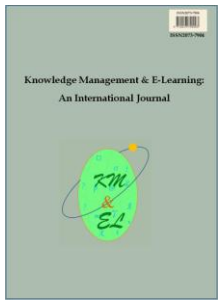
Knowledge Management & E-Learning



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The role of open educational resources in the eLearning movement

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Abstract: Open Educational Resources (OERs) have gained increased attention for their potential to provide equitable and accessible educational facilities for people worldwide. Obviating demographic, economic, and geographic educational boundaries can be the OERs slogan. Realization of this promise is an inevitable target of eLearning, thus offering education new challenges. In this observation paper, we express OERs altruistic and idealistic reasons as well as their opportunities and advantages for three groups of eLearning stakeholders, namely learners, teachers, and educational institutions. Also, this paper addresses open questions such as what are the current limitations and challenges of developing and distributing OERs in the fast changing global educational environment.

Keywords: Open educational resource; OER; Educational content; Advantage; Opportunity; Challenge; Educational stakeholder

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adaptive LMSs as well as applying ontology to semantic web. She was ex-manager of the Department of Information Technology at the University of Tehran and former Director of Technology Incubator, University of Tehran. She is a member of the Editorial Board of International Journal of Information & Communication Technology. Moreover, she is supervising IT Foundation lab which has been founded by her in 2006. She is the author of more than 80 publications including Conference and Journal Papers.

1. What is an open educational resource?

Recent information and communication technology development leads to a significant progress towards realization of the eLearning slogan "providing educational services for everyone at any time and in any place". But the true potential of eLearning (after sixty years of its first announcement) is flourishing nowadays by introducing the Open Educational Resource (OER) concept (Chen, Nasongkhla, & Donaldson, 2014). Trough OERs, obviating demographic, economic, and geographic educational boundaries can be added to this slogan.

Education is one of the basic human rights and training facilities should be provided for all people. Free education, along with the possibility of lifelong learning can lead to the full development of the human personality. In this respect, UNESCO has actively endeavored to disseminate OERs around the world, and operates its own OERs platform (http://www.oerplatform.org/).

The term OER was adopted at a UNESCO meeting in 2002 to refer to the open provision of educational resources, enabled by information and communication technologies, for consultation, use, and adaptation by a community of users for non-commercial purposes (D'antoni, 2008). Clements, Pawlowski, and Manouselis (2015) define OERs as all the resources which are used freely in order to achieve the goal of training and learning improvement. Geser, Hornung-Prähauser, and Schaffert (2007) argue that experts who understand OERs as the means of leveraging educational practices and outcomes will define OERs based on three core attributes as: access is provided free of charge, contents are liberally licensed for reuse, educational systems/tools/software are used for which the source code is available. Aggregating various definitions offered for OER, this concept can be defined as: OERs are digital materials, i.e. resources supporting training, learning, and research activities, which are available, entirely free of charge to all interested students, teachers, and self-learners (Hylén, 2005). OERs can be categorized in tree groups including:

- Learning contents: complete courses, courseware, content modules, content collections, research papers, and learning objects.
- Learning tools: software with the aim of learning support, software to support the development, use, reuse, and delivery of learning contents and their maintenance including searching, organizing, and sharing.
- Implementations: Intellectual property licenses to promote open publishing of materials, design principles of best practice, and localization of content.

These categories are depicted in Fig. 1.

Fig. 1. OERs categories

Introduction of learning objects is a motivation for structuring learning contents and providing the possibility of their reuse, on a technology basis. Nonetheless, OERs are more beneficial to users than learning objects (Lane & McAndrew, 2010; Wiley, 2008), since learning objects can be aggregated, but not adapted. Wilhelm and Wilde (2005) made explicit the all-pervasive, fundamental barrier to repurposing or adapting learning objects: "While we contemplated modifying some learning material to construct part of our course, this task generally required obtaining permission from web site owners." Open-source-style licenses support copyright-related permissions of OERs and lead to their flexibility in modification and reuse.

Various models describe OERs and their features. The 4A model points four requirements of OERs out, namely accessible, appropriate, accredited, and affordable (Daniel, West, D'Antoni, & Uvalić-Trumbić, 2006). The 4R model is one of the most important models (Hilton III, Wiley, Stein, & Johnson, 2010); it is based on the most freedom in OERs' licenses. These Rs are:

- Reuse: Reusability is the first and basic option that OERs provide. Consuming open licenses allows users to apply all or some parts of OERs for their goals.
- Revise: Users can modify, translate, and change the appliance of OERs as well as adapting them to new environments and users.
- Remix: People can take two or more existing resources and combine them to create a new resource.
- Redistribute: People can share original, revised, or remixed of OERs with others.

