

Open Education Resources: Current Limitations and Challenges and its Usage in Developing Countries

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1 Abstract

As the cost and demand of higher education is on the rise all over the world, education stakeholders are searching for ways to meet these demands. Open Educational Resources (OER) have the potential to provide these resources and promote lifelong learning. OER are freely accessible resources for educational purpose. OER are considered to reduce the gap between different strata of society and countries. But despite all these opportunities, OER has still not reached its full potential. This might be explained by the fact that it is still in the early adoption state and the number of challenges that OER is still facing at the moment. Often both teachers and students in higher education communities are not aware of the potential of OER. Furthermore, the major content of OER is mostly English language based and global north dominated. OER is free to use but not free to produce and maintain, because of this the perhaps biggest challenge of Open Educational Resources is their sustainability in financial terms.

Developing countries have the possibility to benefit even more from existing OER to enhance or develop new teaching material based on the knowledge from all over the world but are also facing additional challenges. The western-dominated resources have to be recontextualized for their cultural context and they are plagued by limited funding, poor internet infrastructure and a general lack of awareness of OER and policies for its use and creation. Some projects managed to overcome these barriers like poor internet thanks to solutions like Kiwix, an offline Wikipedia and OER reader.

2 Research Questions

What are the challenges and limitations that Open Educational Resources are currently facing?

How are OER employed in developing countries and what unique challenges are they facing in this context?

3 Introduction

Imagine a world in which every single person is given free access to the sum of all human knowledge. That's what we're doing. - Terry Foote, Wikipedia

Knowledge and access to information is a right for each human being [1]. Unfortunately, this fundamental right is not always achieved. In higher education teaching and learning, resources are often seen as an intellectual property that is only accessible for selected groups of students and professors. Open Educational Resources (OER) promises to make

education accessible to everybody who is willing to learn. Nowadays a lot of institutions and individuals share OER via the Internet free without legal, technical or financial barriers. Ordinary education material found on the internet that is copyright protected cannot be shared or modified without the permission of the author. For comparison, OERs are freely available and can be adapted remixed and used to create new versions. An important milestone for the success of OER has been achieved by the OpenCourseWare (OCW) initiative of the Massachusetts Institute of Technology (MIT), which made most of their course materials online accessible for everybody in 2001. A lot of universities followed this example and this led to a huge distribution of OER worldwide.

According to the non-profit U.S Public Interest Research Group, the prices of textbooks have increased around four times to the rate of inflation since 1994 [2]. US students spend on average 900 dollar each year for textbooks and this is around 26 percent of the tuition cost of a public four-year university. This indicates that a significant factor of the cost of higher education are textbooks. OER is a promising solution to reduce the studying costs of students globally because students can access learning resources online for free.

The opportunities provided by OER can be even more beneficial in developing countries, such as India. At first, this paper gives a short overview of OER in general including its history, benefits and vision. After this, the challenges of OER will be discussed in detail. Furthermore, the use of OER in developing countries is going to be introduced including its adoption problems. The last part is about offline OER repositories in Africa.

4 Overview of Open Education Resources (OER)

Every digital object that is freely accessible and re-usable under different licensing conditions for educational purpose can be termed as an OER [3]. OER is defined as freely accessible resources for educational purpose. In general, OER can be categorized in the following types of artifacts.

- **Learning objects/resources:** are specific objects for educational purpose. This category includes multimedia documents, HTML documents, simulations, web resources, etc.
- **Articles, textbooks and digital equivalents:** can be seen as typical objects provided by libraries such as articles, papers, journals or books. These objects are connected to Open Access as long they are freely available.
- **Software tools:** that are used for tasks as producing and editing of learning resources. Tools for communication and collaboration can be also seen as OER Software tools. These tools are usually referred to as Open Source or Free Software.
- **Instructional/didactical designs and experiences:** objects of this category include access to instructional designs, didactical plans like lesson plans, case studies, or curricula. The experience about materials and lessons between colleagues are also included and the objects of this class can be also called Open Educational Practices.

5 The Vision of Open Education Resources

For the promotion of OER, the Cape Town Open Education Declaration defined the following vision [4]:

“Educators worldwide are developing a vast pool of educational resources on the Internet, open and free for all to use. These educators are creating a world where each and every person on earth can access and contribute to the sum of all human knowledge. . .”

