



Guidelines for OER creation and publishing

DEV 2.1



BAEKTEL

Blending academic and entrepreneurial knowledge
in technology enhanced learning

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Authors - listed alphabetically		
Name	Organization	e-mail
Aleksandar Borković, UBL	University of Banja Luka (UBL)	aleksandar.borkovic@baektel.eu
Maja Ilić, UBL	University of Banja Luka (UBL)	maja.ilic@baektel.eu
Dijana Majstorović, UBL	University of Banja Luka (UBL)	dijana.majstorovic@baektel.eu
Nataša Mrđa, UBL	University of Banja Luka (UBL)	natasa.mrdja@baektel.eu
Marija Radojičić, UB	University of Belgrade (UB)	marija.radojicic@baektel.eu
Irena Rajlić, AMP	ArcelorMittal Prijedor (AMP)	irena.rajlic@baektel.eu
Saša Tatar, UBL	University of Banja Luka (UBL)	sasa.tatar@baektel.eu

Dragana Tepić, UBL

University of Banja Luka (UBL)

dragana.stokic@baektel.eu

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Glossary of terms

Lifelong learning

Lifelong learning is the ongoing, voluntary, and self-motivated pursuit of knowledge for either personal or professional reasons, [3].

edX

EdX is a MOOC provider and an *open source* platform developed by MIT for online learning.

E-learning

Learning conducted via electronic media, mostly on the Internet.

Instructional design

Instructional design is the theory which identifies the methods of instruction which support and facilitate the learning process, as well as the situations in which a certain method should be used or not [3].

Information Communication Technology- ICT

Information and communications technology is often used as an extended synonym for information technology (IT). However, it is a more specific term that focuses on the role of unified communications and the integration of telecommunications (telephone lines and wireless signals), computers as well as necessary software and storage which enable users to access, store, transmit, and manipulate information [3].

Open Access Publishing

Open access publishing usually refers to unrestricted sharing of access to journals across the world in order to provide free and unrestricted access to their content.

Massive Open Online Course - MOOC

A massive open online course is an online educational course aimed at unlimited participation and open access via the web. The upgrade to traditional courses, massive open online courses provide significant participant interaction in the teaching process through user forums [3].

Open License

Open license is a standardized method to grant permission and state restrictions to accessing, using, repurposing, reusing and/or sharing copyright material (sound, text, images, multimedia, etc.), [2].

Open Educational Resources - OER

Open educational resources are teaching, learning and research materials in any medium available in the public domain or released under an open license that permits access, use, adaptation and redistribution by others with no or limited restrictions [1].

Open standard

An open standard is a standard that is publicly available and has various rights to use associated with it [3].

Intellectual Property Rights - IPR

Intellectual property rights include rights over patents, copyrights, industrial designs, trademarks, etc., [3].

Deeper learning

In addition to enabling students to acquire basic knowledge, the concept of a deeper learning prepare students for critical thinking and continuous education with an aim to practically solve new problems they will face in their careers, [4].

Tutorial

A tutorial is a method of transferring knowledge that can be used as a part of a learning process. [3]. This document uses the term tutorial mainly to refer to audio and/or video material explaining a particular concept or demonstrating a procedure on how to solve a particular problem.

Distance learning (education)

Distance learning (education) is a method of providing education and instruction, often on an individual basis, to students who are not physically present in a traditional setting such as a classroom.

Technology Enhanced Learning - TEL

There is no clear definition of this newly-formed term. In a broader context, technology enhanced learning involves every learning style enhanced by technology.

Digital asset management - DAM

Digital Contents Management involves managing tasks and decisions related to acceptance, labeling, cataloging, storage, retrieval and sharing of digital content.

Introduction

1.1 Purpose of the Guidelines

The Guidelines outline the key issues in production and publishing of OER and provide suggestions on how to integrate OER into higher education process, or the lifelong learning process. The purpose of the Guidelines is to encourage state institutions and competent officials to invest in the systematic production and use of OER and to integrate them into higher education, and to enable the academic staff, students, pupils and all interested individuals to participate in production and use of OER in order to improve the quality, increase availability and reduce costs of primary and higher education. A conscious decision has been made not to provide an in-depth overview, but rather to present the basic information necessary for the fulfillment of set objectives, while readers are encouraged to seek additional information in the references cited and on the Internet.

1.2 The concepts of higher education and lifelong learning

The current model of the education system, based on several centuries old Prussian model of compulsory education does not correspond to the current level of development of technology, economy and society.

This phenomenon is best described in a speech delivered by Salman Khan, [5], (the founder of Khan Academy), describing the transformation of the educational pyramid and expertise of workers during the periods of different levels of development of economy and technology. Prussian education model, which is largely present even today, responded to the economy that required extensive workforce and only a small number of highly educated skilled personnel. With the development of technology and society, the demands of the economy have changed (an increased demand for highly educated staff, and reduced demand for regular workforce). At the same time, the education system has remained largely unchanged, and is unable to respond to the needs of the new age.

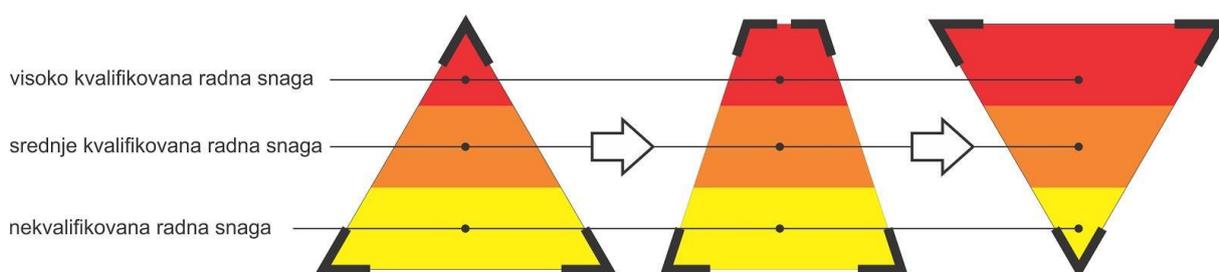


Figure 1 – Education pyramid

A higher goal of OER is to make quality education accessible to all free of charge, regardless of the place of residence and origin. Thanks to the availability of cheap hardware and the increasing connection to the global network, there are conditions to achieve this goal.

1.3 Open licensing and the emergence of OER

Open licenses have resulted from an effort to protect authors' rights in environments where content (particularly when digitized) can easily be copied and shared without permission. The aim of open licenses is to ensure that copying and sharing happen within a structured legal framework that is more flexible than the automatic all-rights-reserved status of copyright. They allow permissions to be given accurately, while releasing the restrictions of traditional copyright.

