

The Information Society in Poland: recent developments and future perspectives

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Abstract

In this paper we will provide brief characteristics of selected aspects and phenomena of the Information Society (IS) in Poland, including the current state-of-the-art as well as new trends and IS-related convergence phenomena in the context of the country's EU accession and global IST development. Poland, as a largest EU NMS with 38,2 M inhabitants and a huge IST market potential attracts the interests of investors and traders as well as market research companies and international institutions. With the anticipated GDP growth of 5.3% in 2006 and continuous inflow of FDI and a massive rise of exports to the EU, Poland outperformed earlier expectations and made optimistic long-term economic development scenarios more realistic. However, the overall positive economic climate is accompanied by potentially negative processes, such as migrations of young educated people (over 1.2 M since 2004) and persisting unemployment of the passive and less educated adults. Nevertheless, the IST development has fostered rapid improvement such attributes of the IS as the internet access, e-government services, e-learning and Polish content growth on the web. The paper will include a description of the current Polish IS, based on the data available until Summer 2006. Furthermore, we will provide a survey of new trends, processes, and phenomena focussing on those aspects and activities of the Information Society in Poland, which are of special interest to IT-Star, such as organisational structure and funding schemes for IST-related R&D, topics of emphasis of ICT research groups and IT-related education structure. To illustrate the current trends and processes, we will mention most successful Polish ITs and IT companies, IT research and education. To cope with the systematic investigation and presentation of potential scenarios, SWOTC and priority analysis, we have elaborated a novel analytic tool.

1. Introduction

In this paper we will provide brief characteristics of selected aspects and phenomena of the information society (IS) in Poland, including the current state-of-the-art as well as new trends and IS-related convergence phenomena in the context of the country's EU accession and global IST development. Poland, as a largest EU NMS with 38,2 M inhabitants and a huge IST market potential attracts the interests of investors and traders as well as market research companies and international institutions. With the anticipated GDP growth of 5.3% in 2006 and continuous inflow of FDI and a massive rise of exports to the EU (the mark of 100 US \$ billion of exports will be exceeded in 2006), Poland outperformed earlier expectations and made optimistic long-term economic development scenarios more realistic. Another goal of this paper is to catch most salient and interesting new trends, processes, and describe those aspects and activities, which were given less attention in previous studies, rather than to present a complete image of the Information Society in Poland. It should furthermore assist in finding those topics, aspects and areas, which are worth further, more penetrative studies. We will provide a characterisation of the IS in Poland in a global context with scenarios for the future, IST-induced changing societal patterns (including migrations), and a SWOTC analysis for the

ICT sector. The selected relevant IST application areas will also be described, specifically, we will give an overview of e-health, e-learning, e-government, e-commerce applications in Poland and their prospects and other topics which are of special interest to IT-Star, such as organizational structure and funding schemes for IST-related R&D, topics of emphasis of ICT research groups and IT-related education structure. To illustrate the current trends and processes, we will mention most successful Polish ITs and IT companies, IT research and education. To cope with the systematic investigation and presentation of the IS, SWOTC and priority analysis will be used as a novel analytic tool. This analysis points out the Challenges as a complement to Opportunities and Threats, becoming thus the (G)SWOTC approach. Finally, we give some general conclusions and recommendations.

To accomplish the above tasks we have used a broad variety of sources of information, including official policy documents and reports prepared on the order of Polish government, the EC, UNO, statistical data. These were supplemented by own research and analyses. The data gathered has been used to assess the future development and give present synthetic characteristics of Polish IST. IS technology clusters have been investigated from the point of view of their functionality, while a single technology can allow implementation of numerous functions, and different technologies can compete offering the same functionality(ies).

2. The institutional background for the Information Society in Poland

After the fall of the Soviet system in 1989/1990, Poland inherited a well-developed R&D infrastructure, whose central core was the Polish Academy of Sciences (PAS), a system copied from the Soviet Academy of Sciences and introduced throughout all former communist countries. The institutes of the Academy were mostly concerned with basic research, while the applied research was mainly carried out at industrial research institutes, which reported to different ministries. This system was complemented by research carried out at higher educational institutions. The latter part of the R&D sector was relatively stronger in Poland as compared to the remaining COMECON countries.

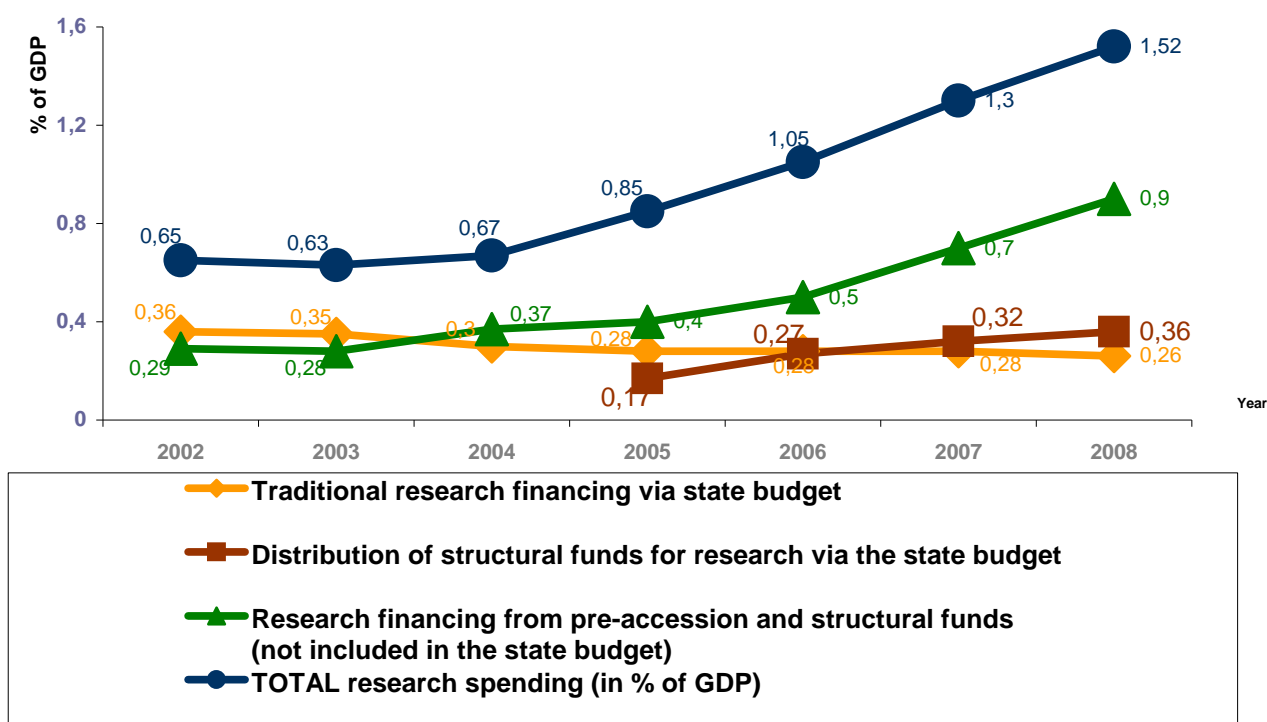
The overall R&D system, except for the fundamental scientific research and the humanities, was targeted at providing assistance to state industry and the military sector. Along with the progress of the privatisation process, most of the industrial institutes lost their clients, while the burden of basic research was too large for the transforming economy. The research spending, which had achieved a share over 2% in the 70's, fell rapidly to below 1% in the 90's. The employment in research units fell from 82,000 people in 1990 to about 35,000 in 2004.

