Turkey, Romania may favour these countries as the oil prices increase

Each trend generates chances, opportunities, challenges and threats that will be further analysed in the SWOTC analysis section. They do also influence directly the scenarios, as each trend may be assigned a set of potential scores, depending on the scenario admitted, that contribute either directly to the overall GDP growth score of a country, or to an IS indicator (cf. Piątkowski, 2004b). The aggregated total scores may be processed quantitatively, applying additionally the information from Fig. 5 and yielding the expected future indicators split into scenarios (cf. Skulimowski, 2005).

Social and economic trends and patterns influencing IS in NMS&CC

Another group of relevant external factors influencing the development of IS are global economic trends and terms of trade. Beyond the social factors, the development of the national economies determines the strength of the IST sector and the rates of growth of the IS indicators. The economic strength of the country and the related buyers' parity determines the speed of diffusion of recent ISTs, services and – to a lesser extent – knowledge. After fifteen years of intensive preparations and one year of the EU cohesion, all NMS have already established stable commercial ties with global leading IT suppliers. The last decade can be described as a period of fast IST use growth showing also in the volume of international exchanges, although the IT terms of trade remain unfavourable for all NMS&CC, especially in the software sector. The total IT market expectation for NMS in 2006 is around EUR 42 billion (EITO, 2005).

Below we present three scenarios of GDP growth in NMS until 2020, based on official forecasts. The data from Turkey and Bulgaria was not available, therefore the CC are not included in this analysis.

Table 4

Three most salient economic development scenarios for 10 NMS until 2020

Year	Most probable scenario		Pessimistic scenario		Optimistic scenario	
	GDP dynamics (official forecast) in %	GDP as a percentage of EU-25 average	GDP dynamics (slow-down case) in %	GDP as a percentage of EU-25 average	GDP dynamics (fast EU catch-up) in %	GDP as a percentage of EU-25 average
2005	3,6	45,2	3,4	45,1	3,7	45,3
2006	4,4	46,0	4,0	45,5	4,4	46,1
2007	5,0	47,6	3,8	46,4	5,3	47,9
2008	5,2	48,1	4,0	46,8	5,5	48,6
2009	5,5	49,5	4,2	47,4	6,0	50,0
2010	5,5	50,6	4,2	48,0	6,5	52,0
2015	5,0	59,5	4,0	52,5	6,5	65,5
2020	5,0	67,1	4,0	55,5	6,5	74,5

Source: PBF, National Statistical Offices, weighted average of national data

As regards the social and demographic factors, which are potential drivers for IST evolution in most of NMS &CC we should list :

- ageing society and the growing press on social security system affecting all CEE NMS
- persisting positive attitude towards postsecondary learning, with tertiary scholarisarion indicators reaching over 50% in all CEE NMS in 2010;

• growing mobility of workforce on one hand, and growing popularity of non-standard employment forms using IST, such as telework, on the other.

These factors combined with other socio-economic factors specific for each of the countries, establish a playground for incentives and measures to provide more thrust for the European economy in medium- and long-term horizons. The report uses these factors as a starting point for the analysis presented below, which all culminate in implications and suggestions for policy makers presented and discussed in the final Chapter.

The SWOTC analysis of IS in CEE NMS

The SWOT(C) analysis (with additional Challenges listing) below contains factors that are common for at least a majority of NMS+CC and those facts and trends which occur in one or a few countries, but influence the outer image of all NMS.

Table 5

SWOTC Analysis for CEE NMS &CC IS

STRENGTHS	**WEAKNESSES**
All or a majority of NMS&CC: • Continuously improving broadband infrastructure through national programmes and policies [NMS] • The size of the domestic online market exceeded already the economic efficiency threshold for new companies using national language content [Czech Republic, Hungary, Poland] • High potential of IT services exports [CEE NMS] • National policies strongly support e-learning [NMS] • Availability of all modern IST (distribution networks, representatives of main IT corporations)	All or a majority of NMS&CC: • Slowing-down economic development [larger NMS] • lack of own private capital to undertake large IST investments • High level of digital divide between the youth and the older population with lower or middle education level • Lack of co-ordinated ICT sector development and support policy for the innovative IST enterprises • Protectionism on the public IST services market in the EU • Demographic decline and brain-drain of IT specialists • A heritage of Soviet mentality that hampers entrepreneurship [CEE NMS&CC except SLV]
INDIVIDUAL STRENGTHS	INDIVIDUAL WEAKNESSES
Bulgaria • High interest and enthusiasm in ICT services • Good general and technical education • Talented workforce • Many ICT specialists and significant R&D potential	**Bulgaria** • Low GDP (per capita) • High telecom prices • Low PC and mobile penetration • Digital Divide • Lack of high-quality content in Bulgarian • IT Security and software piracy

• Dynamic SMEs in the ICT field	
Czech Republic • A long industrial tradition, passed from generation to generation • Availability of well-educated IT experts and the growing number of spin-offs	**Czech Republic** • R&D and higher education sector needs still restructuring
Estonia • Highly developed ICT infrastructure • Proactive government ICT promotion strategies	**Estonia** • Small internal market • Low private investment in R&D • Labour costs rising
Hungary • existence of a comprehensive information society strategy approved by the government • fairly good Internet coverage in public sector and education • relatively high proportion of broadband access at the population • wide use of ICT in many enterprises, even SMEs • very high level research network, with long traditions • fully liberalized telecom market, strong, innovative and competitive service providers • R&D establishments of multinationals in Hungary • dynamic ICT industry, with internationally recognized results in some niche markets • high level of ICT education • strong civil organizations, willing to contribute to policy making activities	**Hungary** • weak coordination and unsatisfactory financing of programmes of the information society strategy • indicators of Internet penetration and usage are rather low, as compared to EU and even to most CEE countries • high telecom prices, dominant service providers • low proportion of available public administration services on Internet • inequalities of the access to information society services on regional, educational, age etc. basis • unsatisfactory measures in IT security and consequently low level of trust of the users in IT services • lack of high-quality content (in Hungarian) • rather low IT usage in some important branches of the economy (*e.g.* agriculture)
Latvia • Strong tradition in electronics and electrotechnical sectors	**Latvia** • Poorly developed IST strategy • Small internal market • Low private investment in R&D • Labour costs rising • Declining numbers of qualified staff
Lithuania • Healthy economy, growing most rapidly among the CEE (5–6% for 2001–2005) • Well-developed IT universities producing over 500 specialists in IT and other disciplines annually	**Lithuania** • Manpower adequately skilled but needs re-training on project management and quality management of ICT projects • Delay in drafting and implementation strategies of ICT policy

