



# Report on the Conditions for OER in WB PC

DEV 1.3



# BAEKTEL

Blending academic and entrepreneurial knowledge  
in technology enhanced learning

*Blending **Academic** and **Entrepreneurial** Knowledge  
in Technology Enhanced Learning – BAEKTEL*

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## 1 Introduction

The strategy for education development in partner countries of the Western Balkans is to define smart growth as a priority for the development of the economy based on knowledge and innovation. Education and digital society are the generators for the development and advancement of knowledge in the EU countries. By adopting strategic documents, accession countries, in addition to identifying their goals and priorities, confirm the policy and commitment to achieving the goals that call for raising the quality of life and strengthening the economic power of the society. The commitment to economic development based on knowledge and innovation is shown in strategic documents, which correspond to the objectives of the European strategy.

Strategic directions in the field of ICT (Information and Communications Technology) are still not widely used in practice. What lacks is the necessary digital infrastructure. In addition, the necessary regulation to make full use of, access to, and distribution of data based on standards and platforms OD (Open Data) and OER (Open Educational Resources) has not yet been adopted. The adjustment of regulations on intellectual property, e-government and information security is an additional requirement for the application of OER.

The importance of the development of OER in higher education has been confirmed in practice and in the experience of developed countries through examples that show the need for the application of innovative technologies to improve the quality of the educational process. BAEKTEL project should raise the awareness of the usefulness of OER for all educational institutions, government agencies and business entities. The project will enable better networking and cooperation between higher education and the industry.

The analysis of the current situation, together with identifying strengths and weaknesses, as well as opportunities and challenges in the implementation of OER, should serve as the basis for the recommended strategies to improve implementation in higher education.

The way to achieve progress in the implementation of OER software and standards requires the necessary institutional framework and the environment within the academic community, which, with the support and cooperation with other social stakeholders, can assure the realization of the European agenda in this area.

## 2 Current legal conditions pertaining to OER in WB PC

### 2.1 Serbian perspective

The development and implementation of OER in Serbia requires the fulfilment of the legal prerequisites at the national and institutional level. In addition to the adoption of current drafts and legal regulations related to open education systems in Serbia, it is necessary to gradually

raise awareness about the importance of OER, opportunities they offer, methods of development and implementation, and the use thereof.

The Education Development Strategy in Serbia up to the year 2020 [1] is the starting point for the analysis of legal regulations in the field of OER. The approach to the elaboration of the content of this strategy is based on the openness of the education system, while its development is formulated from the perspective of its role with respect to the environment. In this strategy the traditional tendencies of the education system for independence from other systems are overcome by the requirement that the system must be open to all other systems in Serbia. It is the starting point in the Education Development Strategy that provides a legal prerequisite for the realization of ideas related to OER.

Bearing in mind the successful practice in Europe in terms of the implementation of OER, it is necessary to comply with national regulations within that domain. The Law on Higher Education in Serbia [2] assumes compliance with the European system of higher education and promotes academic mobility of faculty and students. It is this principle of the Law on Higher Education in Serbia that provides a starting point for the development and implementation of OER through alignment with successful European practices and academic mobility in order to exchange as well as gain new experiences.

Apart from the Education Development Strategy and Law on Higher Education, a significant regulation in this area is the Strategy of Information Society [3], which emphasizes the development of digital educational content as one of the main goals to be achieved. This strategy refers to the introduction of modern concepts of e-learning and Open Distance learning. In accordance with these objectives of the strategy, which are to be achieved by fostering the application of information technology in education, the basis for the development and implementation of OER has been set.

The review of the existing legal framework through these laws and strategies leads to the needs and demands in the future work relating to OER. The existing regulations open the possibilities for the development of OER, however with the necessary improvement and compliance with OER regulations in Europe.

## 2.2 Montenegrin perspective

The application of the Open Source (OS) principle is of great importance for the improvement of educational processes and the quality of all aspects of education. Government policies in the development of ICT contribute to creating a good foundation for the creation of platforms and further development.

