

Polish IT/ICT services information booklet

Analysis of the current state and future prospects

Do IT with Poland



**INNOVATIVE
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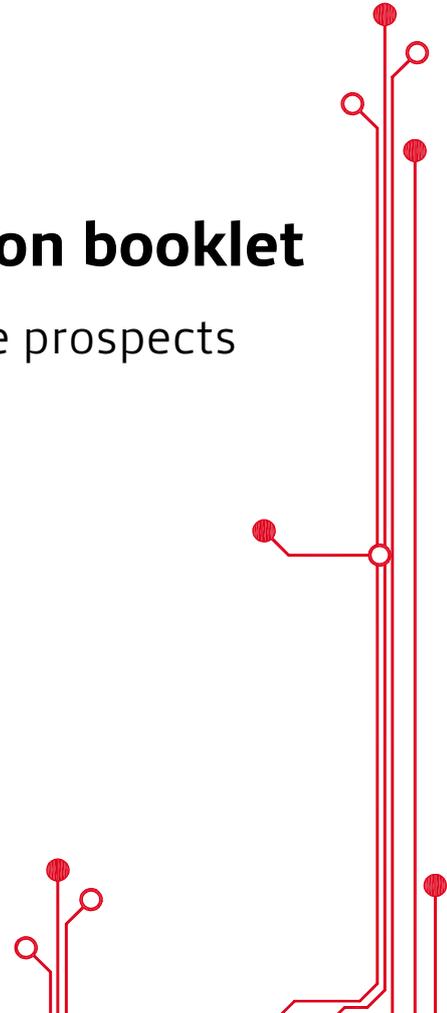
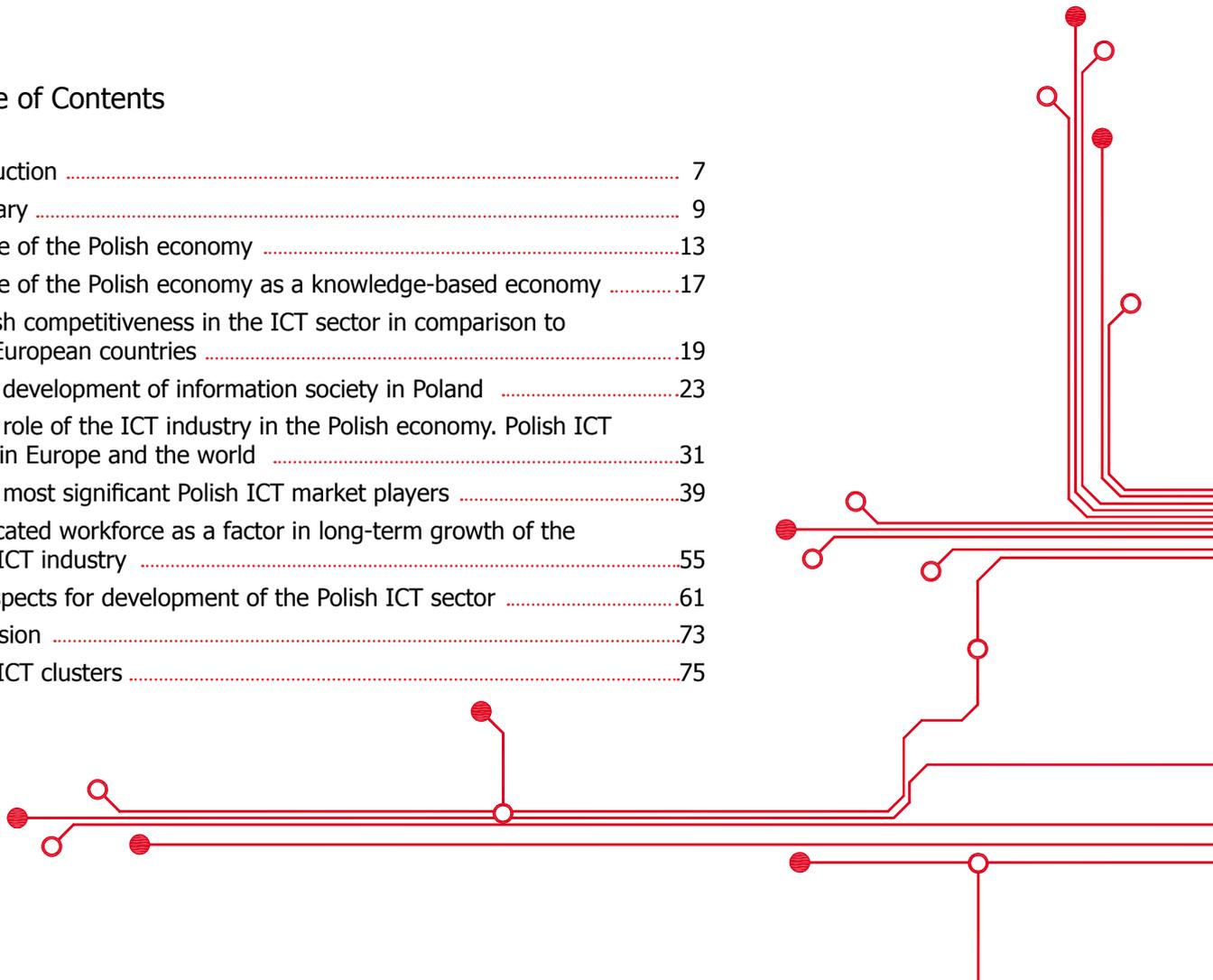
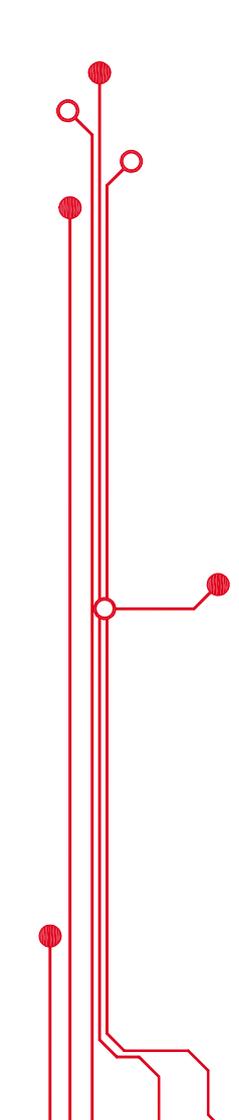


Table of Contents

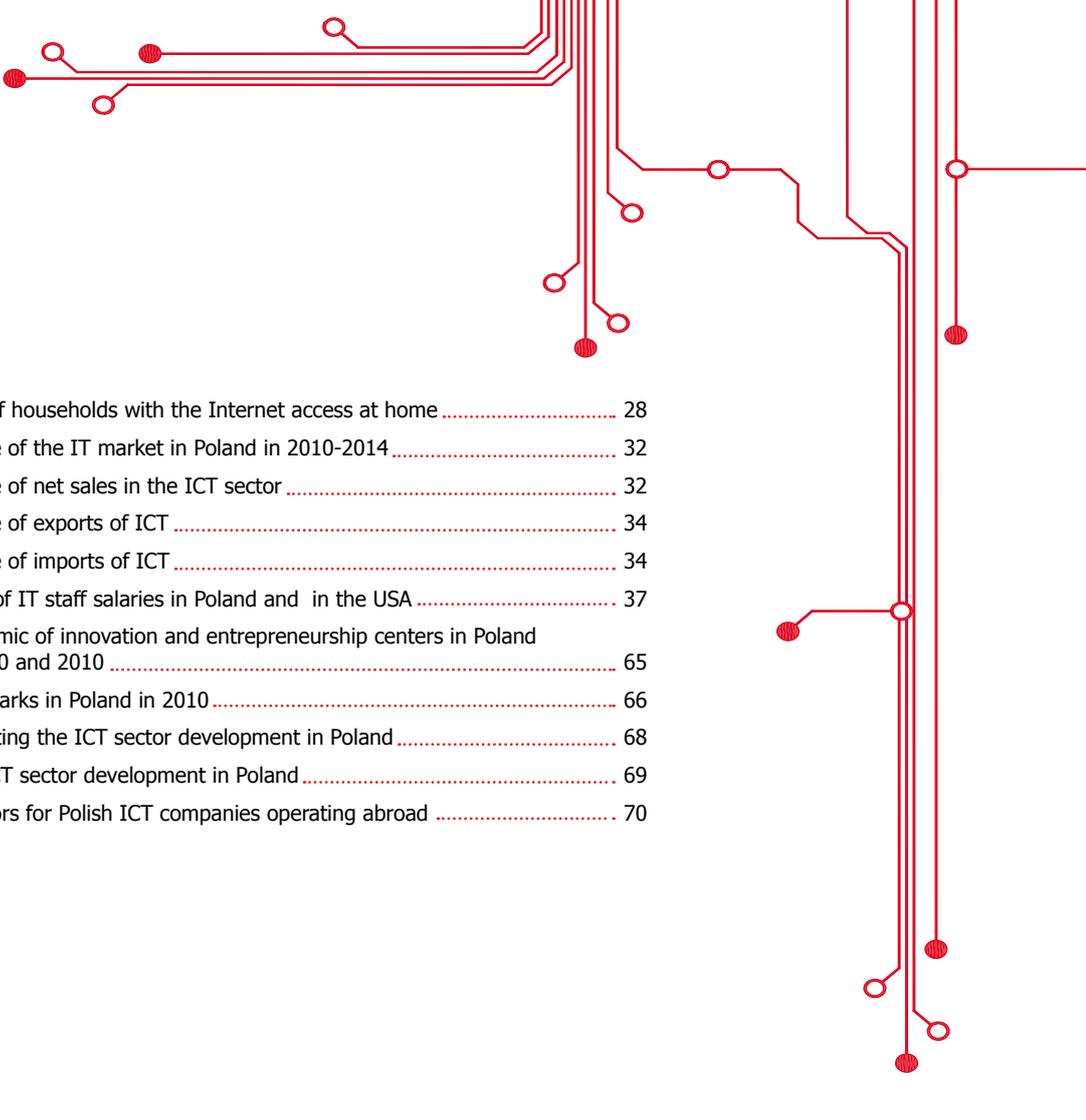
Introduction	7
Summary	9
1. State of the Polish economy	13
2. State of the Polish economy as a knowledge-based economy	17
3. Polish competitiveness in the ICT sector in comparison to other European countries	19
4. The development of information society in Poland	23
5. The role of the ICT industry in the Polish economy. Polish ICT sector in Europe and the world	31
6. The most significant Polish ICT market players	39
7. Educated workforce as a factor in long-term growth of the Polish ICT industry	55
8. Prospects for development of the Polish ICT sector	61
Conclusion	73
Polish ICT clusters	75





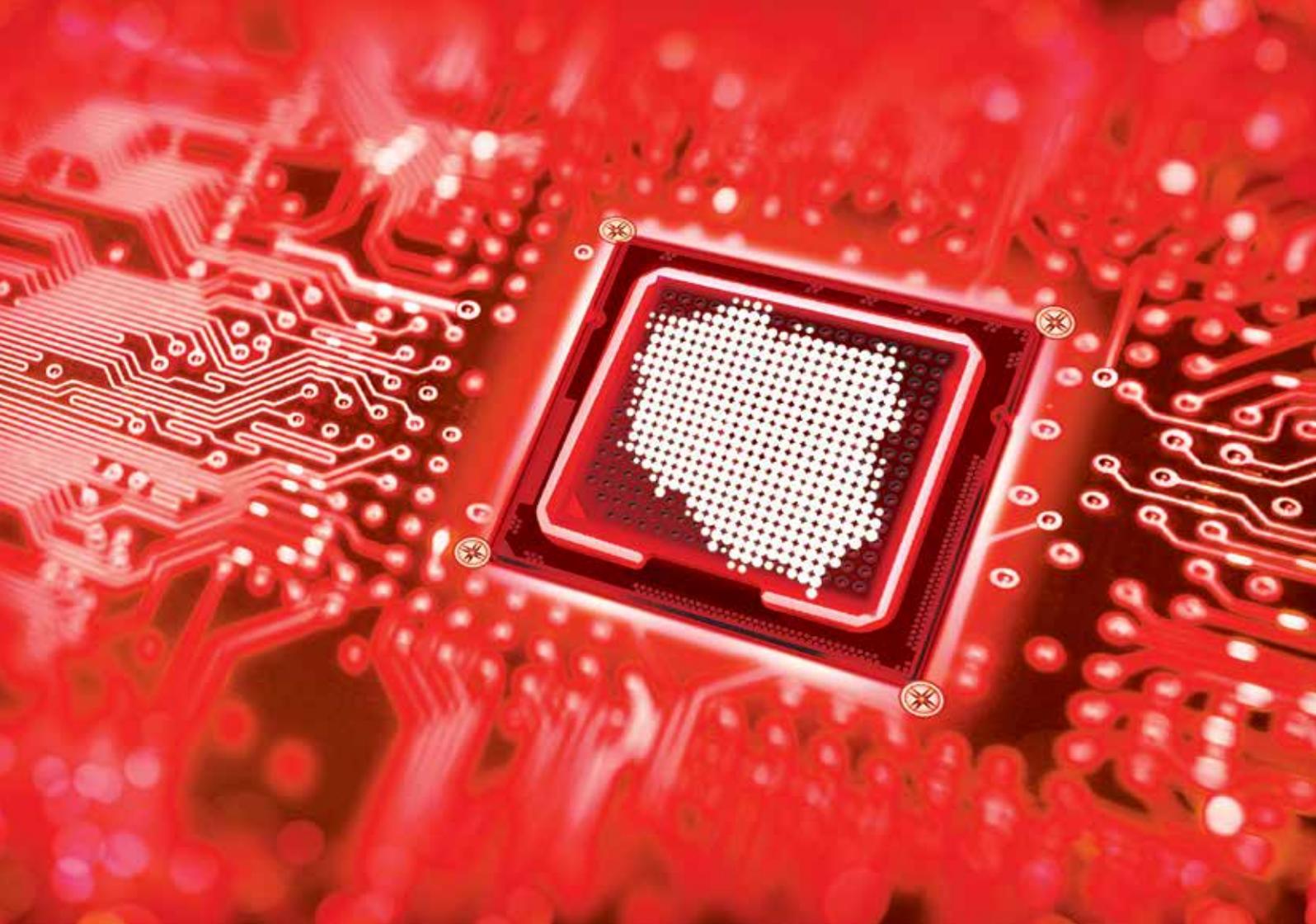
List of tables

Table 1.1	Poland. Key indicators	15
Table 4.1	Indicators of information society development in Poland	24
Table 4.2	Enterprises with a broadband Internet access by type of Internet connection (in %)	27
Table 4.3	Internet literacy skills in selected European countries in 2010 (in %)	29
Table 5.1	Net revenue from sales in the ICT industry (in million PLN)	31
Table 5.2	Research and development potential of IT companies operating in Poland	35
Table 5.3	Sample monthly salary in R&D centers in Poland	36
Table 6.1	The largest IT companies operating in Poland in 2011	41
Table 6.2	IT companies operating in Poland in 2011 with the highest employment	43
Table 6.3	IT companies with the highest employment growth operating in Poland in 2011	44
Table 6.4	IT companies with the largest revenue increase	45
Table 6.5	IT companies that spent the most on R&D in 2011 (in thousand PLN)	46
Table 6.6	The largest exporters of IT solutions in Poland	48
Table 6.7	The largest producers of mobile applications	51
Table 6.8	Polish companies in "Deloitte Technology Fast 50" in Central Europe, 2011.....	52
Table 6.9	Polish companies in the ranking of the rising stars of "Deloitte Technology Fast 50" in the Central Europe, 2011	52
Table 7.1	The most popular fields of study – bachelor's degree.....	56
Table 7.2	The successes of Poles in the "Microsoft Imagine Cup" competition	57
Table 8.1	Entrepreneurship centres in Poland, 2010	65



List of figures

Figure 4.1	Percentage of households with the Internet access at home	28
Figure 5.1	The structure of the IT market in Poland in 2010-2014	32
Figure 5.2	The structure of net sales in the ICT sector	32
Figure 5.3	The structure of exports of ICT	34
Figure 5.4	The structure of imports of ICT	34
Figure 5.5	Comparison of IT staff salaries in Poland and in the USA	37
Figure 8.1	Growth dynamic of innovation and entrepreneurship centers in Poland between 1990 and 2010	65
Figure 8.2	Technology parks in Poland in 2010	66
Figure 8.3	Factors affecting the ICT sector development in Poland	68
Figure 8.4	Barriers to ICT sector development in Poland	69
Figure 8.5	Success factors for Polish ICT companies operating abroad	70



Information and communication technologies (ICT) play an increasingly important role in the global economy and remain critical to the competitiveness and innovativeness of the most advanced economies in the world. They permeate all aspects of socio-economic life, change the internal organization of companies and the ways citizens and businesses interact with the government, change work and learning patterns, determine people's interaction with the infosphere and create new patterns of leisure time. According to a number of forecasts, progress in these areas will determine the pace of the whole economy development. The ICT sector is characterized by higher labor productivity and profitability than other sectors of production and services. Moreover, its share in GDP and employment of modern economies is steadily growing. The development of the ICT sector requires capital expenditure, spending on research and development, science and business co-operation in the process of technology transfer, highly skilled and educated labor, and society that is digitally competent and adequately prepared for the use of information and communication technologies. The citizens' interest in latest technology is in turn the result of availability of telecommunication infrastructure and digital devices, overall wealth of the society and an abundance of interesting and useful online products, as well as services. Developed countries, seeking economic

growth can imitate other economies technologically and organizationally to a limited extent only. On the contrary, they are forced to pave the way in the world of new technologies, characterized by high levels of competition, rapid flow of information and the resulting high rate of diffusion of innovation and high risk of investing in unproven solutions.