OER are part of this process. They provide more flexibility in the use, reuse and adaptation of materials for learning in local contexts, while allowing authors to have their work acknowledged.

Some advocates of OER say that a key benefit of open content is that it is 'free', but this is simplistic approach. Open content can be shared with others without asking permission from the author and without paying license or other access fees. However, some important cost of their production and publishing must be taken into account. In order to take effective advantage of OER institutions need to invest systematically in developing courses and materials. It is important to invest time in finding the existing and developing new OER, and acquiring adequate licensing (if material is not openly licensed). There are also associated costs for the procurement and maintenance of ICT infrastructure (for content-sharing via the Internet).

Through such investments, educational institutions improve the quality of teaching and learning. Academic staff enable peers to share materials and enrich the curriculum for students. Institutions using and adapting OER can find this a cost-effective way of investing in materials design and development.

1.3.1 Emergence of MOOC

The term *MOOC - Massive Open Online Course*, as a special form of OER, was coined by David Cormier in 2008 (Cormier & Siemens, 2010) to describe a twelve-week online course offered at the University of Manitoba, Canada, in the autumn of the same year. The course was attended by 25 full-time students and 2300 registered internet participants. The focus of the course was for the participants to generate, share and promote educational material resulting from collaborative learning through social networks through which materials were exchanged, while the role of the instructor was reduced to the level of *nodes* in the network, that is, it was equated with the other participants. The original form of MOOC was called the "cMOOC", where the letter "c" stands for the word connectivism, which refers to the scientific hypothesis of primarily social and cultural context of learning [12].

The first modern *MOOC*, as we know them, were created in 2011, when Stanford University offered three courses (Artificial Intelligence, Databases and Machine Learning) free of charge via the Internet [13]. The difference from other online courses of this kind, which had

already existed for over 10 years, was their large scale and availability. For each of the three Stanford courses over 100.000 attendees applied. Unlike the original cMOOC, modern courses are based on the traditional model of learning, where the lecturer directly transfers knowledge to the students, while the mutual exchange of knowledge between students only occurs only as a side effect. In addition, these courses are precisely structured (they follow a precisely defined weekly program), with pre-defined beginning and at end, with the aim to enable direct transfer of knowledge as on campus, but to a much greater extent. To differentiate between the two educational approaches, the terms “cMOOC” and “xMOOC” were coined, *c* denoting the focus on connectivism and *x* denoting *exponential*, focusing on the massive enrollments, or *extension*, which refers to an online extension of the university (HarvardX being an extension of the Harvard University). Currently, the three largest MOOC providers (Coursera, edX and Udacity) offer exclusively xMOOC's, which will be discussed in the text below.

1.3.2 Definition of MOOC

Although the term MOOC has been in use for a long time, there is no unified opinion about its meaning, and there are many different interpretations [14].

„Massive“

The term *massive* refers to the fact that *MOOCs* are designed to support the simultaneous use of content by a number of users (thousands), with a significant difference compared to typical online courses which is reflected in instructional design of *MOOCs*.

„Open“

Currently, most disagreement is related to the interpretation of the term „open“. The most generic interpretation is that the course can be considered *open* if the user has the possibility of free-of-charge access to the content. However, a number of authors claim that the term does not only refer to free-of-charge access and includes the following:

Open access

A good example of the interpretation of the term *open access* is related to the contents of Khan Academy, because they are always publicly available, and although users have the option to register to be able to track their progress, they do not have to do so in order to have access to the content. On the other hand, most xMOOCs have limited access to content with mandatory enrollment of users, only for the duration of the course. However, some noticeable changes have occurred with the aim to provide a more open approach, so now there are courses which are held annually, where users can join courses at any time and learn the material at their own pace, with no time limits for individual tasks, with the only condition that the course must be completed by the end of the year, otherwise they have to re-enroll in the new version of the course. It can be said that this is a good compromise, since it allows improvement of the course on an annual basis, without disturbing the user with content changes or limiting access to content during the course.

Open content

Open content in the OER context implies legally open licensing, for example, with a *Creative Commons* (CC) license. Such open content is available for anyone to view at any time, to

download, use, share, and “mash up” with their own materials. In cMOOCs, not only is the content open, but each participant is able to contribute to a course, which eliminates the one-way nature of many teacher-student relationships. When it comes to *xMOOC providers*, most of the content is given with limited rights of use. Since contracts for the development and distribution of *MOOCs* are signed by educational institutions with *MOOC providers*, the authors themselves are not able to choose whether their content will be open or not, and although most authors tends to keep their materials open, that is not always possible.

Open platform

For MOOC to be considered open content, the platform that allows the content use should be an *open source* as well [15]. This is not the case with most providers. However, much progress was achieved when in mid-2013 edX made its platform an open source. In this way, all institutions were enabled to create their own instances of the platform where they could publish content on their own terms.

„Online“

In order to be *massive*, MOOCs must be accessible via the Internet, which is why they are called *online* courses.

„Course“

Most participants agreed that, to be labeled a “course,” *MOOCs* should be bounded by time (have a beginning and an end point); should provide a coherent set of resources; and follow a sequence of activities organized by an instructor in order to address specific learning objectives or goals. Reasons given for enforcing the users to take the course at the same pace included motivating active participants to collaborate among themselves. On the other hand, not a single study has confirmed that setting a certain pace has a positive impact on learning outcomes, quite the contrary. It is expected that, with time, an increasing number of courses will either completely remove the time limit, or make it as flexible as possible, following the highly popular Harvard course CS50 - Introduction to Computer Science and Programming, which is now given annually.

Considering the above mentioned, *MOOCs*, cannot always be considered OER, but it is expected that they will become increasingly more open. What is important, is that even now there is a possibility that with minimal resources OER are made available as *MOOCs*.

1.3.3. Structure of MOOCs

The vast majority of existing *MOOCs* are *xMOOCs* precisely structured as weekly sequences of activities, lasting between 2 and 16 weeks (most frequently 6-8 weeks). Instruction is provided predominantly via several short lecture videos (typically each 10 minutes or less in length) per week, sometimes supported by supplementary readings, and problem sets or other assignments. Videos are often punctuated every two-three minutes with automatically graded “*inline*” questions, usually multiple choice answer, to help participants formatively assess their own understanding. Assessments that serve as a basis for the participant’s final score are provided, usually weekly, in the form of auto-graded multiple choice or short answer quizzes, peer-graded assignments, and some auto-grading for computer code (in case of programming assignments). *Online* discussion forums allow participants to engage

with each other and course facilitators for technical and instructional support. xMOOCs are generally delivered via third party, or MOOC provider, such as Coursera, edX, and Udacity. Most courses are “cohort-based” in that they are offered over a fixed period of time, with participants being expected to complete activities within set windows of time. These courses often become unavailable for non-registered participants not long after their conclusion, until the new beginning of the same course (Coursera and edX). On the other hand, some xMOOCs are self-paced, remaining open indefinitely to participants, who can set their own pace (such as Udacity and some courses on edX).

