

KNOWLEDGE ASSESSMENT METHODOLOGY – RESULTS FOR POLAND¹

*Anna Ujwary-Gil**

Abstract

The object of this paper is to present the latest findings relating to the Knowledge Assessment Methodology (KAM), with particular regard to Poland, which the author has compared to other countries in Europe and Central Asia (taken as one grouping of countries according to region). The four main pillars of this tool for elementary analysis in the area are, eg. the economic and institutional regime, education, innovation and ICT. The article begins by presenting evidence of an emerging knowledge-based economy, its importance and issues concerning its definition. Subsequently the author discussed the key elements of KAM in order to present the results of the so-called, Basic Scorecard and KEI and KI indexes.

Keywords: *knowledge-based economy, the Knowledge Assessment Methodology, KAM, Knowledge Economy Index (KEI), Knowledge Index (KI), Poland.*

1. Introduction

The knowledge-based economy is becoming the next stage in the development of current civilizations, where knowledge is the dominant resource is the knowledge and a person's contributions should be seen by the employer as an investment by the employer. It is where power doesn't depend on position held but is essentially attributed to the knowledge and skills (competence) possessed by the person, and where the functioning management style is network-orientated and flexible. It is an economy in which innovation is not created in isolation. Business strategies must be focused on cooperation and collaboration, where organization is based on trust (especially in the context of sharing knowledge and experience). It is also an economy in which customer relationships are interactive and constant changes are seen through the prism of opportunity to exploit ideas. At the same time the development of businesses in this type of economy is not a gradual

¹ The project was funded by the National Science Centre allocated on the basis of the decision number DEC-2012/05/D/HS4/01338.

* Ph.D., Associate Professor in Management Department of Nowy Sącz Business School- National-Louis University (WSB-NLU) in Nowy Sącz, ul. Zielona 27, 33-300. Email address: ujwary@wsb-nlu.edu.pl.

process and becomes difficult to predict. The use of modern technology is a priority. It is dominated by the service sector and information processing with the Internet as a primary invention of the modern era (comparable to Ford's first moving assembly line, which in the last century revolutionized the automobile industry in the United States). Is Poland's economy this type of economy? Of course, these characteristics are qualitative and are not present in KAM. However, the modern day knowledge-based economy demands that such a perspective be taken.

The object of this paper is to present the latest findings relating to the methodology KAM (Knowledge Assessment Methodology), with particular regard to Poland, which the author has compared to other countries in Europe and Central Asia (taken as one grouping of countries according to region). The four main pillars of this tool for elementary analysis in the area are, eg. the economic and institutional regime, education, innovation and ICT. The article begins by presenting evidence of an emerging knowledge-based economy, its importance and issues concerning its definition. Subsequently the author discussed the key elements of KAM in order to present the results of the so-called, Basic Scorecard and KEI and KI indexes.

2. Knowledge-based economy – premises for foundation

Prior to the "first wave" of transformations associated with what we now call "the Agricultural Revolution", people grouped in small, nomadic groups were engaged mainly in fishing and pastoralism (Toffler, 1996a, 1996b, 1995). According to A. and H. Toffler we are witness to the changes happening before our very eyes of so-called "waves", and we are a generation from an old civilization, while at the same time being the first generation of a new wealth of which the most important element is knowledge.

The so-called agricultural revolution of the Neolithic Age took place about eight thousand years ago. This led to a significant increase in the human population, the formation of villages, cities, states, hierarchical orders, structures of class society and the creation of new communication technology – writing. A characteristic feature of the "first wave" was the rapid development of the rural economy, where capital was the land – an indivisible resource of wealth. The medium of exchange were natural products as well as gold and silver bullion. Societies during this period shied away from competition, modernization and globalization in the name of security and stability.

The period of an agricultural economy continued to gain pace in the more developed countries (northern U.S.A., the industrialized countries of Europe – England) until the end of the seventeenth century. At the turn of the seventeenth and eighteenth centuries, there was another change in the structure

of society from one of an agricultural nature to that so-called industrial. The symbol of this period was the “Industrial Revolution”. Numerous factories were built, in which the power of human hands was replaced by machines. Along with the development of an extensive social security program, a state controlled competitive system (also international) was born perceived to be a source of growth. It was also a period of inventions such as the steam engine, water drive, railways, textiles and iron (Kleer, 2003). A new class, called the bourgeoisie, which focused on possessing sources of production: land, labor, raw materials and capital. According to P.F. Drucker (1999, pp. 22-44), the Industrial Revolution began in the mid-eighteenth century and lasted until the mid-nineteenth century. A characteristic feature of this period was the application of knowledge to the tools, processes and products concentrated in one area of the production process. While the domain of the rural economy had been production of crafts, in the industrial economy a system of machines and factories has become the dominant factor in production based on modern technology.