Examples of countries that succeeded in the past few decades in moving from economy based on low labor costs and efficiency of production to economy based on knowledge shows that this kind of transformation requires the active role of the state supporting entrepreneurship technologically, economically and organizationally, the development of telecommunication infrastructure and facilitation of cooperation between science and business. Poland as a country in transition to an economy based on innovation, is facing the task of implementing an effective strategy at the moment, in order to promote technological entrepreneurship, to promote Polish technological concepts in the world, attracting investment with high added value and enabling cooperation between science and business. This publication is an attempt to outline the current Polish position on the world ICT scene and determine the future prospects of its development, taking into account factors affecting the success of countries well recognized for their innovative ICT solutions.



Strengths of the Polish economy. Poland is ranked 20th on the list of the world's largest economies, 31st in terms of population, 47th in the GDP per capita ranking and 22nd in the ranking of world export leaders. There is a large internal market, high standards of education and highly educated labor. Poland's economy proved resilient to the global economic crisis harassing European and world markets. Strengths of Polish economy are: public safety, increasing transparency of political life and administrative decision-making process, political stability, an economy, which is easily assimilating latest technologies through foreign investment and rising expenditure on research and development reflected in the increasing export of high-tech goods, rising revenue from the sale of licenses and patents abroad and increasing number of registered Community designs and trademarks. According to the World Bank's forecasts, Poland may count on GDP growth at 2.9% in 2012 and 3.2% in 2013. In the Global Competitiveness Report 2011-2012 Poland was ranked in the group of 18 countries in transition from economy based on the efficiency of the production system to innovation-driven economy.

The growing importance of Poland in the global ICT industry. In the last decade, Poland has become an important producer of ICT solutions, partly

due to globalization of the ICT market and outsourcing of production to Asia, Mexico and Central, as well as Eastern Europe. Moreover, the Polish internal market is characterized by increasingly higher demand for ICT technologies. In 1996-2008 Polish ICT export grew at an average annual rate of 28%, and Poland has become specialized in consumer electronics, customized software production, electronic games, and mobile solutions. Polish economy is now the fifth largest European economy in terms of employment in the manufacturing segment of the ICT sector (5.1% of total European ICT manufacturing segment employment). Although Poland is not rated very high in the rankings of information society development defined in terms of Internet usage and availability of broadband connections to citizens and businesses, Polish government has made a conscious effort to change this situation by adopting a document "Strategies for Developing Information Society in Poland until 2013", which has resulted in changes of telecommunications law favorable to the ICT industry, simplification of procedures making it possible to obtain funds for computerization, inclusion of computer and Internet literacy skills in curricula and the facilitation of information and telecommunication infrastructure investment. According to the Digital Agenda Scoreboard, expenditure on development of telecommunications networks defined as a percentage of

total revenue are higher in Poland than on average in the European Union, which promises shortening the distance between Poland and more advanced European countries. Poles are avid users of social media services, much more eager to interact with others than an average European, and government online services utilization rates among enterprises has exceeded the European average.

The growing importance of the ICT industry to the Polish economy.

In 2010, ICT industry share in the manufacturing and services sector was at 5.3%, net sales of the ICT sector amounted to PLN 113.5 billion and compared with 2007 increased by 26%. The ICT manufacturing sector revenue increased by 48%, while the ICT services sector revenue increased by about 17%. Within the ICT services sector, the highest increases were registered in IT services companies (45%) and wholesale companies (44%). In 2007-2010 the number of companies in the ICT sector increased by 404, from 995 in 2007 to 1399 in 2010, while the number of IT services providers increased by 307, wholesale companies increased by 63, and manufacturing companies increased by 27. It is expected that in subsequent years services and software will become the more important part of the Polish ICT market, at the expense of the production segment. In 2010, a number of employees in the ICT sector reached 162 thousand people and was 8% higher than in 2007.

Moreover, there is a growing importance of ICT exports in total Polish exports. Net sales of the entire ICT sector increased in 2007-2010 by nearly 9.1 billion PLN (40%), of which in manufacturing by more than 7 billion PLN (about 38%) and by 2 billion PLN (51%) in services. In 2010, ICT manufacturing companies derived 64% of their revenues from export, and ICT services providers - 8%. According to the Computerworld Top 200, 2012 edition, in 2011 there was a significant increase in spending on information technology in public administration (spending increased by 17%, public administration today is the biggest ICT spender in Poland due to substantial EU grants), telecommunications (13%), utilities (44%), transport (53%), health (45%), education (16%), media (16%) and construction (33%).

Taking into account the whole ICT sector (manufacturing and services) in 2010 and comparing it to 2007, there was more than threefold increase in spending on research and development (about 536 million PLN), and compared to 2009, the increase was nearly twofold (about 379 million PLN). In 2010, expenditure on research and development in the Polish ICT sector consumed 758.6 million PLN. In comparison with other countries in the region, Poland looks more favorably as the place to locate R&D centers and start-ups specializing in software development. BPO service centers and nearby outsourcing facilities flourish in Poland, as well as development centers of specialized

software and services. ICT industry entrepreneurs can gain benefits from the government assistance and refinancing while creating new jobs and investing in fixed capital. They can also apply for EU support under the provisions of five operating programs, with the most popular in ICT industry being Innovative Economy Operational Program. The last two editions of the Antal Global Snapshot study revealed that Polish ICT industry invests the most in the area of embedded applications, e-commerce platforms, mobile applications and social media tools. Most IT projects are conducted in health sector, telecommunications, finance, defense, and automotive industries. More and more companies specialize in the production of electronic games, and this segment recorded double-digit growth. The segment of companies hire out IT specialists or entire design and development teams to conduct specific projects for a specified period of time is growing rapidly; according to forecasts, this segment of ICT market will grow at an annual rate of 20% in upcoming years.

The challenge of transformation to an economy based on innovation. Currently, Poland is confronted with the task of escaping the so-called “middle-income trap”, which requires focusing on enhancing the innovativeness of Polish economy. This in turn requires increased investment in infrastructure development, particularly telecommunications infrastructure, financial markets

growth, venture capital market in particular, stimulating cooperation between science and business, expansion of clusters of cooperating companies, improvement of citizens’ digital literacy and consistent strategy of information society development, R&D investments, especially on the side of companies, brain drain suppression, creation of coherent legal framework, not restricting the development of digital economy, and expansion of government online services.





According to the Global Competitiveness Index 2011-2012, Poland is 20th economy in the world in terms of GDP, 31st in terms of population, 47th in terms of GDP per capita, 22nd in terms of export. Compared to other Central and Eastern Europe countries, Poland stands out favorably in terms of GDP per capita and GDP growth. Polish economy proved to be resilient to the crisis of 2008-2009, when its development was not suppressed. In 2003-2007, an average annual GDP growth rate of Poland was about twice as high as an average GDP growth rate of the European Union countries. In the very difficult year 2008, Poland recorded a GDP increase of 5.1%, while the EU economy increased only by 0.3%. In 2009, the European Union was plunged into recession, and Poland recorded a 1.6% increase and over two subsequent years strengthen its position, growing twice as fast as the average EU country.

According to the World Bank forecasts, Poland may count on GDP growth at 2.9% in 2012 and 3.2% in 2013. Despite the crisis, Poland may be the fastest growing economy in the EU region in 2012. In a period of crisis, Poland benefits from large internal markets and relatively low dependence on export.

Key indicators of Poland's economic condition, 2010

Population	38 million
GDP	468.5 billion USD
GDP per capita	12 300 USD
Unemployment (May, 2012)	12,6%

Poland belongs to a group of countries modernizing their economies after nearly half a century of the centrally planned economy under the influence of the Soviet Union. In the Global Competitiveness Report 2011-2012, Poland was among the 18 countries in transition from economy based on the production system efficiency to an economy based on innovation, together with such countries as Brazil, Chile, Croatia, Mexico, Hungary, Slovakia, and Turkey. In the world ranking of competitiveness, Poland was ranked on the 41st place, decreasing by two places from the previous edition of the ranking, after increasing by six positions in the previous year. It should be mentioned that Switzerland has been recognized for the most competitive economy in the world, followed by Singapore, Sweden, Finland, United States, Germany, Netherlands, Denmark, Japan, and the United Kingdom.

Authors of the Global Competitiveness Report 2011-2012 noted the strengths and weaknesses of the Polish economy. Among the strengths, there are:

a large internal market, high standards of primary and secondary education and a large number of graduates. The financial sector is fairly well developed, and the Polish economy is increasingly considered to be trustworthy. The GCR ranking rated relatively low inflation highly and an acceptable number of procedures required of an entrepreneur intending to establish a business, as well as the growing transparency of political and administrative decision-making process and security of citizens. Since 2007, the rate of governance effectiveness, as defined by the World Bank, has been improving continuously. According to the research of World Bank, since 2003 the quality of Polish law has been improving systematically. The business sector, however, remains skeptical concerning the activities of tax offices and bureaucracy burden, restrictive labor laws, poor infrastructure, inefficiency of courts and inadequate access to business financing. The accessibility of the latest technologies for the business, public sector, and citizens has been rated poorly, although it was recognized that Polish economy has a high ability to absorb latest technologies through foreign investments. Polish residents enjoy a relatively high availability of the Internet and especially of the broadband connections, but further improvement of the competitiveness requires the infrastructure development, especially traditional transport infrastructure.

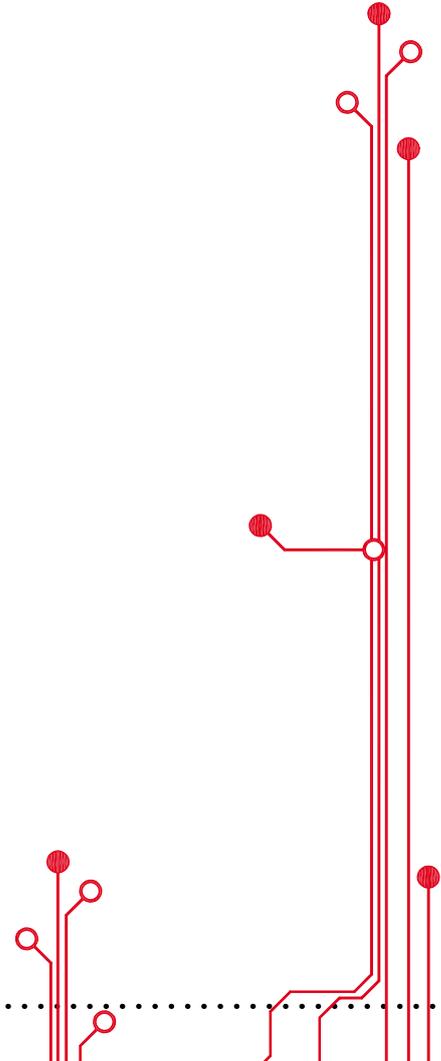


Table 1.1 Poland. Key indicators

Indicator	Source	2003	2004	2005	2006	2007	2008	2009	2010	2011
Average annual GDP growth	GUS	3,9	5,3	3,6	6,2	6,8	5,1	1,6	3,9	4,3
Average annual GDP growth in EU	Eurostat	1,4	2,5	2,0	3,3	3,2	0,3	-4,3	2,0	1,5
Public debt in % GDP	GUS	47,1	45,7	47,1	47,7	45,0	47,1	50,9	54,8	56,3
Public debt in % GDP in EU	Eurostat	61,9	62,3	62,8	61,5	59	62,5	74,8	80,0	82,5
GDP per capita in PPS (UE27=100)	GUS/ Eurostat	49	51	51	52	54	56	61	63	
% population aged 15-64 with tertiary education	GUS	11,6	12,8	13,9	14,9	15,7	16,5	18,1	19,8	20,7
% population aged 30-34 with tertiary education	GUS			22,7	24,7	27,0	29,7	32,8	35,3	
% population aged 30-34 with tertiary education in EU	Eurostat			28	28,9	30,0	31,1	32,3	33,6	
Mathematics, natural and technical sciences graduates as % of total graduates	GUS	2002/03 14,6	2003/04 14,9	2004/05 16,1	2005/06 18,8	2006/07 19,0	2007/08 18,3	2008/09 17,4	2009/10 17,6	
R&D expenditure as % GDP	GUS	0,54	0,56	0,57	0,56	0,57	0,60	0,68	0,74	
including: business sector expenditures as % GDP	GUS	0,15	0,16	0,18	0,18	0,17	0,19	0,19	0,2	
Total R&D expenditure as % GDP in EU	Eurostat	1,87	1,83	1,83	1,85	1,85	1,92	2,01	2,00	
Share of industrial companies investing in R&D in total number of industrial companies	GUS	39,3	38,7	38,2	37,3	31,8	31,9	29,6	29,6	
Share of innovative products in industrial net sales (%)	GUS	28,5	30,1	30,6	31,6	31,5	31,2	32,8	33,5	
Number of Polish residents patents in EPO	Eurostat	111,47	124,38	123,78	140,26	200,65	205,07	142,99		
Information technologies expenditure (% GDP)	Eurostat/ EITO				1,8	1,7	1,6	1,9	1,7	
Telecommunications technologies expenditure (% GDP)	Eurostat/ EITO				4,3	3,9	3,5	3,2	2,8	
Broadband penetration in % of population	Eurostat/ UKE		0,5	1,9	3,9	6,8	9,6	12,8	14,9	

After: Global Competitiveness Report 2011-2012

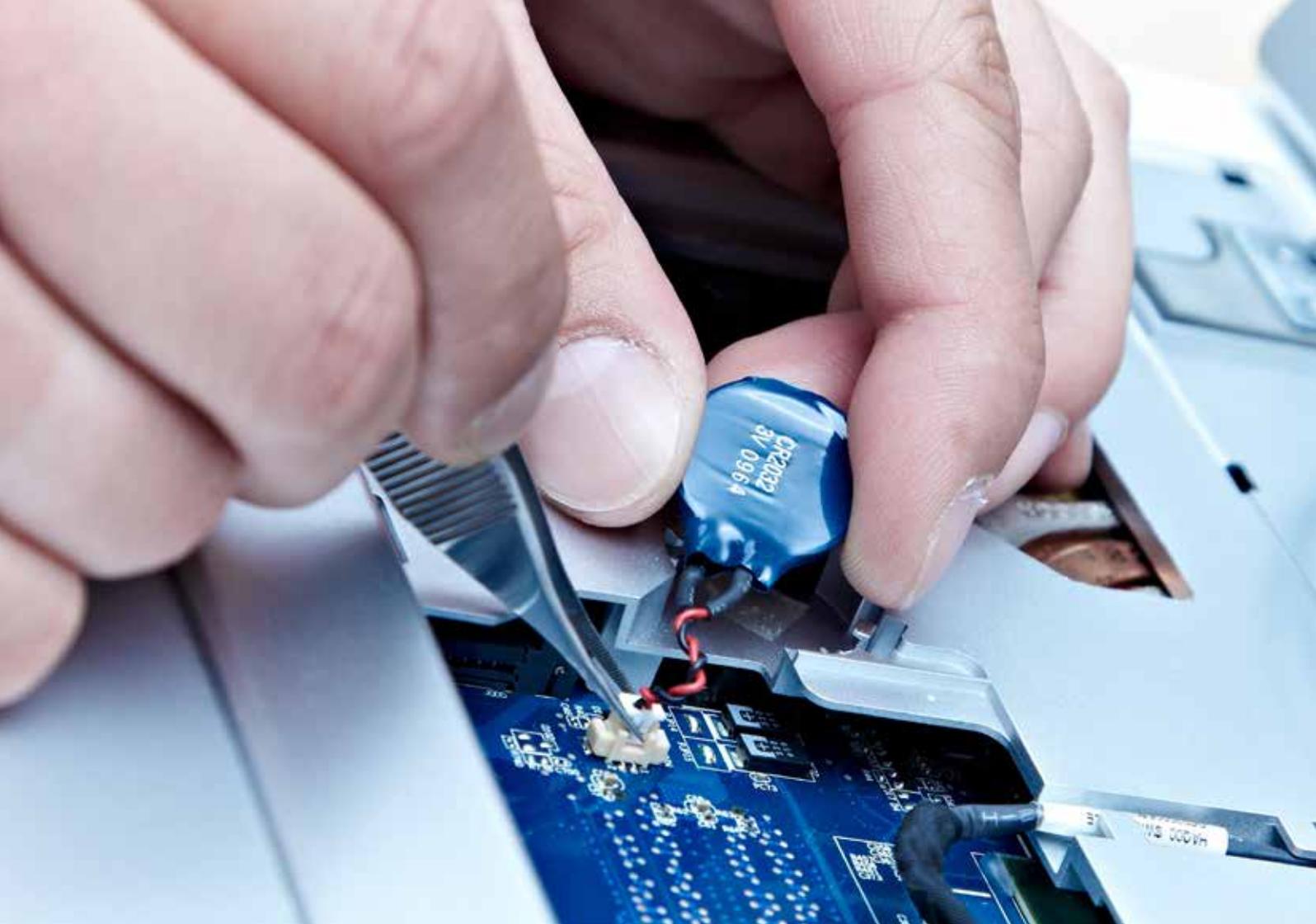


Graduation rates. Poland exceeds European Union rates for participation of the group aged 30-34 in the university education. In 2010, 33.6% of the European Union citizens in this age group graduated from universities, while in Poland the analogical rate was equal to 35.3%, mainly because of women participation in tertiary education. The percentage of population with tertiary education in the age range of 15-64 was amounted to about 21%. Nearly 18% of the total graduates obtained a diploma in mathematics, science and engineering, and in accordance with the strategy outlined in the National Strategic Reference Framework, the rate is to grow to 22% in the coming years.

