

---

## A platform for management of academic and entrepreneurial knowledge

---

Daniela Carlucci

Department of European and Mediterranean Cultures, Environment and Cultural Heritage, University of Basilicata, Matera, Italy

Olivera Kitanović\*

Faculty of Mining and Geology, University of Belgrade  
Đušina 7, 11000 Belgrade, Serbia

Irena Rajlić

ArcelorMittalPrijedor, Prijedor, Bosnia and Herzegovina

Nikola Vulović

Faculty of Mining and Geology, University of Belgrade  
Đušina 7, 11000 Belgrade, Serbia

ZoranJevremović

Faculty of Technical Sciences, University of Kragujevac  
Svetog Save65, 32000 Čačak, Serbia

*\* Corresponding author*

### Structured Abstract

**Purpose** – The globalization of business and education on the one hand, and constant technological development on the other hand, imposes the need for companies to continuously improve the knowledge and skills of their staff. The use of Open Educational Resources (OER) could significantly facilitate and accelerate the development and training of personnel. Using OER employees can gain new knowledge as well as improve their knowledge and skills and to apply them in their work more effectively.

The paper aims to provide theoretical and practical insights for the development and implementation of an OER platform for management of academic and entrepreneurial knowledge. Particular attention is paid to the integration of OER with some solutions of the metadata publishing.

**Design/methodology/approach** – Advances in information technology, and especially web technology, have offered many solutions for OER sharing. However, the biggest defect is the weak search ability of these resources on the internet. The amount of resources is increasing every day and users need much more time to find exactly what they are interested in. Because of that, drawing on theoretical studies and practical challenges, the paper deals with the integration of OER platform with some of the

solutions for metadata publishing. Metadata should provide greater visibility and availability of resources on the internet.

**Originality/value** – This paper seeks to shed more light on development and implementation of an OER platform intended primarily for academic education but suitable also for use in entrepreneurship. The development and implementation of an effective OER poses several challenges. First, it is necessary to define the objectives and target groups and, in turn the contents which will be published. Second, it is essential to define an appropriate set of metadata that should not be too exhaustive, but sufficient to adequately describe resources. Third it is necessary to explore the available platforms on the market and choose the solution that will largely meet our requirements. Finally it is crucial to adapt existing solutions to our needs.

**Practical implications** – The paper offers a snapshot of some main platforms that are used for OER and point out their benefits and disadvantages. In doing that the study highlights how an OER platform intended primarily for academic education can be adapted for use in entrepreneurship. Moreover the paper shows how it is possible to increase the visibility and searchability of resources on the Internet integrating platform for OER and metadata portal.

**Keywords** –OER, e-learning, entrepreneurial knowledge

**Paper type** – Academic Research Paper

## 1. Introduction

Education is the key factor in the development of society and each single person. The mandatory educational system, which is mostly present in today's world, is based on the several centuries old Prussian model. In comparison to the old age, educational processes today are considerably modernized in technological and methodological sense, but the basic concepts have remained the same. The Prussian educational model was suitable for economy that required ample manual workforce and small number of skilled people with high education. Current technological and social developments create completely different educational needs, with growing demand for highly educated staff, and decreasing demand for regular workforce. Figure 1 shows pyramidal transformation of educational levels and work expertise through periods of different levels of economic and technological development. At the same time, educational system has remained largely unchanged, thus it is not able to respond to the demands of the new age (Kahn, 2012).

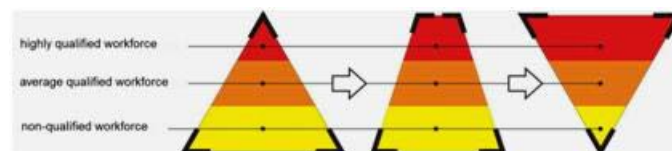


Figure 1 – Educational pyramid

Extensive developments in technology and economy call for a completely different approach to education. Along with theoretical and basic knowledge which is acquired during formal education, there is a growing need for specific and individual skills which can be improved with time and in accordance with new work challenges or technological innovations. There is a need for quick adoption and application of theoretical, practical and analytical knowledge. The importance of education stems from the new demands placed upon modern companies, which are mostly reflected in the fierce competition, market rivalry and customers' needs.

