

Knowledge-Driven Economy and Knowledge Workers: Polish Experience in the Integrating Europe.

Bartosz Surawski

The article presents Poland's position along the way to the knowledge-driven economy. Starting with criteria for a knowledge economy, it analyses Poland's position in comparison to the rest of the EU, and to world leaders. It explains the features and requirements of knowledge workers as a vital group of employees, and proceeds to show their proportion and composition within economies of world leaders and the Polish economy. Further, it presents factors in the labor market, which threaten the development of knowledge workers in Poland. Analysis shows, that Poland has made impressive progress since 1989, but is now at most a developed industrial country, with good prospects, but only at the doorstep of transition to a true knowledge economy

1. Introduction

To be named a 'knowledge economy' is surely a compliment. It automatically places an economy among the world leaders and hopefuls. It implies high level of development, fast progress, high standard of living. In OECD's report "A new economy? The changing role of innovation and information technology in growth" (2000) we read, that knowledge is the most important endogenous factor of production and the most important input into the engine of capitalism. Intangible assets and non-material factors of development (among them notably knowledge) grow in importance: research shows, that the material factors can only explain a half of the differences in the level of economic development (L.Ziemkowski (ed.), 2003). To be counted among knowledge-based economies makes attracting foreign investment and international trade easier. On the other hand, not joining the knowledge-based economies is a threat of building an unbridgeable gap and becoming a permanent periphery of the developed world. Is it possible to bridge such a gap in just 20 years? Can a country, which just 20 years ago shed the burden of half a century of communist utopia, and since then has been going through permanent transformation, to catch up with the world leaders?

Poland is a middle-size country, the 6th largest in the E.U., with 38,2 mln inhabitants. In the last four years, the economic growth averaged 4,65%, reached 6,2 in 2006, and is expected to exceed that result in 2007. Dynamic development is attributable to the accession to the E.U. in 2004, and the results of a fundamental re-structuring of the economy in the 90s and the new, modern branches of economy reaching international level of competitiveness. GDP is 605,4 bln USD (1698,3 bln zł), which gives 15 890 USD (44 490 zł) per capita. In Purchasing Power Parity, GDP is 631,8 bln. USD (1771,7 bln. zł),

and 16 600 USD (46 550 zł) per capita. The level of development is middle-high (HDI index = 0,862 (37^o), 2006). Agriculture contributes 2,8% to GDP, manufacturing – 31,7%, and services – 65,5%. The country is expected to develop fast, aided partly by E.U. structural funds, which will bring additional € 61 bln to its economy in the years 2007-2013. When one recalls the state of the country in 1989, the success of the transformation seems dazzling. But is it sustainable? Jumping to the world's first league requires structural changes from an industrial economy to a service and knowledge-based economy. Can Poland join one of the centres of the world economy, or will it remain just a decent suburb? Is Polish economy knowledge-based, or at least moving in that direction?

2. What makes a knowledge-based economy?

To characterise Poland's evolution, it is necessary first to comment on the meaning of, and the criteria defining the 'knowledge economy'.

First of all, we should remember about two ways of understanding knowledge: broadly defined, knowledge is a set of information, opinions and beliefs, to which we attribute cognitive or practical value. In the narrower sense, knowledge is interpreted as scientific knowledge. Talking about the connection between knowledge and the economy, we tend to think about the narrow definition – which may exclude the all-important cultural foundation (beliefs, values, mentality) for economic success.

The term 'knowledge economy', as the most concise, is in common use. To convey its meaning better, though, we can use the term 'knowledge-driven economy'. In such an economy, knowledge (expenditure for, and capital of knowledge), as a factor determining the rate of economic growth and the level of economic development, becomes more important, than the expenditure for and the accumulated level of, physical capital (L.Ziemkowski (ed.), 2003).

Therefore an economy may be said to be a 'knowledge-driven economy', if the correlation between economic growth and investment in knowledge is stronger, than the correlation with capital investment. By knowledge capital we can understand knowledge accumulated within a society (and measure it for example through the level of education or the past expenditure necessary to educate citizens to the present level). The annual expenditure or investment in knowledge is easier to identify and can have more measures. There are many versions and opinions on the subject of what the indices of a knowledge economy should be: e.g. Whether to take into account the yearly expenditure for computer software? Or to measure expenditure for primary education? Or expenditure for adult learning and business training? Here are two proposed sets of features, which should single out knowledge economies (A.Kukliński (ed.), 2003):

1. The share of employees with higher education in the working population,
2. GDP per capita
3. R&D expenditure
4. The share of the service sector in GDP
5. Falling physical weight of GDP
6. Frequency of profession change within working life

7. Innovative attitude (e.g. number of patents)
8. Openness to international trade (e.g. share of exports in GDP)
9. Access to information (level of IT saturation)
10. Cross-cultural cooperation

Another set of key criteria names six indices (L.Ziemkowski (ed.), 2003):

GERD	gross expenditure for research and development (% GDP),
ICT	expenditure for information and communication technology (% GDP),
EPO	number of patent applications to the European Patent Office (per 1 mln. inhabitants)
INT	internet access (percentage of inhabitants)
EDU	percentage of people with higher education in the working population
EXP	share of high-tech exports in total exports

3. Does Poland meet the criteria of a knowledge economy?

The level of education of the workforce was placed first on the OECD's list. The minimum level for a knowledge economy is suggested as 20%, and is reached by countries such as USA, the Netherlands, Sweden, Finland or Japan. Poland seems to be doing surprisingly well in that respect, noting in 2004, 20,9% people with a Master's diploma or higher, and 6,1% with a Bachelor or Engineer – 27,0% in total (PCSO, 2006). However, the sample for this calculation did not include individual farmers and the self-employed. But even including them, the criteria is met.