• Well-trained & low-cost human resources available • Modern telecom infrastructure with a digitalisation ratio of 100% and mobile penetration of 45% • Versatile in English, Russian, German and Polish • Open economy with rule-based system aligned to the EU & WTO – economic stability • Developed financial institutions & intermediaries • Location between the EU, Nordics, Belarus & Russia. • Capacity to promptly adapt to rapidly changing IT & knowledge-based economy • Privatisation accomplished; industry re-structured based on comparative advantages • Institutional support to SME development • Well developed IT infrastructure across the region • Sound linkage between academia and industry for development applications • EU and NATO integration to provide large market opportunities for IT-enabled services • Legacy of well developed ICT sector Many IT specialists • Rapidly increasing Internet usage among youth	• Vague long-term vision for ICT development including action plans or prioritization of funds • Comparatively small market – small investment by MNCs • Foreign economic relations not formulated on the basis of national interests • Capital market in the development stage • ICT penetration not sufficient to boost e-Commerce and e-Business development yet • Logistics management poor – railway transport system physically deteriorating • Public-private partnership weak & cooperation among economic entities under-developed • Lack of incentives for R&D by business • Rapidly declining and very low fixed line penetration ratio • Weak IS government policy, slow in transposing EU acquis • Enormous discrepancy between potential of e-commerce and actual level of e-commerce • Low digital literacy
Malta, Cyprus • Relatively (vs. EU-25) high GDP per capita, highest among the NMS&CC • Relatively high level of education of citizens	**Malta, Cyprus** • Negative effect of scale: small and isolated economies do not favour IT development
Poland • Strong basic IST research • Availability of qualified IT specialists • Good business climate in the IST-related SME sector Less significant strengths: • Over-EU-25 average of management of IST companies [Poland, Hungary] • Attractive conditions for living and working for IT specialists in some cities that block migration and attract IST FDI	**Poland** • Slowing-down economic development • Foreign investors use often transfer prices for IT services; omit domestic suppliers: most endangered branches: banking and finance, telecommunications • High level of digital divide between agricultural and construction sector employees on one part, and the rest of the society, which is attributed to practically no use of IST in these sectors

[Selected sites in Czech Republic, Poland, Slovenia and Hungary] • Availability of qualified IST immigrants from NIS countries [Poland	
Romania Significant strenghts • The creation of Information Society is one of the strategic goals of the Romanian Government • One of the fastest growing ICT technology markets worldwide • Supportive policy of Romanian Government for economic growth • Liberalized telecom market • Relative strong and dynamic ICT industry • Increasing growth of the R&D expenditure Secondary and less significant strengths • There are workgroups, institutions and projects working on various issues of IST. • Specific computerisation programmes for education sector • Relative high level of ICT education • Significant increases in mobile subscribers • Rapidly growth of Internet Service Providers and Internet users	**Romania** Significant weaknesses • Weak coordination among companies, research institutions and public sector involved in IS issues • Still low R&D expenditure Secondary and less significant weaknesses • Insufficient number of highly skilled IT specialists • Low penetration of ICT in rural areas • Dialup still holds a significant role • One of the lowest mobile penetration
Slovakia Significant strengths • Development of IST is supported by Slovak Government • Favourable demand conditions of economic growth and low level of foreign debt • Liberalized telecom market • Dynamic development of mobile telecommunications and Internet services markets • High ICT investments • Presence of world-class ICT and automotive companies Secondary and less significant strengths • Active non-governmental organizations in IS promotion • High ratio of the mobile telephone • Big annual average growth rate in	**Slovakia** Significant weaknesses • Low level of R&D expenditure • The lowest value of share of foreign funding for R&D activities among the NMS Secondary and less significant weaknesses • Internet penetration is still lower than the EU average • High telecom prices • Dialup still holds a significant role