F. Taylor (Martyniak, 1996, pp. 13-17) was the first to apply knowledge in the testing, analysis and organization of human labor. Somewhat later, in 1907, H. Ford utilized a mobile assembly line for mass production of cars and the famous Model T. However, these developments do not constitute a breakthrough in history and they also were not the only simple transformations of technology from the perspective of building foundations in terms of organization, professionalism, economics and cultural changes to which society must adapt. It is not innovations in technology that instigate changes, but the willingness and ability of societies to evolve and adapt. Industrialization has been beyond doubt a multithreaded social process. It has transformed cities and existing organizations, created a new form of labor, developed transport and new ways of communicating.

P.F. Drucker also singled out “the Revolution in Productivity” as the “Second Revolution”, which lasted from 1880 through to the completion of World War II. The essence of transformations during this period was a more wider use of knowledge in the performance of work duties and in the development of electricity, automobiles, internal combustion engines and in the initial stages of new communication technologies: the telegraph and the telephone. The years 1945 – 1990 was, according to P.F. Drucker, the era of “a Management Revolution” where knowledge was used for this same knowledge and innovation was introduced. Schumpeter (1962, pp. 84, 1934, pp. 153-154) already perceived the need to introduce significant changes. He called for the creation of new structures through the use of new combinations of products and processes within existing structures and would lead to economic development. The whole development process depends

on continuously demolishing and reestablishing a state of balance through the exploration and application of new knowledge (innovation). Schumpeter (Foster, Kaplan, 2001, pp. 7-24) called this process “creative destruction” in the economy caused by the ongoing changes in technology and the emergence and spread of new ideas, products and manufacturing techniques. New technologies mean job losses in some areas, particularly the low-skilled (eg, in production automation, assembly line production), while others contribute to the creation of new jobs, generally requiring different, higher qualifications (eg business research and development in the pharmaceutical and chemical fields). Schumpeter also pointed out that the tendency to innovation and creative destruction is more important than the desire to make the best use of existing resources. Subsequently, R. Foster and S. Kaplan (Foster, Kaplan, 2001, p 31) analyze the functioning of companies and markets from the point of view of the way in which they manage and control the processes of creative destruction. While the functioning of the company is based on its continuous uninterrupted operation, markets are characterized by discontinuity, or creative destruction, and it is they who succeed in the long run.

Social, economic and technological transformations associated with new ICT skills and greater use of computers in social-economic processes are often referred to as the “Third Industrial Revolution” or in other words a knowledge-based economy. The main asset of a knowledge-based economy is the inexhaustible, hardly quantifiable, easy to multiply knowledge and technologies that enable near-instant diversification and its adaptation to the needs of the human being. We are thus dealing with a definitive end to mass production and the focusing of enterprises not on segments of the market, but on the lesser or even individual consumers. Requirements in relation to employees are growing so much that it’s becoming increasingly difficult to even consider replacing them with other employees. With constant and radical changes in the market begins to play a less important position in the economic status of a company is beginning play a less pivotal role, while flexibility and adaptability to change have taken over.

The present-day economy founded on knowledge has become an universal and widely acceptable term; the sources of which may very well stem from the deep recession of the eighties, where traditional industries strove to combat the problems of declining productivity, combined with the increasing the skills and know-how of the workforce (Kukliński, Orłowski, 2000; Kukliński, 2000; Kukliński, 2001; Kukliński, 2003). In this period a knowledge-based economy was identified with a “Service Economy”, where the so-called intelligent machines and industrial robotics were supposed to contribute to a greater economy and rising employment in the service sector as well as generate income in tourism, insurance, and aviation sectors (Quinn, 1992).

Such critics as Baumol (1973, pp. 941-973) and V. Fuchs (1968), Harris (2001, pp. 21-40), however, believed that economic growth based on services, the increasing standard of living would bound to slow down inevitably as many services do not generate any growth in productivity (eg hairdressing). Historians suggest that contemporary differences in productivity and economic growth of different countries are no longer related to the availability of natural resources, but are connected with the ability to improve the quality of human capital and new production factors, and in particular the ability to create and implement new knowledge and ideas. In developing this area of analysis P. A. David and D. Foray (2001, pp. 1-22) argue that intellectual capital in total wealth produced is of growing importance. They divide intellectual capital into two categories, corresponding to two different types of investments, whose share in GDP of rapidly developing countries is growing. They are: investments in the production and promotion of knowledge (eg, training, education, research and development, computerization) and investments connected with upholding the physical condition of human capital (eg expenditure on health). Developments of a knowledge-based economy and information technology (IT) have been observed particularly in the U.S. economy, which has experienced a 4% growth rate since 1994. The USA combined with Sweden have become the most prominent countries in terms of investing in information and communication technologies (ICT), and therefore are most often identified with a knowledge-based economy and advancements in ICT. It is exactly information technology which enables a greater level of efficiency in economic and innovative activities by activating old procedures while implementing new ones.