The main player and the coordinating body for S&T policies and R&D financing is the Ministry of Science and Higher Education (until November 2005: Ministry of Science and Information Technology (MNiI)), in the sequel referred to as MNiSW or Ministry. The responsibilities of the Ministry include a.o.:

- IT infrastructure, networks and systems in administration;
- Establishment of IT standards in administration;
- Supervision and support of the IT project in public central and local administration;
- Education and vocational training in Information Technology standards;
- The development of an Information Society in Poland;
- International cooperation within the IT sector and participation in EU programmes
- Distribution of ERDF funds within the SPO-WKP (till the end of 2006) and POIG (since 2007) schemes.

In 2005 the Polish public research spending reached the level of 0.48% of GDP – one of the lowest in Europe. The number of patents per capita reaches just only 10% of the OECD average. The official expectations (Ministry of Science, 2003) concerning the research spending for the period up to 2009 contrast with the above pessimistic image. During the Poland's accession negotiations it has been agreed that a considerable part of structural funds from the EU budget for 2004-2008 and later will be devoted to support R&D activities in Polish enterprises, namely the SPO-WKP (Enterprise Competitiveness Growth for 2004-2006) and POIG (for 2007-2013) funds will be used mainly to support pro-innovative investment in SMEs and R&D activities in Polish companies and R&D units. These funds, exceeding 1 billion € annually, when matched with the private (usually own share in the EU projects) funds will contribute to the rise of R&D spending predicted for 2007-2009. An officially optimistic evolution of GERD indicators after 2005 follows the approved policy of approaching the Lisbon and Barcelona targets in 2010.

Fig. 1. The research spending in Poland with forecast of up to 2008, excluding research financed from private sources.



Source: MNiI (2003), P&BF (2005, revised 2006).

Another accelerating factor for Polish R&D in the next few years should be the military offset programmes valued US \$ 6 to 10 billion until 2010. According to the offset agreements (a.o. with Lockheed-Martin, Patria and Melara), a considerable part of the offset contracts will be used to finance technology transfer and high-tech exports requiring an implementation of advanced research results. The share of IT in offset programmes is estimated to vary between 20 and 40%.

Last but not least, we would like to mention the national R&D grant scheme whereas small basic research grants (rarely exceeding 100k EUR for a period of three years, with an average of about 30k EUR) and the corresponding “targeted” and “development” grants, which may be used to commercialise research results.

2.1. IST-related exercises within the Polish National Foresight Programme

The Polish National Foresight Programme (PNFP) was initiated in early 2003. The Initiatory Group of high-rank experts was officially established on July 22, 2003. The group has been responsible for the definition of foresight areas, the schedule, initial plan of action and the elaboration of algorithms to select expert panels. These tasks were finished until the end of 2003. Four foresight areas proposed by the Initiatory Group have been approved by the Minister of Science and Information Technology. These are:

- Health and Life
- Information and Telecommunication Technologies
- Sustainable Development
- Safety.

In 2005 the results of the Health and Life panels were submitted for a broad public consultation process. The call for offers to carry out the three remaining fields of the foresight programme has been announced by MNiSW in July 2006, with deadline in September 2006. The main goals of the PNFP have been specified as:

- Prioritisation of research areas to be used when assigning budgetary and ERDF funds for research financing,
- Providing input to the National Development Plan 2007-2013.

It is expected that the IST strand will be initiated in early 2007 while the relevant part of this exercise will be concluded in 2007. The whole programme (all four areas) is to be coordinated by the Polish Ministry of Science and Higher Education. The Foresight Division has been created within the Ministry's Department of Strategy and Development of Scientific Research.

2.2. The policy documents concerning the Information Society in Poland

On 13th January 2004 the Polish government accepted The Strategy on the Development of the Information Society in Poland for the years 2004-2006 (recommended by the Ministry of Science and Information Society Technologies in December 2003). This document puts forward three areas of priority in the context of development of the information society. They are:

- Providing all citizens with Internet access,
- Development of diverse content and services available online,
- Common ability to use ICT.

Within the broad areas mentioned above, detailed actions and objectives to be accomplished are specified. They are presented in Tab. 1 below.

Tab.1. Polish Strategy for the Information Society Development for the years 2004-2006

Priority area	Detailed objectives / projects
Providing all citizens with Internet access	Broadband Internet Access for Schools Broadband Internet in Public Administration General Internet Access Infrastructure ICT Infrastructure for Scientific Research Network security
Development of diverse content and services available online	Gateway to Poland Poland's Gateway to Europe (e.g. implementing the unified European system for the exchange of information on employment opportunities)

	The state administration's central databases Polish Content on the Internet Distance Learning Telemedicine Electronic Commerce Implementation Strategy for surface digital radio and TV broadcasting
Common ability to use ICT	Common Computer Literacy Preventing Digital Divide Developing the IT Component of Readiness for Employment

Source: E-Poland (2003)

In the context of the priority area “Common ability to use ICT”, the stress is put on the struggle against digital divide, with special emphasis on the problems of Internet access of handicapped citizens. Two out of three projects aimed at the prevention of the digital divide, currently underway are focused on the issue of the disabled access enhancement.

The above mentioned documents ePoland (2003, 2004) touches upon the specific issues, which are relevant from the point of view of this study, such as:

- the development of the telecommunications infrastructure,
- widely accessible, cheaper, faster, and more secure internet,
- the investment in human resources and development of citizens' skills,
- the stimulation of the better usage of internet,
- the internet availability expanding to the rural areas.

One of the Polish IS policy goals mentioned above is the intensive training of employees in the area of ICT. This depicts the trend to convert the Polish economy to a knowledge-based one, which is the main focus for the future. Furthermore, during public discussions on the implementation of 'informatisation' policies it has been often pointed out that a better IT infrastructure will contribute to an increase of quality and quantity of research results through easier and cheaper ways of contacting foreign research partners.

Another aspect of the IST development is the implementation of the ICT into the business environment, such as e-commerce, which is expected to contribute strongly to the efficiency of commercial processes by the general decrease of the transaction costs. Therefore the Polish legislators acknowledge the need to assure the appropriate legal conditions for electronic trade, e-payments, e-signatures and digital security. The following e-commerce-related goals, which were set out in the first stage of the e-Poland policy development (2001) are already regarded as achieved or advanced:

- to create the legal norms for the use of the ICT in business according to EU regulations,
- to develop public statistics related to “electronic market”,
- to assure the highest level of security in area of electronic trade,
- to increase confidence in the electronic trade,
- to increase the level of involvement of the SMEs in e-commerce,
- to make possible an intensive use of ICT in public procurement (electronic auctions etc.).

In the context of e-government development, the document entitled “The Framework of Actions towards E-government Development for the years 2005-2006”, prepared by the Ministry of Science and Information Society Technologies in September 2004 sets out the basic policy priorities, as well as presents the schedule of implementation of specific projects. The documents contain guidelines that indicate the direction of the development of Polish national and regional development policies to conform with the IST policy goals.