employment in high-tech manufacturing • Specific computerisation programmes for education sector **Slovenia** Significant strengths High IT and mobile telephony penetration Educated and aware population Low unemployment rate Secondary and less significant strengths Developed SW industry Understanding of importance to learn permanently Developed neighbouring countries **Turkey** • Relatively young society seeking better education and economic chances in unified Europe • Emerging dynamic industrial enterprises seeking closer economic ties to the EU	 **Slovenia** Significant weaknesses Low investment in computer skills and training by companies People do not like to change their place of living Secondary and less significant weaknesses Self-perception of the society at large is not that of IS Lack of governmental support to increase e-skills **Turkey** • Relatively lower level of education of the adult population • Digital and economic divide between the western and less developed eastern part of the country Lowest GDP among all NMS&CC
OPPORTUNITIES	**THREATS**
All or a majority of NMS&CC • Development of small specialised IST companies meeting the niche needs throughout the EU, based on the local specialists and international cooperation; • EU accession facilitates the attraction of foreign high-tech investors in the advanced services and research sectors; • NMS EU accession contributes to the increasing mobility of workforce; • Appropriate use of ERDF and SF subventions may increases the competitiveness and capital strength of IST-related SMEs; • Emergence of new high-quality and affordable IST services in health care; • Low-cost airlines make business visits in some of the NMS [Czech Republic, Hungary, Lithuania, Poland, Slovakia] more affordable; • New investment increase the overall attractiveness of the whole NMS region INDIVIDUAL OPPORTUNITIES **Bulgaria** • Proactive EU integration and catching-up	All or a majority of NMS&CC • Subvention-mentality hampers entrepreneurship [CEE NMS&CC], • Too-high taxes and labour costs slowdown the development of innovative SMEs [NMS except Slovakia, Estonia, Lithuania], • Ageing population [BG, EE, HU, PL, SLV] • Rising e-criminality becomes hampering factors for the IS development • The competition of cheap Chinese and Indian software and outsourcing of IST services makes the affected IST companies bankrupt or worsens their economic standing • Political and economical recession in the EU INDIVIDUAL THREATS **Bulgaria** • Inadequate funding of Education and Science

with developed countries in the IS field • Human Potential • ICT sector as an important driver of economic growth and attraction of foreign investment **Czech Republic, Slovakia** • High FDI in high-tech and automotive sectors that follow the EU accession **Estonia, Latvia, Lithuania** • ICT industry is FDI driven sector • Proximity and good relations with highly digitalised Nordic countries and Baltic neighbours EU integration Use of wireless solutions for Internet access and use of the cable TV network **Estonia** • Funding from EU for additional R&D • Better recording of indicators • Efficient government services using integrated databases • High level of ICT literacy across population **Hungary** • the ICT industry may become the main driver of economic growth • application of ICT in the whole economy may contribute to the increase of productivity • the level of ICT services may increase attractiveness of the country for foreign investment • the usage level of ICT tools may promote international cooperation and contacts • activities of multinationals performed in Hungary (by Hungarians) may extend also to product maintenance and support services • e-democracy may result in improving relations between government and citizens and also contribute to building of communities B) Less significant opportunities • wide usage of ICT applications should strongly contribute to the increase of competitiveness of the Hungarian economy • the use of ICT tools should also	• Brain–Drain **Cyprus** • Political crisis on the divided island may become a threat to foreign investors • Potential negative influence on the reputation of the Cypriot economy of capital investments of companies with unclear sources of capital **Estonia, Latvia** • Overdependence on Nordic economy **Hungary** • further increase of the digital divide • continues the lack of proper coordination of government efforts for the information society • financial problems in education may lead to decrease the level of IT experts on the labour market • without a high level (and well financed) R&D background, the market opportunities of the Hungarian companies (especially SMEs) may significantly decrease • size of the Hungarian market may hinder reaching critical masses in the production and marketing of products

contribute to achieving a leading role of Hungary in its geographical region as well as to enhancing the contacts with Hungarians living abroad.	
Lithuania • Development of labour-intensive sector like informatics and knowledge-based economy to serve a larger market of EU and CIS • Availability of structural funds consequent to the EU accession to provide support to business, employment promotion, improvement in quality of life, etc. • Industrialization processes based on FDI, advanced technology and international management experience to enhance competitiveness and leverage advantages to achieve export-led growth. • EU accession to expand sales markets and provide preconditions for buoyancy of foreign trade • Globalization of financial resources will provide alternative possibilities for financial resource building • Use of digital space will open wider markets and provide conditions for more efficient cooperation with better advanced economies for IT, offshore development, R&D and IT enabled services • Possibility to establish position in the transport service market of continental Europe, founding logistic centres in Kaunas, Klaipeda and Vilnius • Free movement of IT personnel to provide opportunities for application development and onshore software development	**Lithuania** • Intellectual outflow to weaken intellectual potential of Lithuania • Fear of closure of domestic ICT companies due to fierce competition unless they develop niche markets • Fear of becoming a centre of high cost production because of alignment to the EU and distortion in trade from third countries. • Loss of General Preference Systems discounts for exports to US, Canada and Japan • International environmental obligations may lead to high costs of production and other factors. • Advanced ICT countries may treat Lithuania as consumers and not as developers/partners for modern products and services thereby leaving Lithuania as a backward ICT state • Lack of coherent image of industry • Inconsistent policies and lack of critical communication may lead to fragmented growth of IT industry. • High Internet access costs and high fixed telephony charges result in persisting digital divide **Poland** • Too-high taxes and labour costs slowdown the development of innovative SMEs, • High emigration of best IT academic experts to the USA, • The lack of appropriate investors' relations with local authorities, which may lead to losses of investment opportunities
Romania Major opportunities • The ICT industry may grow much faster than the rest of the economy • Expected Romanian EU accession • Participation in pre-accession	**Romania** A) Major threats • Further insufficient financing and lack of cooperation between main actors responsible for IS • Low intensity of integration • Low competitiveness of ICT industry on a global

