
Knowledge Based Economy Assessment

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The importance of knowledge-based economy (KBE) in the XXI century is evident. In the article the reflection of knowledge on economy is analyzed. The main point is targeted to the analysis of characteristics of knowledge expression in economy and to the construction of structure of KBE expression. This allows understanding the mechanism of functioning of knowledge economy. The authors highlight the possibility to assess the penetration level of KBE which could manifest itself through the existence of products of knowledge expression which could be created in acquisition, creation, usage and development of them. The latter phenomenon is interpreted as knowledge expression characteristics: economic and social context, human resources, ICT, innovative business and innovation policy. The reason for this analysis was based on the idea that in spite of the knowledge economy existence in all developed World countries a definitive, universal list of indicators for mapping and measuring the KBE does not yet exist. Knowledge Expression Assessment Models are presented in the article.

Keywords: *knowledge; knowledge expression; knowledge-based economy; characteristics of knowledge expression in economy; instrument for knowledge expression assessment.*

Introduction

We can observe in the present the appearance of a new economy-knowledge based economy. This economy is an economy based on knowledge and ideas, in which the key factor of prosperity and economic growth is the superior knowledge capitalization. This is why today the knowledge is considered to be the driving force of the economic growth, productivity

growth and a resource that can offer a sustainable competitive advantage. For this reason in the present we can see a big interest for knowledge economy, knowledge, knowledge, information and technology and their role in the economic growth. For this reason in the present paper it is presented the concept of knowledge based economy, its characteristics and the main frameworks to asses it.

The knowledge economy differs from the traditional economy in several key respects:

- The economics is not of scarcity, but rather of abundance. Unlike most resources that deplete when used, information and knowledge can be shared, and actually grow through application.

- The effect of location is diminished. Using appropriate technology and methods, virtual marketplaces and virtual organizations can be created that offer benefits of speed and agility, of round the clock operation and of global reach.

- Laws, barriers and taxes are difficult to apply on solely a national basis. Knowledge and information 'leak' to where demand is highest and the barriers are lowest.

- Knowledge enhanced products or services can command price premiums over comparable products with low embedded knowledge or knowledge intensity.

- Pricing and value depends heavily on context. Thus the same information or knowledge can have vastly different value to different people at different times.

- Knowledge when locked into systems or processes has higher inherent value than when it can 'walk out of the door' in people's heads.

- Human capital competencies are a key component of value in a knowledge-based company, yet few companies report competency levels in annual reports. In contrast, downsizing is often seen as a positive 'cost cutting' measure.

Taking into consideration the structure of the research, I considered necessary to review the specialized literature in relation with the knowledge based economy.

A. B. Jones[1] considers that knowledge based economy represents "the fundamental changing from the economy based primordially on the physical resources to the economy based primordially on knowledge" The wealth and power in the XXI century will devolve primordially from the intangible

intellectual resources, from the knowledge capital. Thus, this transition to the economy based on knowledge represents a comprehensive and profound process which generates major changes in the components of the economic activities.

Today the term of „knowledge society/ economy” it is utilized in the whole world. This term it is an abbreviation of the term knowledge-based society/ economy. If we will search on the internet „knowledge society/ economy” we will find thousands of references. Recently, the review DEUTSCHLAND dedicated a special number for the „knowledge society. Nico Stehr remarks “Social order which is under the horizon it is based on knowledge [...]. The volume of knowledge which we can use it has doubled at every five years. If we will wonder which is the effect of the actual transition from the industrial society to the knowledge society, upon the employees and companies, upon the politics and democracy, shortly upon our organizational principles regarding the way of living, than it is justified to talk about the way we will live in the knowledge society”. [2]

The specialists’ opinions regarding the definition of the knowledge based economy or new economy are different from one to another. For example Daniela Archibugi and Bengt Aké Lundvall in “The Globalizing Learning Economy” approach the new economy from the perspective of the information society and internationalization and define the new economy as “a economy more dominated by the global influences and by the speed, often in real time, of the communications and information, no matter what the distance. [3]

Nicolescu O. synthesizing the definitions from the specialized literature, considers that “ the knowledge based economy is characterized by the transformation of the knowledge in base material, capital, products, production factors essentials for the economy and through economic processes in which the generation, selling, acquisition, learning, stocking, developing, splitting and protection of the knowledge became predominant and decisive for the profit obtaining and for the assurance of the economic sustainability on the long term”. [4]