A knowledge economy provides high incomes to citizens. The suggested threshold is 20 000 USD in PPP. Only about 25 countries reach that level. Poland, with 16 600 USD, has not reached it, but Over the past years has made a quick progress towards it. In 2005, income per capita reached 50% of the EU's average (11 700 EUR versus 23 400 EUR for EU), which still places Poland at the end of the new EU members.

Incomes may be rising, but Poland is far from being a research centre. If we consider knowledge the main engine of capitalism, expenditure for research and development should exceed 2% of GDP. All leading countries devote much more. At the end of the 90s the OECD average was 2,2%, and 1,8% for EU – but that level was achieved thanks to the richest: Japan (3,0%), USA (2,7%), Sweden (3,9%) or Finland (3,2%). Poland at the time spent just 0,7% of GDP. In the 00s the situation has hardly changed, with leaders moving up by 0,1, and Poland – falling by 0,1.

Economic development has led to major changes in the structure of GDP. In the past, agriculture and mining were most important, then manufacturing took over, and now the service sector produces majority of GDP. The borderline is 65%, and most developed countries reach and pass it. The trend is followed by less affluent countries, as well. Poland moved from 60% in the 90s, to 65,5% in 2006. It must be remembered, though, that high share of services is not always an advantage, and may well indicate underdevelopment of the first two sectors. High share of services is justified, when GDP per capi-

ta is over 12-15 th. USD. Under that line it usually means, that an economy cannot produce enough material goods to accommodate for the basic needs of its citizens. Poland fell into that category in the 90s, but has successfully revived production since then.

Physical weight of GDP is an interesting indicator. With the rising share of services, the total physical weight of GDP should rise slower. In the past, the higher was the output, the more it weighed. It induced transportation, storage facilities, road-building. But with the technological progress, miniaturisation, conservation of natural resources and environmental protection, the relationship weakened. Since the World War II, the GDP of USA has risen 5 times, but the weight of it – just 3 times. The process is also associated with the freer movement of economic growth-poles and centres of business.

Development of knowledge, and its influence on economies, bring about two important consequences: product life-cycle shortens, and employees are forced to change professions more frequently. It enforces lifelong learning and intellectual flexibility. It is estimated, that over 17 years, 50% of workposts in Poland have either been transformed, or liquidated. It seems that the necessity of a radical economic transformation has successfully enforced a major attitude change.

If knowledge is a genuinely leading growth factor, it should be reflected in the innovative activity – and in the number of patents. This indicator may be misleading, though. Firstly, within the EU, it is measured by the number of patent applications to the European Patent Office. This requires innovators in many countries to change from their national patent offices to EPO. Secondly, due to the pace of technological progress, patents may not be the best way of protecting intellectual property, since they devalue faster than it takes to patent an invention. Also, there are more and more innovative solutions, which are difficult to patent, such as organisational solutions or business models. Thirdly, multinationals, whose employees develop new products in countries such as Poland, patent them from their headquarters, thus obscuring the actual distribution of innovative activity. Poland's performance in patent applications is dismally small, even if we take into account the three mentioned factors. In 2002, the EU's average was 134,7 patents per one million inhabitants, the leading countries reaching 300 (Finland – 306,6, Germany – 297,4, Sweden – 294), and Poland at the bottom with just 4,7.

Poland has become a truly open economy, though. It has integrated well into the economy of the European Union, and making progress in the world markets. Globalisation is one of the main mechanisms of knowledge transfer. But it also means, that a knowledge-based economy must be open to outside influence and international competition. Openness enforces constant development of competitive strengths and acceptance of international models and rules, often at the expense of domestic ones. The share of exports in GDP is 34%, but in that, 77,2% of exports are to the EU-countries. Other directions of exports, such as USA, Eastern Europe and Japan, are slowly developed.

Open societies and open economies experience a revolution in the supply of information, mainly thanks to the development of information technology and infrastructure. A knowledge economy must be characterised by broad access to information within the whole society – not just within the leading groups. A good indicator of that is the level of internet access of households. In this respect, discrepancies between countries are

large, but the situation is very dynamic, with some countries 'exploding' their internet access over just a few years. The most advanced countries, such as Sweden, Finland or the Netherlands, passing 70%. EU's average is ca. 50% in 2006, and Poland has reached 35%, or 70% of the average, and displaying high dynamics: in 2000, internet access was only 10%. Still, Poland is trailing behind smaller countries, like Estonia or Slovenia, which have already passed the EU's average).

Knowledge-driven economy is a product of cooperation of business people and researchers, coming from different countries and cultures. It leads to cultural changes such as limiting particularism, and promotion of communication and collaboration. Cross-cultural cooperation is hard to measure with indicators. In the last years, Polish economy and society were subjected to internationalisation and the influence of other cultures. Some factors were: Poland's integration into the EU, sharp rise in inward and outward tourism, increased access to information about the world, emigration of Poles to EU countries, major foreign investment in Poland and bringing multinational business culture and foreign employees to Poland. Poland has almost no significant ethnic and national minorities, and has not been recently exposed to inward migration, but on the other hand, sharing essentially the same culture base with western European societies, it experienced the ease of working with business partners in EU (again, as also shown by the example of Poles so easily settling in the UK).

Summarising, Poland meets about a half of the criteria for a knowledge economy, and part of other indices move in a desirable direction.

We can also analyse Poland's position along the way to a knowledge economy according to the second set of criteria: GERD, ICT, EPO, INT, EDU and EXP.