The Table 1 below contains some basic definitions of a knowledge-based economy:

Table 1. Definitions of a knowledge-based economy

Source	Definition of KBE
Ministry of Economy, 2007	<p>A Knowledge-Based Economy (KBE) is characterized by the rapid development of the sectors of the economy that are connected with the development of science and information processing (mainly branches of industry in the field of high technology), as well as techniques and information society services.</p> <p>A knowledge-based economy is also one in which the source of competitive advantage for most companies, including both small and medium, are innovative initiatives.</p>
OECD and The World Bank 2001	<p>KBE is an economy in which knowledge is created, absorbed, transmitted and used more effectively by businesses, organizations, individuals and communities, enhancing the rapid development of both the economy and society. This definition does not focus solely on a narrow stretch of high-tech industry or on information and communication technologies.</p>

Oslo Manual III, 2008	The term „knowledge-based economy” suggests a trend in highly developed countries where the role of knowledge, information and advanced personal skills is increasingly vital and where a growing need exists for them to be easily accessible to both the corporate and public sectors . There is a growing complexity of knowledge and techniques / technologies, which in turn enhances the role of relationships between companies and other entities as a means of gaining expertise. A parallel phenomenon present in the economy of highly developed countries is the <u>increasing degree of innovation in the service sector.</u>
The World Bank 2006	An economy can be said to have become a „knowledge-based economy”, when the sustainable use and creation of knowledge are in the center of the process of economic development. A knowledge-based economy is one that uses knowledge as the engine of economic growth.

Source: Own study based on above sources.

3. Knowledge Assessment Methodology – basic information

Methodology for Estimating Knowledge KAM (*Knowledge Assessment Methodology*) was established in 1999 under the Programme for the Development of Knowledge (*Knowledge for Development, K4D*). Since that time regularly appearing on the World Bank’s website are the first results (*beginning with 1995*) in the four major pillars, reflecting the level of advancement of a country’s knowledge-based economy. This year, KAM includes a total of 148 structural and qualitative variables calculated for 146 countries. The results are presented as absolute and normalized values ranged 0-10 using the following formula:

$$\text{Normalized } (u) = 10 * (1 - N_h / N_c)$$

Where:

(u) – the actual data are taken from World Bank data sets and international literature for all variables and countries. Marks are allocated to countries based on absolute values (actual data), which describe each of the 148 variables to form a *u* ranking.

(N_h) – the number of countries with a higher ranking after calculating for each country.

(N_c) – the total number of countries

Individual countries can be assessed as part of individual regions as well as the income category (calculated as Gross National Income per capita), which is illustrated in Table 2. Poland is classified among European and Central Asian nations as well as in the group with gross national income above \$ 12,276 per capita.

Table 2. Categorization by region and income

GROUPING OF COUNTRIES BY REGION						
North America	Europe and Central Asia	East Asia and Pacific	South Asia	Latin America	Middle East and North Africa	Sub-Sahara Africa
2	46	18	5	26	18	31
GROUPING OF COUNTRIES BY INCOME (US \$)						
High (> 12, 276)	Above average (3,975-12,275)	Below average (1,006-3,975)	Low (<1,006)			
46	40	38	22			

Source: Own study based on www.worldbank.org/kam (date read: 10.05.2013).

The basic pillars of KAM form a so-called Knowledge Economy Index and a Knowledge Index, which include the most important and variables readily available as are illustrated in Figure 1. The Knowledge Economy Index (KEI) contains all four pillars, particularly the first pillar (economic and institutional regime), which is omitted in the Knowledge Index (KI). KEI takes into account whether the environment is conducive to the effective use of knowledge in economic development. This is the average value that represents the overall level of development of a country or region towards a knowledge based economy. KEI is calculated based on the average of the normalized performance results of the country or region in all four pillars of the knowledge economy – economic and institutional incentives, education and employment, innovation and ICT system.

KAM Knowledge Index (KI) measures a country's ability to generate, adopt and diffuse knowledge. It illustrates the possibilities of knowledge development on the whole in any given country. Methodologically speaking, KI is simply the average of the normalized performance results of a country or region in the key variables of the three pillars of the knowledge economy with the exception of the first pillar.