programmes and other EU initiatives • Increasing domestic demand and foreign direct investment • Development of new technologies • Improvement of cooperation between the companies and professionals of ICT Less significant opportunities • Identifying priority research topics for development of IS **Slovakia** Major opportunities • Significant regulatory reforms • Multi-source financing of R&D and education • Slovakia may be the world's biggest producer in automotive industry • International companies develop Software Development Centres and links with other sectors of economy, including R&D sector Less significant opportunities • Active participation in EU projects • Rising Internet penetration **Slovenia** Major opportunities Decaying classical industries (*e.g.* apparel) Less significant opportunities Regional collaboration Access to EU funds **Turkey** • Human resources allowing to develop in middle term strong IST services and R&D sector	market B) Less significant threats • Insufficient ICT infrastructure • Emigration of the best qualified researchers **Slovakia** Major threats • Further insufficient R&D expenditure Less significant threats • Emigration of the best qualified researchers • Fragmentation of e-government resources **Slovenia** Major threats Neglecting the importance of training and learning Unavailability of e-services Less significant threats • Insufficient investment in IT infrastructure **Turkey** • The economic development of the country slows down as the oil prices rise; the development gap between the western and eastern Turkey does not diminish • High emigration of best IT academic experts to the USA, which may lead to a weakening of the R&D sector within 20–30 years, • The admission of *acquis* is not progressing, • The EU accession is strongly delayed
CHALLENGES	
All or a majority of NMS&CC: The EU accession allows for competing on the EU market but removes any protection from the domestic IT market [EE, PL, CZ, HU, SLK]	
Globalisation opens new markets, but allows for growing competition in the areas of strengths of IST companies	

New European IPR regulations may jeopardise a part of software producers and IST service providers from the SME sector, but may help to achieve extraordinary incomes for a few companies [HU, PL, EE]
INDIVIDUAL CHALLENGES
Bulgaria • Compatibility with EU regulations and standards, as well as complete access to EU structures, programs and markets • Establishment of public and private partnerships
Cyprus (internal): an eventual reunification process may bring new investors and launch new development drivers, but it is related with the internal destabilisation danger
Estonia (internal): diversified national structure of the Estonian population
Lithuania, Latvia: ICT sector is FDI driven: implies a high development potential as well as limited positive impact on the development of the domestic IT SMEs, a possibility that the software production is outsourced as soon as the salaries of the IT experts grow and exceed considerably the levels in other countries
Hungary (internal) everyday use of information society services should increase the quality of life for most citizens, but the digitally illiterate would feel even more excluded the ICT sector should become a fast developing, successful branch of the Hungarian economy, but if this fails Hungary may experience an economically weaker period
Slovakia (external) Allocation of innovation expenditure in industry sector causes development of Slovak economy and growth of GDP but is a threat that Slovakia will be only *the assembly line*, with little Slovak innovation efforts. (internal) Insufficient financing R&D from public and private sources may cause decline of the quality in education system
Slovenia (external) EU countries' companies that want to extend their business have in Slovenia an access to educated and language skilled people who understand the culture and languages of their neighbours. (internal) Classical businesses that are closing down provide an opportunity for new types of e-services related as there is labour available and aware of a necessity to accept the job – provided that they are trained beforehand in good time
Romania (internal) • Fast development of the ICT industry may cause the ICT market saturation, which may negative affect the Romanian economy
Turkey • The EU accession negotiations and, adoption of *acquis* and economic convergence may fasten the growth and the education of the society or – when the expectation of the society are not fulfilled – lead to disturbances of growth

Sources: PBF, INFOBALT (http://www.infobalt.lt/english/?t=market&i=4075), Constantin B. Zamfirescu, Florin G. Filip, Boldur E. Bărbat (2005), eEurope, Balint Domolki, Niko Schlamberger, Plamen Nedkov – communications to the author

The above presented analysis does not pretend to fully describe the present state of the IST in NMS&CC, but aimed at discovering some new aspects of the IST situation after the EU accession of NMS, which has also shown a considerable impact on the CC.

Scenario building for the Information Society in NMS&CC

To construct the three basic scenarios for the information society development in all NMS&CC we will apply the set of assumptions, which are supposed to hold for all European countries (cf. Skulimowski, 2005): In particular, one can distinguish three levels of events that govern the development of a European IS:

1) The global development of IST affects the behaviour of all kinds of users and affects the competitiveness and overall economic performance of IST suppliers. Thus global technological trends define the boundary conditions for IS development in all NMS&CC. Our study shows that no IT developed in NMS&CC would strongly contribute to these trends before 2020, so the global drivers can at the same time be regarded as external.

2) The political and economical development at European and national level may affect such processes as migration of creators and users of IT, the consumers' demand, the education and attitude towards education etc. In a common opinion the consumption and development of IT and CT is most resistant against the economic and political conditions, as it is shown by a rapid development of mobile telephony and internet in relatively poor countries in Africa and Asia.

3) The third level is driven by the dynamics of local ICT community, the IS and KS policies and their implementation in NMS&CC as well as by results of different disputes at the national and European levels concerning the IST. This level may be also described in terms of an actual use of opportunities and handling the threats coming from both, inside and outside. For instance, a successful implementation of a reasonable IS development policy is a challenge while its abandonment or admittance of an unsuitable policy by the decision-makers is a threat.

The first level may be defined as the chances and constraints and may also generate threats to local industries, the second one defines the real conditions where each individual country's IS develops. The actual development of the IS and ICT proceeds at the third, national level as internal dynamics and responses to the external events and conditions.

The analysis below has been carried out assuming the following **basic political scenario**:

- The human mobility restrictions in the NMS are released according to the timetable defined during the EU-accession negotiations in 2003. Consequently, most of them are released in 2006, while Germany and Austria protect their labour market until 2011.
- All NMS enter the EURO zone in 2011 at the latest.
- Bulgaria and Romania enter the EU in 2007.
- The negotiations with Turkey start in Fall 2005 and will lead to tighten gradually the ties with that country.
- The admission of eventual further countries to the EU will not radically change the economic conditions and terms of trade of the countries analysed in the present study.

Putting together the above rules, remarks, evolution principles and individual factor scenarios with the information about the mutual dependences between IS factors allow us to present the following three major scenarios for the KBS in NMS&CC until 2020. The scenarios are shortly described in qualitative terms, as a characteristics of the IS society and ICT industry at the country level. The full description is available in the underlying FISTERA report (Skulimowski, 2005b).