The level of GERD was already mentioned above Poland spends just 31% of EU's average on research and development. There is a positive correlation between economic growth and expenditure on R&D – and especially private (business) expenditure. EU's average shows the dominance of business expenditure in GERD, with 1,22% of GDP (2004). Government contributes 0,24%, and education - 0,41%. This proportion hardly changed from 2000 to 2004. On average, business contributes 65% of annual R&D expenditure. In case of the leading countries: Sweden, Finland, Denmark and Germany, the corresponding share is 70%, and in Sweden – even 74%. Japan and USA note still higher shares – 75% and 78% respectively. In Poland, this share was 28% in 2004, and it is even lower than previously – 0,17% of GDP in 2004 compared with 0,24 in 2000. As we see, Poland's economy is not driven by its own business-oriented research. There may be an interesting analogy with the situation of Ireland in the 90s. There, the level of R&D expenditure compared to GDP was low, and the share of high-tech exports was high. The reason might have been, that Ireland based its high-tech exports not on its own research, but on technology brought from USA. A similar situation may now be seen in Poland, where multinationals place their manufacturing plants to sell production in EU, but bring with them technological solutions and high-tech half-products developed elsewhere.

Poland may not be able to produce a working R&D sector for many years. Brown and Duguit (2000) remind us, that to obtain knowledge, information has to be put into practice. This shows a threat to economies relying on imported technology: they not only do not possess R&D facilities, but are not efficient in producing researchers, because universities can transfer information, but graduates have little opportunity to change it into valuable knowledge through practice. A few multinationals have started to move their R&D centres to Poland, headed by Intel's research centre in Cracow, but the trend has yet to change.

But Ziemkowski claims, that the knowledge capital of a society is determined chiefly by good education – the ability to circulate now freely accessible knowledge within the society, and not necessarily to produce new knowledge. A country does not have to be a major R&D centre to possess a high knowledge potential. Indeed, in education Poland is doing much better.

In IT expenditure, Poland's situation is slightly better: in 2004 it spent 2,0% of GDP on IT, compared to the EU average of 3,0% (67% of it). The leading countries spend ca. twice as much relative to GDP: Sweden – 4,3%, UK – 4,2%, Finland – 3,8%. And EU's distance to USA is significant here – USA spends 4,7% of GDP on information technology.

By comparison, expenditure on telecommunications can be highly surprising. In 2004, EU's average was ca. 3,2% of GDP per annum, and the value for Poland was 5,1% - 160% of the average. More surprising still, are the leaders: Bulgaria with 7,0%, Estonia with 6,3%, and Latvia with 5,3%. The most advanced economies, Sweden and Finland, note 4,3% and 3,3% respectively. The reason behind that is the huge deficit in communication infrastructure in the new EU countries. Consequently, money is being poured into, most of all, mobile phone networks, but also into landlines, satellite and other modes of communication. The values of EPO and INT were described earlier.

Poland's expenditure on education is also above EU's average. In 2003, it was 6,3% of GDP, or 115% of EU average (5,5%). It is still behind EU's leaders: Denmark: 7,0%, and Sweden: 6,8%. The development of private higher education is shown by a sizable (0,7%) share of private education expenditure, compared to e.g. Sweden's 0,2%. Since 1994, Poland has been experiencing a boom in higher education. The number of students in 2004 was 2,04 mln., and increased by 30% compared to 2000, and virtually doubled, compared to 1990. Germany, a country of 90 mln., had only 300 th. more students. There are over 500 institutions of higher education – most of them small and medium private colleges established after 1991.

Poles display high demand for education and new qualifications, and at least half of students are part time (extra-mural), who work, have their own families, and are often in their 30s, 40s or 50s. This boom is due to market's requirements – a diploma has suddenly become the norm. This has also forcibly transformed Poland into a country, where the need for constant, life-long learning is considered obvious. This is aided by wide promotion of skills' development by the wave of EU-subsidised training courses and post-graduate programmes of 2004-06. It can be suspected, that 'the seed fell on fertile ground': the value of education and competence is highly regarded in the Polish society

(as opinion polls consistently show). The mass character of higher education, however, leads to lower quality. An example of that is the rush for Management programmes and the consequent ‘overproduction’ of graduates, who cannot find proper employment.

An idea of the level of primary and secondary education is given by the results of the PISA study. In 2003, Polish pupils were ranked 24th in maths, 16th in reading comprehension, 19th in science and 25th in problem-solving. The results are within the OECD’s average – worse than Finland, the Netherlands or South Korea, but better than USA, Italy, Spain or Russia. The results improved significantly in comparison with the 2000 edition.

The level of exports and the degree of openness of the Polish economy, were mentioned earlier. It is worth noting, though, that Poland still has a deficit in the trade of goods (71,9 bln EUR of exports and 81,2 of imports), but has reached a small surplus in the trade of services (10,8 bln. EUR of exports to 10,0 of imports). Poland has been receiving major foreign direct investment, coming 7th in the world last year, with 8,5 bln. USD in 2005, and over 10,0 in 2006, resulting in 31 th. new workplaces. Foreign investment, largely by major multinationals, is bringing new and valuable knowledge to the Polish economy. But Poland is still perceived as a location for manufacturing and simple services. According to the ranking of investment attractiveness by Ernst&Young, Poland is ranked 7th most attractive country. It comes highest in locating manufacturing – second only to China. It is 5th in the service centre category, but falls out of the top ten, when it comes to where to locate an R&D plant or the company’s headquarters – company units with highest added value and requiring mostly knowledge workers.

Summarising the six criteria, Poland is not close to leadership in any of them. It reaches the EU average in ICT and EDU. Poland’s economy is not close to a knowledge economy. But when we compare indices with the level of GDP, it has improved significantly over the past few years. In 1999, it did not reach EU averages in any criteria, and the mean was around 40% of EU – the same as GDP. Now GDP is 50% of the EU average, but four indices are above that. When we take three main pillars of a knowledge economy: innovation system, education, and IT and communication system, Poland is doing well in education, catching up in ICT, but far behind in knowledge creation. There is still much to be done to stop world leaders (USA, Japan, Sweden or Finland) from running away, let alone to narrow the gap.