The "Strategy for Development of the Information Society 2013" defines the basic guidelines for the use of OS in Montenegro: *"For the purposes of expansion and greater development opportunities, it is necessary to promote the use of OS solutions. In this regard, special measures will be taken to promote these technologies, such as appropriating incentive funds*

*and awarding projects developed solely with these tools, which will in the final phase contribute to reducing the operational costs of ICT systems in the country and the economy.” [4]*

The existing Information Society Development Strategies implemented by the Ministry for Information Society and Telecommunications are a prerequisite for the development of OER. In the new "Strategy for Information Society Development for the period 2012 - 2016" [5], it was pointed out *that it is necessary to integrate ICT in all aspects of the educational process in order to have more effective and efficient education. In this sense, application of these technologies in education, activities aimed at creating a modern education system adapted to the needs of the information society, development of digital educational content, training teachers to use these technologies, introduction of modern concepts of e-learning and distance learning, development of the concept of lifelong learning, social inclusion of people with special needs etc., will be continued. In addition to developing the application of information and communication technologies in the educational process, it is necessary to simultaneously raise the technological basis in schools, which means equipping schools with necessary information equipment, as well as communication links among schools, with adequate Internet access.*

The existing regulations governing the ICT area should be reviewed in order to introduce innovations in the use of the OS technologies and implementation of this strategy. There is a particularly strong need to define legal regulation on public procurement, which would accelerate the implementation of OS in IT solutions both in public administration and in the wider IT community. [6]

In other legal acts dealing with ICT and public procurement in Montenegro, the processes and methods of using these technologies have not yet been sufficiently regulated. For this reason, the task of the Ministry for Information Society and Telecommunications is to prepare and adopt a set of regulations governing the OS in the future. [6]

### **2.3 Bosnia and Herzegovina perspective**

It is evident that in the territory of Bosnia and Herzegovina not a single higher education institution (public or private) has officially included the OER learning methodology in their process of education through policies and procedures. This makes the BAEKTEL project even more important for application of OER in Bosnia and Herzegovina by their initial presentations and applications. Each institution has some form of implementation of lifelong learning, e-learning and distance learning, as well as internally placed on-line teaching materials by individual teachers; however, they are not integrated into the overall education process within a particular course for the acquisition of specific valid and verified competences and abilities.

Apart from the document entitled *The Decision to Adopt the Policy of Software in the Institutions of Bosnia and Herzegovina*, issued by the Council of Ministers, there are no other clear instructions at the state level in terms of legislation for OER. Moreover, there is no valid Information Society Development Strategy of Bosnia and Herzegovina, which would refer to OER (the last strategy was developed for 2004-2010).

Lifelong education for all citizens of Bosnia and Herzegovina is already envisaged within the Framework Law on Higher Education (HE) [7], based on the concept of lifelong education and interaction with the community and the obligation of the universities to develop social responsibility of students and other members of the academic community, which is one of the main tasks of the BAEKTEL project. The Law also lists the ways of acquiring higher education, through regular learning, part-time studies, distance learning, or a combination of these three modes of studying, as provided in the statute of the HE institution. It also states that the freedom to introduce innovative ways of HE acquisition within the limits of their licenses cannot be denied or restricted for HE institutions. This leaves room for organizing not only standard distance learning, but also the organization of classes through the use of OER.

The Cantonal Law on Higher Education of the Tuzla Canton [8] defines the foundations of HE activities, among other higher education institution (HEI) openness to the public, the citizens and the local community, as well as ensuring the quality and efficiency of studies and the concept of lifelong learning. In addition to existing opportunities for lifelong learning, it is necessary make amendments to add the possibilities for education using OER materials for both the HEI and the companies that have signed agreements of cooperation within HEI. Delivering lectures with the use of the technical and information infrastructure should be envisaged, and an unhindered use of OER materials, way of teaching, training and testing students enabled.

Within the criteria for the accreditation of HEI [9], some criteria for distance learning and e-learning that should be met are defined, as for example: institutional capacity; department/centre for distance learning; cooperation with other institutions; study program; educational resources; implementation of the study program; human resources; specificity of the teaching and non-teaching staff within the distance learning environment; physical resources; study centres; platform for e-learning.

The strategic directions of development of HE [10] provide a climate for inclusion of the BH universities into the European space of higher education and the European research area, as well as its participation in projects and initiatives of the European Union (IPA, TEMPUS, FP, Erasmus+). It also envisages the introduction of lifelong learning (LLL). In order to establish a quality system of LLL, support of cooperation with the industry is required, as well as a comprehensive application of the policy of LLL in partnership with all relevant stakeholders, subject to adoption of a national qualifications framework. Along these lines development policy in the field has been created: development of digital learning content, application of technology in management, support for e-learning and virtual schools as well as support for broadband (wireless) network and supportive funding.