Availability of the Internet. According to Global Competitiveness Index, a growing number of Polish citizens - 62% - uses the Internet at least once a week. In the United States the figure is at 79%, in South Korea 84%, in Sweden 90%, in Norway 93%. It is worth noting that Poland ranks quite high in the ranking of bandwidth per citizen (30th place in the world with a score of 23.5 kb/s, United States at the 26th place with a score of 29 kb/s). The rate of broadband connections in relation to the population achieved in 2010 the level of 14.9%, increasing in recent years at an annual rate of about 3%.

Patenting of technology. The rates of new technology patenting look worse. The numbers of patents granted in 2010 per million inhabitants is the highest in Taiwan (356), Japan (353) and the United States (339), followed by Israel (249), South Korea (241), Finland (216) and Switzerland (212). Poland was ranked 56th (one patent per million inhabitants).

Expenditure on R&D. Since 2006, the total expenditure on R&D, defined as a percentage of GDP is steadily increasing (from 0.56% of GDP in 2006 to 0.74% of GDP in 2010), aiming to achieve a level of 1.5% over the next few years, according to the National Strategic Reference Framework adopted by Polish government. Moreover, spending on research and development in the business sector has slightly increased (from 0.15% of GDP in 2006 to 0.2% of GDP in 2010). According to the National Strategic Reference Framework, in coming years this indicator should be at least doubled. The total spending on information technology and telecommunications in Polish economy in 2011 reached 4.5% of GDP. This ratio in the coming years should reach 8.5%.



3. POLISH COMPETITIVENESS IN THE ICT SECTOR IN COMPARISON TO OTHER EUROPEAN COUNTRIES

The Europe's Digital Competitiveness Report 2010 has been assembled for the European Digital Agenda – a document being an expression of the European Commission approach to the digital economy policy as an element of the Europe 2020 economic strategy. Information technology development in EU countries is considered to be one of the key factors affecting healthy, sustainable economic growth and a key element of economic recovery after the crisis. Information and communications technologies (ICTs) are responsible for half of the European productivity growth over the past 15 years.

One fourth of the research and development activities in the European Union are conducted in the ICT manufacturing sector, although it is responsible only for 1% of the European GDP. In the EU-27 economy ICT services create almost 4% of GDP (462 billion EUR). Japan is much more specialized in the ICT manufacturing (2.9% of GDP), and the United States in ICT services (5% of GDP). More than 70% of the European ICT sector value added and 2/3 of jobs are created by five largest EU economies (Germany, United Kingdom, France, Italy, and Spain). The UK ICT market is of the greatest value (21.7%

of the entire European ICT market), followed by Germany (20.2%), France's market is slightly less important (13.2%), Italy (10%), and Spain (6.3%). Polish ICT market ranks 11th place in Europe with 2.3% of the entire share. The ranking of employment in ICT industry looks somewhat different: Germany (19% of total employment in the ICT sector in EU-27), followed by the United Kingdom (16.3%), France, Italy, Spain and Poland (4.2%). Germany is of much greater importance in the ICT manufacturing sector than other European countries (30.2% of the European ICT manufacturing versus France 12.7% and the UK 12.3%, Poland 1.3%, with the strong position of Finland and Sweden - 6.8% and 4.9%, respectively). The

indisputable leader in ICT services sector is the United Kingdom (24.8% versus Germany 17%, France 13.4%, Poland 2.7%).

The manufacturing segment of the ICT sector in Europe. The European ICT manufacturing sector represents 13% of the total manufacturing sector and as such is one of the largest industrial sectors. In recent years, however, the number of ICT manufacturing jobs in

The European ICT sector creates 4.8% of GDP in member states (593 billion EUR in 2007), of which 80% accounts for services. By comparison, in Japan the ICT sector is responsible for 6.8% of GDP, while in the United States for 6.4%.

the United Kingdom and France decreased significantly, while the Czech Republic, Hungary, and recently - Poland experienced employment growth in this segment. The Polish economy is now the fifth largest European economy in terms of employment in the manufacturing segment of the ICT industry (5.1% of total employment in the European ICT manufacturing segment, Germany 26.8%, France 12.5%, United Kingdom 12.3%, Italy 11.3%). Poland, the Czech Republic, and Hungary have been investing mainly in production of low value added. 17% of employees working in ICT manufacturing in EU-27 work in Poland, the Czech Republic, Hungary, Romania, Bulgaria and Slovakia, but only 4.6% of value added is created in these countries. In comparison, the Netherlands, Sweden, Finland, and Ireland employing a total of only 10% of workers generate nearly 21% of value added in ICT manufacturing industry.

ICT services in Europe. The leader is the United Kingdom (19.4% of employed in ICT services sector, 24.8% of value added). In comparison with the boom years of 2000-2011, in all countries with the exception of Germany employment in the sector of telecommunications

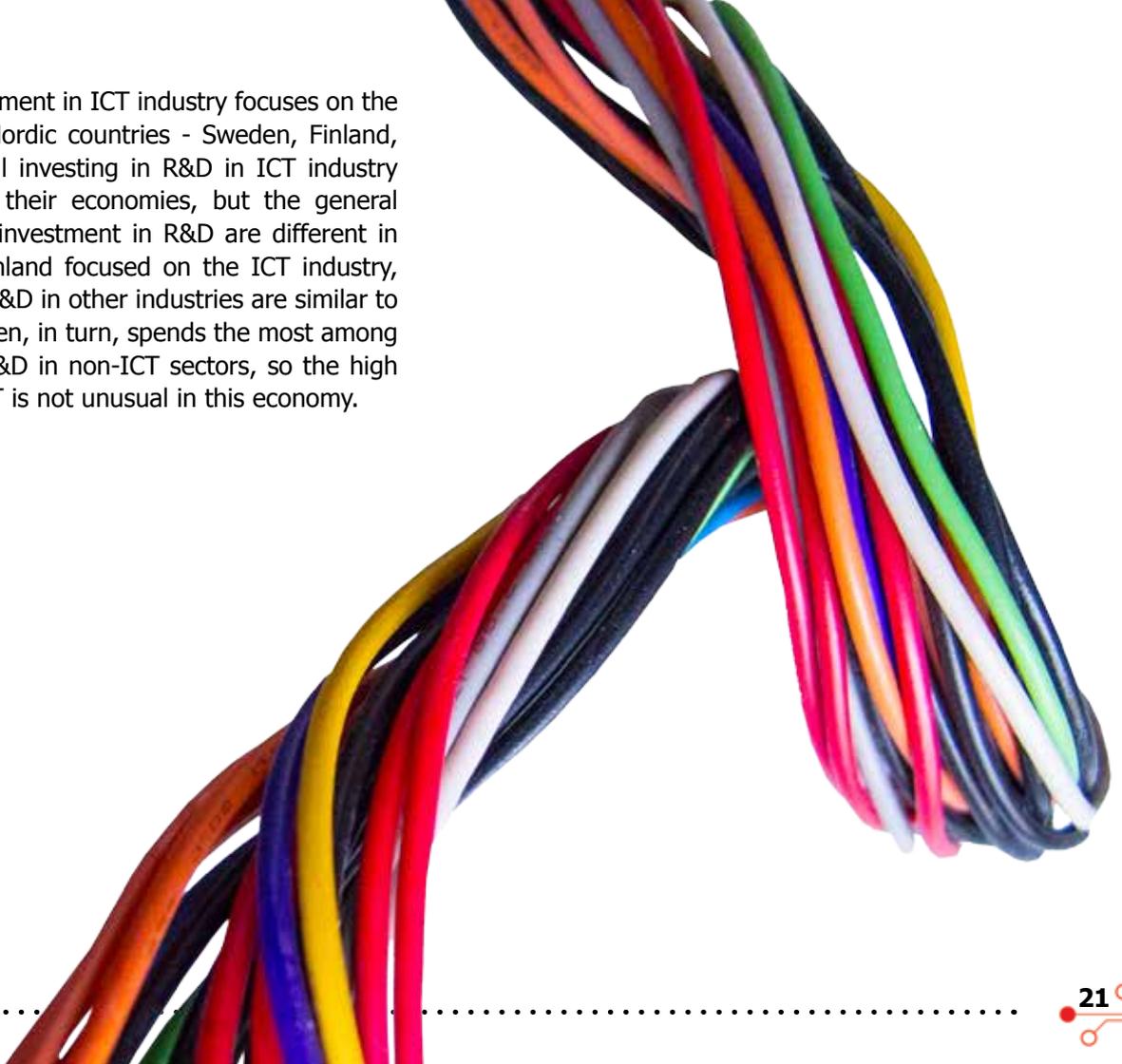
fell, while growing uninterrupted in IT services and software production. Employment in the ICT sector differs considerably in different countries. As a share of the private business sector excluding the financial sector is less than 3% in Portugal, Greece, Spain, Lithuania, Latvia and Cyprus, and more than 6% in Hungary, 7% in Sweden, 8% in Finland and Ireland.

Research and development in Europe.

In 2007, total spending on research and development in the ICT sector amounted to 39.4 billion EUR, with the biggest share – EUR 36.6 billion – being business sector spending. ICT sector accounted for one quarter of the total business expenditure on R&D, being the sector most intensively investing in research and development. In Japan and the United States, this share is even higher, making up 32.4% and 39.2%, respectively. The largest share of spending on research and development in ICT industry falls on Germany, France, and the United Kingdom, and after them on Sweden, Finland, and Italy. **The old EU countries, EU-15, account for almost 98% expenditure on R&D in the ICT industry, and new member states, EU-12, for only 2.8%.** The

Total spending on R&D in Europe does not exceed 2% of GDP, while expenditures of the United States are at 2.6% of GDP, and Japan's at 3.4%. In 2008, R&D expenditure exceeded 3% of GDP in Finland and Sweden only.

increase in R&D investment in ICT industry focuses on the services sector. The Nordic countries - Sweden, Finland, and Denmark - are all investing in R&D in ICT industry most for the size of their economies, but the general characteristics of the investment in R&D are different in any given country. Finland focused on the ICT industry, while investments in R&D in other industries are similar to the EU average. Sweden, in turn, spends the most among all EU countries for R&D in non-ICT sectors, so the high R&D investment in ICT is not unusual in this economy.





Most of the indicators of information society development places Poland on low positions in European rankings. However, Poland put a lot of effort into changing this state of affairs, adopting a "Strategies for Information Society Development in Poland until 2013" document. In recent years, a number of changes favorable to the ICT industry has been promoted, including changes in telecommunications law, simplifying of procedures concerning obtaining funds for computerization, inclusion of computer and Internet literacy skills in curricula, and facilitating information and telecommunications infrastructure development.

According to the Central Statistical Office (GUS), the percentage of households equipped with computers is steadily growing. In 2004, computers were present in every third household. In 2007 - every second household was equipped with them. In 2011, more than 71% of households were equipped with a computer. Similarly, percentage of households with Internet access is increasing steadily. In 2004, just a quarter of households had an Internet connection. In 2007, more than 41% of households had their own access to the Net. In 2011, the percentage of households connected to the Internet reached 66%. Increasingly, it is the broadband access. In 2004, 26% of households had an Internet connection, but only 8% have a broadband connection. In 2011,

66% of households had access to the Internet and 61% had a broadband Internet access. Computerization and Internet connectivity is even more advanced in the case of businesses. Already in 2004, nearly 92% of enterprises had computers, 85% were connected to the Internet, and 23% of them had broadband access. In 2011, the percentage of computerized enterprises reached 95.7%, almost 94% had access to Internet, and 77.5% were using broadband connection.

Table 4.1 Indicators of information society development in Poland

	2006	2007	2008	2009	UE-27	ranking
Broadband						
Total DSL coverage (as % of total population)	67,1	64,0	69,6	74,5	94,0	26
Broadband penetration (as % of population)	5,2	8,4	11,8	13,5	24,8	25
% of households with an Internet connection	36	41	48	59	65	17
% of households with a broadband connection	22	30	38	51	56	16
% of enterprises with a (fixed) broadband access	46	53	59	58	83	24
% of population using a laptop via wireless connection away from home/work to access the Internet		3	6	10	17	19
Internet usage						
% population who are regular Internet users (using the Internet at least once a week)	34	39	44	52	60	21
% population who are frequent Internet users (using the Internet every day or almost every day)	22	27	32	39	48	21
% population who have never used the Internet	52	48	44	39	30	20
eCommerce						
% population ordering goods and services for private use	12	16	18	23	37	16
% population ordering goods and services from sellers from other EU countries				2	8	25
% population selling goods and services (e.g. via auctions)	5	5	7	6	10	11
5 population ordering or buying an online content	6	6	5	5	10	13
eCommerce as % total turnover of enterprises	6	6	9	7	13	17
% enterprises purchasing online	16	13	11	-	24	25
% enterprises selling online	9	9	8	5	12	22
eBusiness (as % of enterprises)						
Using applications for integrating internal business processes (all enterprises)			24	25	41	25
Using applications for integrating internal business processes (large enterprises)			58	60	71	22
Exchanging automatically business documents with customers/suppliers			26	25	26	14

	2006	2007	2008	2009	UE-27	ranking
eBusiness (as % of enterprises)						
Sending/receiving e-invoices		8	11	12	23	20
Using analytical Customer Relationship Management		12	12	14	17	17
eGovernment						
% basic public services for citizens fully available online	8	17		27	66	25
% basic public services for enterprises fully available online	38	38		88	86	8
% of population using eGovernment services		15	16	18	30	23
% of population using eGovernment services for returning filled in forms		4	5	5	13	22
% of enterprises using eGovernment services	61	64	68	61	71	23
% of enterprises using eGovernment services for returning filled in forms	56	56	60	57	55	15
% of enterprises using eGovernment services to submit a proposal in a public electronic tender system (eProcurement)	7	8	6	7	11	25
Indicators showing the development of the ICT sector, ICT and R&D skills						
ICT sector share in total GDP					5,0	
ICT sector share in total employment					2,7	
ICT R&D expenditure by the business sector, as % of GDP					0,3	25
ICT R&D expenditure by the business sector, as % of total R&D expenditure					25,0	24
% of ICT exports in total exports		5,7	6,7			12
% of ICT imports in total imports		9,0	9,5			10
% of people employed with ICT user skills	15,0	15,1	15,5	16,2	18,4	26
% of people employed with ICT specialist skills	2,8	2,8	2,8	2,8	3,2	22

Source: Europe's Digital Competitiveness Report, 2010

Electronic commerce indicators in Poland are lower than the European average, although one quarter of Poles has already ordered products and services via the Internet. According to the Digital Agenda Scoreboard, investment in the telecommunications network development defined as a percentage of total income in Poland is slightly higher than average than in the European Union, which gives some hope for shortening the distance between Poland and more advanced countries.

All indicators illustrating access to the Internet, especially broadband access in households and businesses, put Poland below the EU average. Poles use mobile phones to access the Internet less than the average Europeans do, and are rarely equipped with portable electronic devices to access the Internet by their employer.

More Poles than the average EU-27 had never used the Internet, fewer households have regular access to the Internet, and fewer Poles systematically use this medium. Definitely, Poland lags behind Europe when it comes to reading online editions of newspapers and magazines, searching for health information or sharing in online polls. When it comes to e-learning, Poland remains well behind.

Poles use social media more often than average Europeans. A smaller percentage of the Polish population than the EU-27 average used the online services of government in 2011 in order to send forms or complete them electronically. At the same time, business sector's utilization of the government online services is greater than the European average. Poles are far less likely to procure goods in online stores from abroad than the average Europeans are, and

Poles use social media more often than average Europeans. A smaller percentage of the Polish population than the EU-27 average used the online services of government in 2011 in order to send forms or complete them electronically. At the same time, business sector's utilization of the government online services is greater than the European average.

less likely to sell online and pay for online content. Much less of Polish small and medium-sized companies sell and buy online. Polish companies send electronic invoices and use RFID technology less frequently than other Europeans do.

