BUILDING AND DEVELOPMENT OF THE KNOWLEDGE BASED ECONOMY IN BOSNIA AND HERZEGOVINA

Zijada Rahimić[1], Amra Kožo[2]

[1]School of Economics and Business, Sarajevo, Bosnia and Herzegovina, zijada.rahimic@efsa.unsa.ba
[2]School of Economics and Business, Sarajevo, Bosnia and Herzegovina, amra.kozo@efsa.unsa.ba

Abstract

Throughout a several last years the transition of the educational system in Bosnia and Herzegovina has been evident. Besides the various formal procedures that the education in Bosnia and Herzegovina has to go through, the system of the overall social transformation has a far greater impact on the process of change. Even the very apprehension of the term „educated person" has been changed throughout the need for a countinous adjustment and adoption of the new concept of work. In relation to this it is particularly important to set the base for building of a knowledge based society. The aim of this paper is to represent the current position of Bosnia and Herzegovina on its establishment of the knowledge based society through the application of the instruments such as Human Development Index, Knowledge Index and Knowledge Economy Index as well as to sugest potential steps in order to strengthen the process and to make it permanent. Also, the analysis of the fundamental pillars that are leading to the knowledge based economy will be performed in this paper. These pillars are Educated and Skilled Labour Force, an Adequate Information Infrastructure, a Conductive Economic and Institutional Regime and an Effective Innovation System. What will also be represented in this paper is a general overview of opportunities that Bosnia and Herzegovina should use through the educational, research and other scientific institutions in order to apprehend, generate and spread the knowledge.

1. Introduction

Throughout several last years the transition of the educational system in Bosnia and Herzegovina has been evident. Besides the various formal procedures that the education in Bosnia and Herzegovina has to go through, the system of the overall social transformation has a far greater impact on the process of change. Even the very apprehension of the term „educated person" has been changed

throughout the need for a countinous adjustment and adoption of the new concept of work. In relation to this it is particularly important to set the base for building a knowledge based society. The aim of this paper is to present the current position of Bosnia and Herzegovina on its establishment of the knowledge based society through the application of the instruments such as Human Development Index, Knowledge Index and Knowledge Economy Index as well as to suggest some potential steps towards strengthening the process and making it permanent. In addition, this paper will provide an analysis of the fundamental pillars of the knowledge based economy. These pillars are Educated and Skilled Labour Force, an Adequate Information Infrastructure, a Conductive Economic and Institutional Regime and an Effective Innovation System. What will also be presented in this paper is a general overview of opportunities that Bosnia and Herzegovina should use through the educational, research and other scientific institutions in order to apprehend, generate and spread knowledge.

2. Knowledge Based Economy: Economic Implications and Possible Application in Bosnia and Herzegovina

2.1. Knowledge Based Economy and the Potential Assessment Models

The traditional macroeconomic indicators pointed out work, capital, technology and institutions as the key foundations of the production creating basis for the development parameters of each country. However, even in 1890, in his "Principles of Economies", Marshall stated that innovations and knowledge diffusion might influence the developing and applying of new methods and mechanisms that would increase the capital and labour force productivity. In addition, in 1934, in his "The Theory of Economic Development", Schumpeter pioneered in understanding that the scientific innovations were crucial in any kind of economic development. The contemporary most developed countries have become successful due to their transformation from the capital intensive into the knowledge intensive economy. Hence, their attention has been moved from the material to the non-material factors, i.e. from the traditional production factors to creating, diffusing and exploiting new knowledge. OECD describes the knowledge economy as the economic activities and systems that are directly established in creation, circulation and application of the knowledge and information (Chai-Kai Chen, 2008, p. 502). Also, the OECD is concerned with the institutions and process for:

1. Knowledge production – the research and development of new knowledge
2. Knowledge transmission – education, training and development of people
3. Knowledge transfer – the diffusion of knowledge and innovation (Clarke, 2001, p. 189).