Today's business conditions, economic and social development impose the need of companies to continuously improve the knowledge and skills of their staff. An increasing number of organizational systems are developing special units for employee education, because education must target all employees, from the lowest to the highest position in the organization. Education and training are very complex processes and, in order to implement them successfully, many factors should be taken into account. Material or human resources should neither be neglected, as educational processes can be implemented only in their close coordination.

Constant changes, instabilities and commotions in the business environment cause fear and unease among individuals. Rapid changes in technology, education, management and organization create the need for continuous learning and advancement. Knowledge, skills and capabilities are becoming the key factors for success. An individual who is not making progress in terms of acquiring new knowledge and skills, and improving one's own capabilities becomes dissatisfied and unfulfilled. On the other hand, the individual who obtains new knowledge and has the opportunity to use it in the workplace has a chance to advance and to build a successful career. Educated individuals ground their business and existential security on knowledge and willingness to adapt to variable environment, so they become more competitive on the labor market and more secure in an unstable setting.

Acquiring new knowledge is increasingly achieved by the so-called double-loop learning. Double-loop learning requires following: self-awareness to recognize our weakness, honesty or candor to admit mistakes and discuss them with colleagues to discover causes, and taking responsibility to act appropriately on what is learned. According to Argyris (1994) "today, facing competitive pressures an earlier generation could hardly have imagined...leaders and subordinates alike...must all begin struggling with a new level of self-awareness, candor, and responsibility." The main objective of this approach is that employees gain new and improve existing knowledge and skills and apply them in their work. This will increase their own productivity and hence the productivity of the company.

Acknowledged the crucial importance of continuous learning for people, the paper aims to provide theoretical and practical insights for the development and implementation of an OER platform for management of academic and entrepreneurial knowledge.

The remainder of this paper is organised as follows. Section 2 describes the concept of lifelong learning (LLL) and the importance that companies and employees realize its significance and apply it.

Section 3 describes Open Educational Resources (OER) and options of its application in education. Section 4 presents the guidelines for the development of OER, with a particular focus on the cooperation between industry and educational institutions. As a good practical example Section 4 describes BAEKTEL platform for management of academic and entrepreneurial knowledge putting attention especially on metadata issues.

## **2. Concept of lifelong learning**

The preeminent among the intangible assets of an organization is its intellectual capital. Many companies have recognized the importance of the concept of LLL and developed their own strategies in this area. They give priority to constant education of their employees to make them ready to use new technologies or to prepare them for a new position.

All of the members of an organization should take part in the educational process, as each employee is equally important. One of the crucial things is that each employee is aware of his/her role in the organization, and cognizant of the benefits that continuous training may have for him/her and for the organization. Each employee should be clear on why he/she is learning and what he/she is getting in return for the "lost time" and energy. Unless employees feel their own need for education, such as desire for advancement or competitiveness on the market, they will not be motivated to learn and educate themselves (Gutić, 2012). There are numerous hidden potentials in the people, which they themselves hardly recognize. However, education helps these hidden human potentials get uncovered, developed and standardized. It is important to keep in mind that education on its own, without motivation, persistence and application of that knowledge, doesn't contribute to the success of an individual. The individual must have a willingness to learn and feel the progress, because that's the only way that education can influence the development of an individual.

There are various models of education, skill acquisition and capability advancement. Selection of the proper model is a difficult task and should not be left to chance. The education plan should be prepared according to the identification of the educational needs of the employees and based on the necessary knowledge and skills for each position, in line with the objectives of the organization. Creation of the plans should be done by the Department of Human Resources and managers of departments for which plans are made. Support from the general management is also critical for both creation and successful implementation of the plans. Training can be held by an external institution but it also may be held within the companies themselves, when employees train their colleagues. Every manager is responsible for the competences of the subordinated staff. From a management perspective, new methods of measurement and analysis are needed which are fully capable of reflecting the actual and potential assets available to an organization.

Research within the project "Continuous Improvement of Cross Border national LLL Strategies" has shown that there are good examples of the implementation of the concept of lifelong learning, but these are still sporadic and rare cases. The interest of employers to support LLL of their employees is crucial. However, motivation of employers to

support lifelong learning of their employees has to be increased by different tools, mostly financial tools, for example tax incentives, etc. Involvement of the employers into the system of LLL is crucial also in other ways. It is necessary to involve employers into the process of elaboration of all important conceptual materials, into the process of suggestions making of the relevant legislative materials and also into the process of monitoring and prognosis of educational needs Raimo Vuorinen et al, 2010-2011).