Poles come out slightly worse than the average Europeans when it comes to computer and Internet literacy tests, although

Poles have above-average rates of information technology skills acquisition within the framework of formal education among 16-24 age group, reflecting the inclusion of IT in curricula.

The Central Statistical Office report "Information Society in Poland. Statistical results from the years 2007-2011" provides more details on information society development

in Poland. **In 2011, computers were used by 96% of companies including all the big players. The value of this indicator locates Poland in 2010 above the EU average, and the distance between Polish enterprises and European leaders was not significant.** Since 2008, the percentage of enterprises having access to the Internet has exceeded 90%. In

Poles come out slightly worse than the average Europeans when it comes to computer and Internet literacy tests, although Poles have above-average rates of information technology skills acquisition within the framework of formal education among 16-24 age group, reflecting the inclusion of IT in curricula.

2011, as compared with the previous year, the number of companies benefiting from broadband and 3G wireless connections has increased. Importantly, the largest increase of the Internet accessibility via a broadband connection has been reported in small enterprises.

Increasingly, companies exchange information via automated data exchange systems. The proportion of such firms increased in 2011 to a level of 66%. The highest percentage was recorded in large enterprises (86%), but

the percentage of small businesses that use automated data exchange systems is growing rapidly. Most of the automated data exchange systems - 79% - are used by utility companies (production and supply of electricity, gas, steam, and hot water). Systems of automatic data exchange within an enterprise are most commonly used in accounting, least commonly to manage distribution. Steadily increasing proportion of enterprises – 92% in 2011 - uses the Internet in dealing with public administration.

In 2011, almost half of businesses with the Internet access benefited from connections with a speed limit of 2 Mbit/s to 10 Mbit/s. Almost 60% of medium and large companies were using these types of connections. The connection speed of less than 2Mbit/s was the most popular among small businesses (32%), and a link speed of 30Mbit/s to 100 Mbit/s and more - among large enterprises.

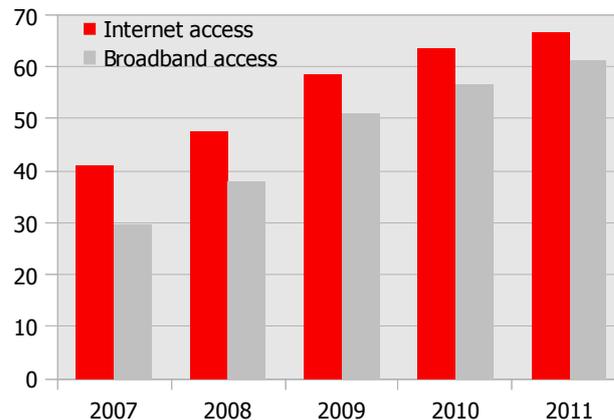
Table 4.2 Enterprises with a broadband Internet access by type of Internet connection (in %)

	2010	2011
DSL (xDSL, ADSL, SDSL etc.)	82,1	81,8
Cable TV networks and PLC	27,6	23,8
Computers with 3G connection	28,0	28,9
Handset 3G	13,0	15,2

Computers in companies. 40% of Polish workers use a computer at least once a week. In Finland and Sweden, this ratio is at 70%, in Germany and the UK at about 60%, the average for EU-27 being 55%. In 2011, a high level of computerization was recorded in Poland in the central province of Masovia, where over half of the workers used the computers, and more than 40% - computers with Internet access.

Computers in households. In 2010, the ratio of households equipped with a computer at home decreased by 5 percentage points than the EU average (74%) and the gap has not decreased in comparison to the previous year. Iceland remains the leader of this ranking with 93% of households having a computer, as well as Netherlands, the Scandinavian countries and Germany. The smallest percentage of households with computers was recorded in Bulgaria (35%) and Romania (48%). In 2011, 20.3 million of Poles were using a computer, of which 17.5 million were regular computer users. In 2010, regular computer users accounted for a smaller percentage of the population of the country by 10 percentage points than in the European Union and smaller by 34 percentage points than in Iceland, where the level of the index was 92%. From the country characterized by the lowest level of the ratio, i.e. Turkey, Poland is 23 percentage points apart.

Figure 4.1 Percentage of households with the Internet access at home.



Internet access. In 2011, 67% of households had Internet access at home, 3 percentage points more than the previous year. The share of households with the Internet access at home grew steadily in 2007-2011. Households in the western region of Poland have access to Internet at home more often than households in central and eastern part of the country do. The lowest percentage of households with a Web home access has been reported in the eastern Poland. Importantly, the disparity between the eastern part of the country and the western part increased in 2011 compared to 2007. In terms of Internet broadband access, Poland is in the same group of countries as Spain

and Ireland, although it lags behind Sweden, Norway, and Iceland, where more than 80% of households have broadband access.

Digital literacy of citizens. In terms of computer and Internet literacy, Poland does not differ from the wealthier countries of the European Union significantly, and in some categories, it even exceeds the EU average, and in some cases comes ahead of the European innovation leaders. 61% of Poles can use the search engine, and every

fourth Pole takes part in the online discussions. Every fourth Pole uses the Internet to make voice calls (due to foreign labor migration and high prices of telecom connections). As many as 15% of Poles can use file sharing programs - a similar rate has been recorded in Finland and the UK. Only 7% of the Poles, however, can create a website - in this category Poland lags behind Finland, where 19% of people can create their own webpage, and such countries as Germany or the United Kingdom, where the figure is equal to 11-12%.

Table 4.3 Internet literacy skills in selected European countries in 2010 (in %)

	Using of Internet search engines	Sending e-mails with attachments	Chat and discussion forums participation	Voice over IP calling	Using of peer-to-peer networks	Websites development
Finland	85	72	13	16	14	19
Germany	82	68	32	22	9	12
United Kingdom	80	72	38	21	13	11
EU-27	70	60	31	22	14	10
Czech Republic	68	62	28	31	6	7
Poland	61	46	25	25	15	7
Ireland	60	52	24	16	7	4
Bulgaria	45	32	21	22	11	4

Source: Eurostat



The source of the data given below is the Central Statistical Office report published in 2012: "Information Society in Poland. Statistical results from the years 2007-2011".

ICT sector revenue. In 2010, net sales in the ICT sector amounted to 113.5 billion PLN. Net revenue from sales in the ICT sector increased in 2007-2011 by more than 23.7 billion PLN (26%). Despite some declines recorded in 2008 (the ICT wholesale) and 2009 (wholesale and telecommunications), the value of net sales at the end of 2010 was higher in each of the indicated groups of entities compared to 2007. In ICT production increase amounted to almost 13.2 billion PLN (48%), ICT services revenue increased by more than 10.5 billion PLN (17%), of which most in services - by almost 6.2 billion PLN (45%), followed by the ICT wholesale (about 3.4 billion PLN, i.e. 44%) and telecommunications (by 1.0 billion PLN, i.e. 2%). Positive trends have contributed to the increase in the total contribution of the ICT sector to the production and services from 4.9% in 2007 to 5.3% in 2010.

Table 5.1 Net revenue from sales in the ICT industry (in million PLN)

	2007	2008	2009	2010
ICT industry (production and services)	89 766,6	93 649,7	96 226,9	113 504,7
ICT production	27 313,7	23 739,5	27 611,3	40 508,1
ICT services	62 452,8	69 910,2	68 615,7	72 996,5
ICT wholesale	7 797,6	7 692,6	6 797,0	11 192,7
Telecommunications	40 882,1	44 341,4	42 609,4	41 888,5
IT services	13 773,1	17 876,2	19 209,3	19 915,3

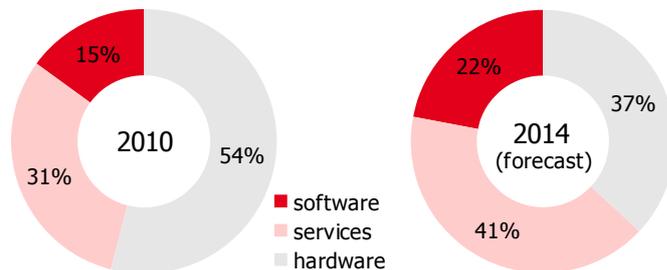
Source: GUS

The share of net sales revenue of ICT sector in the manufacturing and services sector's net sales amounted to 5% in 2007 slightly decreased in 2008, rose to the level of 2007 in 2009 and exceeded 5% in 2010. Production of ICT in total production has exceeded 4.5%, and the ICT services in total services rose to nearly 6%.

The structure of the ICT sector. In 2010, the entities belonging to the service sector accounted for 84% of all companies in the ICT sector. Most of them (almost 72%) specialized in IT services, 15% specialized in telecommunications services, and 14% were dealing

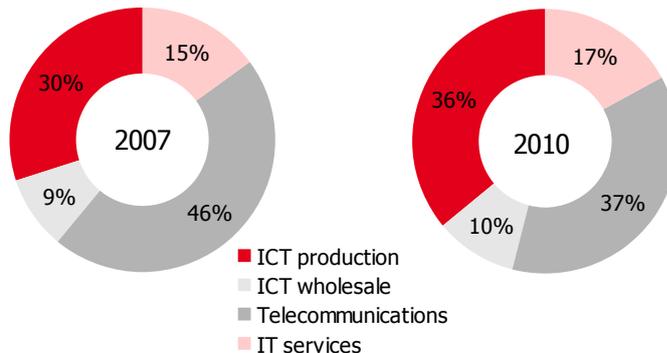
with the wholesale. Compared to 2007, the number of companies selling commodities in the wholesale manner increased significantly – by about 66%, and the number of companies dealing with information technology services - by 57%. The number of companies in the field of telecommunications was growing more slowly (4%). In absolute terms, in 2007-2010 the number of companies in the ICT sector increased by 404 - from 995 in 2007 to 1399 in 2010, the number of companies providing IT services grew by 307, selling wholesale by 63, and manufacturing companies – by 27. According to the Computerworld TOP200 report, 2012 edition, the share of IT services in total ICT solutions sales rises year by year, at the expense of telecommunications solutions, and the largest increases in the services segment were recorded by the major services providers. In 2010, market for BPO services in Poland was worth 250 million USD (according to the IDC), which is the same as Czech, Hungarian and Slovak BPO services market together. The value of Polish IT outsourcing market in 2010 was 500 million, according to IDC.

Figure 5.1 The structure of the IT market in Poland in 2010-2014



Source: GUS

Figure 5.2 The structure of net sales in the ICT sector



Source: GUS

Employment in the ICT sector. In the analyzed period, the number of employees in the ICT sector was increasing steadily. In 2010, it amounted to 162 thousand people and was 8% higher than in 2007. Employment in the ICT services accounted for more than two thirds of all employed in the ICT sector and their number increased in 2011 by 14%, comparing it to 2007, while the production of ICT reported a decrease by 3%. The activities of the ICT sector are characterized by higher productivity and profitability than the entire manufacturing and services sector. With the number of people working in the ICT sector increased by more than 12.6 thousand (8%), in the segment of ICT production, despite a marked increase in 2010, employment was lower by more than 1.4 thousand people (3%) compared to 2007. Increased number of employees working in ICT services was the result of growth in IT services (by 18.5 thousand, i.e. 42%) and the wholesale trade (by 3.6 thousand, i.e. 85%) and in telecommunications there was a decrease by 8.1 thousand (16%) compared to 2007.

In the ICT services sector showed the importance of telecommunications that was evident in 2007 and steadily decreasing in the subsequent years. Between years 2007 to 2010, number of employees in telecommunications services decreased by 16%. While in 2007, the companies from the telecommunications industry employed 35% of labor across the ICT sector, and IT companies - 30%,

in 2010, this share was 27% and 39%, respectively. Companies dealing with the wholesale employed 5% workforce in the ICT sector.

ICT export. The role of the ICT industry in export is growing. The net income from the sale of the entire ICT sector increased in 2007-2010 by almost 9.1 billion PLN (40%), of which by more than 7.0 billion PLN in manufacturing and services (38%) and PLN 2.0 billion (about 51%), respectively.

In the ICT services, there was mainly the growth of IT services export - by 1.6 billion PLN (about 72%). It is noteworthy that ICT production companies derive 63.5% of its revenue from export, while service providers only 8%. The share of the ICT export in the whole manufacturing and services sector rose in the period from 6.4% to 7.6%. The share of ICT sector in export revenue of manufacturing and service sector was 7.7% for production and 7.0% for services. Net income from export sales of products, goods, and materials of the ICT sector with a value of 31.8 billion PLN accounted for 7.6% export value of Polish companies. Over four years period value of exports and imports of ICT grew steadily. In 2010, the value of export of ICT goods amounted to 39.5 billion PLN, i.e. more than double of 2007, and its share in total export value was 8%. Dynamics of the growth of import was slower than it was in the case of export. In 2010, the

value of import of ICT increased, comparing it to 2007, by 42%, coming in at about 3.9 billion PLN higher than ICT export. In 2010, the structure of export of ICT, as it was in 2008, was dominated by consumer electronic equipment (57% of ICT export value). A large share of ICT export value had computers and peripherals, and its size increased comparing it to 2008 by 7 percentage points.

The largest shares of the value of imports of ICT in the analyzed period were computers and peripherals. In 2010, the share of imports of telecommunications equipment and electronic equipment of general use decreased, and the share of other products – among others photographic equipment, smart cards, and electronic integrated circuits - increased.

Figure 5.3 The structure of exports of ICT

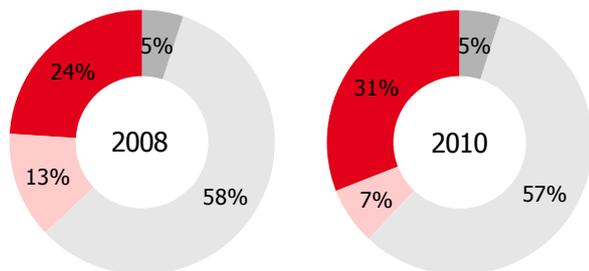
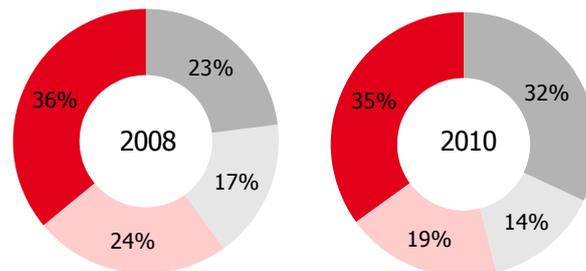


Figure 5.4 The structure of imports of ICT



■ Computers and peripherals ■ Telecommunications hardware ■ Consumer electronics ■ Other ICT goods

Source: GUS

Source: GUS

ICT Expenditure on R&D

Table 5.2 Research and development potential of IT companies operating in Poland

Company	Number of R&D employees	Scope of work
Nokia Siemens Networks	1800	Self Organizing Networks for LTE networks; customization of payment and billing platforms; 3G technologies development.
Comarch	1100	Marrying Ontology and Software Technology (MOST) projects, Advanced Data Mining and Integration Research for Europe (ADMIRE) as well as Netcentric Information and Integration Services for Security Systems (NI2S3); IniTech - strategic market data analysis platform; SaaS applications development platforms; Internet Mall; automated data exchange; Secure Internet Transactions Authorization System; tools for financial instruments management effectiveness analysis.
Ericpol Telecom	1000	BTS systems, WCDMA, multimedia in added services, Machine-to-Machine technologies.
Tieto Poland	1000	Smart connected devices; infotainment embedded systems for automotive industry; Machine-to-Machine technologies.
Motorola	800	Radiocommunication systems development and integration in TETRA/APCO P25 standard (software for radio infrastructure and radio terminals, user applications), development of technologies enabling convergence of different standards of telecommunications systems)
Samsung	750	Digital TV decoders software; set-top-boxes; digital television; video streaming; telecommunications protocol; mobile Bada systems.
Orange Labs	440	VDSL2; FTTH technology; femtocells; CDMA solutions; Content Delivery Network; Apple iOS and Google Android apps; augmented reality; semantic web tools.
IBM	300	Tivoli family solutions, cloud computing.
Alcatel-Lucent	200	Convergent messaging systems; quality of network managemtn systems; tools for telecommunication networks design, instalation and monitoring; new generation tools, geomessaging.

Source: Computerworld Top200 2011

In the context of increasing exports, one should recorded dynamic growth in expenditure on research and development activities. In 2010, comparing it to 2007, there was more than threefold increase in expenditures on R&D, from 222.2 million PLN to 758.6 million PLN, i.e. by 536.4 million PLN. A significant part of ICT sector spending on R&D (over 80%), was disbursed by ICT services companies. Taking into account the whole ICT sector (manufacturing and services) in 2010 compared to 2007, there was more than threefold increase in spending on research and development (about 536 million PLN), and compared to 2009 the increase was nearly double (about PLN 379 million). In any analyzed year in the ICT sector expenditures on R&D, most (over 80%) were disbursed by ICT services providers.