Also, a number of international organizations and institutions were and are interested by the concept of knowledge based economy and by the tendencies manifested within the framework of this new type of economy. Thus, OECD considers that „the knowledge based economy represents the type of economy based directly on the knowledge and information production, distribution and utilization” [5]. In the same time the knowledge are recognized

as a “driver of productivity and economic growth, leading to a new focus on the role of information, technology and learning in economic performance”. [5]

Expanding the OECD definition of the knowledge-based economy, the executive committee of APEC considers that “the production, distribution and the fructification of the knowledges is the main driver of economic growth, wealth, creation and employment at all industries levels” [6]. Conform to this definition, knowledge based economy it is not based only on few high technologies industries for the economic growth and wealth creation. They consider that all economic sectors can be knowledge intensive. So, the executive committee of APEC considers that “all the knowledges required by the knowledge based economy are wider than technological knowledges, and for instance include cultural, social and managerial knowledges”. [6]

In 2002 European Commission published the paper “Towards a knowledge-based Europe- The European Union and the information society”. Starting from the EU goal- “to become the most competitive knowledge based society in the world by 2010” they establish the action plans for the period till 2010. EU considers that „The EU’s success in achieving this goal will help determine the quality of life of its citizens, the working conditions of its workers and the overall competitiveness of its industries and services”. [7]

World Bank and OEDC had cooperated and cooperate in their activities to create knowledge based economies, being helped in their effort also by the transition countries. In the opinion of Carl Dahlman, manager of the program knowledge for development from the World Bank Institute:” to benefit from the knowledge revolution are necessary clear strategies which can satisfy the 4 pylons of knowledge economy:

- An institutional and economic framework which promotes the knowledges efficient utilization
- An educated population for the creation and utilization of the knowledge
- A dynamic information infrastructure
- An efficient innovation system within the organizations and research centers which can satisfy the people new desires”. [8]

Thomas Stewart considers that knowledge based economy has in view, because it is an economy, the money, in the context of knowledge acquisition, production and selling. In his opinion the fundamentals of the knowledge based economy, which are the essence of this new type of economy, are:

- The knowledge become the content of acquisition, production and

selling processes

- The knowledge assets, intellectual capital components, had become more important than financial assets or technical-materials assets
- Knowledges and intellectual capital fructification, the obtaining of prosperity within the market economy requires a new terminology, new managerial methods and techniques, new technologies and not in the end new strategies. In other words, knowledge based economy, „as a new type of economy requires a new type of management- knowledge based management and a new type of organization – knowledge based organization. [9]

Stewart underlines the fact that in knowledge based economy remains essential the economic factor, reflected in the situation in the fore-ground of the economic performances. What it is changed it is the fundament of economic performances achieving, these being achieved through the superior fructification of the existing knowledges.

World Bank Framework

In 1999 the World Bank Institute launched a project entitled “Knowledge for Development” (K4D). Its aims were to raise awareness among national policymakers about the powerful growth effects of knowledge and to encourage economists to combine global and local knowledge in order to accentuate comparative advantages. [10]

It has been determined that successful transition to the knowledge economy often includes four elements: long-term investments in education, the development of innovation capability, the modernization of the information infrastructure and the creation of a conducive economic environment.

The World Bank has set these elements as the four pillars of the knowledge economy within the Knowledge Economy Framework. These pillars are [11]:

- *An economic incentive and institutional regime* that provides good economic policies and institutions that permit efficient mobilization and allocation of resources and stimulate creativity and incentives for the efficient creation, dissemination and use of existing knowledge;
- *Educated and skilled workers* who can continuously upgrade and adapt their skills to efficiently create and use knowledge;
- *an effective innovation system* of firms, research centers, universities, consultants and other organizations that can keep up with the knowledge revolution, tap into the growing stock of global knowledge and assimilate and

adapt it to local needs;

- *a modern and adequate information infrastructure* that can facilitate the effective communication, dissemination and processing of information and knowledge.

Pillar 1 Economic and institutional regime	Pillar 2 Education and skills	Pillar 3 I n f o r m a t i o n and communication infrastructure	Pillar 4 Innovation system
The country's economic and institutional regime must provide incentives for the efficient use of existing and new knowledge and the flourishing of entrepreneurship	The country's people need education and skills that enable them to create and share, and to use it well.	A dynamic information infrastructure is needed to facilitate the effective communication, dissemination, and processing of information..	The country's innovation system— firms, research centers, universities, think tanks, consultants, and other organizations—must be capable of tapping the growing stock of global knowledge, assimilating and adapting it to local needs, and creating new technology

Figure 1: The four pillars of the knowledge economy [11]

The Knowledge Economy Framework postulates that the amount of knowledge and how it is used are key determinants of total factor productivity (TFP).