On the other hand, connectivist MOOCs are characterized by a more fluid structure that addresses an overarching instructional goal or question. Instructors may pose initial or weekly questions and challenges, and provide a variety of text-based or media resources. The success of the cMOOC is highly dependent on participant interaction via discussion forums or social networks. Course outcomes are often unique products, such as articles, images, diagrams, or videos generated by participants. The role of the instructor is to act as a facilitator by aggregating, reviewing, summarizing, that is, indexing material and reflecting on participant activity in a daily or weekly newsletter distributed via e-mail. Courses are usually delivered using easily available platforms, such as Blackboard Collaborate, enhanced with collaboration tools. The cMOOCs ranged in length from 4 to 30 weeks.

The table below summarizes key differences between the xMOOCs and cMOOCs.

<i>xMOOC</i>	<i>cMOOC</i>
<ul style="list-style-type: none"> • predefined, structured and sequenced weekly activities • short, content-based videos, additional reading materials, problem sets • auto-graded tests, peer-graded assessments • discussion forum participation optional • delivered via third party (<i>MOOC provider</i>) • cannot be categorized as OER 	<ul style="list-style-type: none"> • collaborative learning system • unique products created by participants (articles, images, diagrams or videos) • instructor is a facilitator who collects, reviews and indexes materials • course success depends on students' participation in online discussions • distribution via existing collaboration platforms

1.4 Advantages and disadvantages of using OER

Types of OER include: full courses (MOOCs), course materials, modules, instructions for students, teacher's notes, textbooks, articles, audio lectures, video lectures, video tutorials, and assessment tools (tests, quizzes).

OER do not automatically lead to quality, efficiency and cost-effectiveness of the educational process. Much depends on the procedures put in place. Well-designed process of introduction of OER can result in a number of advantages compared to traditional approaches, [1, 9, 10, 11]:

1. Improvement of the quality of learning materials through peer review processes and use of modern technology

2. Better preparedness of students for teaching process and improvement of learning outcomes
3. Innovation in the teaching process
4. Studying learning process by analyzing the data on OER use
5. Benefits from contextualization, personalization and localization
6. Openness and availability with low costs
7. Short waiting periods to publish material
8. Building capacity for the creation and use of OER as part of the professional development of academic staff;
9. Serving the needs of particular student populations such as those with special needs
10. Optimizing the deployment of institutional staff and budgets
11. Serving students in local languages
12. Involving students in the selection and adaptation of OER in order to engage them more actively in the learning process
13. Reducing expenses for students
14. Links with alumni
15. Introduction to practical problems firsthand by experts from the industry
16. Efficient and high-quality training of employees
17. Division of the cost related to creating the material between institutions
18. Sharing and cooperation between individuals, institutions and countries
19. Encouraging creation of new educational models
20. Promoting the institution and individuals creating OER
21. Encouraging lifelong learning

It is also important to point to some disadvantages of OER, such as [9, 10, 11]:

- 1) Content quality issues
- 2) Lack of human interaction between teachers and students
- 3) Language barrier since OER are generally available in one language only
- 4) Intellectual property/copyright concerns, especially in the Western Balkan countries
- 5) Sustainability issues, since there is no payment for OER creation or maintenance.

1.5 Document review

After the introduction, the second section provides general guidelines for the participants in the educational process. Relevant documents used for these two sections were [1, 2].

The third section gives an overview of types of OER and their comparative advantages, with special emphasis on the criteria that the material needs to meet in order to ensure the necessary level of content quality. In addition, more detailed practical guidelines for creating quality OER content are provided in this section as well.

2. Guidelines for Higher Education Stakeholders

2.1 Guidelines for government institutions

The roles of governments in higher education vary from country to country, however, governments usually play an important role in setting policies for higher education systems. Their interest is in ensuring that public investments in higher education make a contribution to socio-economic development. Therefore, governments are in a position to require that material developed with public funds be made available under open licenses. While there may sometimes be reasons for not requiring open licensing, the sharing of educational materials can significantly improve the quality and transparency and increase the effects of public investments, by facilitating widespread use of such material with minimal additional investment. Therefore, the key recommendation for government institutions is to **support the use of OER through their policy-making role in education**, and to **consider adopting open licensing frameworks** [1].

Furthermore, government institutions usually provide financial support to higher education. In the context of ensuring continuity and quality of OER content, government should consider **providing financial and legal support to the development of OER** in creating educational policy.

2.2 Guidelines for higher education institutions

Higher education institutions can play a critical role in supporting the teaching staff in the creation of effective teaching and learning environments and providing ongoing opportunities for professional development. Identifying and developing learning resources are both integral parts of this process. Institutions should aspire both to create OER and to use OER from elsewhere.

Well-designed learning resources encourage greater individual engagement by students with information, ideas and content than is possible with lectures alone. By introducing such resources as integral part of the teaching process, limited face-to-face teaching time with students can be more effectively used to foster engagement of students and to nurture discussion, creativity, practical applications and research activities.

In developing courses and learning resources, teaching staff naturally use what is available. The increasing pool of OER not only widens their choice, but also creates opportunities for new resources to be developed to fit the local context in terms of culture and learning needs, avoiding lengthy copyright negotiations or duplicating content development.

Experience shows that by making good quality courses which are publicly available online, institutions can attract new students, expand their institutional reputation and advance their public service role. Such institutions may easily promote their research results and thereby attract research funding. However, institutions should position OER within their institutional

branding and take into account any income that the sales of their educational materials may generate.