Nevertheless, in 2009, according to the Digital Agenda Scoreboard, R&D enterprises investments in the ICT sector in Poland accounted only for 0.33% EU-27 expenditures (in Hungary 0.44%, the Czech Republic 0.71%, Spain 4.36%, Finland 11.43% France 17.99%, Germany 21.24%). Poland has a great distance to make up for the Nordic countries (2-2,75% of GDP) as well as for Austria and Germany (over 1.75% of GDP). According to the Central Statistical Office (GUS) data, spending on research and development in 2000-2008 ranged within the limits of 0,56-0,64% of GDP, rose to 0.68% of GDP in 2009, and reached 0.74% of GDP in 2010. In 2010, business expenditures on R&D

did not exceed 0.20% of GDP, and R&D activities financed from the public budget claimed 0.26% of GDP.

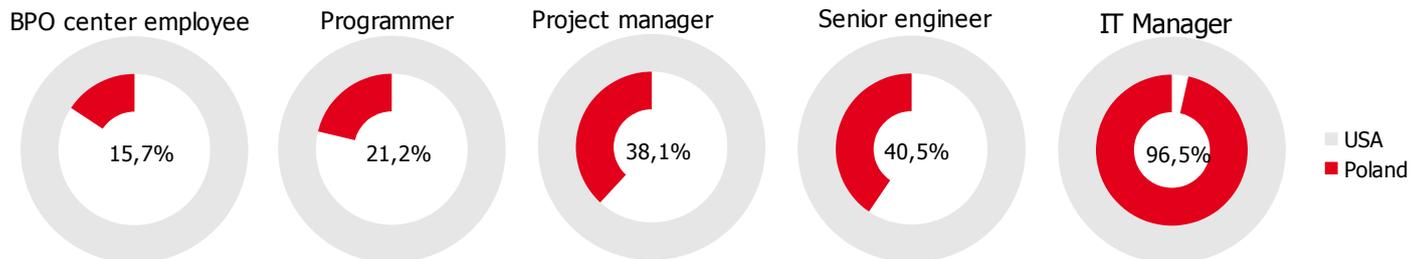
Salaries of Polish IT professionals. According to the Salary Survey Spring 2010 by Advisory Group TEST HR, the IT specialists are one of the best-paid occupational groups in Poland. Taking into account the median salary of programmers in 2010, they found themselves with the remuneration of about PLN 4700 per month in the second position, just behind the product managers. In 2009-2010, salaries of workers related to information technology rose, while the lowest paid positions' (computer technicians) wages rose by about PLN 250, and the higher-paid managerial positions rose by about PLN 1100.

Table 5.3 Sample monthly salary in R&D centers in Poland

Position	Gross monthly salary (in PLN)
graduate /junior specialist	4000-5500
consultant / developer	5500-7000
senior specialist	7000-10000
team leader	9000-13000
manager	14000-20000

Source: Computerworld Top200 2012

Figure 5.5 Comparison of IT staff salaries in Poland and in the USA



Source: Sourcingline.com

State's support for the ICT market. Entrepreneurs of the ICT industry can benefit from various forms of financial aid offered by the Polish government. The Polish government supports the automotive sector, aerospace, ICT, electronics, BPO and R&D. Enterprises investing a minimum value of 40 million PLN with employment of at least 250 people can expect an assistance in creating new job posts ranging from 3200 to 18 700 PLN per one post. Investors can also count on the support of investment in fixed assets in the amount of 1 to 10% of the investment if the value of investment exceeds 160 million PLN. Poland can distribute EU funds in the amount of almost PLN 70 billion between 2007-2013. Businesses can apply for

assistance under five operational programs: Infrastructure and Environment, Innovative Economy, Human Capital Development, Eastern Poland Development and Technical Support. In the ICT industry, the most popular program remains Innovative Economy. Funds of 16 Regional Operational Programmes and European Regional Community programs were also for disposal. In some Polish regions, so called Special Economic Zones, entrepreneurs may conduct business activity on special conditions. They can then rely on the exemption from income tax in the amount of 30-50% of the investment or two-year costs of employing workers. Some local governments apply local policy for exemption from property taxes.



Leaders of Polish ICT market according to the Computerworld Top 200 report, 2012 edition

The largest IT company:	HP Polska (PLN 3.04 million)
The largest holding:	Asseco Poland Capital Group (PLN 4.96 billion)
The largest exporter of IT:	Ericpol (PLN 205 million)
The company with the largest increase in revenue:	CD Project RED (2 257%)
The company with the largest increase in employment:	Capgemini Polska (725 people)
The company with the highest gross profit:	Asseco Poland (PLN 378 million)
The biggest distributor:	ABC Data (PLN 2.96 billion)
The largest supplier of ICT for the banking sector:	Asseco Poland
The largest supplier of ICT for the industrial sector:	Oracle Polska
The largest supplier of ICT for the utilities sector:	Oracle Polska
The largest supplier to the telecommunications sector:	Ericpol
The largest supplier of ICT for SMEs:	Oracle Polska
The largest service provider:	HP Polska
The largest proprietary software provider:	Microsoft
The biggest ERP systems producer:	SAP Polska
The largest telecom operator:	Orange, formerly TP Group
The largest mobile telecom operator:	Polkomtel
The largest telecommunications company:	Samsung Electronics Polska



The situation in the Polish ICT industry in 2011

47% of the ICT companies surveyed by the Computerworld magazine and included in the Computerworld Top 200 report in 2012 recognized the economic situation in 2011 as a good or very good, and only 7% as bad or very bad. In 2011, Polish ICT industry has increased spending on computerization in public administration (increase of 17%, the sector spending the most on ICT due to substantial EU grants availability), telecommunications (an increase of 13%), utilities sector (44%), transport (53%), health (45%), education (16%), media (16%) and the construction sector (33%). Decreased spending on IT was recorded for small and medium-sized businesses, agriculture, wholesale trade, and industry.

In comparison to other countries in the region, Poland is definitely a suitable place to locate R&D centers and startups specializing in software development. Centers of BPO services and neighboring outsourcing flourish, as well as centers of specialized services and software development.

The strength of the Polish economy is based on the large supply of well-educated professionals.

According to the observation of the recruitment firm Antal International, staff turnover is only at about 15% in rapidly growing Polish R&D centers, which promotes retention of knowledge. Centers of services and software development are mostly invested in Warsaw, Wroclaw, Krakow and the Tri-City (Gdansk, Gdynia, Sopot).

The last two editions of Antal Global Snapshot survey indicate that most investments in Poland is related to the area of embedded applications, e-commerce platforms, mobile applications and social media tools. Most IT projects

are conducted in the health sector, telecommunications, finance, defense, and automotive industries. More and more companies specialize in the production of electronic games. On the Polish market, there appeared a group of companies specializing in R&D services for the game industry in the United States, Canada, Germany, Australia and Japan, and this segment recorded double-digit growth. There is also a number of rapidly growing companies hiring out their employees temporarily for specific projects or hiring out entire design teams. This market will grow in coming years at a rate of 20% per year.

Development potential of Polish companies in global markets

Although the Polish economy gives way to the economies of many European countries in terms of innovation, more and more Polish ICT companies successfully build their own solutions based on their own intellectual capital - also

in foreign markets. Below are a few examples of high-potential Polish ICT companies. Data on income, profits, employment, and position in particular segments of the ICT market come from Computerworld Top 200 report, 2012.

Table 6.1 The largest IT companies operating in Poland in 2011

Place	Company	Revenue from ICT goods and services sales (in thousand PLN)			Employment
		2011	2010	2009	2011
1	HP Polska	3 041 000	2 790 000	2 500 000	1 800
2	ABC Data	2 958 640	2 681 417	2 387 732	324
3	Action	2 758 421	2 053 678	1 885 981	465
4	AB	2 514 021	1 933 522	1 642 337	304
5	Flextronics International Poland	1 870 405	1 602 746		
6	Tech Data Polska	1 557 316	1 588 300	1 476 700	205
7	IBM Polska	1 323 700	1 300 000	1 250 000	
8	Asseco Poland	1 322 149	1 160 267	946 440	3 197
9	Microsoft	1 300 000	1 290 000	1 100 000	
10	Incom	1 019 148	941 911	879 234	150

Source: Computerworld Top200 2012

Asseco Poland

Listed on the Warsaw Stock Exchange - Asseco Poland belongs to the largest Polish group Asseco Poland Group with revenue in 2011 reaching 5 billion PLN. Asseco Poland is a result of four companies merge: Asseco Poland (formerly COMP Rzeszów), Softbank, Prokom Software and ABG. Asseco Poland's revenue from the sale of IT products and services totaled amounts to 1.3 billion PLN, noting the 14% increase over the previous year. Asseco is the company with the highest gross profit (in 2011, 378 million PLN), the largest supplier of IT solutions for public administration sector (including the huge long-term IT project for the Social Security Agency - ZUS), for the banking sector, health sector and the largest integration services company. The Asseco has supported the energy sector for years (fifth largest supplier in the utilities sector, the third largest supplier in the industrial sector). In terms of revenues, Asseco Poland is second only to HP Poland. After SAP, Asseco Poland is the second largest provider of ERP systems; after Ericpol, second largest producer of custom software. Employment in 2011 reached 3.2 thousand people (only Capgemini Poland employs more) and employment across the group reached 14.5 thousand people. Adam Goral, president of Asseco Poland, is considered to be one of the most influential people in the Polish ICT industry. He was the driving force behind Asseco becoming the center of international group,

including IT companies operating in the Czech Republic, Slovakia, Hungary, Turkey, the Balkans, Germany, Austria, Switzerland, France, Italy, Spain, Portugal, Scandinavia and Lithuania, Latvia and Estonia. Asseco is currently the strongest Polish company on the map of the European ICT industry. In November 2010, the Asseco group was joined by Formula Systems, Israeli company listed on the NASDAQ Global Market. Due to the acquisition, Asseco entered Israeli, American, Japanese and Canadian markets. Asseco Poland is a Polish company investing the most in research and development (125 million in 2011).

Ericpol Telecom

Ericpol Telecom is the largest Polish exporter of IT solutions (export value in 2011 of 200 million PLN), the largest ICT supplier for telecommunications, and the biggest custom software developer. In 2011, revenues of the company reached 209 million PLN and the company employed almost 1.1 thousand people, employment increased in 2011 only - by 230 people. In 2011, the company reported profit before tax of more than 60 million PLN. The company was founded in Poland in 1991 by Jan Smela, a Polish engineer living in Sweden for many years and working for the telecom company - Ericsson. Ericpol's core competence is software development for global operators and providers of telecommunications services and the implementation of long-term Machine-to-

Table 6.2 IT companies operating in Poland in 2011 with the highest employment

Place	Company	Employment	
		2010	2011
1	Capgemini Polska	4075	4800
2	Asseco Poland	3134	3197
3	Comarch	2735	2807
4	HP Polska		1800
5	Ernst & Young		1585
6	Sygnity		1421
7	Tieto Poland	959	1210
8	Deloitte	1100	1119
9	Ericpol Telecom	865	4800
10	Samsung Electronics Polska		939
11	Sii	470	854
12	Komputronik	733	710
13	WASKO	640	655
14	Asseco Business Solutions	680	645
15	Infovide-Matrix	498	620
16	Comp	462	607
17	PKP Informatyka	624	576
18	AMG.net	244	560
19	Fujitsu Technology Solutions	416	524
20	Qumak-Sekom	442	479

Source: Computerworld Top200 2012

Machine development projects for automotive companies from Italy, Sweden, and France. The biggest and most important client of the Ericpol is the Swedish Ericsson. Every year, the Ericpol spends about five million PLN on research and development. In January 2012, the Ericpol initiated a series of annual meetings “Ericpol Innovation Pathway”, aim of which is to establish and deepen the contacts connecting the Polish innovative companies in the ICT industry, R&D centers and academic institutions. The Ericpol has subsidiaries in Sweden, Belarus, and Ukraine. In May 2011, the Ericpol, as the only Polish company was listed on the Silicon Valley’s list of the best outsourcing companies in the world (The Global Outsourcing 100, International Association of Outsourcing Professionals).

CD Projekt RED

CD Projekt RED is a Polish computer games software house created in 2002 as a branch of CD Projekt’s game distributor. The CD Projekt RED is a company that in 2011 recorded the highest revenue growth in Poland (2257%, total revenue reached in 2011 62 million PLN, the company employs 113 people). The CD Projekt RED is the second largest producer of games in Poland, giving way only to City Interactive with revenue of PLN 82 million. The most famous product of the company is “The Witcher 2” game, which was very well received on the global markets. By now, the company is working on a new cyberpunk game. Managing Director of the company is Adam Kicinski.

Table 6.3 IT companies with the highest employment growth operating in Poland in 2011

Place	Company	Employment	
		2010	2011
1	Capgemini Polska	4075	4800
2	Sii	470	854
3	AMG.net	244	560
4	Tieto Poland	959	1210
5	Ericpol Telecom	865	1095
6	Future Processing	53	227
7	Comp	462	607
8	Outbox	250	380
9	Infovide-Matrix	498	620
10	LGBS Polska	82	200

Source: Computerworld Top200 2012

Selvita

The company was founded in 2007 by Pawel Przewiezlikowski, for many years Comarch's vice president, and Bogdan Siczkowski, when only a few companies was active in the biotech industry in Poland and the supply of well-educated scientists was very high. As Pawel Przewiezlikowski said, he decided to take care of the business, which developed dynamically, carried intellectual challenges, and was tremendously useful to the society and economy, opening new possibilities with the convergence

of molecular biology and information technology. The company has focused on the implementation of management software for R&D laboratories, quality control software, and genetic data processing. The Selvita designed molecule models of proteins and original drugs for Western corporations. In 2011, the company took first place in the ranking of the rising stars of Deloitte Technology Fast 50 in Central Europe. In 2006-2010, its revenue has increased by 2623%. The company employs over 120 people, of which one third has a Ph.D. in computer science, chemistry, biology or related sciences. The strength of the company is transfer of technologies developed at Polish universities.

Comarch

Comarch was founded in 1993 by Janusz Filipiak, Professor at the Mining and Metallurgy University in Cracow, one of the most influential people of the Polish ICT industry in the past two decades, and his twelve students. Listed on the Warsaw Stock Exchange, Comarch is the twentieth largest IT company in Poland, with revenue of about 560 million PLN (70% of the IT services) and employment of 2.7 thousand people (the third company in terms of employment in Poland). Comarch belongs to the Comarch Capital Group with revenue of 785 million PLN and employment reaching 3.5 million people, which includes subsidiaries registered in Germany and the United States.

The Comarch has been one of the first Polish companies, which decided to build a brand in the markets of Western Europe and for a number of years introduced this strategy to life consistently in Germany, Austria, and Switzerland, being the second largest Polish exporter of ICT solutions – right after Ericpol. In subsequent years, the company sees the sources of growth in the development of modern medical services via the iMed24 subsidiary company. In terms of spending on research and development, Comarch takes second place in Poland, spending about 67 million PLN per year on R&D. Comarch is the largest provider of ICT for the wholesale trade sector, the second largest provider for the retail industry, the fifth largest supplier to the industry sector and the third largest supplier to the SME sector. It plays a big role in the implementations of ERP and CRM systems, cloud computing and is the second largest integrator in Poland, after Asseco Poland. The Comarch is also Poland's largest provider of Web applications and portals, the largest provider of print management and labor systems and the second largest developer of mobile applications.

Future Processing

A company located in Gliwice was founded in 2000, and in 2002 won the first contract in the UK for automatic face recognition software development, and later – for the video surveillance software development. In 2010,

Table 6.4 IT companies with the largest revenue increase

Place	Company	% change 2010/2011	Revenue from IT goods and services sales, 2011 (in thousand PLN)
1	CD Projekt RED	2 257	62 339
2	Luxoft Poland	1 605	19 981
3	11 bit studios	503	2 860
4	Impulsy	319	14 293
5	Sanmangar Team	265	7 332
6	Planet Soft	202	3 393
7	CGI Information Systems and Management Consultants	150	81 890
8	Innergo Systems	149	8 347
9	Consdata	136	4 993
10	Passus	136	15 801

Source: Computerworld Top200 2012

the company launched projects for clients in France and the United States. In 2011, Future Processing recorded revenue of 21 million PLN and gross profit of 5 million PLN, 100% of the revenues deriving from the provision of IT services. In 2011, the company quadrupled its number

of employees and currently employs about 300 people. It is one of the ICT companies, which devote significant resources to research and development. All production commodities of the company are exported. In 2011, Future Processing ranked on the 22nd place according to the Deloitte Technology Fast 50 in Central Europe as a software company with revenues increasing in 2006-2010 by 664%. Future Processing is currently working on medical imaging systems, intelligent video surveillance. Moreover, it creates applications for the financial sector. The company actively cooperates with the Silesian Technical University in Gliwice and Opole University of Technology, carrying out joint research projects and conducting training programs for students.