The recent launch of large IST projects at local levels, including local e-government functions, can be attributed to the recent development of regional IS development strategies in Polish regions. They imply the development of e-government applications and the development of the ICT infrastructure, all of this is to be co-financed from the ERDF. To date (October 2006), only five Voivodships have adopted a Regional Information Society Development Strategy (RISDS). While this might be regarded as a preliminary indicator of the recognition of the relevance of IS development, it is expected that all of Poland's 16 regions will follow, as the RISDS facilitates the use of ERDF (in particular the Action 1.5 of the Regional Development Programme (*ZPORR*): Development of Information Society Measures).

In 2003 the Polish Government prepared a programme in response to the needs of entrepreneurs: „ePoland – information society development strategy in Poland in the period 2004 – 2006” (which is an update to ePoland, 2001). The strategy described in the programme is targeted at:

- preparing Polish society for technical, social, and economical changes concerned with the information society and with challenges of new electronic markets and methods of work,
- adapting the Polish economy to global electronic economy requirements,
- adapting Polish law to the requirements of information society,
- creating transparent structures of public administration to enable the use of tele-information tools in an e-government framework,
- improving the competitiveness of Polish economy by increasing the innovativeness of Polish SMEs.

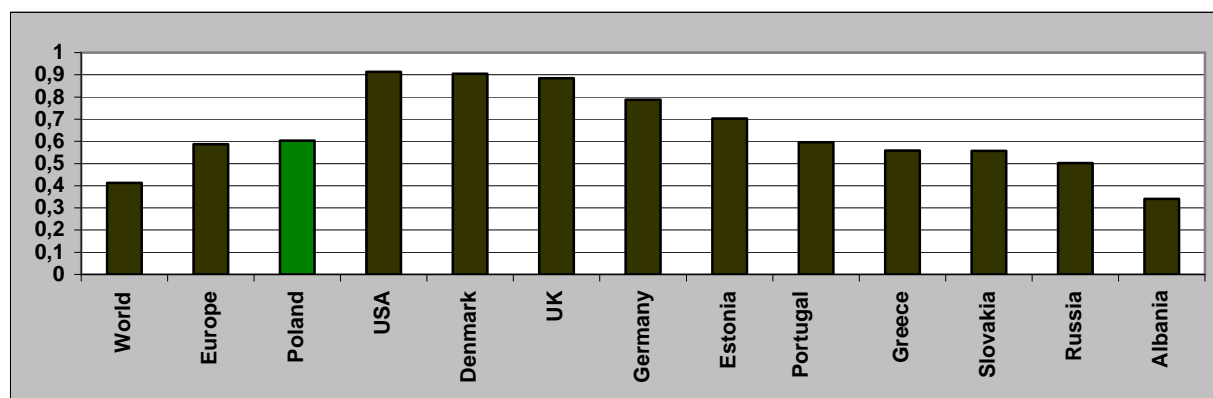
Another key issue in governmental policy is the attitude towards the support of modern teaching and learning media in the public education system and dedicated to SMEs via entrepreneurship support programmes. The government actions targeted at SMEs will be supplemented by general actions related to the:

- telecommunications infrastructure development (tele-information networks, wired, wireless, satellite data transfer and other new telecommunication technologies),
- support for cheap access to extended telecommunication services.
- Telecommunication and media market liberalisation.

3. Prospects for selected IST application areas in Poland

Poland is characterised by a relatively high – when compared to the other EU countries – population living in rural areas (38% of the whole population in 2005 according to GUS). While the migration to cities has been reduced in recent years for numerous reasons, the only way to create a participating society and to avoid social exclusion is to establish communication channels bringing rural population to the mainstream of societal activities. The principal, the most affordable and practical way to achieve this goal is to build an all-inclusive “e-society” based on internet communication. These goals may be attained by the development of e-government, e-health and e-learning functionalities created by the IST and the regulatory framework of the IS.

According to the UN report published in 2004, Poland ranked 29th in the world (191 countries taken into account) and 20th in Europe in terms of E-government Readiness Index, a slight progress if compared with the 32nd place in 2003. The score of Poland (0.6026) is slightly higher than the average for Europe (0.5866) and higher than the world average (0.4130 – cf. Fig. 2). Further analysis shows that the score of Poland is very high if the human capital index is taken into account (0.95), relatively high compared to web measure index (0,579) and very low in case of the telecommunications index (0,279). It proves that the accomplishments in education of the society remain the advantage of Poland in the context of openness towards ICT use in public life, including public administration activity. At the same time the low standard of the infrastructure is the major obstacle on the way towards more advanced application of the ICT.

Fig. 2. E-government Readiness Index in selected countries (2004)

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

The official projection of the prospects of the information society in Poland in the middle range perspective is contained in the document entitled “*The Proposed Directions of the Information Society Development to the year 2020*” issued in late 2004. The document refers mostly to these aspects of societal and economic life, which are highly determined by the state activity. Consequently, the stress is put on prioritisation of various aspects of public life in the context of information society development, and on the problem of ICT infrastructure as a factor shaping the overall framework of development opportunities. Among the priorities for the development of information society the document highlights following 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.

We describe some of them in more detail below.

3.1. E-government services in Poland

Bearing in mind the equal opportunity principle, the common access to e-government services is conditioned by providing all citizens with Internet access, or at least by establishing a network of public Internet access points. According to the policy documents discussed in Sec. 2, they should be established in each Polish commune while Internet information centres should be opened in public schools. None of these projects has been finished yet as the deadline of their final implementation is set for the end of 2006. In addition, for the e-government development the construction of the Gateway to Poland platform is of crucial importance since it will serve as an integrated electronic platform of public services delivery.

In March 2005 the Ministry of Science and Information Technologies published “The comparative position of Poland in basic categories of e-government services”. Among various services delivered by the public administration via internet, two basic categories can be pointed out based on the target group of the specific service: “Government to citizen” (G2C) – with its reverse (C2G) services, and the second one, “government

to business” and reverse (G2B) services. According to the report on the online availability of public services in Europe prepared by CapGemini for the European Commission in October 2004 (CapGemini, 2005) Poland is ranked 27th of 28 European countries surveyed in the context of overall sophistication of online services. The survey included the 25 EU member states, Switzerland, Norway and Iceland. The sophistication of online services was measured in terms of the four levels of e-government advancement. It was based on the characteristics of four service levels, defined in the following way:

- information only available online,
- one-way interaction possible between government and citizen/business,
- bi-directional interaction possible,
- full electronic case handling (high level of automation of public services).

Another indicator was full electronic availability of public services. In this ranking Poland was 26th (Switzerland and Latvia were the last two). Out of the 20 different services taken into account, 12 were G2C, while 8 of them were G2B services. Among 12 services directed towards individual citizens, one is not available in electronic form at all (student grants), while only one (medical costs) is ranked in the group of ten most advanced countries. The overall advancement of online services in Poland is greater in the case of G2B services. Two out of eight services are fully available electronically (social security payments – and customs declaration). Only one service is not available at all (submission of data to statistical office), but it is worth stressing that both taxation for business and registration of new companies – services crucial from the perspective of business activity costs – are ranked low. The data presented shows that delivering information is still the most frequent function carried out by public administration in Poland, with a growing level of one-way interactions (such as eg. downloading administrative forms). Two-way interactions, demanding some forms of authentication of citizens are still behind the desired standards of e-government services.

The e-government in Poland in both quantitative and qualitative terms is expressed in Tab. 2 below.