Three strategies have been planned in order to distribute OER.

- Learners and educators should get encouraged to participate in the OER movement. The creation and use of OER should be embedded in education. For this OER should be supported and rewarded accordingly.
- OER should be licensed in a way that allows facilitate use, revision, translation, improvement and sharing by anyone for free. Furthermore, OER should be published in a format that is compatible with different technical platforms.
- Governments, colleges and universities should give OER a higher priority. All educational resources that have been taxpayer-funded should be published as OER.

6 Brief History of OER

In the 1960s the trend started to remove barriers for students that wanted to pursue tertiary education [5]. An example is the Open University of the United Kingdom that was established in 1969 in order to provide anyone with a high university education who desired to realize their potential. After this, a lot of other Open Universities have been established all over the world.

With the rise of the internet, many institutions of higher education in the United States started to look for new ways to distribute their educational content in the late 1990s. During this time the internet has been recognized as a powerful medium to democratize education and increase the excess of educational content for people around the world. In 1998, David Wiley defined the term “Open Content” and described it as a creative work that others are allowed to copy, modify and share. To signify such a permission David Wiley created an open license for creators. The idea of open content started to spread and Charles Vest, the President of the Massachusetts Institute of Technology (MIT) started to video-tape and post content of MIT courses on the internet. This idea became the MIT project and the MIT continued to publish content from over two thousand courses online. A lot of other universities followed the idea of the MIT and this expanded the concept of open courseware over the next several years. Private philanthropic foundations began to support the creation and distribution of open courseware and other forms of open educational content. At a UNESCO the meeting of developing nations (the forum on the Impact of Open courseware for Higher Education in Developing Countries) the term “Open Educational Resources” (OER) has been officially introduced to describe open content for educational purpose.

The official definition of OER:

"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" (UNESCO, 2002, p. 24).

After this, Lawrence Lessig, Hal Abelson, and Eric Eldred established Creative Commons, which offers flexible copyright licenses that people could use for openly license their works. These licenses have become the standard of OER. The Hewlett Foundation started that all works created with project grand funding require a Creative Commons Attribution license.

Other foundations and government agencies have adopted this requirement and this lead to an increase of OER. Most of the available OER for professors was only suitable as additional material to the primary course content and so supporters recognized that OER should be offered in “textbook” formats so that it can be used as primary course content. With the help of foundations and governments “open textbooks” have been created. For example, over the past years, the OpenStax College at Rice University has produced twenty open textbooks for the highest enrolled college courses. These textbooks have been used by thousands of professors. In 2013 the Tidewater Community College introduced the first degree program entirely based on OER and in 2016 the college reform network called “Achieving the Dream” started to introduce OER degrees to nearly 40 community colleges in the United States. These programs will bring OER into mainstream adoption to higher education and in the next several years Open Education is expected to increase globally [5].

7 Benefits of OER

There exist a lot of benefits that OER brings with it. First of all, OER is considered to reduce the gap between different strata of society and countries [1]. Furthermore, it could improve the quality of education in general and accelerate the knowledge flow. A huge benefit of OER is that it can be used worldwide and independent from the system of education and national curricula framework. OER content can be used, reused, remixed, edited and repurposed without any restrictions. The European Commission has found out that OER allows more personalized learning and a better learning experience, because of the increasing availability of knowledge that is accessible anywhere at any time using any device. Through collaboration in virtual communities students and teachers are encouraged to become more active in the educational process. Teachers, for example, can compare their teaching materials with other teachers around the world to improve the quality of teaching. Finally, OER can reduce the cost of educational materials.

8 The 5R of OER

The term “open” in Open Educational Resources indicates that these resources are licensed with copyright licenses that allow everyone to participate in the 5R activities [6]. Whiley (n.d) described the 5R activities as followed:

- **Retain:** everybody has the right to make, own and control copies of OER content.
- **Reuse:** everybody has the right to use the content of OER in a wide range of ways. For example on a website, in a course, etc.
- **Revise:** everybody has the right to modify, adjust, adapt or alter OER content. This, for example, allows a translation of an OER content into another language
- **Remix:** everybody has the right to combine different kinds of OERs to create something new
- **Redistribute:** everybody has the right to share copies of OER in the original, revised or remixed form.