Strengthening the four pillars of the knowledge economy will lead to an increase in the quantity and quality of the pool of knowledge available for economic production in any country. This in turn will increase productivity and, thus, economic growth [12]. The World Bank Institute has developed the Knowledge Economy Index (KEI), as well the Knowledge Index (KI), for ranking countries. Both are presented in Figure 2.

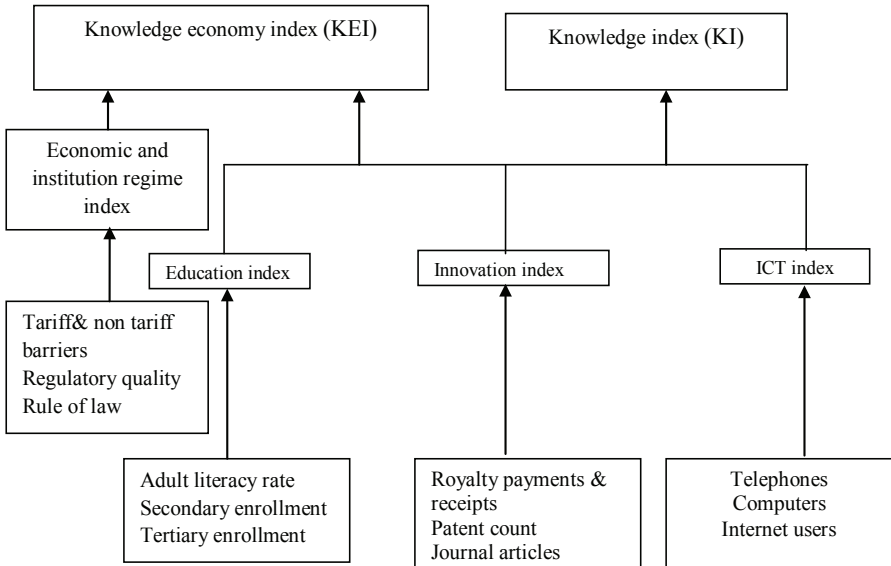


Figure 2: Knowledge Economy Index (KEI) and the Knowledge Index (KI)

The KAM Knowledge Index measures a country’s ability to generate, adopt and diffuse knowledge. This is an indication of the overall potential for knowledge development in a given country. Methodologically, the KI is the simple average of the normalized performance scores of a country or region on the key variables in three of the knowledge economy pillars – education and human resources, the innovation system and ICT. The Knowledge Economy Index takes into account whether the environment is conducive for knowledge to be used effectively for economic development. It is an aggregate index that represents the overall level of development of a country or region in relation to the knowledge economy.

Calculation of the KEI is based on the average of the normalized performance scores of a country or region on all four pillars of the knowledge economy -economic incentive and institutional regime, education and human resources, the innovation system and ICT. [12]

Figure 1 shows the four pillars of the knowledge economy with three key variables, representing each pillar. In calculating the KEI and KI indices, as well as the indices of the four pillars of the knowledge economy, the World Bank ranks countries according to a single model of building a knowledge-

based economy which it applies to all countries.

However, each pillar consists of a large number of knowledge economy indicators (i.e., variables) collected according to the KAM:

The Economic Incentive and Institutional Regime

- Tariff & Nontariff Barriers
- Regulatory Quality
- Rule of Law

Education and Human Resources

- Average years of schooling
- Secondary Enrollment
- Tertiary Enrollment

The Innovation System

- Royalty and License Fees Payments and Receipts
- Patent Applications Granted by the US Patent and Trademark Office
- Scientific and Technical Journal Articles

These three variables are available in 2 forms: scaled by population and in absolute values. Thus, both KE and KIE are also available in “weighted” and “unweighted” forms. In innovation, absolute size of resources matters, as there are strong economies of scale in the production of knowledge and because knowledge is not consumed in its use.