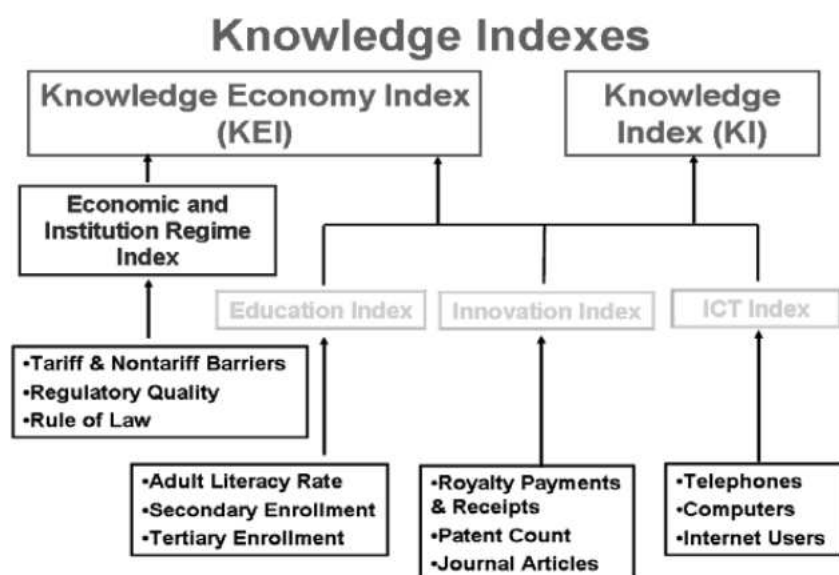


Figure 1. Pillars, Indexes and key variables of KAM

Source: Measuring Knowledge in the World's Economies, Knowledge Assessment Methodology and Knowledge Economy Index, the World Bank Institute: www.worldbank.org.

Within the structure of KAM methodology so-called modules were formed that enabled results to be presented for each country on the basis of:

- Basic Scorecards containing 12 variables (3 from each pillar) listed in figure 1 and allowing for comparisons to be mad between 3 countries or groups of countries maximum. (according to region or income),
- Custom Scorecards containing all 148 indicators and interpretation,
- Ranking countries according to KEI and KI indexes as well as individual pillars (average of 3 variables),
- Comparisons of times for specific periods (beginning with 1995),
- Comparisons between countries (bar graphs of indexes and KAM pillars),
- World map of KAM.

4. Poland against a background of European and Central Asian countries – KAM results 2012

In this part of the article the latest results of KAM will be presented for 2012 (although it's not uncommon for the indicators and calculations to be to be a combination of the years 2009 to 2011 and currently available data). These data, as assured by the World Bank, are constantly being updated. For this

purpose the Basic Scorecard is used to present Poland against a background of European and Central Asian countries.

Poland, Europe and Central Asia

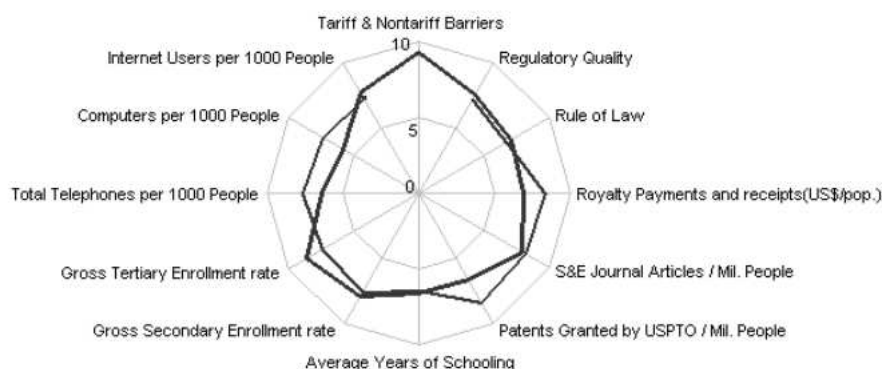


Figure 2. Poland against a background of Europe and Central Asia

Source: : http://info.worldbank.org/etools/kam2/KAM_page2.asp (data read: 10.05.2013).

Results normalized on a scale of 0-10 indicate that Poland in terms of the 12 core variables for the main pillars of KAM has achieved better results in the fields of: quality control (7.60), compliance with the law (7.12), average number of years learning (6.69), enrollment figures in secondary and higher education (7.93 and 8.65) and in the number of Internet users per 1,000 people (7.79). Other indicators fall considerably lower, as indicated in Table 3:

Table 3. Actual and normalized values for Poland, Europe and Central Asia

Variable	Poland		Europe and Central Asia	
	actual	normalized	actual	normalized
Tariff & Nontariff Barriers, 2011	87.60	9.30	n/a	n/a
Regulatory Quality, 2009	0.93	7.60	0.70	7.16
Rule of Law, 2009	0.68	7.12	0.56	6.75
Royalty Payments and receipts(US\$/pop.) 2009	43.12	6.96	170.03	8.36
S&E Journal Articles / Mil. People, 2007	187.24	7.86	327.10	8.10
Patents Granted by USPTO / Mil. People, avg 2005-2009	1.08	6.64	31.44	8.39
Average Years of Schooling, 2010	9.87	6.69	9.65	6.42
Gross Secondary Enrollment rate, 2009	98.94	7.93	96.63	7.55
Gross Tertiary Enrollment rate, 2009	71.35	8.65	58.13	7.41

Total Telephones per 1000 People, 2009	1.420.00	6.48	1.580.00	7.76
Computers per 1000 People, 2008	170.00	5.82	340.00	7.40
Internet Users per 1000 People, 2009	590.00	7.79	540.00	7.34

Source: Own study based on: : http://info.worldbank.org/etools/kam2/KAM_page2.asp (data read: 10.05.2013).