In the HE development strategy of the Republic of Srpska, no guidance for the implementation and realization of OER content are listed [11].

It is necessary to develop a systematic plan of public relations and marketing which would include the general public in addressing the problems related to HE, European and global trends

of modern economy based on creativity and clean technologies, as well as the commitment of the European Union to put in action the idea of knowledge society and technology. In order to promote a knowledge-based society the following areas should be enhanced: establishing the links between theory and practice, including the dissemination and use of ICT, investing in research and development; strengthening the concept of lifelong learning; improving flexibility and strengthening the education system, including better links between universities and the business world. In the need for a rapid development of the information society an Agency for Development [12] has been formed, which aims at developing an information society in Bosnia and Herzegovina, based on the development and application of technologies of the information society.

In terms of legislation for OER at the level of the Republic of Srpska there is no clear guidance, thus it is necessary to clearly define the guidelines for the creation and development of OER content and its integration into the educational process by a new Strategy for the Development of Education in the Republic of Srpska.

In March 2009, the Third Conference of Higher Education of the Republic of Srpska took place, aimed at defining the strategic directions for the continuation of the reform process. The following conclusions were adopted:

- In the area of improvement of the educational process at universities, it is necessary to introduce cooperative, interactive and individualized methods, forms and resources in teaching, as well as training of teachers and assistants in the field of modern teaching methodologies. Also, it is necessary to introduce the monitoring and assessment of the effectiveness of teaching and establishing distance-learning connections with well-known universities around the world, so that students can listen to lectures given by prominent international professors.
- At the Faculty of Electrical Engineering in Banja Luka in 1999, the ODL Centre (Online and Distance Learning) was established. Its main purpose was to promote, develop and improve teaching methods based on modern information technology.
- During 2002 and 2003, WUS (World University Service) Austria, offered support to development of e-learning through its Distance Learning programs. During those two years, Universities of Sarajevo, Banja Luka, Tuzla, Bihac and Mostar got financial support for the development of e-learning content.

### **3 Current technological conditions pertaining to OER in WB PC**

#### **3.1 Serbian perspective**

This section analyses the technological prerequisites of OER on the WB, through a review of the current situation in Serbia, Montenegro and Bosnia and Herzegovina. Existing platforms that form a foundation for the development of OER are pointed out. However, before conditions related to the platform are discussed, it is necessary to emphasize the need to raise awareness

on the importance of OER in Serbia. To this end, several seminars have already been organized in Serbia. In March of 2014, the University Library "Svetozar Marković" organized a presentation of the concept of open access to education, open education and massive use of open courses MOOC (Massive Open Online Courses) [13]. In addition to that, ways of accessing high-quality online education have also been explained. These seminars indicate that even at the institutional level action is being taken for the promotion of OER, in accordance with the current legal regulations. Also, at the Mathematical Institute SANU a lecture was delivered entitled "Digitization and the Knowledge Society", related to free licenses, Wikimedia projects and all aspects of intellectual property in academic projects and papers. The popularization of development, implementation and use of OER in Serbia requires the organization of similar activities at a national and institutional level. Such seminars enable the improvement of educational culture and refer to the OER as the new value to be included in the concept of open education, with the initial aim of building trust in OER [14].

Starting from the basic requirement for working with the OER, which is the availability of ICT, the Information Society Development Strategy [3] is directed towards the maximum utilization of the potential of ICT to increase the quality of life. Among other things, the strategy [3] assumes an "open, accessible and high-quality access to the Internet," which is a basic requirement for the development and use of OER.

In Serbia, there are several attempts to develop OER either using well-defined practices in other countries or their own solutions.

The Khan Academy [15] is an example of a non-profit educational website generated in 2006 in order to facilitate free education "for everyone and everywhere." In Serbia, the translation of videos first started in mathematics. Translation of related materials for other areas is also planned. At the moment about 400 videos have been translated and over 150 have been synchronized. The above mentioned video recordings are available at: <http://www.youtube.com/user/KhanAcademySerbian>. A part of the translated recordings are a result of a co-operation with the LINK Group and the Faculty of Philology in Belgrade, while the rest are the result of the work of volunteers and interested individuals. In addition to the translation of educational content, the Khan Academy in Serbia works on the translation of the Khan platform and interactive exercises. The platform is almost completely translated and is available at: <http://translate.khanacademy.org>. The current work is related to the planning of translating exercises. Also, the initiative on mapping the mathematical content to the curricula of individual countries has been raised, which is a significant step towards using the material in formal education.