International Development Institutions have recognised the need for development of tools that would enable measuring of knowledge management programmes in individual countries, as well as the tools for international comparing. Find below the table presenting the mostly used tools, including their advantages and disadvantages:

Table 1: Summary of Knowledge Assessment Examples

Organization	Methods	Advantages	Limitations
National Research Council-US	National Knowledge Assessment Methodology (NKA Prospectus)	Systematic holistic approach that balances data collection with interviews and consensus building	Benchmarking approach does not take into sufficient account local culture
OECD	Science and Technology Indicators (STI) Scoreboards	High consideration of human and social development indicators	Limited data accessibility and no user-friendly / reusable scorecards
European Union	European Innovation Scoreboards and Lisbon 2000 Indicators	Measurement framework developed within a systemic strategic planning process	Ambitious and broad plan that may not be actionable or sustainable in a short-timeframe
United Nations	ICT-Index; Intellectual Property; e-Readiness index	The ICT index presents clear interrelation and correlation of variables	Limited integration and data re-utilization
World Bank	Knowledge Assessment Methods (KAM)	User-friendly model readily accessible to the public	Limited prediction models and difficult multi-year data aggregation

Source: Passerini K. & Fjermestad (2006), AMCIS 2006 Tutorial Paper:
A Review of Methods to Assess National Knowledge in the Knowledge Economy

The models present both the quantitative and qualitative forms, created by the development institutions, non-profitable organisations and governments of some countries in order to evaluate the knowledge based economies. These models comprise different measuring parameters, depending on the final aim. Thus, for instance, the virtual case studies and benchmarking relate to the specific local components of individual countries, while symposiums and scorecards apply to the national and international level. In this paper we shall concentrate on the model of the World Bank, i.e. Knowledge Assessment

Methods (KAM). The World Bank KAM model WBI 2005 is based on a set of about 80 variables (structural quantitative indicators as well as qualitative indices). A subset of these variables is used to determine cross-country comparisons through a basic scorecard with fourteen indicators: 12 variables considered as proxies for knowledge development and two additional performance variables that represent the relative size of countries (Passerini & Fjermestad, 2007, p. 114). The KAM model consists of the Knowledge Indexes, showing a country's qualitative development. The following graph provides more details:

Figure 1: Knowledge Indexes according to World Bank Knowledge Assessments Methodology
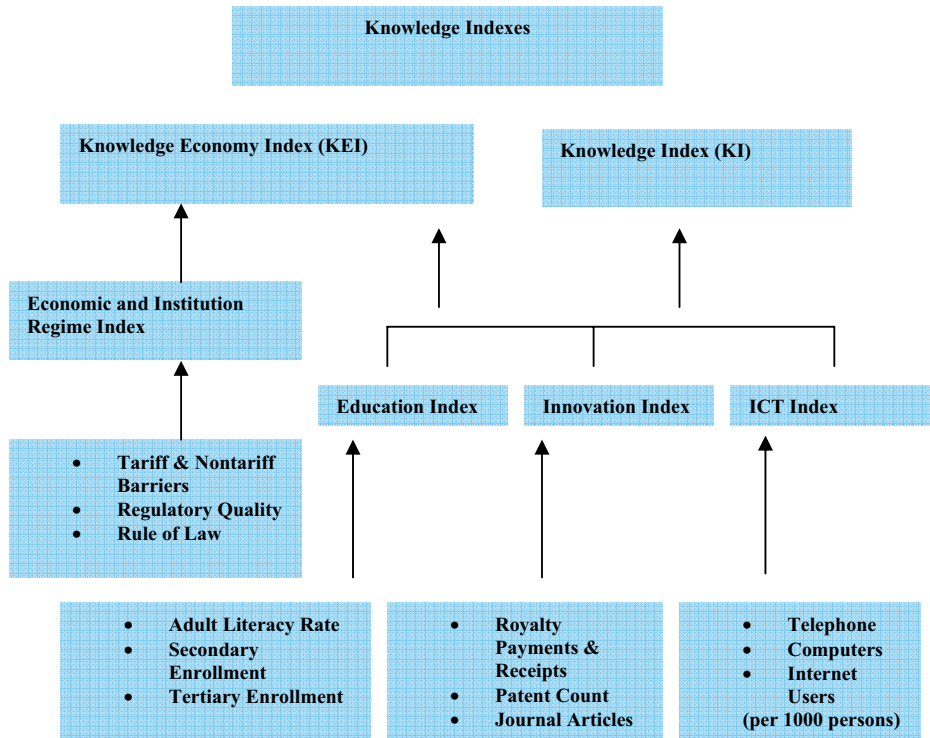
Source: www.worldbank.org (accessed February 2009)

2.2. The KAM Model Indicators for Bosnia and Herzegovina

According to the KAM model indicators for 2008, the top position in the list of the knowledge based economies is taken by the Scandinavian countries (Danmark, Sweden, Finland, Netherlands, Norway). Of course, they are followed by Canada, Switzerland, Great Britain, United States of America and

Australia. The table below compares the KAM indicators of these 10 most developed countries with Bosnia and Herzegovina.