4. Who are knowledge workers?

If an economy is to be knowledge driven, knowledge workers are the group of employees to drive it. Peter Drucker is most frequently considered the author of this term, and its greatest promoter. He first described the ‘knowledge worker’ in “Landmarks of tomorrow” (Drucker, 1959). He wrote, that in the 20th century the great challenge to those managing the economy would be to increase the efficiency of knowledge-based work, as in the 19th century the challenge was increasing the efficiency of physical work.

Productivity of knowledge workers may not be the only factor of global competitiveness, but most probably the deciding one – at least in the majority of industries of de-

veloped economies. It is worthwhile to pursue a rise in the efficiency of the most costly and most growth-inducing part of the working population. In many countries this group decides the size of economic growth. As less skilled work may be moved elsewhere, efficiency of knowledge work is vital to the survival of developed economies. What are the features of knowledge workers? What are their expectations and requirements? How many are there?

Drucker noticed a new group of workers entering businesses in the 50s – professional university graduates, such as engineers, researchers, lawyers, psychologists, who did not fit or obey the ‘command and control’ scheme. Terms alternative to ‘knowledge workers’ were professionals or specialists. They were a narrow group at the beginning. Now it can be said, that knowledge is increasingly necessary in any type of work – also in physical or simple service jobs. In manufacturing, work either becomes robotised, or requires more technical knowledge. Drucker says: "Knowledge results when the intellect (the capacity to think) does purposeful work using data and information, It affects all levels and functions in organizations. Every individual is now a knowledge worker." But the fact, that more and more jobs require theoretical background, does not mean, that everyone is a knowledge worker. Where to draw the line, then?

As usual, definitions try to enclose a complex term in one sentence, and convey part of the meaning. Authors underline knowledge attained through education and experience, engagement in knowledge processes, cognitive role of learning and developing knowledge through different transformations, and the aspect of value creation. Examples are:

“Knowledge workers represent a high level of specialised knowledge, education or experience, and creation, transfer, distribution and practical use of knowledge are among the most important objectives of their work.” (Davenport, 2006)

“People who enrich given information and who learn from the information that is communicated.” (Hayman, Elliman, 2000)

“A person, who produces value, using his/her mind and not hands, through creativity, analysing, synthetising, making judgements etc.” (Horibe, 1999)

Knowledge workers have more interesting features, some of which should be mentioned to help distinguish them within the workforce:

- They own the means of production (brains with knowledge), which cannot be owned by employers. They create and own most of the intangible assets of companies (Propst, Raub, Romhardt, 2000), They resist capturing their unique knowledge by companies (Easterby-Smith, Lyles, 2006),
- They are among the highest earners, and through e.g. pension and investment funds – they may own their employers,
- They can mainly be found in the ‘middle-class’ – they form the backbone of that social group. Many, due to the wise commercial use of their intellect, form the higher class. Those in the public sector (teachers, doctors, civil servants) may economically belong to the lower class, but always mentally aspire to a higher status. Knowledge-related professions are among the most highly regarded, and are by themselves sources of status.

- Many of them are self-employed, work irregularly, on contracts with different companies, do not progress within one company, but build their own brand in the labour/B2B market (Easterby-Smith, Lyles, 2006),
- They can be more loyal to their profession, than to their company, and to themselves than to their profession (Easterby-Smith, Lyles, 2006),
- There are whole professions, the core of which is knowledge work,
- Their brain, not their physical abilities, is their main working tool. Their main effort is the intellectual. (Davenport, 2006),
- They must understand, command, maintain and develop a large body of knowledge (Pinchot, Pinchot, in: Myers (ed.), 1996),
- They know more about their specific field than their superiors (Knight, 2002),
- Knowledge work is rarely routinised – its content rarely stays the same for long. It is largely associated with problem-solving, and the problems solved change with time. K-workers are able to undertake major, complicated tasks and resolve complex problems,
- Knowledge work is irregular, does not fit in regular working hours, is invisible, less structured, than manufacturing or administrative work, cannot be made more efficient by standardisation, is hard to control. It is harder to measure – its results may become apparent with much delay,
- Knowledge workers resist close control and instruction, must have flexibility and freedom, are independent and demanding, Many are hesitant of climbing the management ladder, preferring positions of specialists/experts,
- They are highly mobile and, given appropriate technical support, can work remotely – working hours and workplace change meaning
- They cannot produce much value alone – they require teamwork and dialogue (Pinchot, Pinchot, in: Myers (ed.), 1996), They are humanists, with higher social awareness, they value belonging to a community, social climate and relationships based on trust, negotiations rather than conflicts (Von Krogh, Ichijo, Nonaka, 2000),
- They rely on communication and maintain networks of contacts. They are computer-literate and proficient at using ICT,
- They need to UNDERSTAND the information they pass, not just transfer it (Seely Brown, Duguid, 2002),

The last element brings us to an important question: who are NOT knowledge workers? It is easier with manual work – but what about service work? Is a man in a call-centre a knowledge worker? Is office work synonymous with knowledge work? As Seely Brown and Duguid (2002) point out, it is not sufficient to work with information to be a knowledge worker. Businesses increasingly need not more and more information, but more and more people to understand it – more intelligence. Therefore while trying to approximate the proportion of knowledge workers within an economy, it is important to distinguish between those, who just need to handle information in their work, and those who need to understand it to be able to use it! Knowledge must be understood, information can just be held. Thus the distinction between information workers and knowledge

workers. And between information economy and knowledge economy: the first shows a marked indifference to people. In that, it is similar to the older industrial economy. It threatens to use people as interchangeable processors. Therefore, another, deeper feature of the knowledge economy is the renewed focus on people, both as employees and as customers and stakeholders. So, we should also remember, that even workers in seemingly non-knowledge positions solve problems, notice relationships, and may have insightful and innovative ideas (Ch.Evans, 2002).

What are the requirements of knowledge workers for efficient work?