Information and Communication Technology (ICT)

- Telephones per 1,000 people
- Computers per 1,000 people
- Internet Users per 10,000 people

APEC framework

The APEC framework was developed as part of a project commissioned by the APEC Economic Committee in mid-1999. The title of the project was **Towards Knowledge-based Economies in APEC** and was progressed by a specially created KBE Task Force, members of which included Australia, Canada and Korea. The aim of the project was to “provide the analytical basis useful for promoting the effective use of knowledge, and the creation and dissemination of knowledge among APEC economies”[13].

The project entailed the examination of empirical evidence and concluded that economic growth is most sustainable for those economies which are strong in all of the following four dimensions (findings of the OECD

Growth Project analyzed and cited in the APEC Economic Committee report):

- “Innovation and technological change are pervasive, and are supported by an effective national innovation system.”
- “Human resource development is pervasive: education and training are of a high standard, widespread and continue throughout a person’s working life.”
- “An efficient infrastructure operates, particularly in information and communications technology (ICT), which allows citizens and businesses to readily and affordably access pertinent information from around the world.”
- “The business environment is supportive of enterprise and innovation.”

These four dimensions form the basis of the APEC KBE framework:

- Innovation System
- Human Resource Development
- ICT Infrastructure
- Business Environment.

OECD framework

The OECD has made a significant contribution to research on the Knowledge-based economy. Its work has evolved from a long history of developing and publishing science and technology indicators. In 1996, the OECD published **The Knowledge-based Economy** [14], an early attempt to compile statistical indicators on the KBE. It published another compilation in 1999 and in 2000 started releasing results from the two-year Growth Project. The impetus for the project was to discover the causes underlying differing economic growth of member nations during the 1990s.

The final Growth Project report, **The New Economy: beyond the Hype**[15], was released in mid 2001. The report emphasized:

- the importance of a stable and open macro-economic environment with effectively functioning markets;
- the diffusion of ICT;
- fostering innovation;
- investing in human capital; and
- stimulating firm creation.

Australian bureau of statistics framework

The proposed ABS framework draws on work done by a number of organizations and individuals. In particular, it builds on work of the APEC Economic Committee and the OECD Growth Project.

The ABS proposes a framework model with five dimensions[16]. There are three core dimensions as follows:

- **Innovation and entrepreneurship**
- **Human capital**
- **Information and communications technology**

In addition there are two supporting dimensions: a Context dimension and an Economic and social impacts dimension. Within each dimension are characteristics; indicators are chosen to provide measures of the characteristics.

A highly simplified diagrammatic representation of the dimension structure of the framework is shown in figure 3. It shows the context dimension as being pervasive, the three core dimensions as overlapping and the Economic and social impacts dimension as being affected by both the context and the three core dimensions.

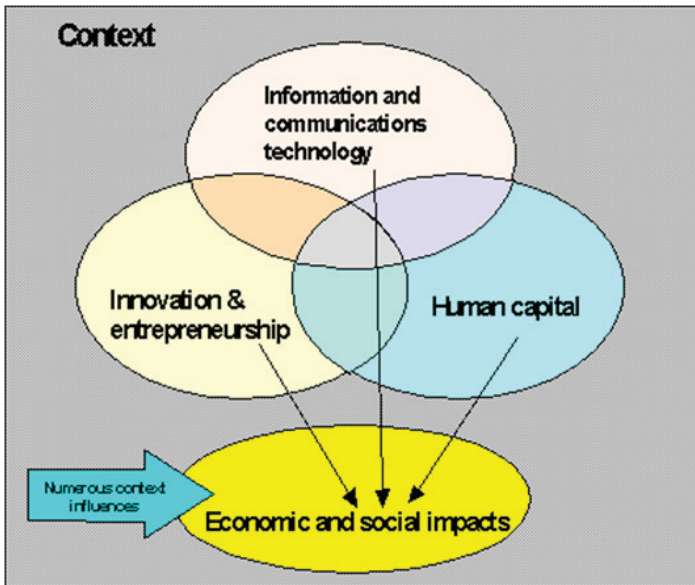


Figure 3: Simplified dimension structure of the proposed ABS Knowledge-based economy/Society Framework [16]

Each of the dimensions is described in terms of a number of characteristics. A characteristic is an aspect of a dimension which has been used to both further describe the dimension and to give it some structure by splitting it into more understandable elements. Most characteristics are populated by one or more statistical indicators.

The context dimension includes a number of economic, social, cultural, legal, political, environmental and global factors which may stimulate, or act as preconditions for, a successful KBE/S.