The Belgrade University Library "Svetozar Marković" developed a project of translation of courses and free learning materials into Serbian [16]. This is also an example of a contribution to the broadening of existing MOOC practices, and the existing platforms for the development and sharing of OER. Moreover, this example shows institutional efforts and initiative in the development of OER, in accordance with existing legislation.

In addition to the existing solutions in the framework of the Khan Academy and the MOOC, original environments for setting and sharing learning materials have been developed. Within the Creative Commons project [17] in 2007, Creative Commons national standards were accepted and some examples of good practice in Serbia were listed.

For the purpose of free exchange of knowledge and participation in the acquisition of educational materials, Wikimedia Serbia was formed in 2005 [18]. It is a non-profit, independent organization that supports free knowledge and related projects. Wikimedia Serbia is an association of citizens currently implementing several projects. This association has been working on the implementation of the Creative Commons licenses in the legal system of Serbia, according to the rules of the international Creative Commons procedure. These licenses are in compliance with national laws and languages, and are also internationally recognized. Wikimedia Serbia is working on popularization of Creative Commons licenses by supporting the project "Creativity and knowledge-based society" within which, among other things, a discussion on intellectual property and open forms of intellectual interaction in digital conditions was launched. In addition to the above-mentioned project, Wikimedia Serbia cooperates with various organizations in organizing seminars and activities that lead to the popularization and education.

Apart from Wikimedia, the New Media Center\_kuda.org [19], an independent organization that brings together artists, activists within the media, researchers, and the general public in the field of information technology, has been operating in Serbia. This organization deals with the potential of information and its influence on political, economic and cultural relations in the society.

The newly formed "Balkan Distance Education Network BADEN" [20] was also created with the aim of hosting resources and information related to open, distance and e-learning. The plan of development of this platform includes providing a base for sharing OER.

### 3.2 Montenegrin perspective

In Montenegro, there is currently no platform that encompasses OER solutions, or provides some form of on-line courses and learning materials, and it is therefore necessary to form an action plan. The formation of the Open Source Academy at certain universities and ICT centres and bodies for maintaining OS licensing and standards, opens up the possibility of membership in networks of international organization.

In cooperation with the Ministry of Information Society and the Ministry of Education and Sports, activities are planned on creating an environment to help local companies become interested in generating didactic software, of which a significant portion should be on OS platforms, as well as on finding the possibilities of activating the existing didactic software for learning. An implementation of the Moodle LMS (Learning Management System) is planned to support existing educational programs, as well as training of teachers for preparation and use of OER. In addition to that, it is necessary to implement OS in educational institutions with Moodle LMS

support for existing educational programs to prepare lectures, as well as to train teaching personnel.

The Action Plan [21] should include the creation of portals for the distribution of the OS software, the exchange of experience in this field for students and teachers, a didactic portal in CIS (Information systems Centre) of the University of Montenegro to serve the needs of university units, and an upgrade of the existing portal of the Ministry of Education and sport to serve the needs of schools. The portal should create a forum within which users could ask questions, express opinions on the software and exchange their experiences regarding the use of specific didactic software.

In the period from 2009 to 2013, progress has been made in the development of ICT and in raising awareness about the importance of open source technology, as well as in spreading information literacy among teaching staff. An actual membership of the national CIRT (Computer Incident Response Team) team was achieved in the FIRST international organization that brings together teams fighting cyber threats around the world. The implementation of the "ECDL for digital Montenegro" provided training for 3500 civil servants who received ECDL certificates for working on computers, of which 2026 candidates were employed in education. Also, 1500 computers were donated to 804 students from 93 schools in 11 municipalities in the north of Montenegro [21]. The strategy also envisaged a body for maintaining OS licensing and standards in Montenegro's education and research network (MREN). At the beginning of 2012, an Action Plan for the Implementation of the Strategy for Development of Open Source Technology was adopted, which provided for a range of activities in the IT sector and promotion of the Open Source ideas.

To some extent the implemented activities contributed to raising awareness about the importance of e-learning, and to the acquiring of the habit of using OER. The main prerequisites for further progress are improving information and web platforms, and developing high-speed broadband access for all subjects.