Transition Technologies

Founded in 1991, the company recorded revenues of 62 million PLN in 2011 and employs 365 people in five offices, including 80 people in R&D department. Transition Technologies was the Polish ICT leader in terms of the number of technology patents for many years. Currently, the company spends about three million PLN per year on research and development. The company is the fifth largest Polish ICT exporter, with export responsible for 70% of company revenue. It is the third largest mobile application vendor, after Softline and Comarch. The company specializes in solutions for the industrial sector,

Table 6.5 IT companies that spent the most on R&D in 2011 (in thousand PLN)

Place	Company	R&D expenditure
1	Asseco Poland	124 636
2	Comarch	66 972
3	Grupa TP (Orange Labs)	54 500
4	Wasko	16 989
5	Unit4 Teta	12 700
6	Asseco Business Solutions	6 139
7	Ericpol Telecom	5 097
8	Rekord Systemy Informatyczne	4 800
9	Infover	4 545
10	Sii	4 000
11	SMT Software	3 828
12	Focus Telecom Polska	3 727
13	Macrologic	3 430
14	Transition Technologies	3 198
15	Globema	3 050
16	Datera	2 711
17	Software Mind	2 500
18	Platan	2 500
19	Comp	2 237
20	LSI Sftware	2 000
20	ITTI	2 000

Source: Computerworld Top200 2012

in particular energy sector, based on new technologies such as neural networks. It sells ICT solutions mostly to American and Western European companies (about 70% of revenue of the company derives from the long-term contracts in those markets). For several years, the company has been investing in mobile technology in industrial applications, technologies supporting people with disabilities and bioinformatics. The company is constantly growing at 20-30% per year, and profits are reinvested in research and development in new areas. President of the company is Konrad Swirski, Ph.D., who combines working for the company with research and teaching at Warsaw University of Technology. The company is also working with Lodz University of Technology, Bialystok University of Technology and a number of other universities.

Aiton Caldwell

Aiton Caldwell SA is a leading company on the Polish market of hosted telecommunications services for small and medium businesses. The main areas of the company's operations are services based on providing remote access to software through the Internet (Software as a Service). The company relies on the cloud technology (SaaS) that constitutes a basis for a secure and reliable telecommunications platform replacing the physical systems. At present, the company owns 40% of the VoIP market and 2% of the Polish SMEs market, providing

services to more than 130 thousand users at the same time. Aiton Caldwell S.A. debuted on the NewConnect stock exchange in 2011. The management board of the company composes of people with international professional experience and extensive knowledge of IT and telecommunications technologies. They manage almost a 40-people team of telecommunications engineers and specialists in sales, IT, marketing, and customer service. In the past year, the Company established business contacts in Romania, the United States, Ukraine, Bulgaria, and Hungary. In 2-3 subsequent years, the company aims to be a leading provider of SaaS services in Central and Eastern Europe.

Cybercom Poland

Cybercom Poland is a consulting company operating on the market since 1997 with offices in Warsaw and Lodz employing more than 100 programmers and IT professionals. The Cybercom Poland specializes in IT consulting, software development, and IT research and development projects (new products, prototypes, feasibility studies, etc.). Moreover, the company offers training services, application security audits, services related to migration and replication of Oracle databases. Cybercom Poland provides services to customers in Poland, Scandinavia, and Western Europe. The export of services is growing rapidly, with emphasis on telecommunications projects, mobile solutions, and



embedded systems for the automotive industry. More than half of company's consultants work for international telecommunications companies setting the trends in the field of telecommunications solutions.

eLeader

eLeader is a provider of business software for smartphones. The eLeader's state-of-the-art mobile enterprise solutions and associated cloud services are used today by global and national companies in over 50 countries worldwide. The company's products meet the needs of fast-growing mobile services market, such as mobile finance, mobile banking, m-commerce, mobile sales forces, and others. The company has also experience in developing tailored software for all mobile platforms. The eLeader additionally offers a full range of IT services centered on mobility. Most of eLeader's smartphone projects are large-scale deployments using client-server architecture and integration with back-end systems, all providing the level of security approved in the finance industry.

Innovio

Innovio was founded in October 2007 by current company's CEO Rafał Ejsymont. The Innovio is the software house and provider of innovative and technologically advanced systems for medium and large enterprises. The essence of Innovio activity is the development of

Table 6.6 The largest exporters of IT solutions in Poland

Place	Company	Revenue from IT goods and services sales, 2011 (in thousand PLN)	Revenue from export, 2011 (in thousand PLN)
1	Ericpol Telecom	208921	204743
2	Comarch	561506	169013
3	Tieto Poland	175749	131812
4	Praxis	253252	60780
5	Transition Technologies	61653	43465
6	BCC	68800	27520
7	Future Processing	21007	21007
8	Hicron	26700	18690
9	PC Factory	607953	18239
10	TBSCG - Banyan Solutions	18200	17836
11	Luxoft Poland	19981	15985
12	PGS Software	17233	15510
13	7N	23162	12507
14	Impaq	30453	12486
15	e-point	16794	12428
16	Modecom	103491	12419

Place	Company	Revenue from IT goods and services sales, 2011 (in thousand PLN)	Revenue from export, 2011 (in thousand PLN)
17	S&T Services Polska	111200	9819
18	Software Mind	26440	8857
19	7bulls.com	16592	8296
20	Asseco Business Solutions	158125	7906
21	AMG.net	66055	6606
22	Globema	16475	4943
23	LGBS Polska	20041	4810
24	BTC	11322	4529
25	Lunar Logic Polska	4053	4012
26	IT.expert	195940	3919
27	CodePill	3817	3779
28	IT.integro	16500	3300
29	SMT Software	33945	3109
30	Mineral Midrange	7101	3070

Source: Computerworld Top200 2012

specialized information systems to individual customer needs. These solutions are dedicated to companies operating in the following sectors: industry, services, administration, education, and logistics. The company offers also a wide range of outsourcing services: systems administration, hosting, and collocation. It conducts research and development in the area of modern information technologies as well. Working with universities and scientific centers in Poland and abroad is the company's priority.

ITM Software House

Since 1997, ITM Software House provides advanced technology solutions for the Polish and foreign companies. ITM products are dedicated to a variety of industries, but the company's specialties are applications built specifically for the furniture industry. The company offers ERP and CRM systems designed for the furniture industry. The unique feature of the company's solutions is an advanced product configurator that allows for the mass production of the individually configured products (mass customization).

QBurst Technologies

QBurst Technologies was established in 2004 and is the provider of Internet and mobile applications with offices in USA, UK, India, Singapore and UAE, and software centers in Trivandrum (Kerala, India), Cochin (Kerala, India), Bialystok (Podlasie, Poland) and Fairfax (Virginia, USA).

QBurst develops solid, safe, and tailored to individual clients' needs applications for start-ups and companies with an established position. The company has provided products and enterprise-class solutions for several succeeding businesses, and it is known for its high quality services at competitive prices. Over the years, it has earned a reputation as an innovative technology company offering excellent services and design solutions.

Uselab

Uselab is a research and advisory company operating in the Human Computer Interaction field. Uselab was founded in 2006 and it is the most experienced Polish agency specializing in UX design and usability testing. A team of analysts and architects is involved in research and consultancy in the field of usability and interaction design and information architecture design, web services, as well as mobile and desktop applications. Uselab team consists of experienced Internet psychologists, sociologists, engineers, graphic designers, and marketers. The company has created a European network of consultants that can meet the most demanding and innovative projects in the field of User Experience Design. Uselab completed over 400 UX projects in 15 countries. Since 2010, the company organizes the largest annual UX industry conference in the Central Europe - Polish IA Summit. In June 2012, the company completed a three-year EU project "Talent Game"

- methodology and tools for diagnosis of occupational aptitudes and interests of students. "Talent Game" is a diagnostic tool in the form of an interesting computer game to investigate the professional interests of children and adolescents.

Masspay

MASSPAY is a completely new perspective on the problem of settling payment transactions. The ongoing project is implementing a modern, comfortable, simple and cheap payment instrument, allowing to settle any type of payment transaction from any mobile phone. Optimal use of existing telecommunication infrastructure (GSM network and phones) and the transactional interface allows the company to offer - with minimal investment - completely new payment services, tailored to the real needs of the market. The project is based on original technology, secured by a number of patent applications worldwide. The project also uses the latest technologies such as 2D barcodes or NFC technology.

Services offered by the company are designed for the mass market, as well as for banking institutions and telecommunication operators. The company also provides consulting services in the area of mobile technology use in the financial sector, and financial services in the telecommunication sector.

Table 6.7 The largest producers of mobile applications

Place	Company	Mobile applications sales revenue, 2011 (in thousand PLN)	% share in revenue	Employment, 2011
1	Softline	11009	90	42
2	Comarch	8975	2	2807
3	Transition Technologies	2860	5	365
4	Hicron	1000	4	120
5	Sii	1000	1	854
6	Jcommerce	830	10	45
7	Norbsoft	827	96	11
8	SMT Software	405	1	74
9	7bulls.com	370	2	100
10	Simple	334	1	124

Source: Computerworld Top200 2012

Polish companies in the European rankings of fast-growing technology companies.

Looking for prospective Polish ICT companies, keep track of Deloitte Technology Fast rankings. For twelve years, the consultancy firm - Deloitte has been tracking fastest growing emerging markets technology companies. The "Deloitte Technology Fast 50 in Central Europe" ranking picks out the fastest growing technology companies in the region of the Central and Eastern Europe. In twelve

editions winners were operating in Poland seven times, three times in Hungary, only once in the Czech Republic and Romania. The participation of Polish companies in the ranking is steadily growing. In 2007-2010 the share of the Polish companies did not exceed 20%. In the edition of 2011, twenty of the awarded fifty companies came from Poland. Leaders of the ranking are companies specializing in software development and production (half of the companies), and Internet companies (one third).

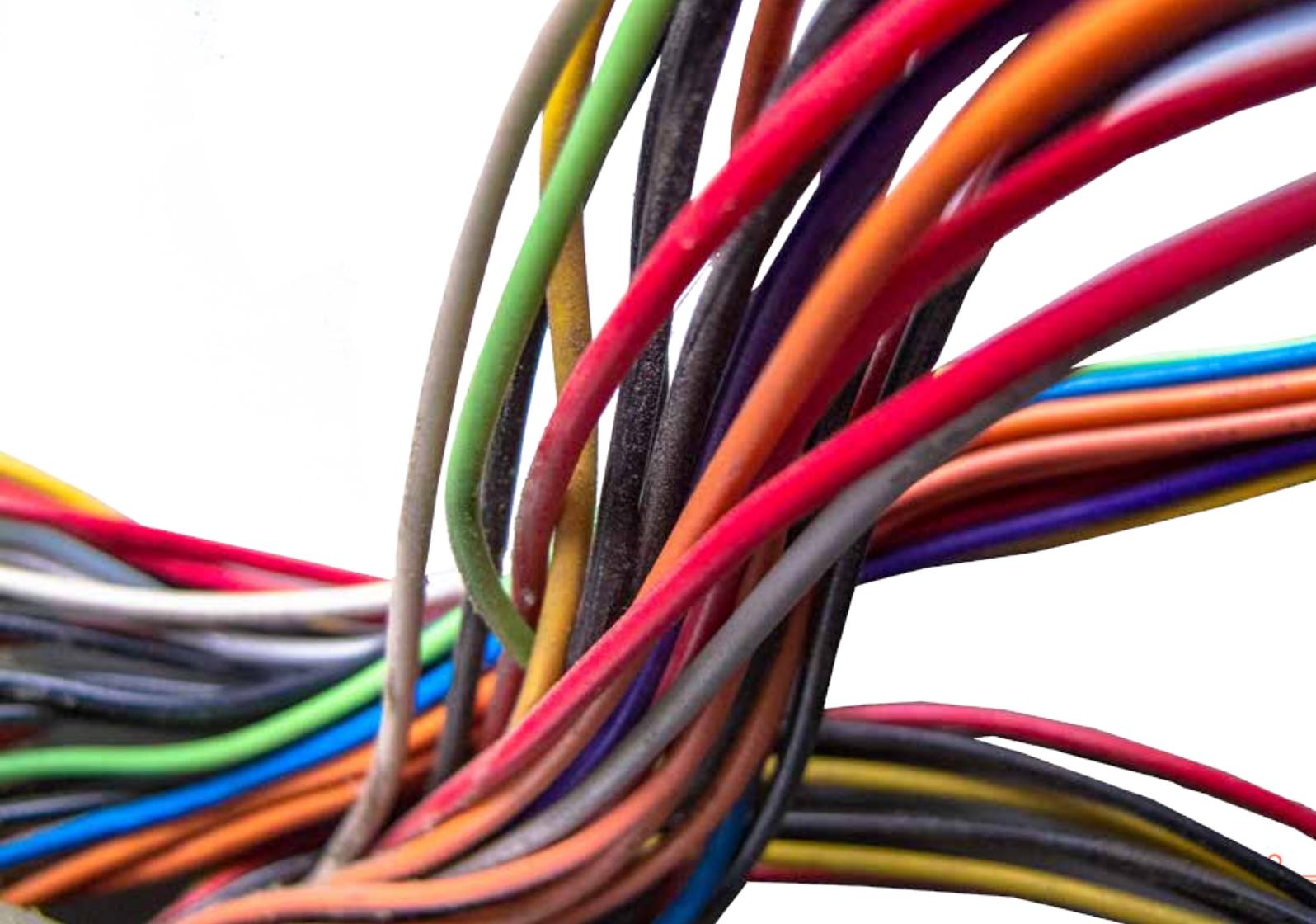
Table 6.8 Polish companies in "Deloitte Technology Fast 50" in Central Europe, 2011

Place	Company	Sector	Revenue growth 2006-2010, %
4	Netmedia S.A.	Internet	364
5	Inwestycje.pl	Internet	2719
7	Datera S.A.	networks/telecom	2011
8	Kompan.pl sp. z o.o.	Internet	1584
9	Technitel s.j.	networks/telecom	1526
10	Ideo sp. z o.o.	Internet	1423
14	IAI S.A.	Internet	1005
17	Euro-Tax.pl	Internet	950
18	Sunrise System sp. z o.o.	Internet	864
20	HAWE S.A.	networks/telecom	748
21	GroMar sp. z o.o.	Internet	683
22	Future Processing sp. z o.o.	software	664
23	4People s.j.	Internet	640
24	BTC sp. z o.o.	software	615
26	Livechat Software S.A.	Internet	545
29	SARE S.A.	Internet	500
35	Grupa Integer.pl	others	352
36	Partners in Progress sp. z o.o.	software	344
38	Nowoczesna Firma S.A.	Internet	320
39	eo Networks	software	319

In the last two years, seven of the top ten companies have been Internet companies, which show that now this particular segment of the market achieves the largest increase in revenue. Netmedia is one of the most prominent Polish companies, which in a row ranks in the top five for the third time, and Selvita, the company employing specialists in the area of chemistry, pharmacy, molecular biology, biotechnology and information technology, cooperating with universities and research centers from Poland, Europe and the United States.

Table 6.9 Polish companies in the ranking of the rising stars of "Deloitte Technology Fast 50" in the Central Europe, 2011

Place	Company	Sector	Revenue growth 2006-2010, %
1	Selvita S.A.	biotech	2623
3	Tequila Mobile S.A.	software	938
4	Focus Telecom Polska sp. z o.o.	networks/telecom	929
5	Redefine sp. z o.o.	Internet	857
6	Fru.pl S.A.	Internet	796
7	i3D S.A.	software	794
8	Incube sp. z o.o.	software	412





Poland has an enormous intellectual potential. According to the Central Statistical Office, there is a steadily increasing number of graduates in natural sciences, technology, and information technology, from one graduate per 1,000 inhabitants in 2000 to 2.2 graduate in 2010, while the proportion of males (2.8) is significantly higher than participation of women (1.6 in 2010). According to the Central Statistical Office, in 2000 spending on education equaled 4.74% of GDP, in 2001-2002 exceeded 5%, in 2006 reached a peak of 5.10% of GDP, but after 2006 were no higher than 4.82% of GDP, and in 2010 fell to 4.66% of GDP.

Poles in the fields of IT. According to the information contained in the report of the Polish Information and Foreign Investments Agency "IT Market in Poland", published at the end of November 2008 87.8 thousand people were studying computer science, which was more than 4.5% of Polish students. Most people were studying computer science in Mazowieckie voivodship (15.5 thousand) and Lodzkie voivodship (11.7 thousand). The biggest share of computer science students was enrolled in Lodzkie voivodship (7.96), Lubuskie voivodship (6.19%) and Lower Silesia (5.49%), the smallest in Kujawy-Pomerania, Swietokrzyskie voivodship, Wielkopolskie voivodship and Lubelskie voivodship.