In this context, it is suggested that higher education institutions, [1]:

- a) **Develop institutional strategies for the integration of OER.** These Guidelines suggest some elements that institutions may wish to consider in developing and adopting strategies for the integration of OER into a range of activities. The strategy should focus on four key aspects: IPR, human resources, ICT infrastructure and development of high quality content.
- b) **Provide incentives to support investment in the development, acquisition and adaptation of high quality learning materials, such as OER.**

Institutional policies should be reviewed to:

- Encourage judicious selection and adaptation of existing OER, as well as development of new materials where necessary
 - Promote the publication of educational materials as OER within rules on academic advancement, rules on publishing activity, and other legal documents
 - Promote research on using, reusing and repurposing OER
 - Encourage students to publish their work (with the guidance of academic staff and within institutional protocols) under an open license as OER
 - Build OER into mechanisms for institutional and individual monitoring
 - Promote collaboration both within and beyond the institution in developing materials as OER
 - Support academic staff with appropriate incentives and rewards for the development, acquisition and adaptation of learning materials
 - Ensure that staff workload models allow for OER curriculum, course and materials design and development.
- c) **Recognise the important role of educational resources within internal quality assurance processes.** This should include establishing and maintaining a rigorous internal process for validating the quality of educational materials prior to their publication as OER.
 - d) **Consider creating flexible copyright policies.** Such policies could make it simple for academic staff to invoke some-rights-reserved copyright when publishing OER, when this is deemed necessary. These policies could be part of a wider institutional process to ensure that rules on IPR and privacy policies are in place and accurately reflected in all legal contracts and conditions of employment.
 - e) **Undertake institutional advocacy and capacity building for OER.** Ongoing awareness-raising, capacity-building (staff development) and networking/sharing can be carried out to develop the full range of competences required to facilitate more effective use of OER. These activities should aim to encourage a shared vision for open education within the organization, which would ideally be aligned to the institution's vision and mission.
 - f) **Develop a strategy to motivate the academic staff to develop OER.** For most academic staff members obstacles to the development of OER lie in the fact that the

activities of development of curricula, unlike research programs, are not recognized and adequately evaluated by the higher institutions. The development of such activities should be supported by recognition and verification of the legal documents relating to the academic advancement of the academic staff.

- g) Ensure ICT access for staff and students.** This means striving to ensure that academic staff and students have continuous access to the necessary ICT infrastructure, software and connectivity to access the Internet to develop or adapt educational materials.
- h) Develop institutional policies and practices to store and access OER.** This includes the capacity to store, manage and share resources and content, both internally and externally. This might be done most cost-effectively as part of a national strategy or in partnership with emerging global OER networks and repositories based on open standards.
- i) Review institutional OER practices periodically.** Such reviews will help the institution determine the value of the adopted policies and practices. They could include the extent of the use of openly licensed educational materials in higher education programs. They could also include assessing the effects of this use on the quality of educational delivery and its impact on the cost of developing high quality teaching and learning materials. Best practice cases should be presented in adequate publications for promotional purposes.

2.3 Guidelines for academic staff

Although open educational resources may replace the role of the academic staff to some extent, academic staff play the crucial role in ensuring the quality of teaching and learning content and materials delivered to students. The teachers are central to the teaching and learning experience of students, because they are responsible for the selection of the materials they use in the teaching process – both in using some other resources (other than their own) and in selecting the material to be used in the teaching process. Teachers face a series of challenges, including:

- Time constraints in preparing curriculum and adapting the existing or developing new teaching and learning materials and tools
- Restricted access to high quality, relevant teaching and learning materials, on the one hand, and constant increase of educational resources on the Internet, whose relevance has not been confirmed, on the other hand
- Diverse needs of students in learning
- Changing teaching and learning environments (from teacher-centered to learner-centered approaches)
- Obtaining license to use protected educational material
- The need to cover a broad and growing knowledge base
- The need to update their ICT skills regularly
- High student expectations
- Ever-increasing competences and participation in many activities within institutions

Some of these problems can be reduced or eliminated with the use of OER. The course curricula depends on the teacher's decision which material to choose, how to use it and adapt it to the context of the course, and how to integrate it into learning activities, which will affect the quality of teaching, [6]. In introducing OER in the teaching process, it is suggested that academic staff in higher education institutions [1]:

- 1) **Develop skills to evaluate OER.** A good starting point is to explore existing OER and determine what might be useful in their courses and serve as an inspiration to improve their teaching materials. Such research and open discussion may encourage the academic staff to adapt existing and publish new materials, which could contribute to the knowledge acquisition, globally.
- 2) **Consider publishing OER.** For most academic staff, the first step could be publishing materials that are already being used in the teaching process, with the possibility of open discussions with colleagues (peer reviews).
- 3) **Assemble, adapt and contextualize existing OER**
- 4) **Seek institutional support for OER skills development.** In order to develop OER, academic staff will need to acquire skills and competences relating to curriculum materials design. The academic staff should receive institutional support for technical and professional development in this area.
- 5) **Encourage student participation in OER development and evaluation**
- 6) **Promote OER through publishing about OER**
- 7) **Provide feedback about and data on the use of the existing OER.** Providing feedback and data on the OER that have been created, specifically relating to support in meeting learning goals and student needs, is an invaluable contribution to effective use of OER.
- 8) **Clearly define information on IPR, copyright and privacy policies.** It is particularly important to be clear about rights of use and privacy of the OER published – what can be used and copied and in what manner.

2.4 Guidelines for student bodies

As the role of universities has evolved, so has the role of the student. The students are now generally perceived as the bearers of knowledge and experience, and they play a significant role in their education. Consequently, the educational experience of students should include *deeper learning* that will enable them to be active members of society. These skills should be developed along with mastering the basic academic content and academic and other forms of literacy.

Emerging trends include a need for active global citizenship, employability, transferable skills and knowledge, communication skills, creativity and innovation. Some of the key challenges include meeting the rising costs of education (including textbooks) and identifying appropriate educational courses/programs that meet learning needs. Effective OER use can contribute to resolving these challenges, both by making the content of educational programs more transparent and lowering the cost of accessing them.

When adequately supported, students have great potential to support higher education providers in sourcing, adapting and producing OER in partnership with academic staff.

To promote these changing student roles, student bodies have to play an active role in shaping the educational experience. Although creating teaching and learning environments that harness OER in educationally effective ways is primarily the responsibility of academic staff, student bodies — as key stakeholders in higher education — should be aware of the relevant issues and integrate them into their regular activities [2].