Table 6

Three most salient scenarios for the IS development in NMS&CC until 2020

IS Scenario 1 ('Basic')
Economic and demographic assumptions: • After a slight decline up to 2010, the birth/death balance in the CEE NMS region remains stable as well as the natural population growth and the migration balance in terms of sex and education. The continuous slow decline in agricultural employment in Poland, Romania, Latvia, Bulgaria and Turkey is accompanied by professional re-orientation measures, including IT training • The GDP growth rate ranges between 3,5 and 5,5%, with an average ratio of 4,5% until 2020, out of which 0,5% is due to the extended use of ICT and ICT-related innovations; the GDP reaches 65–70% of the EU-25 average in 2020. FDI rises continuously until 2015, then the FDI balance fluctuates around a stable value of about EUR 30-40 billion/year. • The migration balance of IT-experts remains at the current stable level. IT, Education, Innovation: • Higher education remains a desirable goal for young people in all NMS&CC; • the higher learning ratio (the percentage of people born in the same year attending a university or equivalent) reaches 50–60%; • The current trend towards self employment continues, growing number of start-ups and SMEs using ICT as a base for their activity, and growing software and design sales; • The IST commercial partner structure remains stable, with a growing role of India and China

- The regulations follow the *acquis communautaire*, allowing the IST sector to benefit from the same development conditions as in other EU countries;
- Government continues to support innovative SMEs and the ICT use in economy.
- "Broadband for all" programme is supplemented by the UMTS and 4G and post-4G expansion. The effective (*i.e.* actually used) broadband penetration rates reach 30% by 2010, 50% by 2015 and 75% by 2020
- R&D institutions in NMS&CC continue to expand international cooperation, mostly within the EU;
- The number of international IST-related mergers and acquisitions increase, while local companies start playing a more active role after 2015;
- A few NMS software products can be distributed worldwide, likely candidates for that are a.o.: billing systems, military control and communications systems, specialised expert systems, pattern recognition software, multimedia content;
- There is no technological and know-how gap between the NMS&CC and leading European IST-related industry.
- E-health and m-health services supplement the services offered by traditional health-care institutions, especially in the preventive medicine and treatment of chronic diseases.
- Social push on the government, local government, civil society institutions and companies to provide information and interactive services on their web pages.
- The growing role of internet communications leads to an alienation of internet users and atomisation of the society,
- home-based telework becomes popular especially among women, reaching up to 10% of all employees after 2015
- After the launch of Galileo GPS applications will become more affordable, leading to an explosion of GPS-containing devices

Scenario 2 ('Optimistic')

Economic and demographic assumptions:

- After a slight decline until 2007, the birth/death balance in the CEE NMS region remains stable, after 2010 it starts to grow;
- The migration balance in terms of number and education of migrants is positive; the migration of IT-experts contribute to the know-how growth in all NMS&CC;
- All NMS reach a favourable employment structure, with the agricultural employment below 10% in 2012; professional re-orientation measures, including IT training, help in reducing unemployment by 0,5–0,7% per year;
- The GDP growth rates range between 4,5% (after 2005) and 7%, with an average ratio of 5,5% until 2020, out of which up to 0,8% is due to the extended use of ICT and ICT-related innovations; the GDP reaches 75–85% of the EU-25 average in 2020. Slovenia outperforms the EU-25 average in 2010, followed by Hungary, Czech Republic, Estonia, Slovakia, Poland
- FDI rises continuously until 2020, the FDI balance reaches the level of about EUR 40-50 bill./year.

IT, Education, Innovation:

- Higher education remains a desired goal for young people in all NMS&CC;
- The percentage of people born in the same year attending a university or equivalent) reaches 60–65%; the ratio of those studying IST-related subjects grows steadily up to the year 2020;

- The current trend to self employment continues, entrepreneurship indicators in less developed regions in the NMS areas reach those of the most developed regions around 2020;
- The number of start-ups and SMEs using ICT as a base for their activity is growing fast;
- The Governments introduces policies leading to an effective support of innovative SMEs and the ICT use in economy, including the favourable IPR legal framework;
- "Broadband for all" programme is supplemented by a rapid UMTS and 4G and post-4G expansion. The effective broadband penetration rates reach 40% by 2010, 65% by 2015 and 90% by 2020
- National and EU regulations facilitate the immigration of qualified people from outside the EU, which contributes to the development and competitiveness of the IST sector in NMS&CC
- IST-related skills are taught efficiently and extensively at schools at all levels;
- Universities in CEE NMS & CC undertake a successful reform, and are able to attract foreign students, despite of the demographically-determined EU-wide lower demand for higher education, expected after 2010; growing educational exchanges within the EU contribute to building the European Information Society and to an integration of national IS therein;
- There is a rich supply of adult IT courses subsidised by the HRD funds under various schemes
- R&D institutions continue to expand international cooperation, mostly within the EU, with international R&D mergers and takeovers;
- NMS engage more intensively in Space research, including ESA full membership, which facilitates access to most advanced IST;
- Up to 2010 a growing number of successful industry – research cooperation cases results in the entrance of new IT products on the market and a considerable IST sector growth after 2012;
- There is no technological and know-how gap between the NMS and EU-15 R&D institutions
- IST sector engages extensively in a growing internationalisation and globalisation trends in IST and IT production and services;
- A growing number of local software products can be distributed worldwide, candidates for that are: billing systems, military control and communications systems, specialised expert systems, avionics, ERP systems; banking software; ICT enterprises are competitive on the global IT market, including those offering specialised software;
- The expansion of IST is market-driven and encompasses virtually all branches of economy; it is additionally fostered by favourable terms of trade; starting from 2006 internet continues to be the major medium of information exchange between companies and their clients;
- The use of internet is based on wireless 4G+ and DSL lines. The effective broadband penetration is fostered by the availability of cheap and simplified IT devices with the functionality reduced to internet and voice communications and gaming (after 2008). Besides that they contribute to overcoming the digital divide;
- E-health and m-health services gradually replace the monitoring, diagnostics, prophylactics and – to some extent – also therapeutic functions and services offered by traditional health-care institutions; these services will contribute to the additional average life expectation growth;
- Around 2008 all basic courses, including those leading to get the IT skills, are available free of charge on the web;
- Concerted actions at EU and international level will assure a growing digital security;