The proposed characteristics of this dimension include:

- Macro-economic factors (such as economic performance including monetary and fiscal macro-economic management to encourage stability of output growth, short-term interest rates and prices).
- Social and cultural factors. These include a wide range of societal characteristics and structures, for example, social capital, age structure of the population, health status, crime levels and income distribution.
- Product, financial and labour markets.
- Openness (an economy's openness and international orientation).
- Legal and regulatory frameworks.

Political institutions and transparency.

Innovation and entrepreneurship dimension includes the support for, and performance of, innovative and entrepreneurial activities within the economy.

Proposed characteristics of the dimension are:

- Research base and potential for knowledge creation. This characteristic deals mainly with the performance of basic research, research in relatively new fields and research by small and medium enterprises.
- Knowledge creation with commercial potential (this includes invention and patenting activity).
- Other knowledge creation.
- Knowledge networks and flows. This refers to sharing and dissemination of knowledge within firms, and between firms and other organizations (other firms, government and education organizations). It includes cross border flows of knowledge.
- Innovation. This characteristic covers the introduction of new or improved products or processes by businesses and non-technological innovation.
- Entrepreneurial activity. This characteristic refers to the creation of

new, fast growing businesses.

- Support for innovation (support for R&D and provision of venture capital funding).

Human capital dimension

The skills and knowledge of people living in a society are clearly of central importance to its development as a knowledge-based economy and society.

The stock of human capital is reflected in the level of skills, competencies and knowledge of members of society. The stock is built up over time mainly through investment in education (public and private expenditure on education and training). A KBE/S framework is therefore concerned with education and training inputs, both formal and informal, as well as outputs in terms of the resulting skills and abilities of the population.

Proposed characteristics of the dimension are:

- Stock of skilled people (information about the education and skill levels of the population and the potential stock of qualified people).
- Flow of skilled people (this characteristic looks at knowledge workers, the level of educational attainment of the labour force, the extent of employer training and human capital loss/gain from the economy).
- Investment in human capital (refers to expenditure on education and training by government and business).
- Lifelong learning and access to education and training.

Information and communications technology

Information and communications technologies (ICTs) are enabling technologies of a KBE/S. They are vital tools for knowledge workers, allowing them to take full advantage of technology's capacity to access, manipulate and process information. ICTs are also an integral part of education, offering students access to information as well as a range of IT based learning tools. Some commentators argued that a strong ICT production sector is essential for a KBE/S. However work by the OECD suggests that the pervasiveness of ICT use within an economy and society is more important than the production of ICT goods and services (OECD 2000b).

Proposed characteristics of the dimension are:

- ICT infrastructure and access. This characteristic considers the ICT infrastructure in place and its availability and cost to members of society.
- Household and individual use of ICT (looks at the extent of use of ICT and the ways it is being used by members of society for particular purposes and activities).
- Business and government use of ICT (examines the penetration of ICT into business and government processes).
- Prevalence of electronic commerce. This characteristic looks at business and individual use of the Internet, and other computer mediated networks, for buying and selling goods and services.
- ICT skill base (refers to the share of ICT workers in the labour force as well as covering skill shortage issues).
- Strength of the ICT industry. This characteristic describes aspects of ICT industries in Australia. In particular, it looks at revenue growth, contribution to value added and employment, R&D expenditure and trade in ICT goods and services.

Economic and social impacts dimension

This dimension deals with the effects on the economy and society of an increased emphasis on, and use of, knowledge. As such, the dimension seeks to inform how 'intermediate' KBE/S outcomes impact on broader measures of economic and social progress. (The 'intermediate' KBE/S outcomes are reflected under each of the three core dimensions.)

Proposed characteristics for this dimension are:

- Economic and structural change (change in productivity, industry structure and trade).
- Social change.

Conclusions

The in the present paper it is highlighted that knowledge based economy is the result of economic development based on knowledge management as a harmonized system of legal and economic prerequisites and managerial as well as economic mechanisms, modern technologies and human resources, the system resulting from development of market economy and different technologies, in particular, information technologies.

In the article are presented several knowledge based economy

assessment framework developed by different international organizations. Each framework it is characterized by a number of dimensions, each dimension being characterized by a number of characteristics. In other words, knowledge expression assessment could be carried out by establishing the penetration extent of knowledge-based economy characteristics. Therefore, the preconditions of formation of knowledge based economy and factors are constructed as the characteristics of knowledge expression.

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