Table 2: Cross Country Comparison KAM 2008

Country	KEI		Economic Incentive and Institutional Regime		Innovation		Education		ICT	
	recent	1995	recent	1995	recent	1995	recent	1995	recent	1995
Denmark	9.58	9.59	9.66	9.57	9.57	9.53	9.8	9.61	9.28	9.63
Sweden	9.52	9.48	9.18	8.84	9.79	9.75	9.4	9.59	9.69	9.73
Finland	9.37	9.56	9.47	9.43	9.66	9.31	9.78	9.74	8.56	9.75
Netherlands	9.32	9.49	9.18	9.5	9.48	9.53	9.26	9.69	9.36	9.24
Norway	9.27	9.49	9.25	9.39	9.06	9.07	9.6	9.71	9.16	9.78
Canada	9.21	9.23	9.42	8.41	9.43	9.32	9.26	9.69	8.74	9.49
Switzerland	9.15	9.41	9.5	9.54	9.89	9.82	7.69	8.65	9.52	9.62
United Kingdom	9.09	9.39	9.28	9.4	9.18	9.36	8.54	9.69	9.38	9.1
United States	9.08	9.5	9.16	9.2	9.45	9.56	8.77	9.42	8.93	9.83
Australia	9.05	9.23	8.66	8.75	8.72	8.87	9.64	9.93	9.16	9.35
Bosnia and Herzegovina	n/a	3.79	4.24	3.71	3.29	2.36	n/a	4.91	5.33	4.18

Source: **www.worldbank.org/kam** (Accessed February 2009)

Comparing the given data we may perceive that the indicators of the listed variables in Bosnia and Herzegovina are from 50% to 70% lower than in the most developed countries of the world. On one hand, this is not strange since many systems and mechanisms for advance of research activities leading to innovations are undeveloped. Besides, the Law on High Education has been approved just recently, the political – legal mechanisms still have not been stabilised, etc. We may get a more realistic illustration of the position of B&H if we compare it to the countries from the region, as follows:

Table 3: Cross Country Comparison KAM 2008

Slovenia	8.25	8.02	8.11	7.96	8.31	7.86	8.24	7.85	8.33	8.41
Hungary	7.85	7.29	8.39	6.66	8.14	7.66	7.62	7.56	7.25	7.27
Czech Republic	7.83	7.55	8.23	7.95	7.6	7.1	8.11	7.51	7.39	7.63
Slovak Republic	7.33	6.94	7.99	6.38	6.86	7.06	6.98	7.15	7.51	7.18

Croatia	7.19	6.33	7.16	4.04	7.54	7.43	6.44	6.96	7.61	6.89
Bulgaria	6.8	6.64	7.01	5.76	6.43	7.1	7.42	7.25	6.33	6.45
Romania	6.37	5.49	6.87	5.73	5.66	4.79	6.3	6.19	6.63	5.24
Macedonia, FYR	5.33	4.93	5.61	4.04	4.76	4.38	4.87	5.17	6.06	6.13
Albania	4.04	3.54	3.91	4.62	3.1	3.41	4.94	3.31	4.2	2.8
Bosnia and Herzegovina	n/a	3.79	4.24	3.71	3.29	2.36	n/a	4.91	5.33	4.18
Serbia and Montenegro	n/a	4.84	3.46	0.68	4.85	7.31	n/a	5.31	5.59	6.08

Source: **www.worldbank.org/kam** (Accessed February 2009)

The comparison of B&H with the countries from the region confirms that B&H is in a completely unenviable situation. All indicators denoting innovations, education, trainings and institutional regimes are significantly lower than the values of the countries from the region. Even more disturbing is the fact that indicators on education are totally unavailable; therefore it is not possible to get at least a general illustration of the B&H current position according to the KE index. Please note that in November 2007 (to be more precise, on 23rd November 2007), when KEI index indicating the development and diffusion of knowledge in B&H was also assessed, B&H was on 76th place and its KEI index amounted to 4.16 (www.worldbank.org/kam accessed 23. 11. 2007). Find below the detailed parameters of each indicator enclosed in KAM:

Table 4: Variables of Economic Performance

	Variable	Bosnia and Herzegovina	
		(Group: All)	
		actual	normalized
Economic Performance	Annual GDP Growth (%), 2002-2006	5.24	6.04
	GDP per Capita (in/nal current $ PPP), 2006	n/a	n/a
	GDP (current US$ bill), 2006	11.3	2.95
	Human Development Index, 2005	0.8	5.94
	Poverty Index, 2005	n/a	n/a
	Composite Risk Rating, 09/2006-08/2007	n/a	n/a
	Unemployment Rate (% of labour force), 2004	n/a	n/a
	Employment in Industry (%), 2005	n/a	n/a
	Employment in Services (%), 2005	n/a	n/a