- Strong push on the government, local government, civil society institutions and retail companies to provide exhaustive information and interactive services on their web pages;
- By 2020 digital libraries will provide free on-line access to all works published in national languages in Poland, Czech Republic and Hungary, and free of intellectual property dues and paid access to later work;
- Civil society institutions and the government work out measures to prevent an alienation of internet users and atomisation of the society, caused by the growing role of internet communications;
- Home-based telework becomes popular especially among women, reaching up to 10–15% of all employees after 2015;
- GPS applications will become affordable, leading to a rapid expansion of the GPS applications; NMS&CC companies will take part in this process supplying specialised equipment and software.

IS scenario 3 ('Pessimistic')

Economic and demographic assumptions:

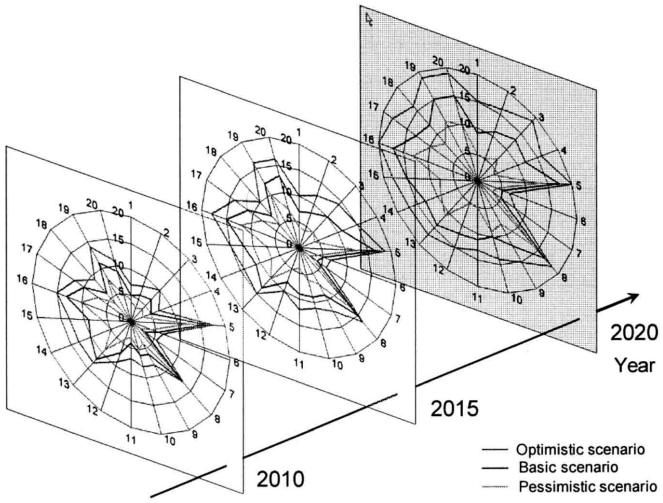
- A decline of population in CEE NMS continues, caused by the negative birth/death balance and the disadvantageous migration balance and structure;
- The professional re-orientation of farmers is slowed down as their motivation to acquire new skills, including IT training, is lower; lower GDP growth makes overcoming regional differences harder;
- The GDP growth rate of the whole NMS area ranges between 1% and 5%, with an average ratio of 3,0% until 2020, out of which 0,3% is due to the extended use of ICT and ICT-related innovations; there is no or only a moderate 'catch up' effect, GDP remains on a similar level vs. the EU-25 average in 2020 as in 2005;
- FDI stagnates around the value of about EUR 15–20 billion/year in the whole NMS area;
- The migration balance of IT-experts is negative, the re-emigration is limited.

IT, Education, Innovation:

- The money and time spent on higher education did not pay off for most graduates; it follows a disappointment and a decline in the percentage as well as in absolute numbers of students;
- After an increase in 2005–2010, the average postsecondary scholarisation ratio in NMS falls down to 35–40%, which causes a crisis in the higher learning sector;
- The attitude towards studies containing mathematics, including the IST-related subjects, remains negative;
- The current trend towards self employment disappears due to inappropriate tax and social security policies in most NMS&CC Entrepreneurship indicators are stable or even decrease, over-regulation and non-favourable taxation make risk taking unacceptable for most of SMEs, the declared support of the innovative SMEs does not change the real economic environment of the enterprises, the ICT use in economy is artificially kept on a high level, but some forced IT investments, are counterproductive;
- The regulations follow the *acquis communautaire*, but contain clauses leading to over-regulation or protection of the interests of large corporations more than those of consumers and SMEs;
- None, or inefficient promotion of domestic IST products abroad;
- "Broadband for all" programme is slowed down due to the persisting telecommunication monopolies. The demand for UMTS is lower than expected. The effective broadband penetration rate reach 15% by 2010, 25% by 2015 and 40% by 2020;
- Rigid regulations do not allow to employ qualified IT experts from outside the EU, which

hampers the development of the IT sector;
- CEE NMS Universities suffer from the demographical decline, but the structural reforms are postponed;
- Adult IT education remains on a low level;
- International R&D cooperation and participation in EU research does not reach the acceptable level;
- Universities and R&D institutions continue to avoid cooperation with industry;
- IST sector is dominated by large international players, which reduces the input of local know-how;
- Globalisation trends in IST and IT production and services are unfavourable for local companies;
- Leading national IST companies are taken over by multinationals;
- The number of new IST companies is stable or even declining. Consulting and R&D services are increasingly imported due to the lack of domestic companies;
- The expansion of IST in all branches of economy does not bring much added value to the national economies as most of the hardware and software and their implementation and installation services are imported;
- The use-of-internet rates grow more slowly than expected. The demand for UMTS is low until 2010. The digital divide remains an issue between urbanised and rural areas;
- E-health and m-health services encounter legal barriers, originating from the traditional health-care institutions, medical corporations and the health-care system;
- The development of the national language web content, including e-libraries is slow, especially in smaller NMS&CC;
- The growing role of internet communications leads to an alienation of internet users and an atomisation of the society;
- Home-based telework encounters problems due to the over-regulation of the labour law;
- The e-market grows following global trends, with the similar rates as the rest of Europe, which is insufficient to 'catch up';
- The distribution of GPS applications is lower than expected due to relatively high prices of the GPS devices.