9 Challenges of OER

OER has a lot of advantages, but it is still in the early adoption stage[1]. In this section, some of the major challenges to the widespread adoption of OER in higher education are

summarized.

9.1 Awareness and Perception of OERs

Studies have shown that teachers and the higher education community are often not aware of the potential of OER [7]. On the other hand, those who are familiar with OER may have the impression that their quality of content is unstable. These are the reasons why OER cannot be used with high confidence in some cases. Teachers usually share teaching material with their students and colleagues of their organisation. On the other hand, such a share is not very common at the global level and through formal channels. In such cases, there exists less use of suitable licenses. A wider acceptance of OER requires the development of more awareness. This could be achieved by increasing the recognisability of OER repositories and ensuring the quality of online content[1]. Furthermore, more online collaborative communities should be developed. There exist also issues regarding ownership, intellectual property and copyright. Does content created by a teacher belong to the teacher who invested his knowledge, experiences and time into it or to the organisation who is paying the teachers salary? Therefore creative commons licenses must gain more popularity amongst teachers and creators of educational content.

9.2 Language and Localization

Currently, the major content of OER is mostly English-language based and global-north dominated [7]. However, there exist also content creation in different languages and cultures. For example, Universia is a network offering Spanish and Portuguese language OER. Furthermore, TESS-India is a project that develops OER for the Indian's teacher education system. Nevertheless, there is a danger that language barriers and culture-specificity cause a future digital divide. Machine translation is still weak and could cause a change in the meaning. The development and adaption of OER in different languages and cultural contexts should be more encouraged [1]. For this Intergovernmental organisations could share OER through languages and cultures with the respect of indigenous knowledge and rights.

9.3 OER Production, Identification and Repurposing Skills

The production of OER require a lot of skills including content, instructional, and graphic design abilities [7]. Furthermore, teachers need to know which resources they should choose, why they should adopt them and how to integrate them successfully into their teaching and learning activities to meet pedagogical aims. The lack of experiences to overcome these challenges causes often a motivation reduction of teachers to use OERs.

9.4 Financial Sustainability

We are mainly going to concentrate on this issue of OER projects in higher education, i.e. universities, in this section. One of the most often discussed issues and maybe the biggest challenge of Open Educational Resources is their sustainability in financial terms [8]. As Wiley and Gurrell put it, "How can we provide ongoing, sustainable resources to support a project whose main activity is giving things away?" [8]. These financial challenges are often identified as the biggest barrier of OER since while they are free to use, they are no free to *produce*. It takes both time and money to find, adapt and produce (good) OER. Ensuring copyright compliance and legislated accessibility and providing technical infrastructure for their distribution and creation are all additional costs that need to be taken into account.

There are some notable examples of OER projects that managed to stay sustainable over the years, the perhaps most prominent one being MIT OpenCourseWare. Projects like this managed to stay sustainable thanks to the continued large institutional funding (and support) they receive thanks in part to their success as a marketing tool for MIT and the ability to draw new students in. However, it is often only these elite higher educational institutions, like MIT, that are able to sustain and produce projects that are able to fare well in the long run because of the large amounts of grants from the university itself, its donors and philanthropic organizations or the government that are needed. At the moment, no university has really found a way to sustain a long-term, self-reliant OER initiative without relying on the transience of philanthropic and governmental funding [8]. Governmental funding can also often be unstable, like in a case in the US where the Department of Labor was stripped of its ability to fund OER projects because they interfered with commercially-available alternatives. This instability of funding and the inability to generate stable revenue on their own is also often the reason why university leaders do not support these initiatives.

There have been many model different funding models for OER projects over the years. But none of these models predicted that a project could ever be able to generate a self-sustainable amount of revenue. They concluded that the only currently realistic alternatives are targeted funds by the government and more incentives by the educational institutions for collaboration and faculty development of OER.

This over-reliance on these grants and other temporary revenue sources has also been the reason why many OER projects failed, similar to "valley of death" phase of innovation observable in other technology start-up projects. After the initial funding by external bodies is used up, OER projects often fail because they were projected to be financially sustainable. Thus, it would seem that still the only feasible sustainability strategy is a stable public funding, with an additional change in a nation's educational strategy.

