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# INTRODUCING A FRAMEWORK FOR KNOWLEDGE ECONOMY DEVELOPMENT IN TRANSITION COUNTRIES: THE CASE OF BOSNIA AND HERZEGOVINA

## ABSTRACT

In the context of the current socio-economic situation in Bosnia and Herzegovina as well as its medium-term aspirations to join the European Union, a question arises as to whether and to what extent Bosnia and Herzegovina responds to set demands related to the creation of a knowledge society and knowledge economy, which should lead to its economy's competitiveness. Bosnia and Herzegovina has been in the transition period for almost two decades. Its current socio-economic situation is urging academics, policy makers and other relevant bodies to address these problems. A shift towards new drivers of economic growth is necessary. In this paper we will identify the key drivers and explore the readiness of Bosnia and Herzegovina to develop a new economy - a knowledge economy. Results which have been presented in this paper are based on data which has been collected from the sample of 143 medium and large enterprises in Bosnia and Herzegovina. The factor analysis results indicated relevance of the six main drivers of knowledge economy development. The findings confirm the relevance of the conceptual framework for assessing readiness of countries in developing a knowledge economy. The main contribution of the paper is the empirical validation of the conceptual framework related to the knowledge based economic development of a transitional country. The identification of key drivers for knowledge economy development is relevant to governments and other policy makers involved in developing and implementing strategies for economic development in Bosnia and Herzegovina as well as the academic community and higher education institutions which are key institutions in knowledge creation and diffusion.

**Keywords:** Knowledge economy, model for knowledge economy development, transition country, Bosnia and Herzegovina

## 1. Knowledge economy and transition countries – preliminary research

Piech (2006) concluded that after the post-social transformation in transition countries the issues of development, growth and a knowledge economy have been in the focus of transition economies. He also presented specific aspects of the knowledge economy in EU transition countries focusing on human capital and innovation. Piech concluded that governments in transition countries need to focus more on education, enhancement of the innovation system and investments stimulating domestic activity in order to absorb technologies and knowledge. Transition countries are urged to build new competitive factors and by developing a knowledge economy new possibilities are created. Veugelers (2011) assessed the potential for knowledge economy development in transition countries. According to the findings of this research it is important for transition countries to identify the potential for future knowledge-based growth. Transition countries have undergone both economic and political changes and specific transition process patterns strongly influence these countries' overall development with implications for knowledge based growth.

Veugelers's analysis of prerequisites for a knowledge economy indicates that these countries have systemic disadvantages which are producing obstacles for knowledge economy development. Based on the results of the analysis, the conclusion was drawn that transition countries do not have highly developed innovation systems, they lack the capability to develop frontier technologies, and there is a low level of R&D. Actually, Bosnia and Herzegovina was identified as a country with low scores of innovation action and a country which failed on potential for knowledge-based growth in the near future.

Furthermore, according to Rodrigues (2002), globalisation has urged nations to compete to attract investment depending on general business competitiveness conditions. These conditions are tied to a greater amount of knowledge as a main source of wealth of nations. This is of great importance for transition economies, which are competing for attracting foreign investments in order to generate growth.

Based on the results of prior research, we can conclude that rather than to evaluate innovation capabilities of transition countries it would make

more sense to assess the potential for knowledge based growth in transition countries based on a broader framework. This has been confirmed by Dyker and Radosevic (2000) who concluded that even though conventional predominantly macro-economic transition policies have to a large extent created conditions for building knowledge economies in transition countries, a different approach will be necessary for such an evolution. The only way transition countries will be able to develop institutional diversity and required learning networks and thereby catch up with developed western countries is by developing all sectors crucial for a knowledge economy.

## 2. Knowledge economy framework

Traditional production factors are of the same importance in this country as the effective and efficient application of knowledge. Knowledge application is an additional factor of productivity, and it is essential for the implementation of economic development goals. Both theory and practice have indicated a positive correlation between the level of knowledge created by countries, its usage and the economic development, especially in transition countries.