Poland is the weakest when it comes to its ICT (information and communication technology) assessment of basic elements, number of computers per 1,000 persons (5.82), number of telephones per 1,000 persons (6.48), and patents granted by the U.S. Patent Office (6, 64) – average being one patent per million inhabitants through the period 2005-2009.

Detailed data, including 136 structural and qualitative indicators in terms of the Custom Scorecard, has been listed in Annex 1 (12 indicators have been subtracted from Figure 2).

A practical tool of KAM is the third module, which enables the ranking of countries according to two indexes, KEI and KI, and by individual categories: regions and income. In the overall ranking of 145 countries listed in this year's edition of KAM Poland finds itself in 38th place, 3 places lower than in the previous edition. However, when it comes to presentation against the background of the total analyzed group the results are as follows:

Table 4. Poland ranked from among European and Central Asian countries (comparison group of 46 and 27 countries)

Ranking from among European and Central Asian countries (46)	Changes (2009)	Indexes and regions	Average value for Poland	Average value for Europe and Central Asia	Poland's ranking in the European Union (27)
27	-2	KEI	7,41	7,47	25
27	-2	KI	7,20	7,64	24
23	3	Economic and institutional regime	8,01	6,95	22
26	1	Innovation	7,16	8,28	23
18	-3	Education	7,76	7,13	17
31	-3	ICT	6,70	7,50	24

Source: Own study based on data from http://info.worldbank.org/etools/kam2/KAM_page5.asp (data read: 10.05.2013).

The results listed in Table 4 are not satisfactory. If one takes into account the group of countries in Europe and Central Asia (46 countries), Poland in the four-dimensional ranking scheme of the KEI index sits at 27th place (two places lower than the previous edition of KAM 2009), putting Poland at 25th place in all of Europe 25 (with Bulgaria and Romania to follow). On the other hand, as far as the KI index by itself, (excluding any environmental impact on the effective use of knowledge in economic development), it is also 27th (for the whole group of 46 countries in Europe and Central Asia, giving it two positions lower than in 2009). In terms of the European Union itself its position is 24th (Latvia also lagged behind). Its average performance in the area of economic and institutional regime looks somewhat better with a ranking of 23rd among the 46 countries in the group (up three places), while in the group of EU member states this position is 22nd, (behind us are France, Italy, Cyprus, as probably are Romania and Bulgaria). The best results were obtained by Poland in Education, giving it a comparable position in both Europe, Central Asia and the EU. This means that other countries obtain significantly worse average results of the three key variables in this pillar: the average number of years learning, enrollment figures in secondary and higher education. Of the 46 countries in the group Poland sits relatively low at 31th place in the area of ICT when it comes to Internet users, quantities of phones and computers. This gives Poland a comparable position in the EU gives its position comparable in terms of the KI index.

Slightly better were the average results compared to the whole of Europe and Central Asia (6.95) Poland gained a rating of (8.01) and (7,76) for the economic and institutional regime and education respectively.

5. Conclusions

The results obtained in the framework of the World Bank's interactive tools are certainly a good starting point for comparing the countries, groups of countries or regions based on a number of indicators, (to date 148 structural and qualitative indicators have been used grouped into a total of seven functional areas: economic performance, economic regime, governing, system innovation, education, work, ICT – tools available in the form of Custom Scorecards). For the purpose of this article comparisons were made of countries on the basis of elementary variables that constitute the essence of KEI and KI indexes. Data was used on tariffs and non-tariff barriers, regulatory quality and regulatory compliance, average number of years spent learning, enrollment levels at secondary and higher institutions, royalties and licensing fees, the number of patents and scientific papers, the number of telephones, computers and Internet users. It remains an issue as to the selection of the key variables

from the group of 148 classified to represent the level of advancement of the knowledge-based economy of a country as well as the reasons for their choice (apart from the availability of data).

References

- Baumol W.J. (1973). The Macroeconomic of Unbalanced Growth, *Journal of International Economics*, 47.
- David P.A., Foray D. (2001). *An Introduction to the Economy of the Knowledge Society*, Maastricht Economic Research Institute on Innovation and Technology, December.
- Drucker P.F. (1999). *Spółeczeństwo pokapitalistyczne*, Wydawnictwo Naukowe PWN, Warszawa.
- Foster R., Kaplan S. (2001). *Creative Destruction. Why Companies that Are Built to Last Underperform the Market – and How to Successfully Transform Them*, Currency&Doubleday, New York.
- Fuchs V. (1968). *The Service Economy*, Columbia University Press, New York.
- Gospodarka oparta na wiedzy. Perspektywy Banku Światowego*, A. Kukliński (red.), KBN, Warszawa.
- Gospodarka oparta na wiedzy. Wyzwanie dla Polski XXI wieku*, A. Kukliński, (red.), KBN, Warszawa.
- Harris R.H. (2001). The Knowledge-Based Economy: Intellectual Origins and New Economic Perspective, *International Journal of Management Reviews*, March.
- Kierunki zwiększania innowacyjności gospodarki na lata 2007-2013*, Ministerstwo Gospodarki, Warszawa.
- Kleer J. (2003). *Czym jest G.O.W.*, (w:) *Gospodarka oparta na wiedzy. Perspektywy Banku Światowego*, A. Kukliński (red.), KBN, Warszawa.
- Martyniak Z. (1996). *Historia myśli organizatorskiej. Wybitni przedstawiciele szkoły klasycznej do roku 1940*, AE, Kraków.
- Measuring Knowledge in the World's Economies, Knowledge Assessment Methodology and Knowledge Economy Index (2012)*. World Bank Institute.
- Quinn J.B. (1992). *Intelligent Enterprise: A Knowledge and Service Based Paradigm for Industry*, New York: Free Press.
- Schumpeter J.A. (1943). *Theory of Economic Development*, Harvard University Press, Cambridge.
- Schumpeter J.A. (1962). *Capitalism, Socialism, and Democracy*, Harper and Row, New York.
- A. Kukliński, W.M. Orłowski (eds.), (2000). *The Knowledge-Based Economy. The Global Challenges of the 21st Century*, t. 4, Science and Government Series, State Committee for Scientific Research Republic of Poland, Warszawa.