Tab. 2. Development prospect of Polish online government services and the present ranking among 28 European countries (2004)

No.	Service	Rank in Europe (2004)	Adult citizens using this service in 2010	Adult citizens using this service in 2020	Year of reaching the 50% penetration
Government to Citizen:					
	Income tax	27	40%	90%	2011
	Job Search	22	60%	85%	2009
	Social security benefits – unemployed benefits	18	30%	60%	2015
	Social security benefits – child allowances	21	45%	75%	2011
	Social security benefits – medical costs	7	55%	90%	2008
	Social security – student grants	-	80%	100%	2008
	Personal documents – passports	17	60%	90%	2009
	Personal documents – driving license	27	55%	85%	2008
	Car registration	25	50%	80%	2010
	Application for building permission	22	50%	75%	2009
	Declaration of offences to the police	26	30%	55%	2017
	Public libraries access	25	80%	100%	2007
	Birth & Marriage certificates	21	50%	80%	2010
	Enrolment in higher education	24	75%	99%	2007

	Announcement of moving	20	50%	75%	2010
	Health related services	17	55%	90%	2009
Government to Business:					
	Social security payments for employees	1	100%	100%	2004
	Corporate Income Tax	26	100%	100%	2007
	VAT	26	100%	100%	2008
	Registration of a new company	28	70%	95%	2008
	Submission of data to statistical office	28	90%	100%	2007
	Customs declaration	1	95%	100%	2006
	Environment related permits	21	80%	95%	2008
	Public procurement	17	70%	90%	2009

Source: ranking - CapGemini (2005), development prospects - a questionnaire survey on the availability of e-government services in Poland performed in May 2005 and re-examined in October 2006 (Skulimowski, 2006a)

The values in columns 4-6 above have been calculated as median values received as a result of an experts' survey in May 2005 and re-examined in October 2006. The experts were all aware of the government plans and policies, including the 'Gateway to Poland' and the schedule resulting from this. Nevertheless, they were also taking into account the deviations from this schedule, which may be expected based on the present delay in structural funds allocation, the main source of financing of most of the e-government enterprises.

It is worth stressing that a trend mentioned before, namely that business oriented services are advancing much faster and more comprehensively than services targeted at individual citizens is a general trend in all European countries. The average result of online sophistication in the countries surveyed was 77% for G2B services and only 57% for G2C services. Such results seem to reflect adequately the priorities set by government IST policies. They underline the necessity of the entrepreneurship stimulation and the growth of business efficiency; while people-oriented policies still lagged behind.

The electronic service delivery is an important but not the only aspect of e-government. If e-government is considered to be a part of electronic democracy, a means to encourage civic engagement in political processes, a crucial aspect of this 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 internet tools available to citizens, aimed at providing information, opinions and especially feedback information from the general public, NGOs, etc. to decision-makers at each level.

The EU funding, together with domestic funds, will contribute to the growth of approximately 7% of IST spending yearly, including the e-government services. External stimuli will not result in the considerable change of e-government status unless they are accompanied by effective steps undertaken in Poland. Most important of these are:

- Further liberalisation of the telecommunication market,
- Stress on the development of the IT education, including distance education at all levels,
- Significant support for NGOs active in the realm of the information society development, especially stimulating civic online activity and enhancement of political participation.
- Coordination of efforts undertaken by local government bodies, so that the clear strategy of "local" e-government services implementation is prepared.

3.2. E-health in Poland

By *e-health* we mean here all computational and electronic communication systems that support diagnostics, therapy, prophylactic, medical information storage, retrieval and exchange. By *telemedicine*, which is a part of e-health, we mean transfer of medical data, particularly medical images and the remote medical diagnosis. E-health supported by mobile devices is often referred to as *m-health* (cf. Skulimowski, 2004). It usually involves the teletransmission of medical data, although there are also autonomous m-health systems.

There is a variety of different e-health applications and not all are represented in Poland to an equal extent. Some of the e-health applications may only be provided under a physician's supervision, the other require only a medical consultation at the design stage and may be operated e.g. by mobile phone providers. Taking into account the target group (clients), one can classify the e-health services into:

- e-health for hospital patients (usually sophisticated therapeutic or diagnostic systems that may be used within the prescribed strict spatial limits of the closed hospital area),
- e-health for chronic sick and risk groups, residing usually at home or at open stationary medical establishments like preventoria or sanatoria,
- e-health supporting treatment in the out-patients' departments,
- e-health for terminally sick in hospices or assisted at their place of residence,
- e-health for healthy people (preventive and informational e-health functionalities),
- e-health for medical personnel, including web applications, communications, PDAs.
- e-health services created primarily for medical administration and authorities, such as central register of medical services, central register of medicaments, payment flow controls etc.

The development of telemedicine has been defined as one of the priorities in the Polish Strategy of the Information Society Development for the years 2004-2006. It has also been pointed out as a priority research area in three thematic panels of the NFP. However, the implementation of modern e-health techniques in Poland suffers from the same obstacles that have hindered the introduction of efficient health care system policies. The "payless health care" and "equal access" dogmas play often the role of a hindrance when introducing innovations in health care. For instance, the system of electronic medical services registration, introduced in 1999 in Upper Silesia Region by the local branch of the state medical insurance system, where every insured citizen was equipped with a microchip-based medical register identity card, was abandoned and liquidated after the elections in 2001. The official reason for this was seemingly the lack of compatibility of the Silesian system with that planned to be introduced throughout the whole country. The pessimistic image of the public health care contrasts with the well-functioning private medical sector providing, however, mostly treatment in outpatients' clinics. The diffusion of innovation in the health care, including e-health, is fastest in the private sector and in a few of the country's best public hospitals.

Tab. 3. Present state of selected e-health initiatives in Poland

No.	Existing or currently developed e-health services	State of implementation
1.	Medical Services Register	Implementation blocked due to the disputes, which services should be included in the Register
2.	National Health Care Fund (NHCF) Clearing System	New ideas of such system, based on e-card system have been announced in Fall 2006
3.	Drugs Register	Payment monitoring functions are insufficient
4.	Patient registry systems via internet	Different spontaneous initiatives throughout the country
5.	Medical content developed by the Ministry of Health, Institute of Oncology etc.	Development of e-learning tools on cancer is supported within the SPO-RZL (A HRD programme financed from ERDF)
6.	Telemedicine systems	Pilot installations in Kraków (cardiology and cardio-surgery), Poznań, Warsaw and other cities

Source : PBF (2005)

The electronic patients' registers are used by virtually all hospitals and most individual physicians; if they do not use registration systems for patients or PDA-based data entry systems for physicians they do not influence the quality of treatment, therefore they are not mentioned in the above list. Recently, the Ministry of Health, jointly with the Gdansk's University elaborated an interactive web-based hearing diagnostic system, which will soon be complemented by a vision diagnostics. Designed as a control tool for people with minor malfunctions and for preventive self-diagnostics, this system shows the potential of e-health tools in increasing the efficiency of health care.

It is expected that mobile Internet access technologies, in particular UMTS (3G) systems will foster the development of e-health services on a commercial basis. The third generation (3G) mobile systems have been introduced by all Polish UMTS operators recently and the subsequent introduction of e-health monitoring services are planned by both of them. They will support bit rates of up to 144kbit/s in rural areas, 384kbit/s in hotspots and up to 2Mbit/s in indoor use. The operators expect that e-health monitoring functionalities will appear more attractive than video transmissions, especially to older mobile phone users, in contradiction to the common expectation that image transmission will be the main advantage of 3G+ mobile phone systems. Thus m-health may turn out to rescue those telecom companies which are burdened by expensive 3G license fees. In addition, m-health creates another relevant field of applications for GPS/GSM systems, whereas a disturbance of living functions could be detected and reported by an m-health application combined with a GPS localisation function.