In this context, it is suggested that student bodies [1]:

- a) **Understand the importance of OER and undertake advocacy of OER.** Student bodies can actively promote awareness among students of the potential of OER to improve the educational experience, based on the understanding of educational and economic benefits of OER [1,2]. Student bodies could also support and advocate the sharing of publicly funded educational materials under open licenses and understand students' own roles as knowledge producers and active participants in the learning process. Student bodies can also collaborate with other countries' student bodies with similar focus on OER. [7].
- b) **Encourage their members to publish work as OER.** Students can make a significant contribution to increasing the use of OER by publishing their work (preferably under the guidance of academic staff and within institutional protocols) under an open license. A repository of student work could serve as a powerful learning resource, while also raising awareness about the distinction between appropriate sharing/collaboration and plagiarism.
- c) **Take an active role in assuring the quality of OER through social networks.** Student bodies can encourage students to participate in social network discussions created around OER repositories and beyond, so that they play an active role in assuring the quality of content by commenting on what content they find useful.
- d) **Recognize that ICT are an increasingly important part of the higher education experience and are often crucial for students with special educational needs.** Student bodies should engage in institutional decision-making processes to ensure that the ICT solutions chosen are directly useful to students, and that they are inclusive and conform to existing open standards.
- e) **Encourage student participation in activities to support OER development.** Student bodies can actively support and promote strategies to allow students to assist in sourcing, adapting and producing OER in partnership with academic staff. Furthermore, student bodies can help to shape the nature and quality of students' educational experiences by encouraging and supporting the use of OER for the purposes of self-directed study and, at the more advanced levels, by having students create their own curriculum/courses of study.

2.5 Guidelines for accreditation bodies and academic recognition bodies

Quality assurance and qualifications recognition have become central elements of higher education at all levels because of its increasing diversity and the mobility of students, researchers and other professionals.

Quality assurance is primarily the responsibility of higher education institutions, although external quality assurance bodies (accreditation bodies) play an essential role in fostering a quality culture through the assessment of programs and institutional quality assurance mechanisms. When assessing the quality of teaching, accreditation bodies normally consider the educational resources that are produced, adapted and used by the institutions (including OER). Quality assurance bodies therefore have a role in ensuring that policies are in place to support the use of OER.

Recognition bodies should also have an understanding of the role of OER in higher education to ensure the fair recognition of qualifications. The missions of accreditation bodies and recognition bodies are closely linked, and recognition bodies often rely on information provided by quality assurance bodies. Therefore, recognition bodies are also likely to consider the educational resources produced, adapted and used by the awarding institution.

In this context, it is suggested that quality assurance bodies and recognition bodies [1]:

- a) **Develop their understanding of OER and how it impacts quality assurance and recognition.** This includes ensuring that professionals involved in accreditation and recognition are aware of the increasing importance of OER in the development and use of educational resources by higher education institutions. Particular attention might be paid to the IPR and copyright, and to developing an understanding of the range of licensing options available for educational resources.
- b) **Engage in debates on OER, in particular on copyright.** Like all other stakeholders in higher education, accreditation bodies and recognition bodies will need to influence policy developments around OER, focusing on both the opportunities and challenges that OER create
- c) **Consider the effects of OER on quality assurance and recognition.** As OER become more common it is increasingly important to ensure that accreditation and recognition principles and processes support the effective use of OER. In this regard, it will be important to review the role and use of OER in improving the quality of teaching and learning and develop criteria for assessing the effectiveness of the integration of OER into institutional practice.
- d) **Accept OER as good practice in quality assurance and recognition.** If OER are accepted as good practice by higher education, then accreditation processes may redefine their scope and outreach. This would ensure a shift in focus towards embedding the creation and use of OER in the institutional culture while monitoring their integration into internal quality assurance practices.

2.6 Guidelines for business entities

OER can provide a strong support to business entities by assisting their human resources to achieve better results, create new values, overcome cultural differences and experience cultural transformation, supporting the implementation of business strategies and policies. Many companies have recognized the importance of OER use in supporting employees in the acquisition and development of personal and professional skills.

On the other hand, direct participation in the development and publication of OER allows businesses entities to build their business reputation and promote its brand among prospective clients, throughout the community and among students, future professionals and prospective employees. With this in mind, the management should motivate the experts with incentives to become involved in the development of OER content. These incentives can be cash bonuses reallocating funds from marketing, or simply allocating a certain part of the working hours to work on the development of OER.

In this context, it is suggested that business entities:

- a) **Include the strategy of using OER, as a form of continuing education of employees, in company policy.** Business entities may represent capacity building through a continuous educational development of employees, and encourage the vision of open education and lifelong learning within the company, which would be in line with internal policy and mission of the company.
- b) **Raise awareness of the role of educational resources in the framework of business quality assurance.** It is necessary to develop a program of inclusion of educational resources as a form of professional development of staff, in order to improve business quality and achievements of business entities.
- c) **Develop a strategy to motivate the employees to use and develop OER.** Business entities can make the effort to recognize and adequately evaluate the efforts of employees who contribute to the quality of work through the development of their skills by using OER.
- d) **Provide management and the employees with access to ICT.** This implies that management and staff are to be provided with a continuous and unhindered access to ICT infrastructure, software and the Internet to facilitate staff development through the use of educational materials.
- e) **Establish a system of measuring the contribution based on the program of continuous education of employees.** Companies can establish a system of key performance indicators (KPI) and measures of "return on investment", that is, the comparisons of business quality in relation to investments in ongoing education of employees through OER.
- f) **Cooperate with educational institutions in order to promote the concept of OER and lifelong learning.** Business entities can promote cooperation with educational institutions by providing support in the creation of educational resources through joint projects.

2.7 Guidelines for experts from industry

Open online educational resources can be of great benefit, for the companies as well as for individual experts from industry. Online resources are readily available source of knowledge which objectively generates lower costs and it is much easier to incorporate this method of learning into a working day.

3. Guidelines for developing high-quality OER

Bearing in mind the objective of the project which involves the creation and availability of educational content from different academic areas and from the enterprises, it is proposed that materials be created and published in various forms. Although educational topics can be very diverse, it is considered that it would be good to enable the use of different ways of presenting educational content.

It is proposed that the majority of the material be based on electronic courses in accordance with the basic pedagogical-didactic requirements. It is also proposed that the existing materials such as textbooks, reading materials, presentations, videos, etc., be made available. In order to further improve materials and make them interesting to end users, different forms of multimedia will be combined, such as video recordings, audio recordings, animation and photography. The basic idea is for the users to become active stakeholders in the learning process, which is why special reference will be made to the establishment of interactivity through different types of questions and tests.

3.1 Types of content, their advantages and disadvantages

Depending on the medium used, OER can be separated by content type into:

- a) text led
- b) graphic led
- c) audio led
- d) video led.

The text below describes the benefits and weaknesses of different types of content with respect to the following characteristics:

- **speed of data transfer** - the time it takes the user to visually process the content and receive content data.
- **data retention level**—the amount of data received that the user keeps in the long-term memory, according to Dale's cone of experience [16].
- **content visibility** – refers to user's ability to quickly find the required piece of content information (e.g. text and graphics can be skimmed relatively quickly, while audio and video recordings have to be rewind manually, which is why their visibility is much smaller).
- **content searchability** - possibility of machine search of content using keywords and phrases, without its previous textual tagging and indexing.
- **content editing** - takes into consideration the resources, knowledge and skills of the author to edit the content.
- **production cost** - includes all types of resources (time, money, material and non-material costs).