- A. Kukliński (ed.), (2000). *The Knowledge-Based Economy. The Global Challenges of the 21st Century*, t. 5, Science and Government Series, State Committee for Scientific Research Republic of Poland, Warszawa.
- Toffler A.H. (1995). *Trzecia fala*, Państwowy Instytut Wydawniczy, Warszawa.
- Toffler A.H. (1996a). *Budowa nowej cywilizacji – polityka III fali*, Zysk i S-ka, Poznań.
- Toffler A.H. (1996b). *Szok przyszłości*, Zysk i S-ka, Poznań.
- Ujwary-Gil A. (2009) *Kapitał intelektualny a wartość rynkowa przedsiębiorstwa*, CH&Beck, Warszawa.
- Zasady gromadzenia i interpretacji danych dotyczących innowacji*, (2008). Podręcznik Oslo (wyd. III), OECD i Eurostat.

Internet sources:

KAM : www.worldbank.org/kam

OECD: www.oecd.org

Appendix 1. Structural and qualitative indicators of KAM 2012 for Poland as well as Europe and Central Asia (with the exception of the 12 indicators presented in the Basic Scorecard in Figure 2).

Variable	Poland		Europe and Central Asia	
	actual	normalized	actual	normalized
Annual GDP Growth (%), 2005-2009	4.80	6.46	1.20	1.32
GDP per Capita (in/nal current \$ PPP), 2009	18.905.00	6.88	23.696.00	7.34
GDP (current US\$ bill), 2009	430.08	8.61	371.28	8.23
Human Development Index, 2010	0.60	3.13	n/a	n/a
Multidimensional Poverty Index, 2008	n/a	n/a	n/a	n/a
Gender Inequality Index, 2008	0.33	7.93	n/a	n/a
Seats in Parliament Held by Women (as % of total), 2009	18.00	5.40	n/a	n/a
Composite Risk Rating, 07/2010-06/2011	75.22	7.26	73.02	6.41
Gr. Capital Formation as % of GDP, 2005-2009	21.60	3.80	20.40	2.91
Trade as % of GDP, 2009	78.00	5.39	70.00	4.33
Soundness of Banks (1-7), 2010	5.20	4.96	4.74	3.51
Exports of Goods and Services as % of GDP, 2009	39.00	5.70	36.00	5.28
Interest Rate Spread, 2009	n/a	n/a	5.00	7.29
Intensity of Local Competition (1-7), 2010	5.40	7.86	4.91	5.53
Domestic Credit to Private Sector as % of GDP, 2009	53.00	5.74	130.00	8.79
Cost to Register a Business as % of GNI Per Capita, 2011	17.30	3.48	6.20	5.92
Days to Start a Business, 2011	32.00	2.62	13.33	5.67
Cost to Enforce a Contract (% of Debt), 2011	12.00	9.65	22.42	6.56
Government Effectiveness, 2009	0.64	6.99	0.63	6.75
Voice and Accountability, 2009	1.03	8.01	0.55	6.82
Political Stability, 2009	0.91	8.56	0.36	6.20
Control of Corruption, 2009	0.48	7.19	0.50	7.23
Press Freedom (1-100), 2010	24.00	7.78	36.11	6.22
FDI Outflows as % of GDP, 2004-08	1.19	6.72	n/a	n/a
FDI Inflows as % of GDP, 2004-08	4.56	5.57	n/a	n/a