### **3. Open Educational Resource**

Any teaching, research and learning materials available from the public domain that have been released under an open source license which permits their free use, access, repurposing, reuse and redistribution by others with limited or no restrictions (Atkins et al., 2007). The first modern Massive Open Online Course (MOOC), were created in 2011, when Stanford University offered three courses free of charge via the Internet (Zou, 2011). The difference from other online courses of this kind, which had already existed for over 10 years, was their large scale and availability. To some extent, it can be considered a first example of OER.

OER is one of the concepts that could significantly facilitate and accelerate development and training of personnel. OERs are providing high level of flexibility in use, reuse and adopting the materials to local learning environments, granting, at the same time, authors with recognition of their work. Thanks to the availability of the low-cost hardware and the increasing connection to the global network, there are conditions for its full implementation.

In the presence of today's modern technology, it is of a great importance that these resources are accessible on different devices, such as computers, tablets and mobile phones, and are compatible with different operating systems.

Since the platform needs to support the creation and availability of educational content from different subject areas and the economy, it is necessary to choose a solution that will allow the creation and placement of materials in various formats and different ways of presenting educational content. Multimedia technology, video or text documents with guidelines for use of software, devices or machines are just a few examples of OER.

In accordance with the basic pedagogical-didactic requirements, the best learning results are achieved when materials are based on electronic courses. It is desirable that the existing materials, such as textbooks, reading materials, presentations, videos, etc., are made available. In order to further improve materials and make them more interesting to the end users, different forms of multimedia maybe combined, such as video recordings, audio recordings, animation and photography. It is particularly important to establish interactivity through questions and tests, in order to make users more active in the learning process.

The main goal of OER platform is to make high-quality education available and free for all. Open content can be shared without the author's permission, without license fee payments or other charges for access and use. However, the real costs of their creation and publication should be taken into account. Systematic investments into curriculum

improvements and purchase of related materials are required. There is, also, time invested in development of OERs, as well as attainment of the licenses for the support materials which are not openly available. The associated costs for the purchase and maintenance of the ICT infrastructure required to enable free access are not negligible.

The above-mentioned facts, as well as the fact that the companies which have successfully implemented the LLL strategy are still rare, implicate that the development of OER needs to involve a wider community, government institutions, higher education (HE) institutions, academic staff, students, business entities and industry experts.

HE institutions play an important role in the development of the OERs and their use. A well-designed learning material encourages greater personal involvement of students than it is possible to achieve with a single class. When a student is familiar with the topic in advance, there is more time in the class to talk and discuss it among students and teachers, which encourages creativity, practical implementation and the spirit of exploration. Institutions should strive to create their own OER, as well as to use the OERs from existing sources. The growing base of OERs, besides giving a wider choice, helps develop new contents adapted to local conditions in terms of cultural and educational needs. A good practice is to encourage the student to publish the results of their research under an open license as OER, with the guidance of academic staff and within institutional protocol.

Experience shows that the use and adaptation of OERs in HE institutions has economic viability. By creating high-quality, freely available courses, an institution can attract new students, increase its reputation and improve its public role. By promoting the results of their research, they can attract additional funding from the relevant funds. When creating a strategy institutions should focus on four key elements for the integration of OER in the teaching process: Intellectual Property Rights; human resources and strategies to motivate teachers to create new OERs, use existing resources and to promote OER concept; ICT infrastructure; Ensuring quality control of content.

On the other hand, many companies have recognized the importance of OERs in supporting employees in acquiring and improving personal and professional skills. OERs represent a significant support to enterprises to, through the development of its human resources achieve better business results and create new values. An example of a good practice is ArcelorMittal, where the company offers its employees the resources and support necessary to improve and advance their careers on ArcelorMittal University, a global university using mainly online learning options.

Through direct participation in the development and publication of OER materials, companies build their business reputation and promote their brands both among the potential clients and the broader community, and among the students as potential employees. In order to successfully implement the OER, it is necessary that companies include OER in their business strategy and work to promote awareness about the impact of the application and the creation of OER on the rise of the quality of the company's business. Motivating individual experts to create OER can be made through cash bonuses or through allocation of the working time to work on OER resources.

Lack of hardware and software, lack of motivation, creativity, workforce or difficulties in finding a suitable platform for sharing OER are just some of the problems with which the company may confront. Problems such as unclear and incomprehensible materials or poor motivation of staff may be a key factor for the failure of this way of learning. Therefore, it is necessary to adjust the OER to the company's objectives, providing an environment conducive to learning and motivation of employees.