- They prefer thinking-friendly environments, are demanding of their work environment, appreciate higher standard of living, often move to the countryside or to regions and countries with higher general living standards. But money motivation is secondary for them – there are more important motivators. Money motivators may even discourage.
- They require opportunities to broaden their knowledge and gather new experience, opportunities for horizontal promotion – career as experts, wider responsibility, more resources, more freedom to choose new tasks,
- They want to work with other talented professionals, guided by expert mentors, to work in a community of practice, maintaining certain standards, group norms and values,
- True motivators for knowledge workers are being recognized and appreciated for their thinking. They must get credit for their achievements. They also require a stage, a forum, a social space to present and exchange ideas (Bukowitz, Williams, 2000).
- They want to take part in decision-making, to be heard and express own opinions. They need to be evaluated and have access to feedback on their results to be able to exercise effective self-control,
- They require flexible organisations, task-orientation, teamwork and democratic style of work and management,
- They require good ICT infrastructure, which allows them to freely access information, organise and process their knowledge, and freely communicate with others (Easterby-Smith, Lyles, 2006),

Thomas Davenport (2006) divides their needs into two groups:

- Need of autonomy – they are weary of obeying orders, think for themselves, work on their own, so their relation with managers must be based on trust; they are able to manage and organise their own effort; they receive the goal, choose the best way, and rarely can describe the way they work.
- Need to be engaged – emotional or intellectual engagement condition knowledge assimilation and development; efficient knowledge work is impossible without engagement – and that is impossible without trust and proper resources.

Knowledge workers assume certain functions and positions within organisations. Managers can be assumed to be knowledge workers, as can specialists or experts within the organisation. Large organisations evolve their own teams responsible for more efficient

knowledge work. Applehans, Glove and Laugero (1999) name three functions, which can be assumed by knowledge workers within organisations:

1. Knowledge Officers – high-level executives who set the strategic directions for knowledge.
2. Knowledge Analysts – individuals charged with the specific knowledge-packaging efforts of identifying information needs and delivering appropriate knowledge, based on the strategic direction set by the knowledge officers.
3. Knowledge Authors – front-line providers of information, who Handle the day-to-day publishing as well as monitoring of information in their particular areas of expertise.

The next task is to identify knowledge workers in the economy and try to count them. If we wanted to name professions, which make up the group of knowledge workers, the list would be too long. Identifying them by professions, it is better to use main professional groups – which will be done below. We could also try to identify ‘knowledge industries’, such as high-tech manufacturing or high-knowledge services. But they also employ non-knowledge workers. And in any industry we can find knowledge-intensive companies. They come in two groups: the leaders, who dominate the market and lead by innovation, and start-ups, who enter the market with innovating ideas – often spin-offs of research or academic activity. Both seek their competitive advantage in knowing more than their competitors.

5. Knowledge workers in the world

Due to a lack of an unequivocal and precise definition of a knowledge worker, it is impossible to precisely calculate their numbers in various countries. Regardless of the definition, though, it is undoubtful, that the biggest number of them are found in the most developed economies of USA, Europe and Japan. In the USA, they form – according to estimates – from 25 to 50 % of the working population (Davenport, 2006). Already in 1958, Fritz Mahlup, an American economist, judged knowledge workers to be one-third of the workforce. American Bureau of Labor Statistics (BLS) does not classify knowledge workers as a separate group, but their number can be discerned by putting together several categories of employees, which are used in BLS statistics. Davenport includes such categories, as: management, business and financial operations, information technology and mathematical disciplines, architecture and engineering, empirical and social sciences, law, medicine and health care, social services, education, training and librarianship, art, design, entertainment and sport, media.

In USA, about 36 mln. people, or 28% of employees, belong to these categories. As said, this classification is not exact: in the group so defined, we find professional sportsmen. But a great majority within these categories earn their living by thinking. Eubin and Huber, who applied less rigorous criteria (including e.g. public administration), counted 45 mln. knowledge workers as early as in 1980. Maybe the best measure is the number of managers, free vocations and technical specialists – who in 2003 composed about 34% of the working population. Another approach to estimation is to count the number of people with qualifications allowing them to perform knowledge work. In USA, about

25% of the employed are able to process highly or moderately complex information in mathematical or verbal form, and transform this information into knowledge. Applying still another set of criteria, Marc Porat calculated in 1977, that knowledge workers compose about 50% of all employed, and the sum of their earnings was higher, than that of the rest.

In Canada, knowledge workers comprise managers, free vocations and technical specialists, whoc comprised 25% of the working population in 2001, and only 11% in 1971. In the UK, research carried out on 28 mln. workposts showed, that 32% of them involved knowledge-based work and required at least a Bachelor degree.

6. Knowledge workers in Poland

Now it is time to estimate the number of knowledge workers in Poland. We shall start with the narrowest estimate – professional researchers. Researchers are professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems, and in the management of the projects concerned, in business enterprises, government, higher education, and private non-profit organisations. According to Eurostat, in 2004, there were 61 th. professional researchers in Poland. This is 0,42% of the working population in Poland, and exactly 5,00% of the total number of researchers in EU – which is better than expected, looking at the GERD index. In 1994 there were 47 th. researchers – a rise of 30% in 10 years, compared to 35% for EU in the same period. Unfortunately, at least 70% of Polish researchers work at universities – their number in businesses is almost negligible. In EU, the proportion of researchers in the working population is 1,2%, with a half of them in the business sector. The leaders – as usual – Finland (2,8%, 1,5% of that in business), Sweden (2,2%) and Germany (2,1%).

We can add to that the prospective researchers – the number of Ph.D. students. In 2004, there were 32 054 Ph.D. students in Poland, 35,7% of which were in empirical sciences and technology. They made up 8,00% of all Ph.D. students in EU (in EU, 37,7% of students are in empirical sciences and technology).