Royalty and License Fees Payments (US\$ mil.), 2009	1,542.00	8.24	1,595.64	8.28
Royalty and License Fees Payments (US\$/pop.), 2009	40.42	7.36	104.23	8.28
Royalty and License Fees Receipts (US\$ mil.), 2009	103.00	7.14	1,007.26	8.86
Royalty and License Fees Receipts (US\$/pop.), 2009	2.70	6.35	65.80	8.60
Royalty Payments and receipts(US\$mil.), 2009	1,645.00	7.92	2,602.90	8.52
Science and Engineering Enrolment Ratio (%), 2009	21.44	4.61	n/a	n/a
Science Enrolment Ratio (%), 2009	8.45	3.89	n/a	n/a
Researchers in R&D, 2009	73,580.70	7.81	n/a	n/a
Researchers in R&D / Mil. People, 2009	1,928.73	4.93	n/a	n/a
Total Expenditure for R&D as % of GDP, 2008	0.61	5.35	n/a	n/a
Manuf. Trade as % of GDP, 2009	50.24	8.11	46.22	7.79
University-Company Research Collaboration (1-7), 2010	3.60	5.50	3.98	6.60
S&E Journal Articles, 2007	7,137.53	8.69	6,247.25	8.52
Availability of Venture Capital (1-7), 2010	2.70	6.26	2.69	6.18
Patents Granted by USPTO / Mil. People, avg 2005-2009	1.08	6.64	31.44	8.39
High-Tech Exports as % of Manuf. Exports, 2009	5.00	5.27	16.00	7.71
Private Sector Spending on R&D (1-7), 2010	3.00	5.57	3.52	7.33
Firm-Level Technology Absorption (1-7), 2010	4.60	4.35	4.96	5.73
Value Chain Presence (1-7), 2010	4.00	7.18	4.11	7.56
Capital goods gross imports(% of GDP), avg 2005-09	11.36	7.69	8.03	4.14
Capital goods gross exports (% of GDP), 2005-09	8.74	8.06	8.48	8.02
S&E articles with foreign coauthorship (%), 2008	45.72	1.46	50.41	2.19
avg number of citations per S&E article, 2008	1.46	4.86	2.36	8.78
Intellectual Property Protection (1-7), 2010	3.70	5.80	4.10	6.87
Adult Literacy Rate (% age 15 and above), 2007	99.51	7.67	n/a	n/a
Average Years of Schooling, female, 2010	9.95	7.17	n/a	n/a
Life Expectancy at Birth, 2009	76.00	7.31	75.00	6.76
Internet Access in Schools (1-7), 2010	4.50	6.56	4.84	7.14
Public Spending on Education as % of GDP, 2009	5.00	7.43	5.00	7.43
4th Grade Achievement in Math(TIMSS), 2007	n/a	n/a	n/a	n/a
4th Grade Achievement in Science(TIMSS), 2007	n/a	n/a	n/a	n/a
8th Grade Achievement in Math(TIMSS), 2007	n/a	n/a	n/a	n/a
8th Grade Achievement in Science(TIMSS), 2007	n/a	n/a	n/a	n/a
Quality of Science and Math Education (1-7), 2010	4.60	7.18	4.46	6.64
Quality of Management Schools (1-7), 2010	4.20	5.57	4.36	5.90
15-year-olds' math literacy (PISA), 2009	495.00	6.56	n/a	n/a
15-year-olds' science literacy (PISA), 2009	508.00	7.54	n/a	n/a
School Enrollment, Secondary, Female (% gross), 2009	98.77	7.59	96.00	6.88
School Enrollment, Tertiary, Female (% gross), 2009	84.31	8.51	64.00	6.89
No Schooling, total, 2010	1.70	7.56	1.30	8.11
No Schooling, female, 2010	2.20	7.40	n/a	n/a
Secondary School completion ,total (% of pop 15+), 2010	9.00	1.65	25.30	5.08
Secondary School completion ,female (% of pop 15+), 2010	14.40	2.60	n/a	n/a
Tertiary School completion ,total (% of pop 15+), 2010	9.10	6.61	9.90	6.81