Source: **www.worldbank.org/kam** (Accessed February 2009)

Table 5: Variables of Economic regime

| | Variable | Bosnia and Herzegovina | |
| | | (Group: All) | |
		actual	normalized
Economic Regime	Gr. Capital Formation as % of GDP, 2002-2006	19.63	3.33
	Trade as % of GDP, 2006	117.2	7.68
	Tariff & Nontariff Barriers, 2008	79.8	5.93
	Intellectual Property Protection (1-7), 2007	2.4	0.81
	Soundness of Banks (1-7), 2007	5.1	3.63
	Exports of Goods and Services as % of GDP, 2006	36.3	4.2
	Interest Rate Spread, 2006	4.3	7.13
	Intensity of Local Competition (1-7), 2007	4.3	2.36
	Domestic Credit to Private Sector as % of GDP, 2006	52.5	6.2
	Cost to Register a Business as % of GNI Per Capita, 2008	30.1	3.41
	Days to Start a Business, 2008	54	1.7
	Cost to Enforce a Contract (% of Debt), 2008	38.4	1.78

Source: **www.worldbank.org/kam** (Accessed February 2009)

Table 6: Variable of Governance

| | Variable | Bosnia and Herzegovina | |
| | | (Group: All) | |
		actual	normalized
Governance	Regulatory Quality, 2006	-0.44	3.07
	Rule of Law, 2006	-0.53	3.71
	Government Effectiveness, 2006	-0.66	2.5
	Voice and Accountability, 2006	0.18	5.79
	Political Stability, 2006	-0.52	3.21
	Control of Corruption, 2006	-0.32	4.79
	Press Freedom (1-100), 2007	45	5.07

Source: **www.worldbank.org/kam** (Accessed February 2009)

Table 7: Variables of Innovation Systems

	Variable	Bosnia and Herzegovina (Group: All)	
		actual	normalized
Innovation Systems	FDI Outflows as % of GDP, 2000-05	0	4.08
	FDI Inflows as % of GDP, 2000-05	4	6.69
	Royalty and License Fees Payments (US$ mil.), Royalty and License Fees Payments (US$/pop.), 2006	n/a	n/a
	Total Royalty Payments and receipts(US$mil.), 2006	n/a	n/a
	Total Royalty Payments and receipts(US$/pop.) 2006	n/a	n/a
	Science and Engineering Enrolment Ratio (%), 2006	n/a	n/a
	Science Enrolment Ratio (%), 2006	n/a	n/a
	Researchers in R&D, 2006	n/a	n/a
	Researchers in R&D / Mil. People, 2006	n/a	n/a
	Total Expenditure for R&D as % of GDP, 2006	n/a	n/a
	Manuf. Trade as % of GDP, 2005	n/a	n/a
	University-Company Research Collaboration (1-7), 2007	2.4	1.69
	Scientific and Technical Journal Articles, 2005	9	1.37
	Scientific and Technical Journal Articles / Mil. People, 2005	2.44	2.3
	Availability of Venture Capital (1-7), 2007	2.7	2.98
	Patents Granted by USPTO, avg 2002-2006	0.4	3.57
	Patents Granted by USPTO / Mil. People, avg 2002-2006	0.1	4.29
	High-Tech Exports as % of Manuf. Exports, 2005	n/a	n/a
	Private Sector Spending on R&D (1-7), 2007	2.8	2.82
	Firm-Level Technology Absorption (1-7), 2007	3.5	0.65
	Value Chain Presence (1-7), 2007	2.7	1.46

Source: **www.worldbank.org/kam** (Accessed February 2009)

Table 8: Variables of Education

	Variable	Bosnia and Herzegovina (Group: All)	
		actual	normalized
Education	Adult Literacy Rate (% age 15 and above), 2007	n/a	n/a
	Average Years of Schooling, 2000	n/a	n/a
	Gross Secondary Enrollment Rate, 2006	n/a	n/a
	Gross Tertiary Enrollment Rate, 2006	n/a	n/a
	Life Expectancy at Birth, 2005	74.4	6.57
	Internet Access in Schools (1-7), 2007	3	3.31
	Public Spending on Education as % of GDP, 2006	n/a	n/a
	Prof. and Tech. Workers as % of Labor Force, 2004	n/a	n/a
	8th Grade Achievement in Mathematics, 2003	n/a	n/a
	8th Grade Achievement in Science, 2003	n/a	n/a
	Quality of Science and Math Education (1-7), 2007	4.4	5.97
	Extent of Staff Training (1-7), 2007	3	1.69
	Quality of Management Schools (1-7), 2007	3.4	2.1
	Brain Drain (1-7), 2007	2.3	1.45