Cooperation between industrial companies and educational institutions is of great importance and benefits are multiple. Cooperation may be developed through joint projects, but it is desirable to ensure continuity in the process. Through this cooperation HE can better identify the needs of the economy and adjust their curricula accordingly. The students are better prepared for the labour market, being timely informed about the requirements of the labour market, problems in the economy and about the ways to overcome them.

On the other hand, employees of the companies attending courses designed by HE can constantly enrich their acquired formal knowledge. The role of government institutions is also very important. They can support the development of OERs through their role in policy-making in education and through the adoption of open licensing framework (UNESCO, 2011). In the context of ensuring continuity and quality of OER content, government should provide financial and legal support to the development of OER in creating educational policy and require that some of materials developed with public funds be made available under open licenses.

To reach its maximum utility value, OERs needs to be of high quality, but the way they are published is also very important. The platform which publishes the content should enable easy access and serve as a medium that allows users to interact with each other and to with the content. Number of educational content on the Internet is growing rapidly every day and correspondingly with that, the time to find exactly what the users are interested in. Hence, another important aspect of publishing OER is to make content easily searchable.

OER concept is a new approach that has emerged as a response to contemporary educational needs

#### **4. BAEKTEL Platform for OER publishing**

The BAEKTEL (Blending Academic and Entrepreneurial Knowledge in Technology Enhanced Learning, <http://www.baektel.eu>) project was initiated with the main goal of building an OER network offering educational materials by higher education (HE) institutions and best practice examples by enterprise experts (Stanković et al., 2014).

The BAEKTEL platform consists of two segments. One part is a system for creating and publishing educational content, and the other is a web portal for describing the content with metadata. Within the project, the initial framework is conceived as a network of six nodes at six universities in the Western Balkans countries. Every partner will create and publish open resources using their own Learning management system

(LMS)platform. Metadata portal(BMP) is centralized in one place and connected with the contents of all nodes in the network. New members are able to easily join the system.

After a comparative analysis of the architecture, functionality and safety of existing open source solutions, edX platform has been selected. . The edX platform was recently (2012) conceived by MIT and Harvard University (<https://www.edx.org/>). The platform has been developed as open-source software, and is available to academic institutions under edX Terms of Service. Its basic goal is to support massive open online university courses. Among its main features, edX offers interactive online learning software, which enables production of multimedia educational materials, combining text, images and videos, followed by the exercises where students can immediately check their understanding of the educational content. The platform also offers creation of online textbooks, as well as discussion forums for student-student interaction, online laboratories. The tool is user friendly, easy to use and allows publishers of educational materials to master it without much effort ([https://www.edx.org](https://www.edx.org/)). Although edX has been selected as the common LMS, other LMS are not excluded.

The main role of BMP is to increase visibility on the Internet for all content published on the individual network nodes. After the publication of certain content, the creator enters metadata (“data that describe other data”), about the content on the BMP portal. Based on these descriptions, resources become more searchable on the Internet, users are able to quickly find the content relevant to their needs or an answer to a specific question. They are also informed about the content and can compare similar contents of different facilities, instead of spending the time to attend the whole course or browse the full material.

As an optimal platform for BMP, ResourceSpace has been selected and customized for the BAEKTEL'S need. ResourceSpace is an open source Digital Asset Management system originally developed for Oxfam by UK Company Montala Limited in 2006. The main features of the ResourceSpace are: intelligent search ordering by scoring resources against keywords on basis of user search activity; preselected groups of resources; resource access level permissions by user group; multilingualism, allowing the user to change the language, with most major languages supported; multiple file upload using SWF upload; possibility for geolocation searching; possibility for changing metadata input fields; PHP, MySQL platforms; any operating system; BSD Open source license (<http://www.resourcespace.org>).

During defining a set of metadata for describing the OER, the important criterion was to provide an opportunity for sharing and exchanging data with other OER repositories. In order to achieve interoperability with other systems and enable possibility of merging into federation, it is necessary to comply with existing standards for selection of metadata. Standards used for purposes of BMP Portal are Dublin Core and Learning Object Metadata (LOM).