### 3.3 Bosnia and Herzegovina perspective

With regard to OER, the University of Tuzla has no organized system in terms of legislation and overall technical requirements, although it has implemented an integrated module for electronic teaching. The implementation of modules for electronics education for all faculties of the University of Tuzla (all subjects, all teachers and all students) was realized by integrating module related to coverage of teaching, student services and the data base of curricula. This has opened up the possibility of authorized access to resources (because it is connected to the RADIUS server) and the possibility of interaction of each student and teacher and staff member through the e-learning module, that is, open source LMS solutions. For this purpose, software tools such as Apache, PHP and MySQL were used. For hardware resources, the server system of the University of Tuzla, and the available network and storage space were used.

For now, there is no commitment to the development of the teaching staff, capable of supporting the educational process, based on the use of ICT. The use of ICT in education [22] and teaching is usually determined by the content of communication between students and computers. The education system in BH is mostly confined to the modality of learning about the computer. When it comes to the use of ICT to support learning and distance learning, there are no precise facts on the real situation in BH. There are several examples in Sarajevo (Faculty of Economics, case studies at Loyola University - Chicago, E-Net Center - GDLN), Mostar (School of Computer Science) and Tuzla. It is safe to say that the educational institutions are on their own with regard to strategic decisions and are not part of an interest group or appropriate institutional environment. There is no financial concept which would follow the practice of development and introduction of ICT in education, either on the entity or at the state level, though it cannot be denied that financial preconditions to support these activities exist and have existed before.

In this context, it is necessary to introduce and ensure broad acceptance of information technology and IT tools as the normal means of daily work of the teaching staff and students, to improve communication between teachers and students, to improve communication within educational institutions (simplified and partially automated exchange of data and documents), to improve communication with other institutions in the country and the world, to provide an effective integrated support to operational activities, to develop and offer quality courses supported by methods and technologies of distance learning and OER, and to educate teachers to use ICT, OER and distance learning.

The University of Tuzla covers over 5000 m<sup>2</sup> of wireless infrastructure that is intended solely for the student population to download content within the teaching process at the University of Tuzla, as well as for basic access to internet services. A centralized database of enrolled students automatically generates access data to activities in student services, generates e-mail addresses and provides SSO services for the integrated web services. In addition, 6 km of fibre optic installations connect objects through the city centre with proper and sufficient capacity needed to deliver demanding multimedia content. For the purposes of teaching and distributing teaching materials "e-learning" is used, a platform organized on a modified Moodle, OpenSource solution [23,24].

The delivery of other services such as radio streaming, e-mails, notification to students, weather forecast and the University sport activities, is distributed through an already existing portal for students that can be used for the BAEKTEL project. It is integrated with the existing, abovementioned services into a visual entirety, with access through <http://student.untz.ba>. All thirteen organizational units of the University have a single access through the Faculty of Electrical Engineering to the internet service provider (BH Telecom). At the Faculty of Electrical Engineering a central communication room, which houses eight physical servers that run on Linux/Solaris platforms, is located. In addition to these servers, the Centre for Distance Learning at the University of Tuzla has two of its own servers, the Web and the Streaming Server for storage and delivery of electronic, audio and video learning content. On these servers platforms for learning, Learning Cubes and Test Forms are located. Each of the thirteen organizational

units of the University has a web page within the untz.ba domain. The university centres also have their own sub-domains within the untz.ba domain. Currently the University of Tuzla has two multimedia rooms located on the site of the laboratory complex of the Faculty of Electrical Engineering at the Gymnasium "Meša Selimović", which are equipped with sophisticated audio, video, presentation, communication, computer and videoconferencing equipment. Their purpose is manifold, as they can be used in distance learning through video conferencing, seminars, congresses, conferences, targeted practical training and the like.

At the University of Banja Luka, the ICT infrastructure is not sufficiently integrated, and consequently the University does not have all the necessary resources for reliable storage of OER content. On the other hand, there are low-budget or completely free initiatives where the teaching staff independently created and uploaded OER content using free services for their storage and publishing (Google Sites, YouTube). Examples of such initiatives can be seen on the pages of [www.budi.inzenjer.org](http://www.budi.inzenjer.org) and [www.agfbl.org/predmeti](http://www.agfbl.org/predmeti). A number of the faculties of the University of Banja Luka use the Moodle LMS platform, but in a closed form, where educational materials are available for enrolled students only, thus it cannot be said that they are OER. Nonetheless, it is certainly a good starting point for future creation of OER.