Considering the level of technological development of society and project target groups, certain characteristics that have a reduced impact on the usability of content, such as the size of the content, accessibility, etc., have been deliberately omitted.

Table 1 – Overview of advantages and disadvantages of individual types of contents

Type of content	Advantages	Disadvantages
Text led	low production costs, good searchability, good visibility, easy to make changes	low data transfer rate with only 10% retention
Audio led	a higher degree of data transfer with 20% retention	high production costs, very poor visibility and searchability of content, it is difficult to make changes
Graphic led	low production costs, good transparency, high data transfer rate with 30% retention, relatively easy to make changes	poor searchability (possible only with indexing or accompanying text)
Video led	a high degree of data transfer with 50% retention	extremely high production costs, poor visibility and searchability of content, very difficult to make changes

General guideline for choosing the appropriate medium may be the amount of data transmitted and their complexity. If there is a large amount of data, a combined textual and graphical representation should be considered. If the text includes frequent references to a particular graphics element, it is often more effective to present such content in video format, where the instructor explains presented graphical content, visually indicating its relevant parts or demonstrating its very structure.

It is important to note that, although the video content has the highest transfer rate and data retention rate, its use is not always justified. Avoid the use of video content whose display is mostly static. In such situations, it is much more efficient to combine the text and graphics, or graphics and sound.

The key disadvantage of video content is its poor clarity and inability to search the very content of the video, which is especially important when the user wants to find an answer to a specific question. However, video services, like YouTube, lessen these disadvantages to some extent: by simply keeping the mouse at a certain point on the time axis displays a minimized, frozen view of the video content at a certain point in time; another great feature is the possibility of placing text links to a specific point on the video timeline, which enables machine search, so it is good to combine every video with accompanying text that summarizes it; it also is possible to set markers with textual description to the video timeline, so users can easily find the part of the video that they are interested in, which is of particular importance when it comes to long videos.

There are, of course, many other types of content that are obtained by combining the four types and application software, such as, for instance, interactive learning programs, virtual labs, simulators and the like. One of the ways of combining the contents are MOOCs.

3.2 Basic didactic criteria

When it comes to creating educational materials, one of the important didactic criteria is **adjusting the content to the target group**. Since the project BAEKTEL is primarily concerned with the open education resources relating to higher educational institutions as well as partners from the industry, the nature and the needs of the end users are hard to define. Since the level of education of the end users, nor their age or their motivation for using these means of education is easily predicable, it is important to create courses in a way that would enable the users to be familiar with the aim, knowledge and skills which can be obtained by a given course at all times. To that end, it is necessary to provide a description of the course and of the necessary prerequisites and competences which the user must possess in order to follow the content of the course.

It is desirable to combine different forms of teaching content, such as plain and dynamic text, power point presentations, video clips and animations, etc., in order to adjust the educational content to various needs and learning styles of the end users. Furthermore, the courses based on various types of materials can contribute significantly to keeping the educational materials dynamic, which can play an important role when it comes to keeping the end users motivated. In addition to the important impact of these materials on increasing the motivation among users, integrating various audio-visual components should be essential; it should help users increase the quality of learning outcomes and better understand content presented.

In addition to the above described didactic principle which referred to adapting the educational content to the end users, it is also important that educational materials satisfy the didactic **principle of systematization and gradualism in the teaching process**. This principle can be partly accomplished through structuring and organizing courses. It is desirable to create a clear structure of the course through which the user will gradually advance until the end of the course. It is necessary that all segments which form the structure of the course be combined into a coherent whole. One of the ways to achieve that is to divide the course into sections, sections into units, units into lessons, where lessons can be designed by combining different textual and audio-visual components. When it comes to the structural content of a single lesson, it is recommended that each lesson has a form that can be divided into three basic segments. In the introductory part of the lesson it is desirable to create motivational examples and tasks that will spark end users' interest and introduce the content presented. The main part of the lesson, consisting of the largest part of the planned content, should be in accordance with the didactic principle of science, while the third part of the lesson should preferably contain a short resume as well as some kind of self-evaluation consisting of questions, summaries, quizzes, etc.

Another important didactic principle is **connecting the theory and the practice**. The aim of BAEKTEL is in accordance with the mentioned principle, since it establishes a link and cooperation among the higher educational institutions and companies from the industry. The idea is for the higher education institutions to connect the necessary theoretical knowledge with examples of practical application through courses. On the other hand, partner companies will present practical and theoretical knowledge necessary for practice.

It is also important to adjust OER to the didactic **principle of awareness within the teaching process**. The principle itself refers to the active role of participants in the learning process, as opposed to them being passive bystanders in the process. The users should adjust the learning process to their own needs, and there is a specific interaction between users and the course creator, as well as between users and the learning platform itself. This segment can be improved by combining different types of questions in line with the aims and the desired outcomes of the course, as well as with meaningful animation and interactive applets which will demand direct user interaction.

3.3 Guidelines for MOOC production

Considering the above mentioned didactic criteria, the text below discusses some of the requirements to be met in OER, with special reference to MOOCs as the most popular forms of educational content. These criteria are in accordance with BADEN project proposals that deal with the distance learning system improvement.

- 1) Introduce the lecturer (MOOC creator), put up CV - to introduce the lecturer to the users.
- 2) Prior to creating MOOC it is important to:
 - provide objectives of MOOC and expected learning outcomes
 - specify the necessary prior knowledge for MOOC users
 - provide a brief description of the structure of MOOC
 - give a brief review of the course literature
 - describe the learning pace and the expected activity of users relating to a given content
 - present the possibilities of support and communication between teachers and users
 - refer users to forums and discussion groups within the platform
 - describe the method of evaluation and assessment, if there is one
 - set motivational keynote lecture; it is recommended that an introductory lecture provides a brief overview of the MOOC and includes motivational examples and issues related to the MOOC content
- 3) Enable easy navigation and movement through MOOC.
- 4) Define keywords that relate to the course content that will be used when searching (metadata).
- 5) When choosing content for a specific topic pay special attention to the principle of scientific value.
- 6) Keep courses fresh and constantly improve them.
- 7) It is desirable that MOOC has different content types: electronic books, animation, interactive applets, audio-visual content, tests, quizzes and the like.