The Dublin Core is a small set of vocabulary terms that can be used to describe web resources (video, images, web pages, etc.), as well as physical resources such as books or CDs. Dublin Core fulfils the general requirements for documenting web-distributed objects. However, educational resources demand a more specialized treatment and



characterization. To that end a combination of the IEEE 1484.12.1-2002 Learning Object Metadata (LOM) standard elements (Barker, 2005) to DC is proposed, as a basis for delivering web services for educational resources (Koutsomitropoulos, 2010).

Another important criterion for defining metadata set is the number of attributes that will be used. On the one hand, this set must contain enough data for describing resource, but on the other hand, it must not contain too many values. The number of mandatory elements has to be balanced. Selected elements have to meet the needs of search and browse functions of the Portal.

In the BPM model, there are 23 different types of metadata. Some of the attributes that are taken from DC standard are: title, creator, description, language of the content of the resource, date when the resource was made available to the public, contributor, type of resource, identifier, format, publisher etc. Interactivity Level, version, status, size, location(web address), typical learning time and other are taken from the LOM Standard. More detailed description of selected fields can be seen in “Using Metadata for Content Indexing within an OER Network“ (Stanković, 2014).Metadata can be controlled with list of predefined values. Collection of these values represents a vocabulary of terms described in document. For example, for some fields, as the title or the author, the user enters a text value, while for some other such as language and type user chooses a value from a list or dictionary. Some of the data are mandatory, but not all.

There are three different types of search on the portal. The first simple way is when a user enters keywords and the system searches through the entire database in all fields. Figure 1 shows an example of the results of the simple search, on the left side is Large Thumbnail look, and on the right is List view. Advanced Search allows users to search for resources by entering keywords for each field separately. Figure 3 represents the form for advanced search. The third way is a geographic search. By selecting the region on the map the system identifies all resources that have been placed in that region.



Figure 2 List of resources (Large Thumbnails and List view)

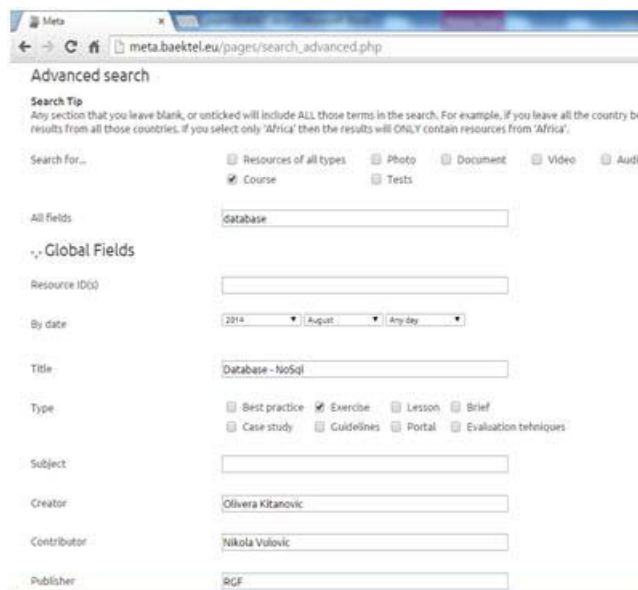


Figure 3 Advanced search

## 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.

In order for the LLL concept to become fully accepted, it is of the greatest importance that all participants that can contribute are involved into development of modern strategies and procedures for its planning and implementation. These are, primarily, HE institutions, industry organizations and state institutions. Their cooperation and committing to mutual goals is crucial.

This paper presents a platform for development and publishing of OERs that will be used mutually by HE institutions and companies for providing the educational content online both to students and to experts already employed in companies. OERs may be provided by both HE institutions and experts from the industry partners.

The paper discusses the problem, that is unfortunately increasing with the number of OERs, and that is ever-increasing problem for the users to find a resource that is suitable to its needs. Within the BAEKTEL network, a repository containing metadata about individual OERs is created. Every entry on BMP portal is connected uniformly to the location of the resource. This way user is able to get enough information about the resource and to compare it to another resource, prior to registering to the course. Introducing of such a concept enhances the search

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.

For the partners on BAEKTEL project, gains are mutual: HE institutions are ensuring they students become a competitive future workforce, and companies ensure that, supporting the concept of LLL attract, develop and retain the best talent, and inspire the workforce of tomorrow.