It seems that the existence of the term "open" in the OER concept may resolve many of the consuming, revising, and publishing limitations. However, if educational resources are closed, only their owners can perform these tasks. Hilton III, Wiley, Stein, and Johnson (2010) argues that openness is not an absolute concept. According to a supporting license, it can have a different range, as shown in Fig. 2.

Creative common license provides the highest degree of openness. One challenging provision of the creative commons licenses is the 'Share Alike', which requires that individuals who revise or remix the contents use the same license as carried by the original contents (Hilton III, Wiley, Stein, & Johnson, 2010). Fig. 2 illustrates the creative common license permits applying the 4R processes on the original resources.

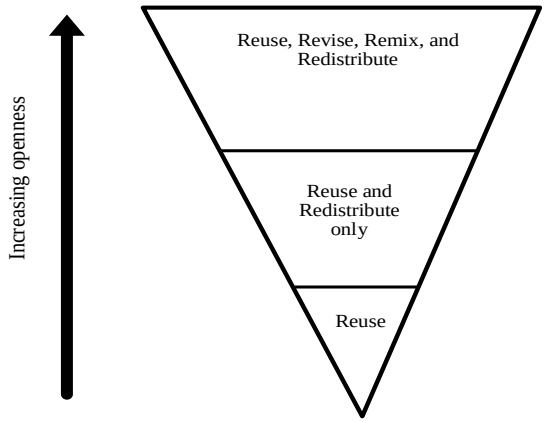

Fig. 2. Increasing openness of OERs in the 4R model. Adapted from Hilton III, Wiley, Stein, and Johnson (2010)

2. Scientific and ethical justifications of OERs publication

Reducing lots of eLearning costs and consequently promoting education among more people are two important outcomes of applying OERs. Production, especially reproduction, distribution, and use of learning systems are expensive processes of the educational system which can be affected by OERs. Decreasing these costs leads to a fulfillment of the promises of eLearning service providers to establish learning facilities for all people (Caswell, Henson, Jensen, & Wiley, 2003).

Content as an effective element in educational resources attracts special domains of research. In the learning process, the transformation of knowledge is usually accomplished via content. Therefore, half-life of knowledge in one domain determines the content life of that domain. Andreatos and Katsoulis (2012) estimated the half-life of knowledge in some scientific areas in 1992. Table 1 refers to some details of that research.

Table 1
Half-life of knowledge in some areas

Half-life of knowledge	Field of study
Business administration	5–8 years
Engineering	5–7 years
Biotechnology	5–6 years
Medicine	3–5 years
Information science	1–2 years

According to the results of this study, the half-life of knowledge in some fields is continuously shrinking. In addition, technology development can intensively affect the shrinking time. Frequently, revising and remixing open educational contents lead to their custom update and the ability to be reused for a long time. Therefore, the overall funds paid for developing educational contents can be reduced.

A comparison of the life time of an open learning object with a closed learning object is demonstrated in Fig. 3.

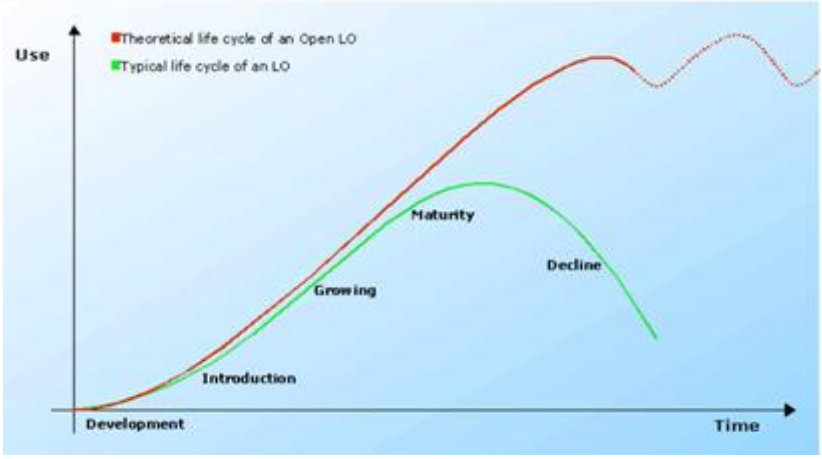

Fig. 3. Life cycle of open learning objects compared to closed learning objects. Adapted from Fulantelli, Gentile, Taibi, and Allegra (2008)

As Fig. 3 demonstrates, obsoleting open learning objects may occurred only with a low probability. The open learning objects are frequently revised and remixed in the maturity of their life, thus avoiding the risks of obsolescence and overcoming the limitations of closed ones.