3.4 MOOC production costs

The major cost drivers in MOOC production and depend on [14]:

- the number of faculty members participating in the process;
- the quality of videography;
- the nature of the delivery platform;
- technical support for course participants;
- programming for special features such as computer code auto-graders, virtual labs, simulations, or gamification, and analysis of platform data.

An xMOOC production team seldom included fewer than five professionals and, in several cases, over 30 people were involved, [14].

3.4.1 MOOC production resource requirements

Personnel

MOOC production is foremost a team effort, sometimes including technical support staff such as programmers, videographers, instructional designers and graphic designers, in addition to the academic staff. It is desirable to include, in addition to academic staff, students with an aptitude for using IT, as well as those who have successfully completed relevant course. It is estimated that the development of a MOOC requires three to four times greater effort than a traditional course. Instructors usually spent several hundred hours (about 400 per MOOC) over several months preparing course materials and practicing lecture delivery prior to video-taping. To create one hour's worth of MOOC video-lecture requires 3 to 10 hours of preparation, the lower end of the range being in instances where the materials were being re-purposed from existing lectures. To create a ten-minute video tutorial (such as a voice-over-PowerPoint video) requires in average 6 to 8 hours.

In addition to time spent on creating MOOCs, some other considerations have to be taken into account with relation to the lack of engagement of academic staff in other regular activities (publishing papers, participation in conferences, etc.).

MOOC platform costs

In the case of the Western Balkan universities, the opportunity for MOOC distribution most likely lies in the use of some of the free MOOC platforms such as edX, OpenMOOC, Moodle or Canvas Network, set on their own server resources. In the future we can expect some kind of free service for the storage and distribution of MOOCs for all interested institutions, [17].

Videography

Many MOOCs include an hour or more of video per week. Services of the third party can be used for MOOC production (professional cameramen or specialized video production companies), but such engagements require significant financial resources. An acceptable alternative is to develop in-house video production resources (purchase of recording

equipment and technical staff training). Fortunately, good recording equipment (camera, tripod and wireless microphone) is available from € 500.00.

Assessment

Another important feature of MOOCs is student testing and assessment. Assessing students at scale also requires a significant investment of resources, first to develop assignments that can be graded in large numbers and, secondly to devise peer-grading or auto-grading. In most cases, *multiple choice* tests are devised for this purpose.

Obtaining copyright permissions

Additional costs may be incurred for use of copyrighted materials, both for the personnel time involved in obtaining permissions and for fees to cover use of the material. Alternatively, it is possible to substitute copyrighted images and text with open or self-generated artifacts. All major search engines (Google, Bing, Yahoo) offer search, for instance, exclusively, of open source material, which is of great importance when searching for suitable OER material.

Refreshing MOOCs

Whether the MOOC is time-restricted or not, adjustments to its design and content need to be made in time. Human and time resources needed for this activity depend on its scope and effort.

MOOC delivery resource requirements

While some MOOCs are designed to run without involvement on part of instructors, there is almost always a need for some sort of involvement on part of the course production team. It usually involves providing additional explanations, participating in forum discussions, making course corrections or “debugging” the platform or the server.

Other services

Different administrative services can be involved in the creation of a MOOC, in activities such as the regulation of copyright, signing contracts with external stakeholders, awarding academic credit or verified certificates for successful completion of the course, and the like.

3.4.2 Proposed strategy

Given the large resources needed to create and distribute high-quality MOOCs, as well as their complexity in terms of instructional design, it would be unreasonable to tackle MOOC development without gaining the necessary experience in the development of other basic forms of OER material (text, graphics, audio and videos). Therefore, we propose a modular approach, modeled on the Khan Academy, where authors set modest goals and concentrate on the development of individual short video tutorials with the accompanying textual and graphical content and tools for testing concepts presented. It is important to have a global plan, which provides for a combination of individual tutorials in complete lessons, lessons into sections, sections into chapters. The combination of more chapters could be generated as material for one comprehensive MOOC.

At the same time, publishing individual content on the Internet as OER, would enable their selective use - users with prior knowledge could find specific fragmented content with the

information required, without registering for the online course and reviewing all of its materials.

3.5 Guidelines for production of video tutorials

Video materials include audio-visual files in a digital format that can be accessed via personal computers or mobile devices, [18]. After 2006, there has been a noticeable expansion of video content on a variety of topics via Youtube channel. Accordingly, it is expected that there will be an increase in educational video materials as well. Previous studies generally point to the positive effects of the use of video material. Therefore, the authors [19,20,21,22] claim that the use of videos for educational purposes can contribute to the improvement of teaching and learning styles. Furthermore, the authors [23,24,25,26] observed positive attitude towards the use of educational video content among the students, while in [26,27,28,29] it is argued that video content can contribute to the increase of students' competencies. Students defined positive features of video use as: satisfaction of learning by using video, interesting material, a high degree of motivation, usefulness, impact on improving learning [25,29,30,31]. Overall, based on the results of different studies, it can be said that the use of videos for educational purposes has a positive impact on the improvement of student motivation, development and improvement of learning styles and techniques and increases student competencies. Given the advantages and possibilities of video material and its positive impact on the users, we suggest implementing videos in OER content. The text below provides guidelines for creating videos.

Prior to creating the video it is desirable to answer the following questions in order to clearly define the object and purpose of the video.

- What is the purpose of the video (what do we want to achieve with this video)?
- Who is it intended for (who is our target group)?
- What would be the best way to present the content?
- What is the best environment?
- What is the motivation, why is it good to use the video for specific content?
- What materials need to be prepared for lesson presentations?
- What is the prior knowledge of the target group?
- When creating video content improvisation is not desirable. Before recording the video you need to plan in detail the content of the video, create a clear structure that will embrace the content presented.

Since video is a specific form of presenting educational content, it is recommended to keep focus on one topic during the presentation. It is not desirable to represent more topics in one video.

It is advisable to take advantage of audio-visual potential of videos that can be used to properly present a specific topic. In addition to voice-over and texts, which represent the most common content of educational videos, it is recommended to use images, tables and graphs. Also, video presentation should be followed with key words (sentences) put up on the visual display to allow users to follow the content easily. For a video to be coherent, it is

necessary for audio and video content to be aligned. Bearing in mind that a video is a short form of educational content it is not desirable to have long introduction and conclusion. It is recommended that the content is represented simply, with clear explanations and instructions. It is important to focus on the key parts of the material.

As when creating standard educational content, when creating video avoid typographical errors, and especially content errors. It is recommended that the prepared materials be reviewed by several relevant teachers in the field before the release of video. When creating videos pay attention to all the materials used and their licenses. It is very important to properly license a specific video content, which will certainly depend on the content used when creating videos.