The development above will be to a great extent independent from the state health care policies. The market for medical services will soon be invaded by low-price mobile medical services providers, using medical personnel only for operational and incidental tasks. It is expected that the patients with the following diseases will seek e-health services irrespectively whether it is covered or not by the state medical insurance systems:

- cardiovascular system diseases, especially those with a danger of heart infarct,
- diabetes,
- bronchial asthma, especially its acute forms,
- elderly people who need m-health-based monitoring,
- over 40% of Polish citizens suffering from sleep and/or breathing malfunctions.

To sum up, there is a huge potential market for e-health in Poland, especially preventive, applications. Its development will depend on the one hand the overall growth of economy and social welfare, and on the other the success of the health care reform and the shape of new health care policies. The costs of the individual services or subscriptions may be low for popular systems, additionally the emerging additional medical insurance schemes financed by the employers are ready to at least partly cover the costs of e-health.

3.3. E-learning

E-learning is one of the top priorities of the „ePoland” programme. During the first stage of its realisation (2001-2003) it created a background for further development of e-learning: Polish educational programmes have been modernised, most schools connected to the internet. The programme also puts emphasis on SME training, training of teachers, creating multimedia information centres and educational content databases (portals, electronic libraries, educational content servers). Another goal of the „ePoland” programme related to the e-learning on-line content providing is to assure net security guarantee and protection of IPRs, as well as support of smooth integration between new technologies and applications, including the amendments of existing law concerned with electronic criminality.

The background for applying e-learning courses in schools was created by the Interkl@sa programme started in 1998. The goal was to equip Polish schools with computers connected to internet – over 70 thousand PCs were placed in schools within this programme. The programme created an institutional co-operation platform for IT companies (i.e. Intel, Microsoft, Sun, Vulcan, YDP) and schools aiming at preparing young Poles for the use of modern IST, to provide equal educational chances irrespective of the location of the school, and to educate IT specialists. Interkl@sa launched a number of noteworthy subprojects: "Teaching for future", "Notebook for teacher", Polish educational portal (www.interklasa.pl), European Community information centres, local information academies, in cooperation with different partners. Interkl@sa has strongly contributed to an extension of IT courses offer for secondary schools and municipal educational centres. Following an agreement with the Association of Polish Districts and Cisco Systems, 300 Local Information Technology Academies have been established at secondary schools and other educational institutions.

As regards the adult learning, the development of e-learning tools in Polish SMEs is promoted by the Polish Agency for Entrepreneurship Development (PARP), the governmental body responsible for the support to the SME sector. There are several barriers which slow down the development of e-learning in companies. One of them is a limited access to broadband internet. The second barrier is the lack of educational policies in companies – an efficient use of e-learning systems in companies has to be preceded by a reorganisation of training processes. The lack of or insufficient feedback may cause problems in evaluating and selecting training programmes. Over 80% of Polish companies surveyed do not measure the effectiveness of courses attended by their employees. The third barrier is attitudinal: whilst traditional training is seen as an incentive, it is difficult to persuade employees to participate in courses provided only as e-learning. An additional barrier to e-learning in Poland is the limited computer and Internet literacy of employees in some sectors. Despite the barriers mentioned above, internet is used for training in over 60% of SMEs (2005), which is one of the highest results in Europe.

In the area of education, „ePoland” programme priorities related to e-learning are as follows:

- modernisation of Polish educational programmes,
- provide schools of all levels with computer systems connected to internet,
- train teachers,
- create multimedia information centres and educational databases (portals, electronic libraries, educational content servers).
- Stimulation of internet usage for e-learning will be accomplished a.o. by the following activities:
- Polish culture promotion through internet,
- tele-information on countryside.

Activities supporting private sector's participation in the electronic economy will be undertaken in parallel. „ePoland” programme assumption is to provide everyone access to telecommunication services. Future e-learning systems developers should take into account the process of convergence of telecommunication and information technology with radio and television. Digitalised radio and TV eliminate primary barrier of transmitted data type, broadband networks can transmit data, voice, and video. The expansion of broadband internet, UMTS and emergence of multimedia platforms joining radio, TV, PC, and phone will make a transition from e-learning to m-learning possible, i.e. mobile e-learning systems will gradually replace paper manuals taken as travel companions.

The market for distance learning systems in Poland is rapidly developing. We estimate that e-learning market value in Poland in 2004 amounted to over €15 million and that this market will grow at the rate of 50-70% during next 3-5 years. In a short time e-learning has evolved from being just fashionable novelty, but it will become an important element of the emerging e-economy.

3.4. Prospects for e-banking, e-commerce and other e-services

The fast development of e-banking in Poland dates back to 2000-2002, when three internet banks: mBank (a sub- subsidiary of Commerzbank AG), Inteligo (owned first by BGB, then sold to PKO BP SA) and VolkswagenBankDirect developed attractive internet-only consumer products. The expansion of internet banking (the above three banks reached about 2 million clients up to 2005) moved other banks to lower their prices for e-banking and offer new e-products. At present almost all banks offer accounts allowing customers to perform all substantial operations via internet. This trend has been followed by an '*internetisation*' of brokerage services, which eliminated to a large extent the traditional brokerage services for private individuals.

In contradistinction to e-banking, the development of the e-insurance market in Poland is slow when compared to the EU-15. As a remarkable exception, the company Link4, which entered the insurance market in 2003, has quickly gained a remarkable market share in obligatory car insurances (CR).

The number of e-shops has risen rapidly in recent years to reach over 10,000 in 2004. Most of them offer limited products and it is estimated that the number of active e-shops, i.e. having at least one transaction per month, does not exceed 2000. Poland has an example of success in having its own electronic auction system, allegro.pl. Its competitor, which has recently entered the Polish market, the world leader e-bay.com, has attempted to conquer the Polish e-auction market in the past, with no avail so far, allegro.pl has some 6 million users (September 2006), a figure reached after a sustainable rise during recent years, while e-bay.com does not exceed the mark of 2 million, despite massive marketing efforts.

4. Trends and development patterns in Polish IS

We will this overview of the development of the Polish Information Society and Information Technologies from the identification of IS major elements, drivers and processes. Following the findings of the FISTERA report [Skulimowski, 2006a] they are listed in the box below:

Box 1. Eight major elements, factors and drivers of Polish IS

- The population and its structure according to age, sex, education, welfare, relation to the labour market, professional background, the attitudes towards IT and innovation in general;
- IT (and overall) education system;
- R&D sector producing and consuming IT;
- IT sector (industry and services);
- 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;
- IT at use by the population and the industry, including the IT infrastructure, consumer IT and telecommunications;
- Relations to the other sectors of Polish economy: their IST absorption capacity, overall GDP growth and sustainability of country's economical system;
- Relations to the outer IS & IT world: close EU neighbours, EU-25, FDI, most relevant IT non-EU foreign partners, and global IS society

To obtain an image of Polish IS one can study and explicit the relations between the above elements. They can be often characterised 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 developed societies, their efficiency may vary strongly from country to country. A list of interrelations between these drivers and processes, with their brief characteristics as regards Poland, together with the results of the complementary research on the global IST trends affecting Poland are shown in the following Tab.4.