An indicator, that much more closely reflects the proportion of knowledge workers within the economy, is the HRST index. Human resources in science and technology is the percentage of the total labour force in the age group 25-64, that is classified as HRST, i.e. having either successfully completed an education at the third level in an S&T field of study or is employed in an occupation where such an education is normally required. For EU, the index was 29,2% in 2004. Poland is not far from that average, with 25,0%. But the leading countries are far ahead, with 39,9% for Sweden, 38,2 for Finland and 38,0 for Denmark. The 15% difference is a gap, which seems unbridgeable at least for one generation.

A different approach to approximating the proportion of knowledge workers is to count persons working in high- and medium-high-technology manufacturing and knowledge-intensive services. Such calculation includes all employes (even unskilled) in these industries, and excludes e.g. managers in other industries. Proportion of workers in these industries is presented in Table 1:

Table 1. Proportion of persons working in high- and medium-high-technology manufacturing and knowledge-intensive service sectors in Poland and EU.

	Employment in high- and medium-high-technology manufacturing			Employment in knowledge-intensive services		
	1995	2000	2004	1995	2000	2004
Poland	-	-	4.4	-	-	24.3
EU-25	-	5.8	5.7	-	29.2	33.1
Sweden	6.0	6.4	6.0	44.2	45.7	47.0
Denmark	6.1	5.4	5.0	39.0	42.1	42.3
United Kingdom	6.0	5.8	4.6	36.8	39.7	42.1
Finland	5.2	5.3	4.9	37.3	37.9	40.3
Netherlands	3.8	3.5	2.6	36.7	39.2	41.0
Germany	9.2	9.3	9.4	26.9	30.4	33.4
Ireland	4.3	3.5	3.8	29.2	31.7	33.4

Source: based on *Europe in figures. Eurostat yearbook 2006-07*, Eurostat 2007,

Data available for Poland, for 2004, shows, that 27,7% of the working population can be considered knowledge workers – compared to HRST of 25,0%. The EU average was 38,8%, and European leaders exceeded 45%, with Sweden reaching 53,0%. Here Poland reached just 71,4% of EU's average, while in HRST – 85,6%.

Polish Central Statistical Office publishes data on employment in different groups of professions. Table 2 shows employment in 2004, in two groups, which may be considered to comprise knowledge workers.

Table 2. Two main groups of knowledge workers in Poland, in 2004.

	Total	Public sector	Private sector
RESEARCHED WORKPOSTS	6213,8	2725,1	3488,7
1. MEMBERS OF PARLIAMENT, HIGHER OFFICIALS AND MANAGERS	390,7	153,5	237,2
in %	6,3	5,6	6,8
MANAGERS OF LARGE AND MEDIUM ORGANISATIONS	380,1	144,8	235,3
in %	6,2	5,3	6,8
General managers, executive managers and	123,3	48,2	75,1

their deputies			
Managers of internal organisational units in core activity	93,9	30,4	63,5
Managers of other internal organisational units	163,0	66,3	96,7
MANAGERS OF SMALL ENTERPRISES	1,5	0,4	1,1
in %	0,0	0,0	0,0
2. SPECIALISTS			
	1220,8	873,7	347,1
in %	19,6	32,0	9,9
SPECIALISTS IN PHYSICAL, MATHEMATICAL AND TECHNICAL SCIENCES			
	169,6	68,2	101,4
in %	2,7	2,5	2,9
Physicians, chemists and associated specialists	8,4	6,9	1,5
Mathematicians, statisticians and associated specialists	3,3	3,2	0,1
Information technology specialists	46,8	14,3	32,5
Engineers and associated specialists	111,2	43,9	67,3
SPECIALISTS IN NATURAL SCIENCES AND HEALTH CARE			
	113,1	93,5	19,6
in %	1,8	3,4	0,6
Specialists of biological sciences	7,3	7,0	0,3
Specialists of agriculture and forestry	15,1	12,7	2,4
Health care specialists (without nursing)	75,6	60,4	15,2
Nursing specialists	14,9	13,3	1,6
SPECIALISTS IN EDUCATION	552,7	532,3	20,4
in %	8,9	19,5	0,6
Teachers in higher education	81,9	69,3	12,6
Teachers of gymnasium and post-gymnasium schools	201,2	197,9	3,3
Teachers of primary schools and nurseries	204,1	201,2	2,9
Teachers of special schools	15,5	15,4	0,1
Other specialists in education and upbringing	49,9	48,5	1,4
OTHER SPECIALISTS	385,2	179,5	205,7
in %	6,2	6,6	5,8
Specialists in management and economics	283,1	90,0	193,1
Lawyers	25,2	22,1	3,1
Archivists, librarians and scientific information specialists	10,2	9,6	0,6
Specialists of social sciences	13,7	12,4	1,3
Specialists in art and culture	17,7	10,2	7,5
Public administration specialists	35,1	35,0	0,1

Source: based on *Struktura wynagrodzeń według zawodów w Polsce 2004*, Polish Central Statistical Office 2006,

Professional managers of different levels comprise 6,3% of the working population. Specialists are the largest professional group, with 19,6%. In total, 25,9% of workers belong to both groups. As mentioned earlier, this research did not comprise individual farmers and the self-employed. Counting them in, the above group shrinks to 18,94%. There is a significant difference between the public and private sectors: the private sector only employs 16,7% of the two groups, while in the public sector they form 37,6% of workers. The imbalance is partly due to public education, with over 0,5 mln. employees, public healthcare system and public administration.

The research of the Polish CSO also includes data on employees' education. In the researched group of employed, 20,6% of them possessed a university degree of Master or higher, or Dr.med., and further 6,1% – the degrees of Bachelor, Engineer or equivalent. In total, 27,0% of employees have higher education – but can they be named knowledge workers, and does their work require them to have higher education?

Knowledge workers should be the best paid group of employees. This is confirmed by data in Table 3:

Table 3. Wages of knowledge workers in Poland, in 2004, according to the level of education and professional group.