## References

- Argyris, C. (1994), Good Communication that Blocks Learning, Harvard Business, Vol. 72, No. 4, pp. 77-85
- Atkins, D.E., Brown, J.S. and Hammond, A.L. 2007. A Review of the Open Educational Resources (OER) Movement: Achievements, Challenges, and New Opportunities. Available from: <<http://www.hewlett.org/uploads/files/ReviewoftheOERMovement.pdf>>. [4 April 2014].
- Barker, P and Campbell, L.M. Learning Resource Metadata Initiative: using schema.org to describe open educational resources. In Proceedings of Open Course Ware Consortium Global 2014: Open Education for a Multicultural World. [http://conference.oeconsortium.org/2014/wpcontent/uploads/2014/02/Paper\\_34-LMRI1.pdf](http://conference.oeconsortium.org/2014/wpcontent/uploads/2014/02/Paper_34-LMRI1.pdf), 2014.
- Carlucci, D., Schiuma, G. , Managing knowledge assets for business performance improvement, <http://citeseerx.ist.psu.edu/viewdoc/similar?doi=10.1.1.194.8464&type=sc>  
[http://www2.warwick.ac.uk/fac/soc/wbs/conf/olkc/archive/oklc5/papers/k-5\\_carlucci.pdf](http://www2.warwick.ac.uk/fac/soc/wbs/conf/olkc/archive/oklc5/papers/k-5_carlucci.pdf)
- Raimo Vuorinen et al, Continuous Cross Border Improvement of National Lifelong Learning Strategies (CCBI-NLLS), <http://www.cbi-nlls.net>, 2010-2011
- Gianluca, E., Poce, A., (2010) Open Networked "i-Learning", Models and Cases of "Next-Gen" Learning, XXI, 157 p., ISBN 978-1-4419-6854-8
- Guidelines for Open Educational Resources (OER) in Higher Education, Commonwealth of Learning (COL), United Nations Educational, Scientific and Cultural Organization (UNESCO), 2011
- GutićRudelj, Human Resource Management, Osijek, 2012.  
<http://www.resourcespace.org/>  
<https://www.edx.org/>
- Jie Jenny Zou, Stanford U. Offers Free Online Course in Artificial Intelligence, The Chronicle of Higher Education, <http://chronicle.com/blogs/wiredcampus/stanford-u-offers-free-online-course-in-artificial-intelligence/32622> [2 August 2011]
- Koutsomitropoulos, D.A., Alexopoulos, A.D.Solomou, G.D. and Papatheodorou, T.S., The Use of Metadata for Educational Resources. In Digital Repositories: Practices and Perspectives, D-LibMagazine, Volume 16, Number 1/2, 2010.
- Longworth, N. (2013), Lifelong learning in action: Transforming education in the 21st century, Routledge.
- Obradović, I., Stanković, R., (2014), Using technology for knowledge transfer between academia and enterprises, Proceedings of IFKAD 2014 - International Forum on Knowledge Asset Dynamics, 11-13 June 2014, Matera, Italy, pp. 792-805, ISBN 978-88-96687-04-8, ISSN 2280-787X.
- Obradović, I., Stanković, R., Prodanović, J., &Kitanović, O. (2013).A TEL Platform Blending Academic and Entrepreneurial Knowledge.In Proceedings of the Fourth International Conference on e-Learning, eLearning - 2013, 65 - 70.

- Salman Kahn, Rethinking Education - Sal Khan: 3 MIT Degrees, 85,487,485 Lessons Delivered (<http://youtu.be/z9JCpMCQ5qM>), March 2012
- Stanković, R., Kitanović, O., Obradović, I., Linzalone, R., Schiuma, G., Carlucci, D. (2014), Using Metadata for Content Indexing within an OER Network, Proceedings of the Fifth International Conference on e-Learning, eLearning 2014, September 2014, Belgrade, Serbia, K. Jovanović(ed.), Belgrade Metropolitan University, Belgrade, Serbia, 2014, pp. 49-54, 978-86-89755-04-6.
- Stanković, R., Obradović, I., Kitanović, O., & Kolonja Lj. (2012). Building Terminological Resources in an e-Learning Environment. In Proceedings of the Third International Conference on e-Learning, eLearning-2012, 114-119.
- The Dublin Core Metadata Initiative (DCMI) <http://dublincore.org/>
- Unesco, (2011) A Basic Guide to Open Educational Resources (OER), Commonwealth of Learning (COL), United Nations Educational, Scientific and Cultural Organization (UNESCO), 2011