Therefore, sharing OERs results in an ideologically and financially acceptable approach. In addition to the mentioned reasons, literature review in OERs shows additional scientific and ethical reasons of developing OERs as following:

- Every human being has the ability to learn and progress. Therefore, free access to educational facilities is a basic human right (Caswell, Henson, Jensen, & Wiley, 2003).
- OERs development and publication lead to knowledge sharing and providing identical learning resources for people around the world. This event can decrease the world digital gaps (Smith & Casserly, 2006).
- A well-known concept that has emerged from the OERs movement is Massive Open Online Course (MOOC). Learning technology specialists argue that MOOC and its social aspects can evolve education and learners interactions (Fidalgo-Blanco, Sein-Echaluce, & García-Peñalvo, 2015).
- OERs can increase the awareness level and self-learning motivation of learners to professions and occupations. In this way, they can be a positive step towards lifelong learning. Lifelong learning embraces various concepts of lifelong education practices such as workplace learning, continuous education, skills development training, adult education, open and distance learning, etc. (Kumar Das, 2011).
- MIT's open courseware has expressed its goal as "to advance knowledge and educate students in science, technology, and other areas of scholarship that will best serve the nation and the world in the 21st century" (MIT, 2001).

- By preventing "reinvention of wheel" (Jones, 2013), OERs engage researchers, teachers, and production companies in providing novel knowledge and learning resources.
- Knowledge sharing is a valuable goal by itself. Attending it, not only distribution of knowledge in a society would be possible, but also worth proliferation of the open resources becomes conceivable (Lane & McAndrew, 2010). In some cases, applying reviewers and users comments can improve these resources.
- Open sharing will stimulate innovation of people. In many cases, the digital junk of one person may be the piece of a knowledge puzzle for another. In other words "what is junk to one may be gold to another".
- Sharing OERs and permitting their revision and remix can improve resources and consequently teaching quality and learning experiences (Thoms & Thoms, 2014).
- Economic issues (reducing the cost of educational resources especially their reproduction) is another reason of OERs production. According to Thoms and Thoms (2014), the cost of producing a book for undergraduate students in America was USD 1200. However, OERs can decrease these national costs.

The recent potential of OERs in the eLearning movement has been considerable. The effect of OERs can be increased and multiplied by introducing adequate changes in educational perspectives, applications, and requirements. This will empower the learners to really study on their own, in a self-paced manner, and without payment restrictions. The appearance of MOOCs and the enrolment of a huge number of learners from different ages in them is a significant step towards a global lifelong learning.

3. Why are individuals and institutions engaged in OERs?

The previous section explored considerable scientific and ethical reasons to explain why educational resources are shared freely. However, the question that must be answered in addition is what are the possible gains in sharing educational resources for their producers? If educational resources are their producers' capital, why should they give away their products for free?

Advocates of sharing educational resources can be any stakeholders of the education process. In order to consolidate the eLearning stakeholders, we can distinguish three categories. Learners, tutors, and educational institutions/production companies are main stakeholders who may be influenced by sharing educational resources.

3.1. OERs advantages for learners

Since learners can be considered as customers of the educational industry (Mosharraf & Taghiyareh, 2013), they can benefit from both, production and consumption of OERs. The advantages of engaging learners in OERs are as following:

- Arguably, the first benefit of OERs is their availability to learners without paying the cost for them.
- Existing OERs which are available for learners can save their time (Jones, 2013). Discovering, finding, and checking several contents which are accessible freely,

not only save learners time in acquiring appropriate contents, but also improve their learning outcome. In addition to learners, OERs can save teachers and authors' time. Instead of producing contents from scratch, they can use directly accessible open contents or revise and remix them to produce new ones.

- In some cases, encouraging learners to produce educational materials is accomplished by their use of OERs. In the form of a collaborative activity, learners can participate in a group and produce open learning contents. This learner-centered activity leads to achieving various experiences in the learning process for learners (Thoms & Thoms, 2014).

3.2. OERs advantages for teachers

In addition to advantages that OERs bring for students, there are benefits for teachers, too.

- Teachers can directly apply open educational contents in their classroom. Also, they can use previous open contents for constructing new ones, instead of producing from scratch.
- Sharing open contents leads to proposing the contents and recognizing their producers. Visiting these contents frequently can increase both, the producers rank in search engines (Caswell, Henson, Jensen, & Wiley, 2003) and their academic rank (Lane & McAndrew, 2010). Even, they can be recognized as the first mover in the related subject. Therefore, sharing qualified contents can lead to personal gains through increased reputation of teachers.
- Stereotypically, most teachers work alone in constructing and delivering their teaching experiences (Lane & McAndrew, 2010). Teachers' engagement in OERs and their collaboration for educational co-production can be an approach to avoiding job isolation.
- Sharing educational resources can provide teachers the opportunity to get free feedback from people which can improve the quality of the resources. Also, in using the resources by other people, existing problems can be easier identified.