Based on the eight fundamental IS factors analyses, in the analysis of the above scenarios one can distinguish 20 variables describing the overall performance of an Information Society. This allows us to represent the scenarios graphically in the following form (cf. Fig. 6).



Source : Skulimowski (2005b)

Figure 6. A graphical representation of the three basic IS scenarios for the NMS&CC until 2020.

The variables used in Fig. 6 are explained in the following table:

Table 7

The variables describing the IS scenarios in NMS & CC

Variable	***index in Fig. 6***	***Variable***	***index in Fig. 6***
Age structure	1	Policies	11
Welfare contrasts	2	Broadband penetration	12
IT training level	3	Migration balance of IT experts	13
Postsecondary scholarisation	4	IT education	14
No.of SMEs/1000pers.	5	Intensity of industry research cooperation	15
Overall GDP growth	6	IT sector	16
IST contribution to the GDP growth	7	e-learning	17
GDP as % of EU average in 2020	8	e-health	18
FDI	9	e-government	19
Terms of trade	10	Telecommunications	20

The scale ranges for all 20 variables in Fig. 6 are always from 0 to the EU-15 average in 2005, except the GDP, which ranges from 0 to 10%.

Final remarks, conclusions and recommendations

A complete description of all aspects of the Information Society in the thirteen NMS&CC has been neither an intention of the author of this report or such goal was defined by FISTERA. The availability of a comprehensive and still up-to-date surveys (fiste.jrc.es) exempted the author from quoting basic facts and figures. Nevertheless, it is the hope of the author that the study approaches the initially formulated goal, *i.e.* presenting those aspects and phenomena, which are characteristic for the NMS & CC, but have not been included in the previous FISTERA perspective studies.

General observations and conclusions

As we have stated in Chapter 3, the determination of the strategic goals of a Knowledge Based Society cannot be separated from the general policy goals, which is subject to the sovereign decision of a nation. Therefore, in general, the notions of 'strength', 'weakness', 'level of development', etc. is subjective and can be interpreted differently depending on the political context. In all NMS, after an enormous legislative adjustment effort leading towards the admission of the acquis communautaire that accelerated between 2000 and 2004, the policies regarding the IS/KBS coincide with those of the EC. Moreover, the general policies concerning the IS/KBS are based on the very strong political and social consensus.

This is why the above subjective notions can be anchored both, to the European policies and to the commonly accepted directions of development of the Information Society. Therefore, having in mind the existence of the strategic objectives and priorities, the role of an analyst may consist merely in a more explicit or a more precise formulation of the strategic level objectives and to propose operational recommendations on how to achieve them more efficiently, applying the report's findings and referring to the analysis of the IS factors, legislative acts concerning the IS and taking into account the trends, scenarios and SWOTC in a dynamic context, as shown in the preceding Chapter. Generally, while formulating the recommendations, which have mostly operational character, the European strategic objectives were supplemented by the middle-term KBS policy goals and taken into account jointly.

Recommendations to the decision-makers

The general recommendations below refer to all NMS&CC regarded as parts of the larger European Information Society. Some of them can be accomplished by the participation in the European initiatives and programmes carried out at the European level, such as e-Content, 6th (and subsequent) Framework Programmes etc.

1. Creation of modern IS/KBS-related policy-forming mechanisms that allow for appropriate and rapid reactions to the outer trends, chances and threats,
2. Affordable and commonly accessible e-infrastructure,
3. Availability of comprehensible and common e-government, e-learning services and policies respecting the growing role of e-health,
4. High-quality IT education at all levels, strong IST-related R&D,
5. Sustainable development of the IST sector basing on strong links with the R&D institutions and competitive on the global market,
6. Extension of common intellectual sphere in the e-space by the development of open source applications and publicly available digital content,
7. Awareness of negative aspects of IST development, such as personal alienation through e-gaming and -gambling, dependence on internet etc. and undertaking the appropriate measures when necessary.

Some specific policy recommendations (target all NMS&CC) may emerge from the analysis aiming at accelerating the development of national IST sectors in all NMS&CC, particularly the innovative SMEs and mid-major companies, where the lack of capital was often mentioned as a weakness.

Further IS-related policy recommendations may be derived from the above general principles and may touch upon only some of the NMS&CC:

- Based on the results of the National IST foresight exercises, a mechanism of continuous or fixed interval updating the IST policies should be implemented [target: countries with an advanced and still up-to-date National Foresight Programme];
- Research institutions for providing support and services to the IST sector should be created. The creation of private research establishments to be facilitated;
- Define the best technologies, measures, financing and timetable, perform a long-term impact and profitability study, make decisions as to financing the common broadband access;
- Provide continuous support to the IT school education; initiate common IT-literacy courses for adults, irrespective of their professional status, to be supported from the ESF [ESF beneficiary countries];
- Continue the deregulation of the telecommunications sector;
- Introduce incentive schemes for local governments that provide e-services to the citizens.