Although some authors have different views on this concept, they all emphasize the importance of new knowledge and observe it from different angles. Common to all these attitudes is the importance of knowledge for modern economic development. Therefore, it is important to recognize that all economic activities are based on some form of knowledge, not only in developed countries but also in all forms of human activity and societies. The presumption of all the mentioned theories and arguments is the thought that advances in education and technology research development have a key role in today's economic growth, especially in those countries with limited natural resources. However, it is necessary to take into account the disadvantages that are related to the development of the knowledge economy. It not only leads to faster economic growth, but also to significant social changes, such as migration from rural to urban areas and others.

In earlier years it was thought that changes occur only in producing and providing services, but today it is proven that knowledge affects every element of

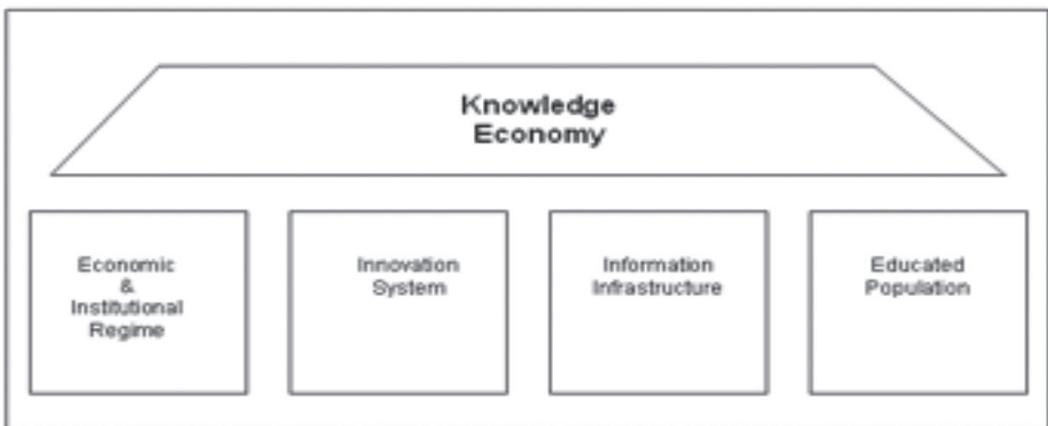
the economy and society. The speed at which the development of new knowledge and technology are presented to the market changes the way of interactions and operations, increasing efficiency and flexibility in business, providing public services and lifestyle. However, authors also emphasize that the revolution of knowledge can lead to greater differences in incomes of individuals and the development of most urban areas, whereas rural areas that rely on agriculture and other rural activities are becoming increasingly marginalized. There is also a possibility of creating a gap between those with higher and lower levels of education, which can lead to further fragmentation of society and the decline in the living standards of individuals with lower qualifications.

However, despite some negative social consequences of developing a knowledge economy (e.g. gap among workers with lower education levels and those with higher qualifications, gap between rural and urban communities etc.), from the economic point of view it can significantly contribute to the initiation of economic development of a country.

However, a question arises how to create and measure the development of a knowledge economy? Measuring the development of a knowledge economy is a complex issue, because it involves changes in many aspects of the economy (as well as the society). The World Bank has presented a framework with indicators that can be used for measuring the knowledge economy, taking into account the specifics of each individual economy. The main aim of this framework is to help developing and transition economies to build their capacity and use of knowledge in order to strengthen their competitiveness and increase their economic and social well-being. According to the mentioned framework, the four main pillars of a knowledge economy are:

1. *Economic incentive and institutional regime* which provide adequate economic policies and institutional infrastructure for enhancement and stimulation of knowledge creation, dissemination and utilization,
2. *Educated and skilled workers* with adequate skills and knowledge,
3. *Innovation system* which is effective and based on strong ties between academy and industry especially in R&D activities,
4. *Application and infrastructure for ICT* needed for communication, dissemination and processing of information and knowledge.

*Figure 1 The Knowledge Economy Framework*



**The Knowledge Economy framework**

Source: Available at: <http://data.worldbank.org/data-catalog/KEI> (Accessed on: March 13, 2015)

This framework asserts that investing in the mentioned knowledge economy pillars is necessary for the creation, adoption and utilization of knowledge in an economy. All of these pillars are important determinants for long-term economic growth, therefore, a country cannot develop only one of these pillars in order to create a knowledge economy. All of the four pillars need to be developed equally as they are all crucial for knowledge economy development. This requires long-term strategies for coping with the transition towards a knowledge economy.