3.3. OERs advantages for educational institutions

Arguments of production companies and educational institutions for involvement in OERs include:

- Not only OERs can reduce national costs of education, but also they have a great impact on reducing the costs of institutions producing educational resources. de Langen (2011) believes that institutions producing OERs should be exempt from paying taxes, because of their business which delivers educational services to all members of society.
- Attracting more customers and users can be one of the goals of OERs providers (Lane & McAndrew, 2010).
- Many institutions attract consumers trust and confidence by either attaching the institutional brand on OERs or hosting them. Open University furthers this idea to increase its reputation and educational prestige (Lane & McAndrew, 2010).
- Replacing the business model of generating revenue from customers' data instead of generating revenue from customers themselves is a reason for providing OERs (Lane & McAndrew, 2010; de Langen, 2011).

- Sometimes, after receiving a free service, users are encouraged to participate in doing some activities. On condition that, if those works should normally be done, the institution never has sufficient funds to cover their costs (Wiley, 2006).
- Publication of OERs can lead to quality improvement in educational and organizational relationships within the issuing institution. OERs publications are attached with institutional brand, which actually means publishing institution's credit. This makes staff eager to improve their knowledge as well as their efficiency through appropriate interactions (de Langen, 2011).

In conclusion, gaining publicity or reaching the educational market more quickly may result in economic advantages for the educational institutions.

In addition to the mentioned groups, there are other stakeholders in the eLearning process who can benefit from sharing and using OERs. Governments, parents, researchers, and society are among them. We can agree that open educational facilities lead to cultural and scientific improvement in all the education pillars.

4. OERs limitations and challenges

Despite the many advantages of OERs, several challenges arise in their production and distribution. Technology limitation is a main problem in broadcasting OERs globally (Downes, 2007). Other limitations refer to a wide range of issues from individuals feeling and intellectual property rights to social, cultural, and language aspects.

- Unfortunately, there is a widespread belief that if a product is provided freely, it is worthless.
- One problem that occurs in OERs publication is considering them to be more and more open and portable rather than their subject matter quality. Focusing on courses design, modular architecture, standard annotation, and enrichment with complete metadata are some efforts toward facilitating OERs finding and reuse.
- Intellectual property rights raise other challenges of OERs, making producers assign clear restrictions on the use of these resources. Usually faculty members permit the reuse of their ideas when referenced. What happens when the content is distorted or its quality is diminished when it is reused (Smith & Casserly, 2006)?
- Sharing educational contents addresses some responsibilities for producers according to their validity and correctness (Smith & Casserly, 2006).
- One of the reasons that some institutions and teachers publish their contents is their knowledge sharing self-efficacy. In other words, one reason for teachers to avoid publishing their contents originates from the fear of evaluation and low quality of the contents (Van Acker, Vermeulen, Kreijns, Lutgerink, & van Buuren, 2014).
- Economic challenges and constraints are other concerns related to the OERs for the first producer, because of the initial production costs; besides maintenance, update, and hosting costs can be numerous (Smith & Casserly, 2006). Although, production and publication of OERs are ethical and charity work, this must be economically justified.
- Another economic barrier concerns inadequate resources to invest in the necessary software and hardware. Sustainability of OERs and their repository is

another problem. Uncertainty in OERs sustainability can trouble provider institutions, which their return on investment occurs after long time.

- Historical issues can be central in accepting OERs and any other possibilities provided for developing countries. Negative colonial experiences make some politicians be cautious in accepting or even appreciating any help from Western.
- Language gap is another issue that causes barriers, namely when people around the world cannot use open educational contents which are issued in English. In this respect, it should be investigated how many people worldwide, especially who adhere to free education, know English as a second language.
- Contextual gap is the other problem which results from the language gap. This is because people think based on words which are expressed and languages that they are speaking. Language means not only different words, but also offers a different way to express thoughts and build sentences, and such ideas could be regarded as context specific (Richter & McPherson, 2012).
- Cultural diversity should also be considered in OERs production. However, all the national identities worldwide cannot obviously be considered in the OERs design and production process. Localization and adaptation of OERs evolve to pre–usage steps that may lead to considerable costs.
- Some researches concur that available OERs will not necessarily serve the aim of achieving educational justice throughout the world (Richter & McPherson, 2012). The literacy level is not equal in all the countries. In addition, using eLearning facilities and OERs needs basic computer literacy skills which are recently not formed in all the applicants, a fact that causes additional effort and demand for new developments also on the content side.