In addition, the decision-makers from the NMS and – in another framework – the CC should take into account the IS/KBS objectives when formulating their negotiation position at the EU (Council of EU, European Parliament, European Commission) or another supranational level for a (e.g. while negotiating the trade regulations in WTO):

- Monitoring – with other European partners – the integration of the NMS' IST sector in the European unified market; develop indicators and alert schemes;

- Support the regulations concerning the IP protection in the IST sector to the mutual benefits of European stakeholders;
- Monitoring and harmonising the development and integration of the European IS (e.g. promotion of VoIP, etc.);
- Including nationally relevant IST research priorities in the 7th and subsequent FP work programmes and in general, stimulating the participation of NMS&CC institutions and companies in European research, including the 6th and 7th FPs;
- Reforming the CAP (*e.g.* gradual shift to more research in IST and converging technologies); such policy would considerably accelerate the development of IS and economy in NMS&CC, leading to the fulfilment of the optimistic scenario in the perspective of 15–20 years;
- Strengthen the international cooperation and human resource exchange at the European level with China, India, Ukraine, Russia and other countries;
- Initiate and support actions leading to the creation of a Europe-wide know-how exchange system accessible to everybody, on a non-commercial (general education) or commercial basis (technologies, patents, know-how offered by individuals etc.);
- Initiate and support actions leading to create a European venture capital exchange.

Based on the previous discussion on the role of IST in the overall welfare growth, we would like to stress that to raise all NMS &CC to the average welfare level of the EU-15, both, a reasonable period of time must pass, and the appropriate IST-related policy measures are to be taken. Specifically, the further development of the IST industry in NMS&CC can provide solutions to solve at least a part of socio-economic problems. If accompanied by appropriate education programmes, high or hidden unemployment, which seemingly disadvantage Poland, Czech Republic, Hungary, Romania, Bulgaria, Slovakia and Turkey – when regarded as availability of workforce in a longer perspective can become their asset and chance. Even if a part of idle workforce cannot be brought to locations where free jobs exist, the ICT facilitates creating jobs in lean services or lean production in locations where workforce is available.

To create such telework environments, the following conditions have to be fulfilled:

- there should exist producers, products and production technologies, which can be cost effective if located far from large industrial zones,
- local conditions (the whole range of factors, from infrastructure to people and local authorities attitude) should be favourable.

We have shown that there exists some potential in most – if not all the NMS & CC – to fulfil the first condition. The discussion of the problem of how to create favourable local conditions and what are required actions of policy makers is left to next section of this Chapter.

It is to be noted that the population distribution is significantly different in Poland and Romania than in most of EU countries, with a relatively large percentage of Romanians and Poles living in rural areas, with a growing number of non-agricultural jobs. Although this would create significant challenges for social and political country organisation, the appropriate policies and actions might allow to exploit the 'shorter path' effect, by achieving the future organisation of a post-industrial society in a shorter time than the Western European societies developing in the same direction nowadays. For instance, an approach to combine IST-related job creation with bridging the digital divide gap in rural areas may be supported by two additional potential drivers of rural areas revitalisation: the development of agro-tourism, which encourages the use of electronic communications by the farmers, and a growing demand for 'eco-food' or 'local food' that is especially suited to be supplied by the NMS&CC farmers, but needs an intensive e-promotion. Policies that support the above drivers, *e.g.* by creating the ITC infrastructure, providing e-learning content for people in rural areas, or tax reductions for creating jobs in telework, can help contribute to the development of rural areas, as well as to assure the common access to IS services and the overall quality of life.

Another potential opportunity, pointed out in the SWOTC analysis refers to the fact that all CEE NMS&CC share the relatively well developed, although ineffective, R&D system inherited from the Soviet academia. The academia units were intended mostly to be basic-research-oriented institutes and did not play an essential role in IT and know-how transfer, while the industrial institutes, complementing the academia units, were oriented mainly towards supporting the heavy industry and the military sector. At present, the IT innovation potential resides mainly in universities and technical universities and in those research institutes, which have undertaken an intensive modernisation. The emerging strength of national IT sectors may be attributed to the opening of mostly informal – *i.e.* emerging without any intentional policies – cooperation channels between the universities, research institutions and SMEs. Further strengthening of the IT sector by the transfer of innovations and know-how, in particular the SMEs, is desired and expected due to the availability of considerable amounts of funds from the ERDF and ESF, whose distribution began in the NMS in 2004.

There are also common trends, threats and challenges that touch upon the IS development everywhere, without particularly favouring the NMS&CC, nonetheless the arising problems must be solved by each country at the national level and in a close cooperation with other countries and European institutions at the European or other supranational level. One should mention here e-criminality and pathologies related to the IST development, such as computer viruses, spam, hacking and phishing, which belong to major hampering factors on the way towards a developed and user-friendly IS. The protection of the national IST sectors can be accomplished by a diversified set of measures, such as monitoring

cybersecurity, helping protecting IP rights and abusing the IP protection mechanisms and building the international and European cooperation mechanisms to fight out e-criminality. Since the above issues are subject of concern at the European level, it is hoped that the legislation- and decision-makers in all NMS&CC are ready to undertake appropriate concerted actions and that such policies will be followed during the whole forecasting period covered by the present paper.

The reader is referred to [Skulimowski, 2005b] for other detailed recommendations.

Final remarks and acknowledgments

The trends or phenomena in NMS, which have been observed, sometimes surprisingly, after the EU accession are especially worth noticing. One shall mention here the increasing exports of high-value added goods, including IT sector products and services, the accelerating plans of major global IST players to establish R&D centres in NMS, intensive use of IT in SMEs, reaching or exceeding in some sectors the average EU-15 level, no migration explosion at all, specifically no emigration of the qualified IT people to the EU-15 and so on.

We have to mention that some relevant trends, especially those related to e-commerce, could not be analysed due to the time and scope constraints of this study. The continuing rapid development of e-banking and other financial services, fast growth and increasing maturity of the internet advertising market, strong competitive position of domestic e-auctions or e-bookstore providers winning on the local market against global players, when considered as case studies, can be a subject of a separate report.

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- EUROSTAT http://europa.eu.int/comm/eurostat
- World Bank http://devdata.worldbank.org/data-query/SMResult.asp
- FORETECH project: http://foretech.online.bg, http://www.arc.online.bg/foresight.php
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