In order to facilitate this process, adequate measures need to be developed for assessing the progress in the development of a knowledge economy. For example, the World Bank developed a *Knowledge Assessment methodology (KAM)* for countries to assess their readiness for knowledge economy development. Given that the purpose of measuring the knowledge economy is to determine progress in each economy or region, these indicators can serve as useful benchmark indicators which allow comparison but do not represent absolute measures. When it comes to Bosnia and Herzegovina, these indicators can have an important role in convincing those responsible to create policies that will provide the development of the knowledge economy as the potential alternatives for diversifying the economy.

A framework for the development of a knowledge economy is specific for each country because it reflects the specific socio-economic goals of development. Regardless of the specifics of each country's effective governance, modern education system, effective information and communication technology, infrastructure, services and research institutions, development and innovation are fundamental prerequisites of development strategies of the knowledge economy, especially in countries such as Bosnia and Herzegovina. However, applying a unique model for the evaluation and improvement of development capabilities is not possible. It is necessary to take into account the specificities of each country to understand the key determinants that can generate growth and progress. The development of a knowledge economy is a long-term process that involves the creation of new socio-economic values that enable dynamical changes, through the promotion of productivity, innovation and lifelong learning.

Most of the frameworks for the development of a knowledge economy can be adapted to the specificities of each country given that countries are at different levels of socio-economic development.

Regardless of those specifics, effective government institutions, a developed educational system, which educates individuals in accordance with the needs of the economy, effective information and communication technology and infrastructure are key prerequisites for the development of strategies and for the development of a knowledge economy, especially in countries which are in transition.

### **3. Developing a knowledge economy in transition countries: a framework for Bosnia and Herzegovina – empirical research**

In the context of the current socio-economic situation in Bosnia and Herzegovina as well as its medium-term aspirations to join the European Union, a question arises as to whether and to what extent Bosnia and Herzegovina responds to the set demands related to the creation of a knowledge society and knowledge economy, which should lead to its economy's competitiveness. Taking into consideration its current economic situation, a long period of transition, the trends in macroeconomic indicators in the past few years; it is evident that we should be looking for a new foundation for economic growth and development. In this research we will try to identify key knowledge economy drivers for knowledge economy development in Bosnia and Herzegovina?

#### **3.1 Methodology of the primary research**

In order to introduce a framework based on key drivers for the development of a knowledge economy in Bosnia and Herzegovina, taking into account the specifics of the country, an empirical research was conducted aiming to provide the answer to our research question. The research was conducted based on a questionnaire survey targeting medium and large enterprises in Bosnia and Herzegovina.

For the purposes of this study, four independent variables have been identified – drivers of the knowledge economy. The results/outcomes of knowledge (knowledge economy) have been identified as the dependent variable in this study.

**Table 1** The structure of the sample

Number of Employees	Frequency	%
50-100	70	48.95
101-250	48	33.57
251-300	16	11.19
301-400	6	4.19
401 and more	3	2,10
<b>TOTAL</b>	<b>143</b>	<b>100.0</b>

Source: Authors' research

From 1 520 companies which have been identified as the population based on the size of the enterprise defined by the number of employees, based on probability, sampling the sample size has been determined at 150 enterprises. Due to the fact that the number of employees is recognized as the valid criteria for classification of enterprises by size, the structure of the sample in accordance with the number of employees in enterprises included in the research is shown in Table 1. As explained, 150 questionnaires were distributed and the response rate was 95.33% (n = 143).

### 3.2 Results of the research and discussion of results

Data analysis was performed using factor analysis. The analysis of the knowledge economy's main components included 54 variables. As a reference for the selection of factors, a characteristic value was used (Eigen value) which is higher than 1.00 and Scree plot diagram. On the basis of that, initially 16 factors were identified with a characteristic value higher than 1.00 after 25 iterations. Identified factors explain 78.64% of the variance. Namely, significant factors are only the factors that meet the following conditions: - their Eigen values (characteristic values) must be higher than 1, the percentage of the total variance higher or equal to 0.60 (in social studies), the significance of the factor coefficients higher or equal to 0.50.