The successes of Poles in programming contests. Polish students have been winning international competitions in programming for many years, both individual and team competitions. In the well-recognized competition from Microsoft, Imagine Cup, the Poles were in 2011 among the leaders in three categories, that positions Poland in the world lead. First place went to a young team of game developers - Cellardoor at the University of Adam Mickiewicz in Poznan, which has prepared an interactive novel "The Book of Elm." In an individual category of the IT Challenge, the second prize went to Blazej Matuszyk of Poznan University of Technology. In the category of Interoperability, third place was won by the project team DemosceneSpirit for the Trident project - a warning system against flood used also to facilitate problems resolution after the flood crisis. In 2010, when the competition attracted 325 000 students from 100 countries, the most successful Polish teams took all the first three awards in a special category of Internet Explorer 8 Award. First place went to Rhea team from Bialystok University of Technology, the second to the LittleRitle team of the Poznan University of Technology, and the third to CieszakTeam from the University of Warmia and Mazury in Olsztyn. In 2009, the Poles won three prizes of 48 in 19 categories, in 2008 one prize of 36, in 2007 three prizes from 27, in 2006 four out of 16.

Table 7.1 The most popular fields of study – bachelor's degree

Major	Number of students in 2009	Number of students in 2010	Change %
Mathematics	10 241	11 328	11%
Construction	24 275	25 570	5%
Medicine	16 817	17 486	4%
Automatics and robotics	10 211	10 437	2%
Environment engineering	15 933	16 040	1%
Engineering and management of production	17 819	17 800	0%
Finance	16 168	15 979	-1%
Law	29 414	29 069	-1%
English studies	12 970	12 762	-2%
Psychology	13 122	12 833	-2%
Computer science	32 020	30 793	-4%
Translation studies	39 215	37 542	-4%
Mechanics	17 732	16 889	-5%
Electronics and telecommunications	11 260	10 286	-9%
Management	41 506	37 641	-9%
Physiotherapy	12 995	11 762	-9%
Nature conservation	13 757	12 430	-10%
Tourism and recreation	18 299	16 532	-10%
Pedagogy	44 596	39 489	-11%
Economics	26 588	23 385	-12%
Physical education	12 765	11 066	-13%
Administration	21 446	18 320	-15%

Source: Balance of Human Capital in Poland (Bilans Kapitału Ludzkiego w Polsce), 2. edition, 2011, PARP

Poles are among the top players taking part in programming contests organized by the American TopCoder company. Tomasz Czajka is the most successful programmer, TopCoder Open competitions winner in 2003, 2004, and 2008 and TopCoder Collegiate Challenge winner in 2004. In 2005, TopCoder Open competition in the category of algorithm was won by Eryk Kopczynski. For a long time, Poland occupied the first place in the world, currently it is on the third position. The Warsaw University is second in ranking, the Jagiellonian University twenty-first and the Wroclaw University twenty-sixth. Przemyslaw Debiak won the competition TopCoder Open in 2008 and 2011 in the Marathon Match category.

Table 7.2 The successes of Poles in the "Microsoft Imagine Cup" competition

Year	Total number of prizes	Number of prizes earned by Poles
2011	33	3
2010	35	5
2009	48	3
2008	36	1
2007	27	3
2006	16	4

Source: Microsoft's press materials

Poles also occupy a very high position in the ACM International Collegiate Programming Contest, international team competition for students from around the world. Polish team won the competition twice in the last ten years, in 2003 and 2007. In both cases, the winning team came from the Warsaw University. During this period, five games were won by the Russians and three games by the Chinese competitors. The competition is organized since 1977, but gained international significance only in 1989. In 2012 the championships were held in Warsaw for the first time.

The Polish national team remained at the forefront of International Olympiad in Informatics, the annual programming competition for high school students for many years. In 2006, the competition was won by Filip Wolski, the first Pole ever. A year later, another Polish representative, Tomasz Kulczynski, took first place. In 2008, the Polish team took first place tie with China, bringing three gold medals (Marcin Andrychowicz, Jaroslaw Blasiok and Marcin Koscielnicki) and one silver (Maciej Klimek), while Martin Kościelnicki was ranked third in the world. In 2009, the Polish team took third place winning two gold (Jaroslaw Blasiok, Tomasz Kociumaka) and two silver (Adam Karczmarz, Jakub Pachocki) medals. Seventh place in the world and second in Europe took Tomasz Kociumaka. In 2010, Adrian Jaskolka ranked third in the world.

Moreover, Poles acquitted themselves well in the competition from Intel. In the Intel Challenge competition Europe 2011 Polish team was one of the three awarded European teams, in addition to Danish and Israeli teams. The Polish NeurON team has developed software using brain waves to control objects and the "brain keyboard."

The usability market in Poland

In college we concluded together with a partner that if the U.S. and Western European usability market is growing nicely, and Poland has not yet even started to crawl, this gap requires filling. Today the Polish market looks better and better in this respect and we really do not have anything to be ashamed of.

Anyżewski Hubert, a member of the board of UseLab, a company dealing with designing and usability testing of Web sites, Computerworld, January 31, 2012.

Global aspirations

Polish start-ups think often (perhaps too often?) only in terms of the Polish market. Obviously this is not a small market, and it is still good money. It is also easy to copy ideas tested in the West and find in Poland proven distribution channels. We have in Poland a lot of smart people, but we lack global aspirations. As a team we have always worked with clients from abroad, and now we are also working on a global product. For several years, we were building a network of contacts with partners and investors with our future global success in mind.

Ela Madej, co-founder of the Polish company Applicake and U.S. company Future Simple, organizer of the European Railsberry conference for developers using Ruby on Rails framework, Computerworld, November 4, 2011.

The capital funds

I think that the Polish market needs a slightly higher risk funds than available today. Investors are willing to spend money, but demand immediately securing a mortgage. Meanwhile, there is a lack of seed investment funds ready to invest PLN 50-100 thousand for idea validation. Investors, in turn, complain that the founders of startups would like to sell the shares immediately and no longer deal with the introduction of the idea onto the market. The minimum wage for a young entrepreneur to test the idea should solve this problem.

About the perception of innovation in Poland

Launch of a solution that has not been proven in the West takes several years. Poland has learned to securely copy proven ideas and capital funds are afraid of really innovative projects, which admittedly involve higher rates of return, but also higher risk. They are not ready to invest PLN 20 million and wait five years for return on investment. Few people in Poland have experience in developing and commercializing innovation. The innovator must have so much patience and perseverance.

Marek Łangowski, initiator, founder and CEO of Telemobile Group companies, one of the initiators of the Pomeranian ICT Cluster, Computerworld, September 20, 2011.

Henryk Kułakowski, CEO of MassPay and the owner of international patents for mobile payment systems, Computerworld, February 14, 2012.



Prospects for development of the Polish ICT market as the relatively backward civilization in relation to the EU-15 countries, Japan and the United States, are determined by the development scenarios of economies at a higher level of digital development. The same development trends that characterize the ICT market in the world, shape the Polish market. Demand for the ICT solutions is conditioned by the level of digital literacy and affluence of ICT users, public expenditure, the propensity to invest, as well as financial capabilities of companies using ICT, the availability of modern technology and their dissemination in the society and the ability of ICT industry to create new needs. The supply of ICT solutions is conditioned by the availability of capital for research and development, investment and promotion, intensity of competition in the ICT sector, intensification of cooperation of business and science and business ability to cooperate, especially in case of small and medium-sized companies with complementary solutions. Development of the ICT in Poland depends on the extent to which the Polish government will be able to support the development of the Polish information society and to support capital market development allowing it to introduce innovative projects by funding support. It is also important, to what extent science is able to strengthen the sector cooperation with business, and facilitate the transfer of technologies

developed in research institutions to enterprises. The key factors are individual aspirations of entrepreneurs in the technology industry that will allow for expansion into global markets. Time will show to what extent Poland will be able to take advantage of its current competitive advantage in global markets and good condition of Polish economy to make it the engine of transformation to the economy 2.0.

The biggest strength of the Polish economy in terms of ICT sector development is the intellectual potential and past experience of Polish companies, which managed to gain significant customers in foreign markets, to establish R&D cooperation with multinational companies, and to prove the possibility to introduce advanced ICT products with their own brand into foreign markets.

It is worth mentioning that the Internet and related technologies, products and services play an increasingly important role in the ICT sector. Thus, increasing economic importance of the availability of telecommunications, including fixed broadband and mobile broadband, in order to make use of advanced digital services through laptops, tablet PCs and smartphones. Increased Internet traffic is not a simple function of connecting new users – it is determined by provision of new, cutting-edge services and

technologies allowing to transfer data faster. So far the subsequent milestones were set by www and multimedia development, creation of portals, peer-to-peer technologies facilitating file transfer, video streaming (YouTube), the development of ADSL technology, and finally spread of social media. Recent milestones are the development of LTE technology and dissemination of smartphones and tablets. The potential of the Polish ICT sector as a whole will depend on the preparation of the economy to absorb Internet technologies.

Poland: opportunities and challenges. In an interview with Computerworld magazine in June 2010, Zeev Holtzman, a chairman and founder of the Israeli VC fund Giza Venture Capital, while asked a question "What should Poland do to create better conditions for technological entrepreneurship development?" replied: "The education system is the most important, particularly in the case of secondary and tertiary education. In addition, you should invite big multinational companies to be active in the local market and attempt to encourage engineers to found new start-ups. Organizations with appropriate abilities should be encouraged to invest in Poland. At the moment, Poland has all elements needed for success. It is one of the reasons why we also want to invest here." Paul Bragiel, managing partner of i/o Ventures fund in conversation with Computerworld magazine in April 2012 said: "You

have very talented engineers and computer scientists. Polish specialists are missing, unfortunately, marketing skills, and ability to promote their solutions. Usually, they make something with Polish market in mind only, not the global market. Polish entrepreneurs do not travel abroad, do not meet people, and this is a mistake! First, they want to sell something, and then meet their future partners, but good relationships are crucial. You have to meet people and let them remember you. It is necessary to visit Silicon Valley a couple of times every year. There are places where you just have to be! Many transactions in which I participated, was concluded just over a cup of coffee or at beer. You must change the way you think. The scientist is not an entrepreneur, therefore, he will not be able to find his way on a real market, but representatives of the Polish universities should stop swagger. In the United States universities invite entrepreneurs constantly, and in Poland, such contacts are rare." Paweł Przewieźlikowski, the president of innovative biotechnology company Selvita, in an interview with Computerworld in March 2011, remarked: "In Poland, the largest companies rarely rely on their own, original technologies. Patenting is of no importance, licensing technology from universities is not widespread. Now we begin to lose our cost advantage to Asian countries and we must create higher value-added proposition. Centers of technology transfer in Poland are in their infancy, but there are some valuable examples. I think

that the Jagiellonian University slowly begins to resemble the transfer center at the Stanford University, which is the best model in this area. In cooperation with the majority of research institutions, for now, we must rely on a personal reaching out to scientists and to this end, we have even established the team that deals exclusively with visiting campuses and seeking interesting ideas. Poland has good conditions for development of the so-called "life sciences" due to the intellectual potential and the growing affluence of the Poles. Our scientists have a very good reputation in the world, but unfortunately, many had to leave for the West to lead a well-funded research and commercialize their research results. This changes, however. Poland is beginning to be an attractive location for research and development centers. It is visible in IT, we see it soon in medicine, biology and chemistry. Polish bio-IT specialists are world leaders and their work in the field of computer modeling of protein structures are among the best in the world. Fruits of Polish scientists' effort will be successfully sold abroad."

Institutions supporting ICT industry. In all competitiveness rankings of economies of the world the value of the cooperation of science and business sector in creating new solutions is strongly emphasized. Without a doubt, innovative economies depend on the quality of cooperation between the different actors, their interaction,

and cooperation with the business environment. Most companies in Poland are small companies that do not have the capacity to implement new technological solutions effectively. The formation and development of new companies based on innovation requires the development and provision of adequate technical infrastructure, consulting services and seed capital. Small businesses need support from the business environment institutions, which may mediate the transmission of information, technology transfer, and developing links with research centers. This role is played by technology parks, i.e. groups of separate buildings and technical infrastructure set up to facilitate the flow of knowledge and technology between scientific labs and businesses, where companies using modern technology are offered the consulting services in creating and converting the results of research and development into technological innovation. Parks act as incubators, catalysts of cooperation and promotion centers. As incubators, they are to increase the number of modern technology companies in the region, founded mostly by students, graduates, and research staff. As catalysts for cooperation, they increase the number of links between all participants in the innovation system in its zone of influence: enterprises, research institutions, business support institutions, local and regional governments, as well as in the society of the region. As promotion centers they aim to promote local companies in the investment

community. Small entrepreneurs operating in the parks are able to take advantage of all local resources available, which is a strong foundation enabling business development in overseas markets.

The oldest technology parks in Poland are already 16 years old. Between 2004 and 2010, technology parks in Poland underwent an intensive development due to availability of European Union grants under the European operational programs. In March 2010, 33 technology parks operated in Poland, consisting of 523 institutions and 18 scientific research units. In 2010, the Polish Business Chamber for Advanced Technology and F5 Consulting conducted on behalf of the Polish Agency for Enterprise Development (PARP) parks a benchmarking of technology parks in Poland. Most popular occurred to be Wroclaw Technology Park with 85 business entities and one scientific research institution. The next place was taken by the Pomerania Technology Park with 68 companies and two research institutions, Krakow Technology Park (respectively 58 and 3) and Poznan Science and Technology Park (51 companies, three scientific institutions). In total, 17 most active Polish technology parks employed 16.5 thousand people – 7.7 thousand of them in the Cracow Technology Park.

The study showed that the parks operating in Poland should improve the efficiency of their operations, by increasing the number and value of services sold, as well as cost rationalization. The number of scientific and financial institutions, and enterprises cooperating with the technology parks should be significantly increased, that in turn should lead to an increase in the number of patents, technology applications, and technology transfers. It is necessary to boost the academic entrepreneurship expressed in the number of spin offs and spinouts. Such action may be successful especially in the case of the parks owned by the biggest Polish universities. The use of seed capital and venture capital by the parks tenants is too small. Many tenants do not report patents or trademarks - parks could do more to support the commercialization of inventions, designs and new technologies. The number of spin offs and pending patents depends on the activity of universities and research centers to a large extent. Only in five out of seventeen parks, there are numerous international contacts resulting in participation in international projects. In other parks, international cooperation is marginal and inefficient. Most of the parks are very favorably situated, close to universities, roads, and large production companies. Residents of the parks value high quality of management, good location, infrastructure, and innovative services offerings, but criticize the cooperation with universities and research

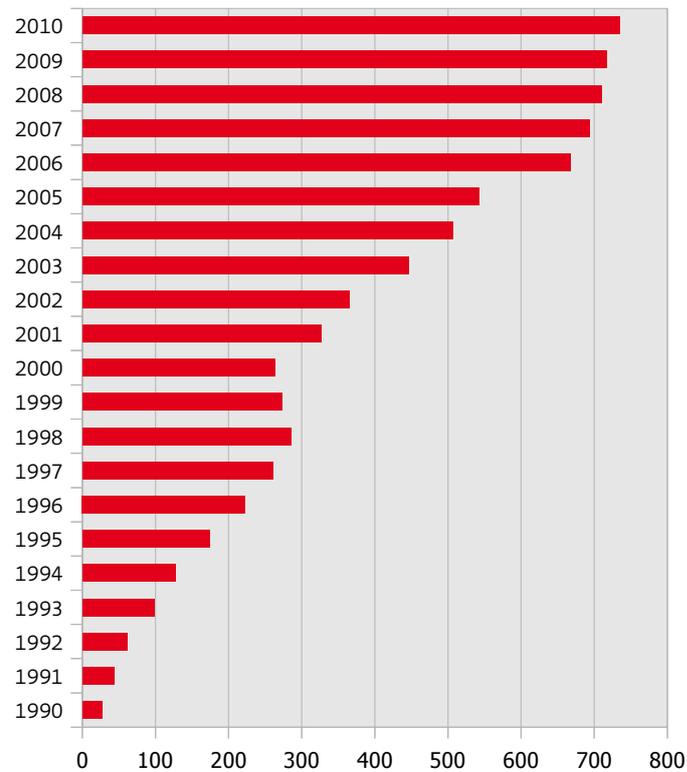
institutions, technology transfer mechanisms and the fees for the use of infrastructure.