3.6 Types of videos

Depending on the topics and objectives which the author wants to cover by using the video and depending on financial resources available, choose one of the following types of videos:

1. Writing or drawing directly on the screen or record the content of the screen. In this case the instructor should not be seen. This type of material can be created by using a tablet or computer using software for screen capture.
2. Recording a lecture in a classroom with students. This type of video is a recording of a traditional lecture most commonly used in MIT Open courses or OpenCourseWare.
3. Speaking directly to the camera or taking a snapshot of a certain process.
4. Recording multiple stakeholders. There is a number of alternatives to consider, for instance, while one lecturer describes an experiment another lecturer conducts it; or you can record a conversation between the two lecturers.
5. Combining the steps described above; for instance, recording lectures with presentation of individual slides on a computer.
6. Some other type of video material.

3.7 Technical features of the video material

The duration of the video

A video is an effective way of presenting educational content, but it cannot keep attention for a long time, and it is recommended that videos used be short. When it comes to educational videos intended for adults, one group believes that the video should not be longer than 12 minutes, while others claim that it is okay for a video to be up to 15 minutes long. However, one should not strictly adhere to the recommended time; exceptions are possible depending on the topics presented. It is recommended that the video is not too extensive, neither in terms of content nor in terms of duration. If the topic is broad and requires a long video, it is desirable to divide the content into smaller segments.

Speaking tone

A difference between educational videos and other educational materials is audio track. It is not desirable that the voice sounds too formal, or sterile like the voice on GPS devices. The tone should be friendly as if the author is talking directly to the user. It is not advisable that the author suggests that the topic is too simple nor that it is something that only the author can understand. It is desirable that the video looks like a conversation. Another effective approach is the presentation of content through conversation between two lecturers. Another good effect may be achieved through moderate use of humor.

Speed of speech

During the presentation speak clearly. Some educators argue that lecturers should speak slightly faster during the video presentation than when explaining the same content live, while others believe they should speak at the pace that is comfortable for the lecturer, and the users can speed up or slow down the video.

Transcript – yes or no?

The teaching community has no unified stance when it comes to the use of transcripts in videos. Some educators recommend reading the transcript when creating the video but suggest that it should be done in such a way that the user does not notice that the speaker is using the transcript, while educators from Khan Academy do not recommend the use of transcripts. It is up to the creators of the course to decide whether they will use the transcript or not, based on their preferences and capacities.

Camera position

Position of the camera depends on the type of content presentation and the type of video material. If it is a tutorial on how to work on a computer, the camera position is not important because the tutorial is recorded by means of software.

When it comes to recording the lecturer, it is important to think about what we want the user to see in the video. If the educator is shown in the video, it is recommended that he/she looks directly at the camera.

When it comes to recording more stakeholders, it is desirable to use two or more cameras so that they can be combined to display a wider and large frame.

Technical guidelines for video equipment, recording and editing content

It is very important that the audio track is clear, so it is not recommended to use the integrated microphone or computer camera. It is recommended to use external variations of these devices. The video should be recorded in HD (min. 1280x720px, 1920x1280px recommended). If this is not possible for technical reasons, then it should at least be in the 16: 9 format.

When recording, if the lecturer makes a mistake, it is necessary to stop, take a break of a few seconds and repeat this segment correctly. Video is a suitable a presentation mode

since individual segments can be easily deleted or changed at a later stage. It is not necessary to interrupt recording and start from scratch if a mistake is made.

It is desirable to edit each video after recording. There is a wide range of programs that enable video editing. During video editing, it is desirable to delete all the background noise or possible bywords of lecturers.

4. ICT solutions for OER publishing

In order for OER to reach their full potential, in addition to high quality, the manner in which they are published is also important. The platform which publishes the content enables easy access to the content and serves as a medium that allows users to interact with each other and to interact with the content. High quality OER, their users and the platform provide rich user experience. Another important aspect when publishing OER is to make content easily searchable. In this way, users are able to quickly find content relevant to their needs or answer to a specific question.

Taking into account all of the above, an optimal solution is a platform consisting of two segments: a **web portal for content indexing** and a **learning platform**.

By enabling advanced search of content within the indexing platform increases accessibility and facilitates data discovery. For this reason it is important that the published content is described in detail using supporting metadata. The most appropriate open source solution for managing digital resources proved to be ResourceSpace [8] platform which offers multiple options for OER metadata management. Also, it is possible to add the advanced search option by keyword, author, area, or multilingual terms, by simply expanding the platform. In order for advanced search to function properly, it is important to enter all the required metadata about the indexed content.

Some of the most popular existing learning platforms are: edX, OpenMOOC and Moodle. During the production of this document, we analyzed and compared these three platforms by defining a number of criteria such as: architecture, functionality, security and so on. It was concluded that edX platform, developed by MIT, provides the richest and the most interactive user experience.

4.1 edX

After publishing the source code, edX became widely popular. Thanks to its modular design and the users' needs, which include custom plug-ins (software plug-ins that can be installed on the basic skeleton to improve functionality), new features (such as forums, equation editor, code execution simulators, etc.) are constantly added. With modern design and user interface, edX is easy to use for both content creators and users. Control panel for authors (edX Studio) makes it easy to combine different types of media and create a course structure that meets the above didactic principles of systematization and gradualism. It is also possible to create interactive tests, to incorporate the option of self-evaluation and monitor users' progress.

4.2 ResourceSpace

ResourceSpace is an *open source* DAM system originally developed for Oxfam by UK company Montala Limited in 2006 [3, 8]. Montala continue to manage the project in addition to providing commercial hosting, support and development services relating to the software.

The system is easy to manage from the web engine, even from an administrative point of view. A particular focus is on the improvement of collaboration between users when assembling resources together for a project. Users can create custom 'collections' which include resources and saved searches, which can be shared with other users, [3, 8].

5. Conclusions

Modern trends in development of technology, economy and society pose new challenges for the modern education system. The speed of creation and flow of information require different approaches to learning and create new opportunities for knowledge transfer. One of the modern means of education is the creation of OER.

The proposed adjustments of the state and institutional regulations can create a favorable environment for acceptance, creation, modification and use of OER.

When creating the content, it is important to pay attention to compliance with certain criteria in order to produce high quality OER. Also, it is necessary to create mechanisms for external evaluation of such content.

Since the OER represent a relatively new way of knowledge transfer, its introduction into the education system requires a series of procedures and rules. The benefit to society can be multifold, since its use contributes to increasing knowledge on a global level.

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Annex 1

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