**Table 2** Results of KMO and Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.602
Bartlett's Test of Sphericity	$\chi^2$	6298.931
	df	1485
	Sig.	0.000

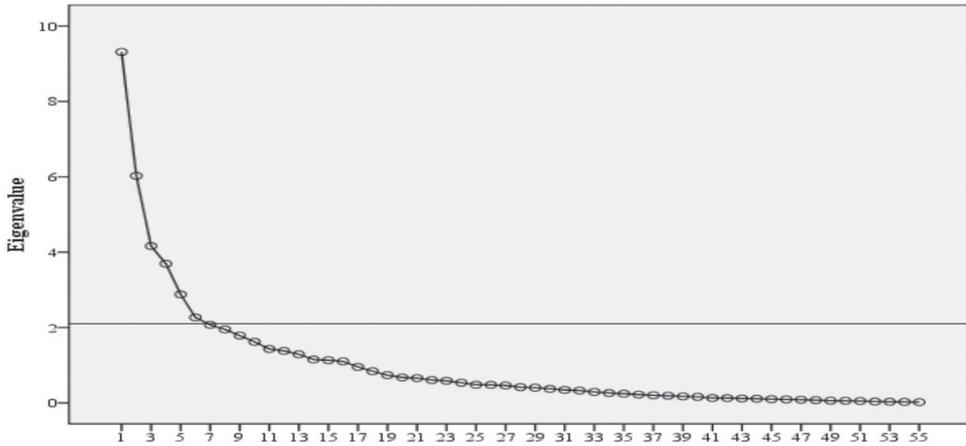
Source: Authors' research

According to values of measures presented in the table above, it can be concluded that it was appropriate to apply factor analysis in this research. The KMO test shows the benefits of applying factor analysis and its value varies in the range from 0 to 1. If the value of the KMO test is in the range of 0.5 to 1, as we have already noted, there is a justification of the application of factor analysis. Since the Kaiser-Meyer-Olkin measure in our case is 0.602, we can conclude that the data used in variables are suitable for conducting a factor analysis, while Bartlett's test is statistically significant with a value of  $\chi^2 = 6298,931$ ,  $p = 0.0001$ ,  $df = 1485$ .

After nine reductions, we obtained six factors that meet all the criteria and accounted for 51.52% of the variance. These factors have a common factor weight in the value of 28 (Eigen value). The scree plot test also confirms that the solution with six factors is appropriate.

The analysis of the main components revealed the presence of 16 components with characteristic values over 1.00, which explains 78.64% of the total variance. Based on the scree plot criteria which is based on Cattell's diagram the existence of the turning point behind the 6<sup>th</sup> factor can be identified, which confirms the separation of six factors, because their Eigen values are separated from the Eigen values of the remaining factors. Solution with six factors explained 51.52% of the variance, where the participation of the first factor is 16.9%, the second is 10.95%, the third is 7.57%, the fourth 6.72%, the fifth 5.2% and the sixth is 4.12%

According to Živadinović (2004) the initial matrix does not have the characteristics of the simple structure; the rotation factor is carried out, which changes the relationship between variables and factors. In this study, after the extraction of factors, the orthogonal rotation of factors 35 was performed (where the factor axes retained a right angle) using

**Figure 1** Scree plot diagram of input factors of the economy knowledge (independent variables)

Source: Authors' research

the “varimax rotation with Kaiser normalization”, whose goal is that each variable must be representative with as few factors as possible and with better geographic dispersion. This method, compared to other methods of rotation, was more successful in achieving the principles of a simple structure (Živadinović, 2004: 961).

The Factor analysis solution extracted the following factors according to their importance with the following surrogate names:

- University education and development of the higher education system,
- Government regulation and environment,
- Utilization of ICT and infrastructure,
- Investment in R&D,
- Employee education and training,
- R&D activities and innovation.