Tab. 4. Global IS&IT trends that affect Poland.

Trend description	Global effects	Impact on Poland	Specific impact characterisation in Polish circumstances
Decreasing hardware prices	Better affordability of hardware	Mass hardware production is not profitable	The Polish CRT and LCD factories may be put in jeopardy due to the rising labour costs
The end-user software lifetime remains stable on a present low level or becomes even shorter	Higher demand for IT training and e-learning; a need to replace hardware suitable for new software versions; high software costs	More difficult to bridge the digital divide gap due to a higher complicity of new software versions	People increasingly use older versions of MS Windows, MS Office etc., or even DOS software (e.g. in book-keeping)
Consumer and office hardware production remains dominated by Far East producers	Growing dependence on these suppliers due to outsourcing domestic production in the EU and US	Small assembling enterprises may be put in jeopardy when laptops and PDAs (these need specialised know-how to be assembled) dominate the market	Small Polish companies assembling the desktops may get in trouble or be forced to change the profile of activity in the perspective of 2 to 4 years
Laptops and PDAs replace desktops			
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, e.g. in big companies clearing, telecentres or book-keeping centres, one can expect a middle-term decline, before these services got a relevant labour market player	The IT service centres opened in Poland recently will be viable only if investors develop close ties with Polish subcontractors and consumers
Infavourable demographic trends in Europe and Poland	Ageing societies, increased demand for health care services; increased migration and consequent multiculturalism of EU societies	More immigrants coming to Poland foster multiculturalism. Growing demand for multicultural content production, there arise potential social conflicts	Some demographers say that the sharp decline of the birth rate may be reverted after women adjust to a higher average age of birth
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 shows in Poland as well, sustainable demand for adult education	Some of the private tertiary learning establishments will not sustain the growing competition
Growing sophistication of AI-based systems allows to replace gradually translators, people responsible for monitoring, content production etc.	Jobs losses in some professions, a need to adjust labour market policies to the expected changes	The initial penetration of IST-based novelties in Poland will be lower due to the lower buyers' parity, with an adjustment trend following a logistic curve	Emerging application create opportunities for Polish AI-based IST industry, a focus area, such as e-health may be pre-selected
Relatively more spending on e-entertainment and publicity	Growing importance of electronic media industry in terms of creating jobs and sales; Europe forced to adjust its policies to avoid staying behind these trends	Consequent policy promoting content development, e-promotion of cultural heritage, support to innovative e-media will be required at the national level as well	The domestic e-media industry should get a clear development strategy
Emerging field of GPS applications	Affordable GPS services open new markets for GPS devices and increase the productivity in most sectors	Polish companies may benefit from new markets for miniaturised GPS devices	Some Polish companies are already active on the GPS market, supplying software and (assembled) hardware for

	of economy		GPS systems in transport
Growing role of biotechnology in the supply of pharmaceuticals, cosmetics, bio-fuels etc.	Countries which developed biotechnology will gain in their relative position on the global market	Poland shall avoid growing lag in pharmaceutical industry production and other biotechnology- products	Region's largest bio-fuels production capacity in Poland may favour the country

Source: Skulimowski (2006a)

The information about the relations between the elements of Polish IS has been used in Skulimowski (2006a) to derive the scenarios of Polish IS development. One can note that common framework of European regulations imposes limits on internal societal mechanisms, nevertheless differences to the other countries might be found when the phenomena above were described in quantitative terms.

4.1. Socioeconomic factors and patterns of Polish Information Society

There are three key social factors, which are implied by and related to the first two quantitative factors listed in Box 1 and are specific for Poland.

The **first factor** is proactive attitude of various groups of the society, who perceive changes as carriers of economical and social advancement of the country since 1990, bringing them a unique opportunity to achieve a higher level of life quality and a chance to catch up with wealth and status of similar groups in more developed countries considered often as a model. The resulting pursuit for a better life makes large groups of the society work longer and harder, and encourages them to acquire IST-related skills.

The **second factor**, highly correlated to the first one, is a strong drive to self-governing and self-organization at a local level that facilitates bottom-up initiatives which foster the development of public e-services and hinder government's ideas to put financial and bureaucratic constraints on the emerging e-society.

The **third key factor** is a continuous upward trend in higher education, that shows e.g. in the percentage of young people entering tertiary education programmes, the increasing number of new academic institutions, and the increasing number and widening scope of postgraduate programmes. This trend in absolute figures has recently been slightly corrected for demographic reasons, but the share of young people of the same age entering higher learning institutions is still rising. Specifically, over the last fifteen years the number of graduate and post-graduate students in Poland has increased five times. One can also observe a rising push to increase the quality of services provided by the education system.

The above factors, combined with other socio-economic factors specific to the country, establish a playground for incentives and measures to provide more thrust for the Polish IS in medium- and long-term horizons. We have used the above factors as inputs for analysing the scenarios for the remaining six output factors, which all culminate in implications and suggestions for policy makers (cf. Skulimowski, 2006a).

4.2. Economic trends, globalisation and the scenarios for Poland

The external factors influencing the development of IS are the common economic trends and terms of trade. Beyond the social factors, the development of the national economy determines the strength of the IST sector and the rate of growth of the IS indicators. In particular, the terms of trade in IST and intensity of international IT exchanges of a country define the speed of diffusion of recent ISTs, services and threats. Based on the recent Eurostat and National Statistical Authorities data on economic exchange and MNiSW data on international S&T cooperation and HR exchanges (cf. Skulimowski, 2006a), one can conclude that Poland is already well linked with leading IS nations and IT suppliers. Looking at data from the last decade

we see an almost undisturbed upward trend in international exchanges, although the terms of trade remain stable and unfavourable for Poland, especially in the software sector. Three scenarios of Poland's GDP growth until 2025, based on official and independent research forecasts are shown in Tab.5.

Tab.5. Three most salient economic development scenarios for Poland until 2025

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
2006	5,3	46,0	5,2	45,5	5,4	46,1
2007	5,0	47,5	4,5	46,5	5,5	48,0
2008	5,5	48,5	4,0	47,0	6,0	49,0
2009	5,5	49,5	4,5	47,5	6,0	50,0
2010	5,0	50,7	4,5	48,0	6,5	52,2
2015	5,0	59,5	4,0	53,5	7,0	66,5
2020	5,0	67,1	4,0	58,5	6,5	75,5
2025	5,0	70,0	4,0	60,0	6,5	80,0

Source: PBF (2006), National Development Strategy (2005)

4.3. IST-infrastructure and telecommunications prospects

In the context of the ICT infrastructure, the basic forecast is limited to the year 2013. It is assumed that until then the following parameters will characterise the status of the ICT availability in Poland:

- The majority of households will have broadband access to the Internet (75% according to other estimations),
- Availability of high speed connection (10 Mbps and more) for 20% to 30% residents of metropolitan areas,
- WiFi- and/or WiMax –based internet access will be available in all densely populated areas.

With regard to economic availability of the ICT infrastructure, it is assumed that after the permanent internet access prices fall below 50 zlotys (12-13 EUR), the marginal penetration of internet may reach the level of about 90%, compared with the current rate of about 40% (Fall 2006). It should result in Internet penetration comparable with the current level of cable TV penetration in Poland. It is stressed that at the moment Poland is significantly behind with respect to the ICT infrastructure standards compared with the average level in the EU. Thus, reversing that situation demands not only the growth of the ICT infrastructure investments, but surpassing the average ICT investment rate in European countries.