Tertiary School completion ,female (% of pop 15+), 2010	9.70	6.93	n/a	n/a
Unemployment Rate,Total (% of labor force), 2005-2009	11.28	1.52	8.00	3.88
Unemployment Rate, Male (% of male labor force), 2005-2009	10.56	1.28	7.80	2.98
Unemployment Rate,Female (% of female labor force), 2005-2009	12.18	2.48	8.40	4.82
Employment in Industry (%), 2008	31.00	8.72	26.00	6.98
Employment in Services (%), 2008	55.00	3.21	66.00	6.19
Prof. and Tech. Workers as % of Labor Force, 2008	26.51	6.30	n/a	n/a
Extent of Staff Training (1-7), 2010	4.20	6.49	4.11	6.18
Brain Drain (1-7), 2010	3.20	5.04	3.50	5.95
Cooperation in labor-employer relations(1-7), 2010	4.10	3.97	4.51	6.56
Flexibility of wage determination(1-7), 2010	5.40	7.18	4.75	3.78
Pay and productivity(1-7), 2010	4.20	6.79	4.13	6.28
Reliance on professional management(1-7), 2010	4.60	6.26	4.58	6.11
Local availability of specialized research and training services(1-7), 2010	5.10	8.47	4.59	7.10
Difficulty of Hiring Index, 2010	11.00	7.87	32.50	5.50
Rigidity of Hours Index,2010	33.00	4.18	33.74	3.87
Difficulty of Redundancy Index,2010	30.00	5.53	25.87	6.13
Redundancy costs (weeks of wages), 2010	13.00	8.71	27.85	6.26
Labor tax and contributions (%), 2011	23.60	2.77	25.29	2.30
Employment to population ratio, Total, 15+ (%), 2005-2009	48.10	1.69	53.40	3.13
Employment to population ratio, Male, 15+ (%), 2005-2009	55.84	0.77	61.40	2.01
Employment to population ratio, Female, 15+ (%), 2005-2009	41.02	3.03	45.80	4.47
Employment to population ratio, Total, ages 15-24(%), 2005-2009	25.74	1.41	35.40	3.91
Employment to population ratio, Male, ages 15-24(%), 2005-2009	29.02	0.99	39.40	3.24
Employment to population ratio, Female, ages 15-24(%), 2005-2009	22.34	2.54	31.40	5.04
Employment to population ratio, Total, 25+ (%), 2005-2009	53.12	1.34	n/a	n/a
Employment to population ratio, Male, 25+ (%), 2005-2009	62.38	0.77	n/a	n/a
Employment to population ratio, Female, 25+ (%), 2005-2009	44.92	2.89	n/a	n/a
Share of unemployment with tertiary education , 2007	10.00	7.87	18.00	4.61
Share of unemployment with secondary education, 2007	73.00	0.48	49.00	3.49
Labor force participation rate, total, 15+, 2005-2009	54.27	1.69	n/a	n/a
Labor force participation rate, male, 15+, 2005-2009	62.46	0.63	n/a	n/a
Labor force participation rate, female, 15+, 2005-2009	46.80	3.03	n/a	n/a
Labor force participation rate, total, 15-24, 2005-2009	34.50	1.83	n/a	n/a
Labor force participation rate, male, 15-24, 2005-2009	38.21	1.13	n/a	n/a

Labor force participation rate, female, 15-24, 2005-2009	30.63	2.54	n/a	n/a
Labor force participation rate, total, 15-64, 2005-2009	63.51	2.39	68.80	4.61
Labor force participation rate, male, 15-64, 2005-2009	70.26	0.63	76.60	2.57
Labor force participation rate, female, 15-64, 2005-2009	56.87	4.01	61.40	5.53
Labor force participation rate, total, 65+, 2005-2009	4.95	1.34	n/a	n/a
Labor force participation rate, male, 65+, 2005-2009	7.73	1.34	n/a	n/a
Labor force participation rate, female, 65+, 2005-2009	3.25	2.25	n/a	n/a
Youth unemployment rate, total, 2005-2009	25.43	1.62	18.20	3.79
Youth unemployment rate, male, 2005-2009	24.08	1.13	18.00	3.35
Youth unemployment rate, female, 2005-2009	27.15	2.27	18.80	4.28
Adult unemployment rate, total, 2005-2009	9.56	1.11	n/a	n/a
Adult unemployment rate, male, 2005-2009	8.83	1.03	n/a	n/a
Adult unemployment rate, female, 2005-2009	10.43	2.06	n/a	n/a
Share of youth unemployment in total unemployment, total, 2005-2009	24.93	7.58	n/a	n/a
Share of youth unemployment in total unemployment, male, 2005-2009	25.78	7.94	n/a	n/a
Share of youth unemployment in total unemployment, female, 2005-2009	24.02	7.73	n/a	n/a
Long-term unemployment, total, 25+, 2005-2009	4.61	1.15	39.00	0.38
Long-term unemployment, male, 25+, 2005-2009	4.16	1.15	38.00	0.38
Long-term unemployment, female, 25+, 2005-2009	5.15	1.15	39.60	0.38
Labor force with tertiary education (% of total), 2007	22.00	4.78	29.00	6.67
Labor force with secondary education (% of total), 2007	68.00	9.59	46.00	6.58
Firms offering formal training (% of firms), 2009	61.00	9.53	n/a	n/a
Females in Labor Force (% of total labor force), 2009	45.00	6.06	45.00	6.06
Main Telephone Lines per 1000 People, 2009	250.00	6.51	370.00	7.95
Mobile Phones per 1000 People, 2009	1.170.00	7.24	1.210.00	7.72
Households with Television (%), 2008	98.00	7.86	98.00	7.86
Daily Newspapers per 1,000 People, 2004	114.00	6.00	173.00	7.33
International Internet Bandwidth (bits per person), 2009	2.748.00	6.41	16.713.00	8.84
Fixed broadband internet access tariff (US\$ per month), 2009	14.00	8.93	29.00	5.43
Availability of e-Government Services (1-7), 2008	2.14	0.88	4.20	6.12
Government Online Service Index (1-7), 2010	0.39	6.22	0.43	7.01
ICT Expenditure as % of GDP, 2008*	6.00	7.61	4.00	1.97