Of course, there also problems that arise from the conclusion that governmental funding is the only way to use OER. Acquiring continuous funding from the state is usually very tedious and requires an institution to always stay on top of other competitors that are also seeking to benefit from the limited funding pools and philanthropic sources. Which brings us back to the issue that only elite higher educational institution like MIT can afford such OER endeavors. It might be a good idea for smaller institutions to wait for OER to be more widely accepted and supported by the government and only use OER from other institutions for now.

Annand states that there seems to be very few feasible solutions in the literature about how OER can result in a stable, self-sustainable revenue stream in non-elite institutions at the moment [8]. Which is especially interesting for him since it could potentially save a lot of money that is currently spent on educational materials despite the fact that both educators and students saw little difference in quality between commercial and OER. The problem here is that at the moment students often bear the brunt of these costs in countries like the United States. Finding high quality OER is often time-consuming for the faculty, time which is often not made available for them. They might just rather use a commercially-produced textbook with high-quality production value and good assessment material. Additionally, these commercial publishers often employ sales representatives that assist faculties in selecting the learning material. These commercial investments into marketing and sales are also an often overlooked factor why OER might not be as widely supported and known by both educators and faculties.

We want to conclude this section with the idea that maybe we should abandon the economic logic that education should be treated as a business the same way we do with the retail and commercial sector. Maybe they shouldn't be governed by the same rules and incentives?

9.5 Institutional Policy and Support

Institutional support is determining for innovation and institutional policies are the primary guide on how the staff approaches OER creation and adoption [7]. In some higher education institutions, the development of OER is not included in the performance evaluations. Furthermore, reward or incentive structures may not exist to encourage OER creation or adoption. Some institution even dictate ownership of teaching materials what could be released as an OER. This is a common concern within faculties of (renowned) institutions about losing ownership and control over their intellectual property or *surrender* the most valuable faculty knowledge within institutions they have acquired over the years [8].

Annand opines that higher educational institutions are often plagued by inflexible instructional policies with a certain reluctance to approach learning as a collaborative student-teacher process [8]. Additionally, more resources are needed to overcome these institutional barriers by incentivizing the creation and use of OER and create a mindset of openness and collaboration among institutions in the process.

As we covered in the previous section, the faculty often does not get the time allocated by the educational institutions to research OER repositories and select these resources for their curriculum which often skews teachers away from OER. It is usually easier and cheaper for institutions that are not legally required to include instructional materials into their tuition fees. Because these institutions can assign the time of their teachers for actual teaching instead of finding instructional material, a cost which is instead often pushed onto the students.

10 OER in Developing Countries

In this section we are going to take a look at the usage and unique problems of OER in developing countries, with an emphasis on higher education.

While developing countries are often lauded as the countries that could benefit the most from OER, the actual literature on their usage is still limited [9].

The opportunities provided by Open Educational Resources can be even more beneficial in developing countries, such as India. One reason for that is that at the moment they are often facing additional barriers to high quality scholarly literature which is made even worse thanks to the ever increasing costs of accessing peer-reviewed journals [10]. This limits the access to this literature to only elite institutions in developing countries. Additionally, because articles published in periodicals of such countries have limited distribution ranges, their research is often overlooked.

This is where open access literature provides a substantial opportunity to let this research reach a global audience. Ghosh et al. highlight that researchers from developed

nations are increasingly accessing articles from India thanks to them being published in open access journals which helps making developed nations more aware of all the quality research being done in developing countries [10].

Such recognition of the research projects could also help to generate more public funding and would also allow citizens access to the research they funded with their taxes. This open access can also further socially empower them.

An important contention to make here is that these open educational resources and open courseware should serve as an extension and additional resource to education in developing countries and not replace it. These countries should not be dependent on western countries for educational content and be "westernized" too much in the process. The opportunity that educational content can be developed in many different languages and cultural contexts should be used, instead of imposing our research on developing countries, as discussed in 2005 at an UNESCO forum on Open Educational Resources [11]. OER from western countries can't just be used in other countries, e.g. a Sub-Saharan country like Nairobi, without recontextualizing them before usage.

Another impediment is the access to technology in general in developing countries, and especially the users' ICT literacy. If we want to employ OER more widely in campuses, we need to ensure that we can reach more than just the students and teachers with a background in ICT, for example by investing more into ICT literacy training.