Source: **www.worldbank.org/kam** (Accessed February 2009)

Table 9: Variables of ICT

	Variable	Bosnia and Herzegovina (Group: All)	
		actual	normalized
ICT	Total Telephones per 1,000 People, 2006	730	5.07
	Main Telephone Lines per 1000 People, 2006	250	6.21
	Mobile Phones per 1,000 People, 2006	480	4.29
	Computers per 1,000 People, 2005	50	4.42
	Households with Television (%), 2005	87.2	4.71
	Daily Newspapers per 1,000 People, 2000	n/a	n/a
	International Internet Bandwidth (bits per person), 2005	39.67	4.19
	Internet Users per 1000 People, 2006	240	6.5
	Price Basket for Internet (US$ per month), 2005	7.78	9.07
	Availability of e-Government Services (1-7), 2006	2.78	2.7

	Extent of Business Internet Use (1-7), 2006	3.8	5.17
	ICT Expenditure as % of GDP, 2006"	n/a	n/a

Source: **www.worldbank.org/kam** (Accessed February 2009)

It is obvious that the current situation is completely unsatisfying and that it is necessary to make great efforts to improve the existing indexes. Furthermore, analysing the listed variables one may assume that B&H is in a "vicious circle", where each variable impacts some other variable, even from a different group of clusters. Many data are totally unavailable, which is an additional obstacle to any further analysis. Thus, based on the given data we may conclude that knowledge is not a primary stimulating and developing factor in B&H. On the other hand, since the innovative activity of companies depends on the knowledge, brilliance and the general education level, it is logical that the innovative activity rate amounts to 3.29 and that it has not increased even by one whole level compared to 1995 (in 1995, it amounted to 2.36).

The missing data on education in B&H considerably obstruct further calculating and comparing with other countries. It is unquestionable that education should be considered in the context of the life-long learning. To reach inclusion in education and to completely utilise the learning potential it is necessary to integrate the life-long learning in the educational system, which also implies its financing. Since this topic is comprehensive and we are not to elaborate the concept of life-long learning, we will only underline that these programmes are especially important for the categories which for certain reasons have not passed through an appropriate system of formal education.

1. Summary and Open Issues

The listed indicators speak for themselves; at the moment, B&H is among the worst positioned countries in the region, facing numerous problems and challenges. Yet, despite the great disproportion with the countries from the region, and especially the developed countries, we should find these data useful since they underline the elements that should be enhanced. Knowledge is to be treated as a universally available common good and it should be used in that way. The priority in advancement should be given to educating, affirming and motivating human potentials and preventing the brain drain. Motivating of human potentials will probably be contributed by a better political-legal and the complete social and cultural atmosphere. Within these variables we should work on decreasing corruption and bureaucracy, but also on encouraging the economic initiatives and protecting copyright. We should incorporate training on application and enhancement of the modern technologies in the whole educational system, creating a culture favouring changes and innovations. Furthermore, the human resources should be encouraged to generate new ideas (either fundamental and/ or applicable) and not just to reproduce the existing

ones. This will be possible only after information and information infrastructure become totally available to all users. The cooperation between universities and business sector should refresh the whole managerial and business culture, enhancing the existing research laboratories and creating fields for knowledge diffusion. Considering the great technological changes, arriving every day from the developed and lately even from the less developed countries, as well as the more frequent and easier possibilities to copy its competitors, B&H should be able to bridge the technological gap. As any other developing country, B&H may and should use the experience of countries that have already passed this way, taking into account its own specificities. The examples of other countries, whose KE indexes have increased, confirm that the increase in the indicators enclosed by KAM is directly related to the GDP's increase on the country level, which eventually leads to the higher social prosperity. The elements analysed by the KAM model are closely related; it is difficult to speak about the innovations' development if there are no appropriate human resources. Furthermore, it is not possible to speak about a good quality educational system unless there is an adequate ICT platform. These and many other questions are still opened; yet, they point out that we should establish an analytical and systematic approach towards their answering.

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