It is evident that the role of higher education is recognized as a key factor for the creation of new knowledge and its “spillover” in the economy. Secondly, we identified the factor related to the role of their government indicating its relevance for creating a regulatory environment which is important for creating the knowledge economy.

The ICT, infrastructure and services are important for enhancing productivity and acquisition of knowledge. R&D capabilities and investments in R&D are important in order to enhance the innovation and creation of new products, technologies, processes and new knowledge in general. But, on the whole, human resources and education and training of employees is important in order to enable them to acquire skills and knowledge which is applicable.

After the main inputs/drivers of a knowledge economy were identified, we approached the determination of results (outputs) regarding the knowledge economy by the same criteria as in the case of drivers of the knowledge economy. In case of knowledge economy outcome, the KMO is 0.884, Bartlett's test is highly statistically significant and is  $\chi^2 = 951,181$  with statistical significance  $p = 0.0001$  and degrees of freedom  $df = 78$  confirmed justification of approaching to the use of main components of factor analysis.

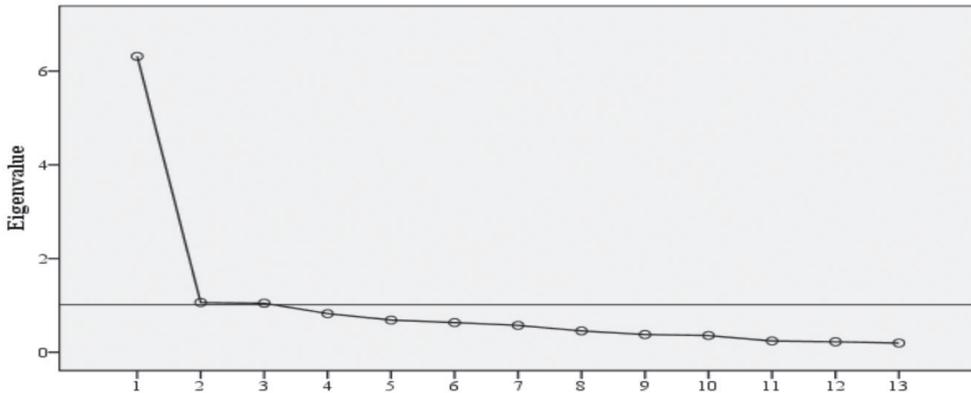
**Table 3 Results of the KMO and Bartlett's test (results of the knowledge economy)**

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.884
Bartlett's Test of Sphericity	$\chi^2$	951.181
	df	78
	Sig.	.000

Source: Author's research

After two iterations, two factors were identified which accounted for 56.75% of the variance, which is acceptable to criteria.

**Figure 2 Scree plot diagram of the results of knowledge economy (dependent variable)**



Source: Authors' research

The factor analysis extracted the following factors according to their importance with the following surrogate names:

- Productivity (performance),
- Acquisition of new knowledge.

The key outcomes of the knowledge economy and productivity have been identified as a result of applying new technologies and knowledge, and the creation of new knowledge and its utilization for improvement of processes as well as R&D activities.

#### 4. Limitations to the research

Like any research, our conclusions based on the results of our empirical research have some limiting factors. As we presented in the theoretical background of our research, the term knowledge economy is a relatively new phenomenon, especially when it comes to research on knowledge economy development in transition countries. Our research was conducted on a sample of medium and large enterprises only and these results could be used as a foundation for a wider research which will be conducted on a larger sample that would include enterprises of all sizes from all sectors. In our empirical research, we have chosen input factors which we found to be suitable for Bosnia and Herzegovina and therefore this framework does not represent a universally applicable framework due to the fact that these input factors might not be suitable for other transition countries due to their economic or social specifics.

#### 5. Conclusions and recommendations

Modern socio-economic developments in the past two centuries have led to the need of identifying new ways of achieving economic growth, development, competitiveness of companies and economies. Knowledge in this context has become an important resource for achieving the mentioned goals, regardless of some critical views of the economic theorists on creation of society and knowledge economy. This "new economy based on knowledge" represents the concept in which knowledge becomes the main production factor. However, this

economy implies fundamental changes in the concept of achieving economic growth, changes in economic and other policies, all the way to the changes at the organizational level and changes within enterprises, universities etc.