RESEARCHED WORKPOSTS	Total	Public sector	Private sector
General:	2368,52	2527,63	2244,24
Education:			
Master degree or higher, or dr.med. or equivalent	3649,08	3244,08	4647,69
Engineer, Bachelor or equivalent	3262,85	2790,17	3617,86
Professional groups:			
Members of Parliament, higher officials and managers	5482,11	4854,15	5888,66
Specialists	3180,32	2992,89	3652,09

Source: based on *Struktura wynagrodzeń według zawodów w Polsce 2004*, Polish Central Statistical Office 2006,

The wages of the best educated group of employees were 54,1% higher than the average. Bachelors and engineers earned 37,75% more than the average. In professional groups, managers earned 231,5%, and specialists – 134,3% of the average. On the other hand, specialists in the public sector – in education or health care – earn considerably less. But together, managers and specialists take over 40,89% of all wages in the economy! Taking business sector alone, they catch over 50% of wages – business offers even better conditions for knowledge workers.

7. Labor market – threats to the development of the knowledge economy in Poland

In the forecasts of the “Poland 2000+” Forecasts’ Committee at the Polish Academy of Sciences, made to 2013 (the end of EU’s budget perspective) and 2025, specialists/ professionals/ knowledge-workers will be the fastest-growing group of employees. Their numbers should double between 2000 and 2025 (from 1 507 th. to 3 155 th.). Their number rises by 1/3 every 10 years. Within that group, professions with highest potential are IT specialists, business professionals, statisticians, financiers, sociologists, psychologists, media and communication specialists. The fastest growing industries are expected to be ICT, robotics, computer services, business consulting, PR and advertising. A. Karpiński, secretary to the Forecasts’ Committee, claims, that since Poland’s accession to the EU, there arise conditions for a fall of unemployment to around the natural level within 10 years. He names five main factors working towards that (Karpiński (ed.), 2006):

- Quick rise and change in structure of domestic demand, aided by a jump in demand for housing.
- Broad use of EU funds will result in large capital investment and rapid development of workforce due to extensive training.
- The demographic pressure on unemployment is going to ease, since from 2010, the size of population in working age is going to fall.
- Due to the development of the service sector worldwide, there will be the opportunity to capture investments such as service centres for multinational companies.
- The labor markets of other EU countries will slowly open to Polish workers, and outward migration will force wage rise at home and rise in domestic consumption.

Unemployment may be falling, but still over 1,8 mln. people are registered in labor offices, and the unemployment rate, according to the ILO’s definition, is 10,6%. Another important indicator is falling, too – although it already is the lowest among EU countries: the employment index is 52,8 % compared to the EU’s average of 65,2. Emigration is intensifying. Business organizations alarm, that work shortages might shortly stifle Poland’s economic growth. Companies meet more difficulty finding suitable employees. Quickly developing industries, such as IT, electronics or construction, suffer most – but others join, as well. In 2008 the demand for IT graduates will surpland the supply. And the rapidly growing construction industry is already missing ca. 200 thousand employees – and this is before the proper construction boom (not to mention stadiums, highways, airports and hotels to be built for the 2012 European Soccer Championships). Dramatic shortages can also be found in the public sector, e.g. police officers and nurses. Shortages of staff apply both to highly qualified graduates, and to qualified and non-qualified manual workers.

The reverse side of this may be favorable to knowledge workers: the shift from the employer’s market to the employee’s market. Employees have felt their power and position strengthened, and are starting to exercise their power and be more demanding. Which

will hopefully lead to a change in corporate culture towards greater egalitarianism, democracy and individualism – which are features favourable of proficient use of knowledge workers. But it also results in a worrying rise in pay – over 10 % year-to-year since 2006, and a possible rise in inflation.

Consequently, we can name four factors hampering the development of the population of knowledge workers in Poland:

- proportion of the economically inactive people,
- emigration and brain-drain,
- maladjustment of the educational sector,
- social climate,

Any approximations of the proportion of knowledge workers within the economy, must be distorted, when over 47 % of adult population is outside the labor market. This has been the ongoing problem throughout the whole transformation. The level of employment has fallen by 4,2 mln between 1989 and 2005 – from 17,5 mln to 13,3 mln. One of the factors was reduction of employment in agriculture, which amounts to 2,0 mln. Another reason was major overemployment and inefficiency in most of the industries. There were industries, in which the fall was to 15-40% of original employment – some of them were clearly relics and doomed in a market economy. Now, despite the fall of unemployment and rise in wages, the total number of economically active people is still falling. Who are the economically inactive? S.Golinowska (2006) names 4 groups:

- 29 % are young people in education. This may be perceived as encouraging, as majority of them are in higher education and will increase the number of knowledge workers. But two things counter that hope: firstly, universities have for the past few years been temporary refuge from the unemployment-ridden market and bleak prospects for young people, and secondly, the outburst of higher education in Poland has raised the numbers, but pushed down the quality of education.
- The second group are the (early) retired and people with disability pension. They often work part-time or in the ‘grey economy’. Many of them also find work abroad, while still drawing state pensions.
- The highest part of the professionally inactive are the unemployed (over 31%). Among them are the long-term unemployed and those already discouraged from seeking employment at all. There is also a significant proportion of those, who work irregularly (seasonal jobs, short-term work) and illegally.
- Another 10% of the inactive are housewives, mothers and grandmothers caring for children and family.

It turns out from the above, that in fact a large proportion of the ‘inactive’ display activity, which does not fit into the term ‘employment’. It may be the case, that the 47 % figure is, therefore, unnecessarily worrying, but on the other hand it is clear, that we cannot expect many of people composing it to enter the labor market as knowledge workers.

Emigration is another major threat to the knowledge economy in Poland.