We can conclude that many of the mentioned challenges are resulted from the OERs early adoption stage. However, research has shown that a wider acceptance of OERs requires development of awareness and reaching to an understanding of all their dimensions (Krelja Kurelovic, 2016), including pedagogy, technology, strategy, funding, and contextualization.

5. OERs examples

Today, MIT's open courseware is the largest provider of open courseware. MIT's open learning object repository represents the historical milestone of OERs. This university's target is to provide free educational contents for people worldwide. Therefore, annual production of new courses, updating old contents, and archiving them are MIT services. Up to 2015, more than 2250 courses are being archived and about 450 new courses will be added to them each year.

After MIT, many institutions have followed the policy of publishing free course materials. The new tides of the OERs advancement, such as MOOCs, are opening the new landscape of open education and higher/tertiary education. In addition to Coursera, other MOOCs such as EdX and Udacity have attracted a great deal of attention from the international community.

Table 2 presents related actions accomplished by four countries in the OERs area.

Table 2
Four active countries in the release of open courses

Country	Released courses	Participants	URL
America	2700	Seven university projects	http://ocw.mit.edu/, http://cnx.rice.edu/, http://ocw.jhsph.edu/, http://ocw.tufts.edu/, http://www.cmu.edu/oli/, http://ocw.nd.edu/, http://ocw.usu.edu/
China	451	176 professors from 150 universities	http://www.core.org.cn/cn/jpkc/index_en.html
Japan	350	10 universities	http://www.jocw.jp/
France	178	11 universities	http://graduateschool.paristech.org/

Regardless of open courses, there are numerous further open resources provided for example as open access journals, scientific papers, curriculum units, modules, learning objects, and simulations. Among all the accessible resources, only Wikipedia English pages are containing 1300000 articles. Rice's Connexions (http://cnx.org/) project covers 3461 open learning objects. Textbook Revolution (http://textbookrevolution.org/) includes 260 free books that are not involved in copyright law. Open learning repositories such as MERLOT (http://www.merlot.org/merlot/index/), ARIADNE (http://www.ariadne-eu.org/), and IDEAS (http://www.ideas.org) provide free access to a large number of learning objects.

As shown in Table 2, in America, Europe, and Asia a number of OERs related projects have been initiated even if the creation and implementation of OERs varies. For example, despite the significant development of MOOCs and OERs in North America, in Latin America, OERs are still in their early stages (Torres, 2013). In Europe, OpenLearn (http://www.open.edu/openlearn/) was launched in 2006 as an open content initiative of The Open University, UK. Afterward, with a growing interest of European universities in OERs, a consortium of European higher education institutions was launched to promote open courseware development (OCW EU Project Team, 2012). In Asia, in parallel to Japan there is also implementation of OERs in countries such as India, Pakistan, Indonesia, Korea, Vietnam, Malaysia and the Philippines (Jung & Lee, 2014).

Education demand far exceeds supply in the form of OERs, a fact that drives governments globally to start seeking ways to offer them. Although this approach can solve some cultural and contextual challenges of OERs, many issues remain unsolved in small and developing countries, because of their delay in producing or localizing OERs (Krelja Kurelovic, 2016).

6. Conclusion

In this observation paper, we have attempted to show that OERs increasingly play a fundamental role in education and training processes on a world-wide scale. Definitely, sharing educational resources openly and with no admission fee has ideological and

financial justifications which creates a major demand for clarifying fundamental questions, such as who are the stakeholders in this processes, in what way are they involved and why, and how do they influence the development, use, and widening of OERs? To answer these questions and make clear the roles, intentions, and driving forces behind those stakeholders, we categorized eLearning stakeholders in three groups and discussed various reasons, motivations, and purposes that appear to fit to each of them. Although producing as well as using OERs provide many opportunities and personal gains for both, institutions and individuals (teachers and learners), there are many barriers and challenges discussed in this paper. OERs challenges are investigated from the technological, personal, economical, historical, cultural, and social perspectives.

It is evident that if the appropriate solutions, situations, and scenarios will be applied to the investigated challenges, OERs can not only evolve the world of education, but also revolve it. The future work concerns a case study on applying OERs in a developing country and the discussion of the findings with regard to advantages and disadvantages in such a multifaceted society. Combination of OERs with semantic web technology follows the groundbreaking trends in information technology and will be explored at a next step to promote OERs discovery and accessibility.

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