Table 8.1 Entrepreneurship centres in Poland, 2010

Technology parks	24
Technology park initiatives	21
Technology incubators	20
Preincubators and academic incubators	62
Entrepreneurship incubators	45
Technology transfer centers	90
Seed capital funds	12
Business angels networks	8
Local and regional loan funds	82
Bail funds	54
Training and information centres	317

Source: *Innovation and Entrepreneurship in Poland, Report 2010 (Ośrodki innowacji i przedsiębiorczości w Polsce, raport 2010)*, edited by Krzysztof B. Matusiak, Warsaw 2010

Figure 8.1 Growth dynamic of innovation and entrepreneurship centers in Poland between 1990 and 2010



Source: *Innovation and Entrepreneurship in Poland, Report 2010 (Ośrodki innowacji i przedsiębiorczości w Polsce, raport 2010)*, edited by Krzysztof B. Matusiak, Warsaw 2010

Figure 8.2 Technology parks in Poland in 2010



Source: *Innovation and Entrepreneurship in Poland, Report 2010 (Ośrodki innowacji i przedsiębiorczości w Polsce, raport 2010)*, edited by Krzysztof B. Matusiak, Warsaw 2010

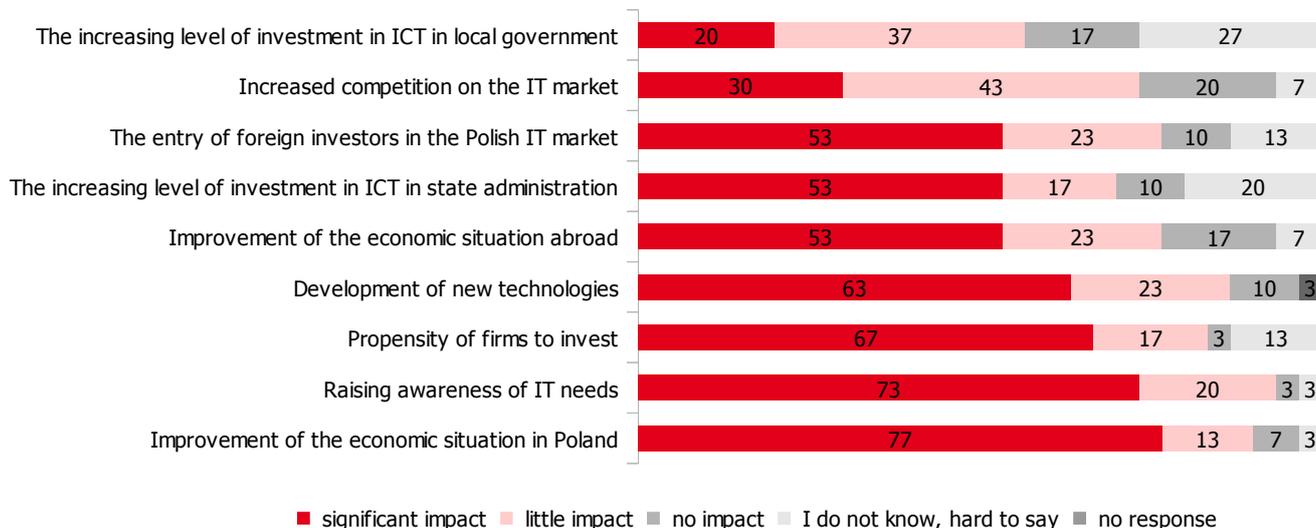
Polish innovative IT and telecommunications companies establish their headquarters in existing technological parks willingly, looking for interesting contacts with other companies and focusing on close cooperation with universities and their intellectual capital. The Polish ICT sector can receive a powerful impetus for development, if experience of technology parks and other centers for supporting entrepreneurship can be taken advantage of to make use of the partially hidden potential of the Polish science and ICT business.

Entrepreneurs' perspective

Complement to assess the prospects for the development of Polish ICT sector is the result of the "ICT in Poland. Perspectives and opinions of entrepreneurs on opportunities for ICT companies" survey conducted among small and medium-sized companies involved in ICT production and service provision. The study was conducted in the second half of 2012. Almost two thirds of businesses surveyed felt that the value of ICT market in 2012 will increase compared to the previous year, and only 3% expressed opposite view. Almost a quarter of businessmen, however, had no opinion on the subject, which may be considered evidence of uncertainty about the conditions which they operate their business in. Among the most important factors in the development of the ICT sector in Poland during the next two years, surveyed companies indicate

"improvement of the economic situation" as the very first item; more than three quarters of entrepreneurs believe that the advancement of the national economy will have a significant impact on the economic situation in the ICT industry. The economic situation of the world seems to be less important - just over half the respondents recognize its importance. Among the "soft" factors, usually mentioned were "increased awareness of the IT needs (73%) and the "propensity of companies to invest in IT" (67%).

Figure 8.3 Factors affecting the ICT sector development in Poland



Source: own study

Although the respondents indicated “propensity of companies and institutions to invest in IT” as one of the most important factors in the industry development, a lack of willingness to invest was cited as one of the most significant barriers to the prosperity of the ICT sector in Poland. As many as 98% of surveyed individuals identified a reluctance to invest as a barrier to development, with over 70% seeing it as a significant barrier. It therefore appears

that building the potential customers’ awareness of the opportunities offered by new technologies and convincing them of the benefits of investment in ICT solution is still one of the key marketing issues for many companies. In the forefront of development constraints, there is also a “state policy”, regarded as “significant barrier” for almost two thirds, and by a further 23% identified as “small barrier”.

Figure 8.4 Barriers to ICT sector development in Poland



Source: own study

Respondents, when asked about the reasons for the success of Polish ICT companies in the foreign markets are least likely to mention “product promotion” - only 30% considered it “definitely decisive factor.” For most respondents the price of the product is conclusive (70%) as well as its novelty (60%). It is worth noting that companies see more competitive advantage of Polish ICT companies in a low price than in product novelty, which proves the

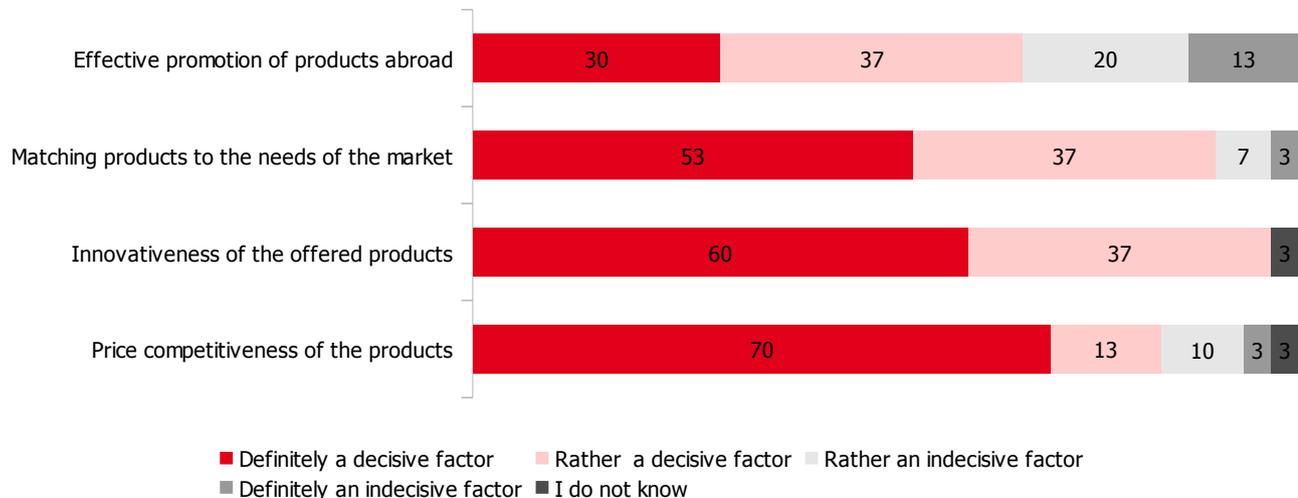
nature of the current factors of competitive advantage.

63% of surveyed companies found support for the business environment “rather insufficient” or “clearly insufficient”, while only 3% found it “clearly sufficient”. Almost 60% of respondents felt that there is little information and no clear rules concerning the possibility of cooperation with business environment institutions, research, and development funding opportunities and the

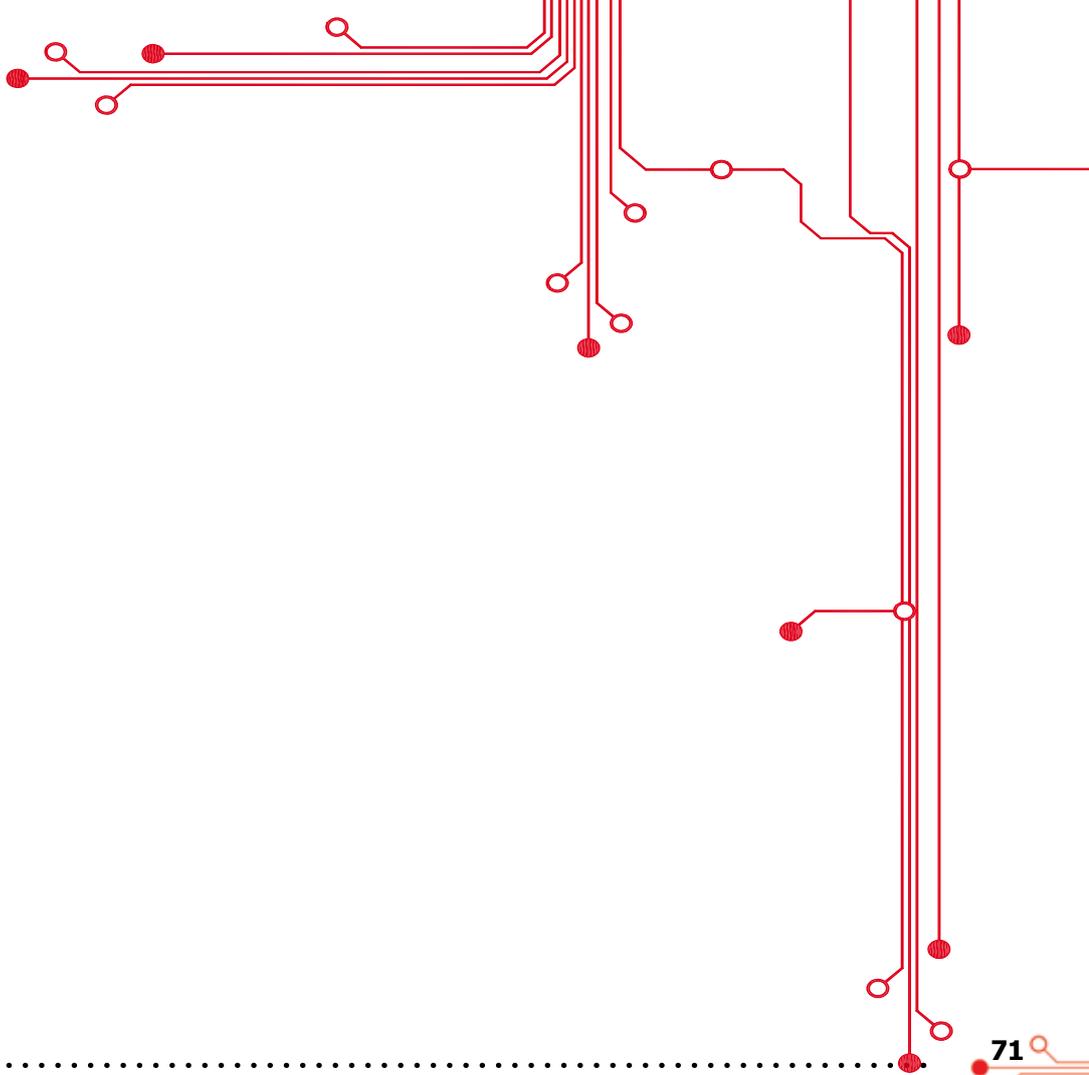
possible use of knowledge and competence of experienced staff. It is apparent that improving communication between entrepreneurs and business environment institutions, funding research and development and strengthening cooperation between science and business could bring improvement. As many as 77% of respondents felt that their company is able to create a product with

a global potential, while only 20% opted for „rather not“. Respondents, who thought that their company could not compete in global markets, reported lack of funds for investments, competition too intense in the global market and the lack of research facilities as the cause. This global optimism shows opportunities for Polish ICT industry development.

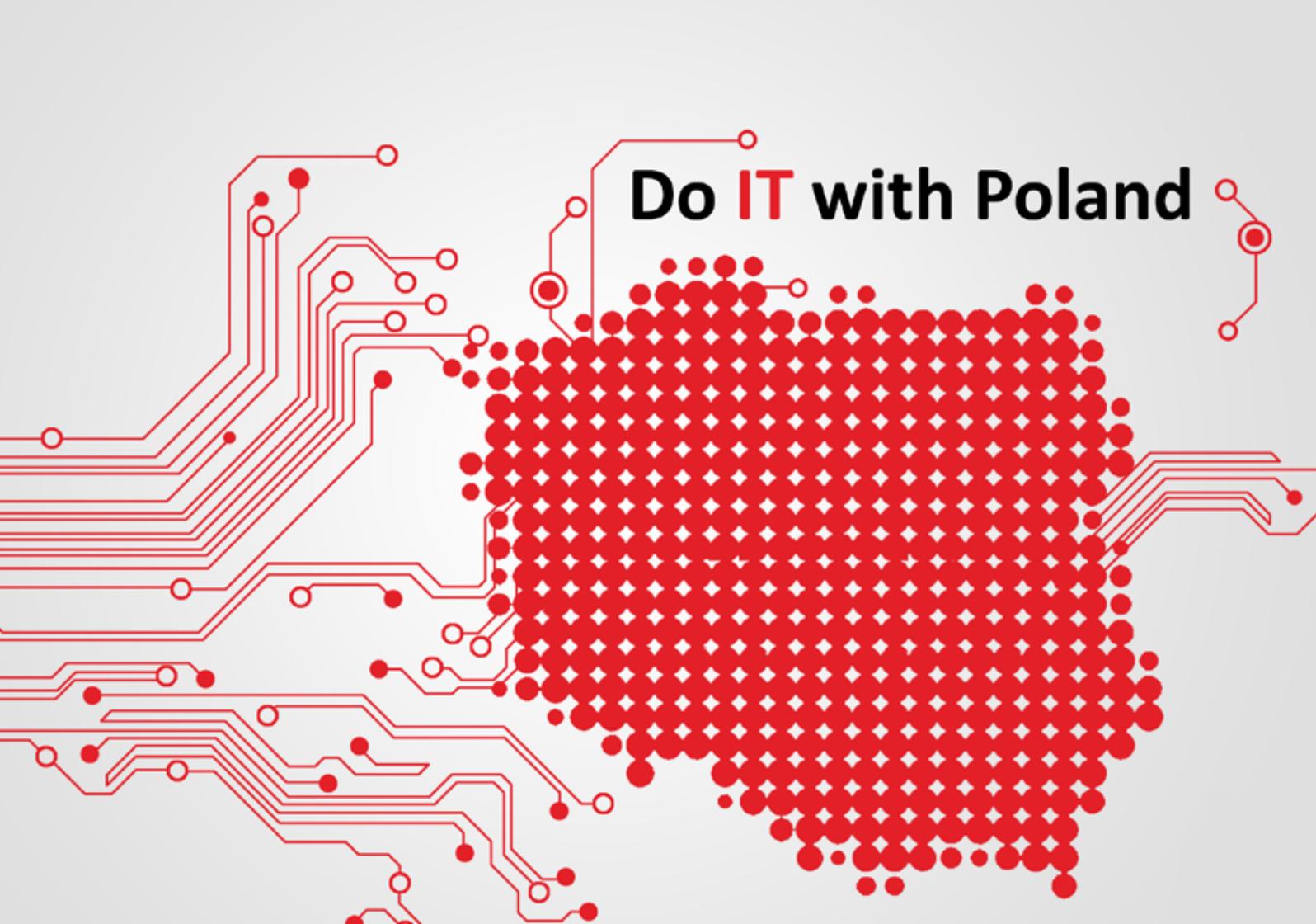
Figure 8.5 Success factors for Polish ICT companies operating abroad



Source: own study



Do IT with Poland



CONCLUSION

The Polish ICT sector has a very good growth prospects due to a very large Polish intellectual capital, but its potential remains partly hidden. The current weakness of the Polish ICT sector is also its strength – a clear definition of problems allows for the effective implementation of remedies. Positive examples of Polish companies that found their place in the international knowledge economy and a very good condition of Polish economy in crisis do not leave doubts that Poland manages to build a strong position on the international scene consistently and its role in the growing ICT sector will increase each year.



Polish ICT clusters

Name	Location	WWW
Mazowiecki Klaster Technologii Informatycznych i Telekomunikacyjnych	Warszawa	www.klasterict.pl
Klaster Firm Informatycznych ICT Pomorze Zachodnie	Szczecin	www.klaster.it
Beskidzki Klaster IT NT Hills	Bielsko-Biała	www.nthills.pl
Małopolski Klaster Technologii Informatycznych	Kraków	www.klaster.krakow.pl
Klaster Multimediów i Systemów Informatycznych	Nowy Sącz	www.multiklaster.pl
Wielkopolski Klaster Teleinformatyczny	Poznań	www.wklaster.pl
ICT Amber Klaster Teleinformatyczny	Elbląg	www.ictamber.pl
Wschodni Klaster ICT	Lublin	www.wschodni.klaster-ict.pl
Pomorski Klaster ICT	Gdańsk	www.pomorski-klaster-ict.pl
Podkarpacki Klaster Informatyczny	Rzeszów	www.klasterit.pl
Klaster Medialny	Łódź	www.mediaklaster.pl

Project co-financed by the European Regional Development Fund
under the Operational Programme Innovative Economy

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