We identified six key factors based on the results of the factor analysis and they are considered to be key drivers of knowledge economy development in Bosnia and Herzegovina as a transition country. Even though the World Bank introduced a universal framework for knowledge economy development based on four main knowledge economy drivers, based on the results of our primary research we identified key knowledge economy factors and introduced a framework based on these six knowledge economy drivers, taking into consideration the specifics of Bosnia and Herzegovina as a transition country. These factors are: university education and development of the higher education system, government regulation and environment, utilization of the ICT and infrastructure, investment in R&D, employee education and training, R&D activities and innovation. Based on the research results we also identified key knowledge economy outcomes as the key drivers, which contribute to the acquisition of new knowledge and increased productivity. These drivers must be developed if Bosnia and Herzegovina wants to make the transition to a knowledge economy. Furthermore, we have been able to contribute to scientific knowledge related to the identification of key knowledge economy drivers

and knowledge economy development in transition countries.

A primary importance of education was pointed out, especially higher education, which allows the creation of new knowledge through collaboration with industry and the use of that knowledge in order to increase productivity. Of course, the role of the state in this context is not to be questioned and is very important since it is necessary to create the framework conditions for the development of the knowledge economy through regulations, policies, etc. Furthermore, innovation and R&D are also important driving factors of the knowledge economy and they are directly associated with other factors. The ICT, infrastructure and the development of the highly productive ICT sector in Bosnia and Herzegovina will allow an adequate development of the knowledge economy. However, it cannot be forgotten that in a knowledge economy an individual who possesses the knowledge and skills is crucial. Therefore, the interaction of three key players - government, education and business - is the key precondition for development of the knowledge economy. In this context, it is necessary to develop a system which will in its core focus on the creation, acquisition and utilization of new knowledge - the knowledge economy - based on the key drivers identified in this research in order to achieve productivity and competitiveness as key outcomes of a knowledge economy.

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## **UVOĐENJE OKVIRA ZA RAZVOJ EKONOMIJE ZNANJA U TRANZICIJSKIM ZEMLJAMA: SLUČAJ BOSNE I HERCEGOVINE**

### **SAŽETAK**

U kontekstu trenutačne društveno-ekonomske situacije u Bosni i Hercegovini, kao i njezine srednjoročne težnje pristupanju Europskoj uniji, postavlja se pitanje udovoljava li i u kojoj mjeri Bosna i Hercegovina postavljenim zahtjevima koji se odnose na stvaranje društva znanja i ekonomije znanja, što bi gospodarstvo te zemlje učinilo konkurentnim. Tranzicijsko razdoblje u Bosni i Hercegovini traje gotovo dva desetljeća. Trenutačna društveno-ekonomska situacija nameće potrebu rješavanja tih problema i to s razine akademske zajednice, donositelja politika i drugih relevantnih tijela. Potreban je zaokret prema novim pokretačima gospodarskoga rasta. U ovome radu identificiraju se ključni pokretači i istražuje spremnost Bosne i Hercegovine za razvoj nove ekonomije - ekonomije znanja. Rezultati prikazani u ovome radu temelje se na podacima prikupljenima na uzorku od 143 srednja i velika poduzeća u Bosni i Hercegovini. Rezultati faktorske analize pokazuju relevantnost šest glavnih pokretača razvoja ekonomije znanja. Rezultati potvrđuju važnost konceptualnoga okvira za procjenu spremnosti zemalja na razvoj ekonomije znanja. Glavni doprinos ovoga rada je empirijska validacija konceptualnoga okvira koji se odnosi na razvoj ekonomije temeljen na znanju u tranzicijskoj zemlji. Identifikacija ključnih pokretača razvoja ekonomije znanja važna je za vlade i druge donositelje politika uključene u izradu i provedbu strategija ekonomskoga razvoja u Bosni i Hercegovini, kao i akademsku zajednicu i visokoškolske ustanove koje su ključne u stvaranju i širenju znanja.

**Ključne riječi:** ekonomija znanja, model razvoja ekonomije znanja, tranzicijska zemlja, Bosna i Hercegovina