Obviously, the dissemination of all e-services, including the public e-government services, e-health and e-learning tools and methodology, which will be partly supplied by public bodies, strongly depends on availability of affordable high-speed internet connections. Entrepreneurs sceptically evaluate the government's IT policy, specifically internet development in Poland: 52% of small and middle companies'

managers claim that government policy has not sufficiently supported internet dissemination [PARP, 2002]. At the same time they emphasise the potential role of government in promoting the use of internet. 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 PARP programmes,
- improve intellectual property law, especially that related to the web.

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

5. The SWOTC analysis, scenarios, conclusions and recommendations for the Polish Information Society

Basic quantitative IS 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. In our SWOTC analysis adjusted to Poland's circumstances, it is important to know whether and when the basic indicators reach the average EU level, and which of them will perform best. Let us mention that in such complex objects as the Information Society in one of the larger European countries, even the notions of strength/weakness is ambiguous, since there exist numerous possibly conflicting [cf. Skulimowski, 1996] criteria describing the performance of an Information Society. The classification of relevant IS factors and aspects on the scale of Weak-Strong presented below is relative to the most relevant Poland's partners considered as a benchmark, or to an international standard or average (if available). To establish a more adequate classification, the Threats–Opportunities characteristics is complemented by the Challenges category (which may become either a threat or an opportunity, depending on the way it is handled) classified as internal - related to the future development of features, external factors, and the pairs of internal features and external factors, events and processes. The results are presented in Tab. 6 below.

Tab. 6. SWOTC Analysis of Polish IS

Strengths	Weaknesses
Strong basic IST research Availability of qualified IT specialists Good business climate in the IST-related SMEs Over-EU-25 average of management of IST companies Continuously improving broadband infrastructure through national programmes and policies Attractive conditions for living and working for IT specialists that block migration at the salary substitution ratio over 0,5. Availability of qualified IST immigrants from NIS countries	Slowing-down economic development in 2005 Foreign investors often use transfer prices for IT services; omit domestic suppliers: most endangered branches: banking and finance, telecommunications High level of digital divide between agricultural and construction sectors' employees and the rest of the society High level of digital divide between the youth and elderly population and between groups with lower education; Development gap between the part of Poland under

<p>The size of the domestic online market exceeded already the rentability threshold High potential of IT services exports National policies strongly support e-learning Immediate availability of all modern IST in Poland</p>	<p>Russian rule (1795-1918) and the rest of the country Lack of co-ordinated ICT sector development and support policy for the innovative IST enterprises Insufficient protection against protectionism on the public IST market in the EU and in other countries Lack of consequence in the development of public information systems</p>
<p>Opportunities</p> <p>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; Poland's EU accession contributes to the increasing mobility of workforce; Appropriate use of ERDF and SF subventions may increase the competitiveness and capital strength of IST-related SMEs; Emergence of new high-quality and affordable IST services, e.g. in health care; Low-cost airlines make business visits in Poland more affordable; New investment increase the overall attractiveness of the whole NMS region</p>	<p>Threats</p> <p>Subvention-mentality hampers entrepreneurship, Too-high taxes and labour costs slowdown the development of innovative SMEs, High emigration of IT academic experts to the USA, which may lead to the desertification of the R&D sector within 20-30 years, The lack of appropriate investors' relations may lead to systematic losses of investment opportunities, 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</p>
Challenges	
<p>The EU accession allows for competing on the EU market but removes any protection from the domestic IT market</p>	
<p>Globalisation opens new markets, but allows for growing competition in the areas of strengths of Polish IST companies</p>	
<p>Patenting algorithms may negatively affect a part of software producers and IST service providers from the SME sector, but may help to achieve extraordinary incomes for a few Polish SMEs</p>	
<p>E-health may provide better conditions for health care only in cases where the health care financing is adjusted to accommodate new initiatives coming from outside of the traditional health care sector</p>	

Source : Skulimowski, 2006a

The analysis above does not pretend to fully describe the present state of the IS and the IST in Poland, but may serve at discovering some most salient aspects after the EU accession of Poland.

5.1. Future Scenarios for the Polish Information Society

There are three basic levels of events that govern knowledge and information society development in Poland. The global development of IC technologies affects the use of IT and CT by all kinds of users and may affect the competitiveness of Polish IST industry. The scenarios and technology trajectories at the first, global level define the technological boundary conditions for Polish IST as long as technologies developed in Poland do not affect the global industry. The technological trends and factors that may affect Polish IS have been listed in Tab. 4. Their impact will be visible, first of all, in a contribution to the GDP growth. In qualitative terms, they will allow development of different e-services and make them available to the nation.

The second level is the political and economic development at European and national level that may affect processes such as migration of innovators and users of IT, the consumers' demand, the education and attitude towards education etc. The common opinion is 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 some relatively poor countries in Africa and Asia.

The occurrences of events at the third level are generated by the dynamics of local ICT community, the IS and KBS policies and their implementation in Poland as well as by results of different disputes at 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, while a successful implementation of a reasonable IS development policy is welcomed, its abandonment or admittance of an unsuitable policy by the decision-makers is a threat. Whereas the first level define the chances and constraints and may generate threats to local industry, the second one defines the real conditions where the Polish IS will develop. The actual development of the IS and ICT will proceed at the third, national level, as internal dynamics and responses to the external events and conditions.

In a developed ICT consumers' society the demand for consumers IT products, excluding the luxury goods, is proportional to the size of population. We conjecture that Poland will reach this development stage after 2010. Based on the economic forecasts and scenarios, the infrastructural IT satiation in Poland will come between 2012 and 2015. At the same time IT literacy will replace poverty as a major digital divide factor. The demand for ICT-related education will be continuously higher than the qualified supply until 2025; consequently the IST teaching and R&D sectors will be immune to the demographical decline. Higher GDP increases the ability to sell IST-based products abroad; the domestic demand for IST products grows slower than GDP with the exception of the demand for e-health services, which may grow faster than the GDP. Both consumers and industry solicit efficient IT infrastructure planning and construction, and a moderate but clever legislation framework. Then it follows an expectation of having comfortable e-government services, which is, however, less preferred to a reduction of a number of situation when any contact (electronic or not) with the authorities is necessary. There will be a growing importance of e-health services over the whole period until 2025 and later. Without a substantial health care system reform this challenge will become a threat to citizens' discomfort and worsen state of peoples' health. A more detailed description of Polish IS scenarios until 2025 is given in Skulimowski (2006a)

5.2 General conclusions

Having had a look into the R&D sector in Poland one can see a discrepancy between the research potential related to 'low technology' sectors and to the IST. One can find several research institutes carrying out research on textiles or timber technology, but very few dealing exclusively with modern IST. All (with no exception) industrial research institutes were created at the time when only the state-owned industry was allowed to exist. The private IT sector, emerging since the end of 70's, was – in the best case – tolerated, more often regarded as a threat to the communist regime. The information blockade and strict information control were essential for the existence of the system, therefore everything related to the 'information' such as IT, was suspected and controlled very strictly, while the official propaganda and legislators were busy with fighting out the technological novelties instead of supporting them. The development of telecommunications was intentionally blocked to not exceed the capacity of security forces, computer technology was regarded as potentially dangerous due to the possibility of transferring data, every single printing device (including the typewriters) had to be registered at the state security authority, as well satellite TV receivers and dishes. To complete the description of these circumstances, COCOM restrictions and Mr. Reagan's embargo weakened the state-owned IT sector, working in the 80's almost exclusively for military purposes, while the PAS units were intended as basic-research-oriented institutes.