#### 4 Weaknesses, deficiencies, and ambiguities in OER implementation

Although there is an evident constant growth of e-learning and digitization of content for learning in the Western Balkans, there are still significant weaknesses in the development and implementation of OER. In the plan for implementation of OER it is necessary to predict the weaknesses, difficulties and ambiguities that arise during the implementation of OER. The implementation plan is one of the necessary activities and is a prerequisite for an effective and efficient implementation of OER. According to [25] the implementation plan includes:

- Identifying activities, barriers and potential proposals for overcoming them;
- A detailed description of all activities;
- The allocation of responsibilities and defining time frames.

Potential problems are identified with a defined plan and specific actions, as well as the ways to overcome them. Besides difficulties in the implementation of OER, there are also benefits, and in this section the difficulties of OER implementation in the Western Balkans will be highlighted, followed by a SWOT analysis systematizing:

- Strengths: characteristics of the implementation that provide benefits and incentives in relation to others;
- Weaknesses: characteristics that hinder the process of implementation and are typical for the Western Balkans;
- Opportunities: features related to the elements that lead to advantages;

- Threats: characteristics of the environment that could lead to problems in the implementation.

Through the SWOT analysis below, strengths, weaknesses, opportunities and threats are determined, with various levels of significance. Table 1 shows the abbreviations and meaning of elements of SWOT analysis as well as possible quantifications of assessment [26] that will be used in this report.

Table 1: SWOT analysis and quantification of significance [26].

Strengths	S
Weaknesses	W
Opportunities	O
Threats	T
Highly significant	+++
Moderately significant	++
Of little significance	+
Without significance	0

### **S-Strengths:**

- Availability of information on the implementation of OER, experiences and current strategies related to OER; ++
- The process of decision making and implementation of OER includes not only teachers and staff, but also interested individuals; +
- A large number of educational institutions has computer equipment and internet connection; +++
- Computer science is a compulsory subject in primary and secondary education curricula; ++
- There are special programs focused on the acquisition of specific ICT skills; +
- There is a willingness of academic institutions for further implementation of OER through formal and informal education; +
- Low cost of the production and publishing of OER (using free internet tools and services for their creation, storage and publishing) with high and permanent value generated (once created the resource has a virtually unlimited shelf life) +++
- Existence of strategic development plans and action plans; ++
- A respectable professional potential of alumni at home and abroad; ++
- Intensive cooperation with the international academic community; ++
- Quality of human resources; +++
- A system of quality assurance established in all public universities; ++
- Existence of the necessary critical mass of teachers and staff who are ready to reform; +
- Awareness of their own responsibility for the development. ++

### **W-Weaknesses:**

- Lack of professional internal control in the area of implementation of OER and resource sharing; ++
- Unclear definition of jobs and individuals responsible for monitoring OER implementation; ++
- Insufficiently developed system of feedback from people who use OER; +++
- Insufficient development of the system of vocational training related to implementation of OER; +
- OER is applied by a small number of subjects with insufficient technical equipment; ++
- IT content on OS platforms is not sufficiently represented; +++
- No targeted training for implementation of OER; ++
- Didactic software not provided in the teaching process; +++
- There are no defined plan for the procurement and licensing for the selection and application of didactic software; +++
- Lack of staff and informal skill trainings; ++
- Non-compliance of the Law on Higher Education with the Framework Law on Higher Education of BH; +
- Disintegration of three public universities in Serbia; ++
- Predominant focus in teaching on the transmission of information and “adoption” of knowledge; +
- Lack of a stable source of scientific research funding; +++
- Lack of involvement of students in scientific research work; ++
- Insufficient and inadequately resolved funding of higher education; ++
- Relatively poor motivation of university staff; +++
- Poor investment in the training of teachers and staff on the use of new technologies and techniques; ++
- Lack of quality administrative staff to support the activities of international cooperation; +++
- Inadequate monitoring of the implementation of decisions and legislation; +++
- Inadequate infrastructure in the field of ICT; +++
- Insufficient number of training abroad; ++
- Insufficient number of research projects with the industry; ++
- Inadequate cooperation with the industry; ++
- A large percentage of "brain drain". +++

### **O-Opportunities:**

- Cooperation with European universities and institutions that successfully implement OER; +++