It is reducing unemployment by 0,4-0,6% since 2004, but it is hardly any cause for satisfaction. The present wave of emigration is, unfortunately, to a great extent, a brain-drain. The recent research shows, that 43 % of the emigrants declare the will to stay abroad permanently (I.Dryll, 2007). This group is composed mainly of active, energetic young people. The average age of a migrant is 26 years and – which is important – he/she does not yet have a family. They are well-educated, many leave the country just after graduation. According to various estimates, from 600 thousand to 1 million Poles have left the country in the last three years. It is difficult to judge, what percentage of them leave permanently, what part leaves for 1-3 years to raise capital and come back, and what part finds seasonal or other temporary employment to supplement their income in Poland.

The phenomenon is a major threat to the future of the knowledge economy in Poland. We lose the most promising part of the workforce – the combination of dynamic and well-educated, which should be the catalyst of economic development and entrepreneurship. Poland loses the group of employees, who should in later years support the pension burden of the aging population. It is significant, that brain-drain is most vivid in the group of the most gifted youth. The brightest students use Erasmus to leave and stay abroad. The brightest graduates are not sufficiently appreciated and are not given opportunities suitable to their potential, which is connected with the misery of the R&D sector. Even the graduates of the secondary school International Baccalaureate (IB system), who have open doors to world's best universities, prepare themselves to study abroad as their first and natural choice.

There seems to be growing maladjustment of the educational sector to the labor market. First example are the manufacturing workers. Due to an inflow of foreign investment once again there is demand for qualified industrial workers. This is met with a sharp decline and neglect of vocational education after 1999, in favour of general high schools. Uncontrolled shutting down of vocational schools results in shortages in construction workers, mechanics, electricians, nurses, textile workers etc.

The extent of maladjustments in the Polish educational system provokes a claim, that it educates mainly for unemployment. Educational activity loosely corresponds with the needs of the market. Majority of both secondary schools and universities do not maintain close relations with local labor offices or business organisations, though in the last two years the trend is gradually changing. Private higher education is the exception, as it has had to be market-oriented from the start and offer programmes, which are perceived as attractive (though this often means a fad rather than a true market demand). Another factor adjusting education to market needs, is the huge popularity of part-time studies. Majority of students in Poland are working students, often with considerable professional knowledge and experience. Through their demands on the practical dimension of knowledge, they force a change of attitude on universities. This also signifies the existence of one of the pillars of a knowledge economy: the focus on constant, life-long learning. In Poland, it happened naturally: due to structural maladjustment of competences, thousands of working, middle-aged professionals have had to update or change their qualifications through additional degrees – and thus starting a degree over 40 has become understandable and natural.

But prof. Karpiński also sees maladjustment in the group of knowledge workers – key to modernisation and the new economy. Since 1989 technical studies were unpopular, and only in the last 2-3 years they are again promoted as the surest way to secure attractive and well-paid jobs in future. But new, narrow, technical specialties in the knowledge sector arise so quickly, that universities are not prepared to offer them fast enough to produce graduates, when demand appears. To overcome this, even quick reacting would have to be supplanted by careful forecasting in close cooperation with the industry. As experts say, among the 9-year-olds at school in the 90s, every second one will work in a profession, which does not yet exist.

A knowledge economy requires a knowledge society – and this requires mechanisms of knowledge circulation within a society. It requires a culture of high trust, openness to change, low barriers of communication, and an efficient set of social institutions facilitating knowledge transfer, such as schools, universities, training companies, media and publishing. And valuing knowledge above other things. Poland is still tailing in this respect. Mutual trust is low. People protect, what they know, even if they do not have to.

Surveys show, that the motivation of the current wave of emigration is not just economic. It is also the social climate abroad: healthier interpersonal relations, clearer appraisal and promotion criteria, more friendly and relaxed attitude to life. These factors are more important in the case of the best-educated group of emigrants – the knowledge workers such as IT specialists, engineers, financiers, doctors – who could earn a decent living in Poland, but for whom the social and intellectual climate is of higher value.

The social communication space in Poland is dominated by mistrust and hostility towards intelligent, educated people. It is attributable to the aggressive populism of the present government, and the medias' obsessive preoccupation with the political scene, which unnecessarily dominates the social debate. The ruling party's disregard for educated people (often labeled the 'lying elites') and open favouring of blind loyalty over independent competence, the strategy of 'ruling by scandals' – a never-ending campaign of dirty war on opposition and its own coalition partners instead of constructive resolving of real problems, and the so-called 'war on corruption: 'regaining' and founding new law-enforcement and anti-corruption agencies and undermining the authority of the justice system, while cynically taking over public institutions (like television) and using them to attack other parties and reap 'historical justice' – all three are destructive to the social fabric of interpersonal relations, which should support and frame the knowledge economy. Healthy separation of the economy and politics has protected the steady economic growth and transformation from the direct influence of politicians, but the indirect deterioration of social relations may turn to be much more harmful.

8. Conclusions

It is surely worthwhile to invest in knowledge workers. Over the past 20 years, the ratio of the market value to the book value of American companies doubled - which clearly shows knowledge as the source of economic success.

Poland has reached the stage of a developed industrial country – which is a major achievement in historical perspective. But the world leaders have already moved into the era of knowledge, and Poland is just at the door of the post-industrial age. Its advantages are a sizable proportion of well-educated knowledge workers (18 to 25%), strong economy, good education and fast-improving ICT system. Threats include underdeveloped R&D sector, brain-drain and unfavourable social climate. As incomes rise, Poland will lose competitive advantage as manufacturing centre, and be forced to move to a knowledge economy, or remain a periphery, contributing to Europe just the steady flow of educated emigrants and a market to sell to. It will continue to develop – the question is of direction. And the only way to enforce the direction towards a knowledge-driven economy must be through conscious decision, commitment and concerted effort of policy-makers and the whole society.

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Bartosz SURAWSKI, co-ordinator, International Relations&Research Projects, Business and Administration School in Gdynia, Poland