This heritage imprinted the development of research supporting the IST. The fifteen years after the fall of communism in Poland did not change much the R&D landscape. The state subsidies were not redirected, and the majority of low-tech institutes, after a deep crisis in the first half of 90's recovered to the extent which allows them to survive on the market, benefiting from both, the opportunity to rent the office space (the R&D institutes were usually endowed with generous real-estate establishments) and from the subsidies. At the same time several 'institute restructuring' programmes were carried out under Phare SCITECH I, SCITECH II and other schemes, which helped to attain the above mentioned financial stability. This – on

one hand – proves that research can be profitable even in sectors regarded as low-tech or secondary, but – on the other – it engaged the authorities in rescuing the centrally planned economy heritage rather than to support the development of new technologies and the IST sector. Neither a specialised IST institute nor an institutional support system to the IST sector was created after 1990. The *ad hoc* grant distribution schemes to the SMEs within the Phare 2000 through 2002 and the Structural Fund (SPO-WKP) were directed to all technological sectors and their volume was very low as compared with the needs (only about 3% of over 20000 SME investment grant applications under the latter scheme in 2004-2005 were assigned the grants). As a result, the development of strong ICT products, with a European or global market opportunities was slowed down, awaiting the capital accumulation at IT trading companies, their transformation to IT trade – software development, then own research –covered mostly from own sources - and expansion.

The IT innovation potential resides mainly in universities and technical universities. The emerging strength of Polish SMEs from the IT sector is due to the opening of mostly informal – i.e. emerging without any intentional policies – cooperation channels between the universities and SMEs. Further strengthening of the IT sector, in particular the SMEs, is expected due to the availability of considerable amounts of funds from the ERDF (SPO-WKP, then POIG) and ESF, whose distribution began in 2005.

This is also still a good moment to strengthen the IST sector institutionally, by creating new or improving the performance of existing national institutions protecting the IST consumers (they are often cheated and abused, mostly by foreign IT companies and Polish importers). The national companies look better not just because of a higher honesty, but also because SMEs that dominate the IST sector in Poland are more vulnerable to legal procedures and criminal prosecution and perhaps – did not learn all cheating tricks yet. The pathologies related to the IST, from computer viruses and spam to hacking and phishing belong to major hampering factors on the way towards developed and user-friendly IS. The stimulation of the development of the national IST sector can be accomplished by a diversified set of measures, such as monitoring cybersecurity, helping protecting IP rights and abusing the IP protection mechanisms. It would be natural to create such an institution based on the intellectual potential of ICT experts taking part in the National IST Foresight Programme and adjusting its everyday activity to the 'permanent foresight' needs.

Finally, let us conclude that a determination of the strategic goals of an Information 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 Poland's case, after an enormous legislative adjustment effort leading towards the admission of the *acquis communautaire* that accelerated between 2000 and 2004, most policies regarding the IS/KBS coincide with those of the EC. Moreover, these policies are based on the very strong political and social consensus – most of the legal acts forming the IS in Poland have been passed by the Parliament (almost) unanimously, which is exceptional on the otherwise conflicting Polish political scene. Nevertheless, the bureaucracy and over-regulation still hamper innovativeness and entrepreneurship that is clearly seen in those sectors of economy, which can be subjects of quick reallocation to other countries (including all IT) by moving companies to innovativeness-friendly havens,

6. References

- 1 *Action plan for the development of e-government in 2005-2006*, MNiI, Warsaw, 2004, www.mnii.gov.pl (in Polish).
- 2 *Development of eGovernment in Poland*. 3rd Report prepared for the Ministry of Science and Information Technology, CapGemini Ltd., 2004.
- 3 *Directions of the IS development in Poland until 2020*, MNiI, www.mnii.gov.pl, Warsaw, 2004
- 4 *Draft project of the National Development Plan 2007-2013*, document accepted by the Ministry Council on 11 January 2005, Ministry of Economic Affairs & Labor, Department of Structural Policy Coordination, Institution

- Managing the Community's Support's Base, Warszawa 2005, p. 105
- 5 Economist Intelligence Unit, [The 2004 e-readiness rankings](#).
 - 6 *Educational offer analysis, 2003*. Report of the Management Institute, Warsaw, 2003
 - 7 „*ePoland – information society development strategy in Poland in period 2001 – 2006*”, MN, Warsaw, 2001
 - 8 *ePoland. The Strategy on the Development of the Information Society in Poland for the years 2004-2006*, Ministry of Scientific Research and Information Society Technologies, MNI, Warsaw, December 2003, www.mnii.gov.pl
 - 9 *European Trend Chart on Innovation, Annual Innovation Policy for Poland, Covering period: September 2003 – August 2004*. European Trend Chart on Innovation, http://trendchart.cordis.lu/reports/documents/CR_Poland_September2004.pdf.
 - 10 *Global E-Government Readiness Report 2004. Towards Access for Opportunity*. UN Department of Economic and Social Affairs, New York. www.unpan.org/egovernment4.asp
 - 11 *Government Online. An International Perspective 2003, Global Summary*, 2003, www.tnsorefres.com
 - 12 *Ipsos-Demoskop research ordered by PAED*, www.parp.gov.pl, 2003
 - 13 National Plan of Development-Forecasts 2007-2013, Warsaw, 2004
 - 14 *Online Availability of Public Services: How is Europe Progressing? Web Based Survey on Electronic Public Services*, Report of the Fifth Measurement, Capgemini, 2005; www.europa.eu.int/information_society/soccul/egov/egov_benchmarking_2005.pdf
 - 15 Piątkowski, M.: Factors and Impacts in the Information Society. A Prospective Analysis in the Candidate Countries. Report on Poland, Institute for Prospective Technological Studies, 2004, fiste.jrc.es.
 - 16 *Polish R&D Sector in 2003*, Central Statistical Office (GUS), Warszawa, February 2005
 - 17 Skulimowski A.M.J. (1996): *Decision Support Systems Based on Reference Sets*, AGH University Scientific Publishers, Series: Monographs, No. 40. Krakow, p. 165.
 - 18 Skulimowski A.M.J. (2004): *M-Health as a Challenge to the Medical Decision Making System*, IPTS Report, No.2 (March 2004), 3-11 [available in English, French, German and Spanish]
 - 19 Skulimowski A.M.J. (2006a). “Framing New Member States and Candidate Countries Information Society Insights”.- W książce : Ramon Compano i Corina Pascu (Red.) „Prospects For a Knowledge-Based Society In The New Members States And Candidate Countries, Publishing House of the Romanian Academy, January 2006, ISBN 973-27-1319-4, s. 9-51.
 - 20 Skulimowski A.M.J. (2006b). “Future Prospects in Poland : Scenarios for the Development of the Knowledge Society in Poland. *Ibid.*., s. 114-159.
 - 21 Skulimowski A.M.J. (2006c, Ed.). *Technology Transfer in ICT*. Progress & Business Publishers, Kraków, 2006 (in Polish).
 - 22 The level of IT implementation in Polish administration – report from the quantitative research prepared for MNI, Warsaw, September 2004, www.mnii.gov.pl.