- Provisions for improvement of professional competencies of non-teaching staff in the field of OER; +
- International IT projects are of special interests for OER promotion; ++
- Affirmation of OER and ideas is done through inter-academic cooperation;
- Awareness among the public about the necessity of joining the European higher education area; ++
- The possibility of active participation in various European projects; +++
- Constant increase of demands from the industry for lifelong training; +
- Linking of different scientific areas and initiation of interdisciplinary projects; +
- Regular monitoring and support for quality improvement, raising awareness about the quality; ++
- Ability that technology transfer offers for faster acquisition of knowledge; ++
- Possibility for involvement of our experts from abroad. +

#### **T-Threats:**

- Lack of a strategy pertaining to OER; +++
- Basing the work on the implementation of OER only on the enthusiasm and motivation of individuals or groups, not on an organized structure that would continuously work on the development and implementation of OER, followed by quality monitoring; +++
- Lack of training funds for those interested in training in the field of OER implementation; ++
- Economic instability; +
- Insufficient access to broadband Internet; +++
- Lack of awareness and resistance to changes in the implementation of new solutions; +
- Lack of awareness about the importance of OER; +++
- Unresolved funding system for higher education in BH; ++
- Lack of a clear strategy for the development of higher education at the cantonal level in BH; ++
- Incomplete legislation and poor implementation of existing legislation; +++
- Limited employment opportunities for scientific staff; +
- Constant "brain drain"; ++
- Uncontrolled development of higher education institutions in different parts of BH at the expense of quality; +
- Weak feedback between the industry and universities; ++
- Lack of culture of lifelong learning. +++

## 5 Ways to improve the offer and implementation of OER

In addition to the outlined categories in which weaknesses, difficulties and uncertainties are identified, this section provides potential solutions for overcoming the perceived barriers. Suggestions for corrective measures and actions to improve the quality are as follows:

- Include all employees of the institutions that implement OER in accordance with their professional functions in all of the phases of implementation and quality control of OER, with resource sharing and constant collaboration;
- Develop a methodology for evaluating the OER implementation;
- Consistently monitor the progress of the prescribed procedure, and take measures for ensuring quality;
- Benchmark the performance of the procedure implementation and the measures for ensuring quality;
- Provide training in quality assurance of OER implementation;
- Develop institutional strategies for OER implementation;
- Continuously promote existing and ongoing work on the development and use of OER;
- Within the forthcoming activities perform an analysis of the institutional needs in the field of OER use;
- Provide for a comparative analysis in the field of OER development and use through constant exchange of persons involved in the development and use of OER, at home and abroad;
- Systematically promote the benefits and opportunities of OER;
- Improve collaboration between individuals and institutions involved in development and use of OER;
- Create an action plan to define a platform that integrates OER solutions or provides some form of on-line courses and learning materials;
- By creating Open Source academies at universities and ICT centres, educational and research networks can become members of international organizations and follow standards of Open Source;
- Create an environment for the inclusion of companies to produce didactic software, of which a significant portion should be on the OS platform;
- Include creating a portal for the distribution of OS software, exchange of experience in this field for students and teachers, and a didactic portal for the university in the action plan;
- Create a portal with a forum in which users can ask questions, express their opinion on the software and exchange their experiences in the use of a didactic software.

## 6 Conclusions

The use of OER enables the implementation of technologies that radically improve the educational process and contribute to the advancement of scientific collaboration. Companies that are in the process of transition and development of new knowledge-based economies have a special importance in further development of these technologies. The commitment that Western Balkan countries channel their economic development towards knowledge and innovation in the EU accession process requires the application of new technologies to strengthen the institutional mechanisms for the development of OER.

It is necessary to improve the legislation for the development and implementation of OER, as well as to organize the promotion of awareness about the importance, need for and opportunities of OER, by linking the educational system and economic systems.

In order to foster innovation and promote development, the educational process should be directed toward research for which OER is an important platform. Young researchers should especially be encouraged towards knowledge innovation through various forms of education using web technologies.

The development and advancement of knowledge requires greater investment in professional educational training and fostering of the implementation of innovative technologies. Special effort should be made towards integrating the expert resources within the academic community as a nucleus for further expansion and application of OER.

Getting acquainted with European achievements through participation in international projects provides an opportunity for recognition and enforcement of European values and harmonization of individual practices and laws.

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