Other, perhaps more significant problems that are still true to this day were also noted in the UNESCO forum [11]. These include the aforementioned cultural and linguistic differences. Slow and expensive internet connections as well as a general lack of access to computers in developing countries are obviously one of the major impediments of OER and have to be tackled first if we want to employ and benefit from OER on a global scale. Studies in many African countries like Kenya, Uganda, South Africa and Tanzania all listed limited internet access and high costs as major impediments of OER.

Despite all the possibilities of OER for developing countries, its usage is still not very high in many countries, for example Sub-Saharan countries have only been responsible for 2% of users. One way to explain this, is the aforementioned often missing awareness of OER in section 9.1. A study conducted in Tanzania and other Sub-Saharan countries showed that a lack of trust or interest in OER are usually not their biggest barriers in high educational institutes [12]. This is also reflected in the lack of policies concerning OER and eLearning. Even institutions that had such policies in place did not implement them. 82% of instructors were not even aware of the Creative Commons licence as a result [12].

The teachers are interested in high quality educational resources and already use and trust sources from the internet to enhance their courses despite these hindrances. But they are simply not aware of good OER repositories with quality content. To combat this problem, it is the responsibility of institutions and the government to help raise awareness. Additionally, if teachers are not aware of such high quality repositories they might continue comparing the OER with other (possibly more unreliable) sources they find on the Internet which could lead to a bigger distrust in OER in the future.

10.1 *Offline* OER Repositories

So far, we have only talked about OER cases in developing countries where the higher educational institutions do not serve as a consumer but also as a creator of OER resources.

But there are a lot of cases where this is not a feasible scenario thanks to aforementioned hardware and infrastructure barriers. Take Africa for example. Universities have started to well-equipped with computer hardware but their internet connectivity is still too poor and unstable to allow regular use of sites like Wikipedia. These issues often prevent teachers and students from using knowledge repositories like Wikipedia to learn more or improve their instructional materials [13]. This is where projects like Kiwix can help bridge this gap.

Kiwix is an open-source web browser which allows offline access to numerous Wikimedia Foundation projects, the most notable and first available one being Wikipedia. It is available in more than a 100 languages and allows users to download and compress entire projects such as Wikipedia or other educational resources like scientific videos [13]. Kiwix has seen more and more usage in many African countries, like Senegal where a larger scale project was conducted by Gabriel Thullen in 2016 where seven Senegalese schools were given offline access to Wikipedia thanks to Kiwix. His motivation was that even schools in large cities had very poor internet connections, so he noted that the only way to stay true to the Wikimedia foundation's unofficial motto of "giving every single person on the planet free access to the sum of all human knowledge" is by providing this knowledge in an **offline** format [13].

Another notable example is the Afripedia project whose goal is to increase offline access to Wikipedia in French-speaking African schools and universities [14]. However, the aim of this project is not to let members of the institutions to become passive users of Wikipedia but instead it actively encourages and trains them to become contributors to the platform. The main reason for this being that content about Africa is severely under-represented on the platform at the moment. Only two percent of all contributors are from Africa and most of them are from North African countries.

The project used Kiwix to implement a computer deployment project which was able



Figure 1: The hardware used in the **Afripedia** project consisting of a plug computer, a wireless router as well as a USB drive containing a copy of the French Wikipedia [15]

to broadcast the French Wikipedia over offline WiFi networks. This allowed members of universities in West and Central Africa to connect to this network and read Wikipedia without needing an internet connection or a desktop computer. 15 people from French-

speaking campuses in eleven African countries were hired and given training about how to use and install the offline Wikipedia tools as well as editing Wikipedia articles and important concepts like free and creative commons licenses.

Afrikipedia was successful in spreading Wikipedia to over 13 universities with no internet like those in Niger for example and its press coverage even allowed the idea to spread to other universities in the Democratic Republic of the Congo where they installed similar offline Wikipedia setups [14].

11 Limitations

In this paper we mainly looked at the usage of OER projects in a higher educational context with an additional focus on developing countries, i.e. we assumed that OER are used in a formal higher learning environment.

There are of course many more application areas of OER that we did not further discuss in this paper. We also put a bigger emphasis on not only the *passive* usage of OER resources and projects but also the *active* creation of additional OER resources when we discussed and covered some of the challenges that OER are facing.

12 Conclusion

We have discussed and identified various issues and challenges that Open Educational Resources in this paper. One of the main problems of OER is its limited support and awareness amongst higher educational institutes. This is also due to a lack of the exploration of its cost-saving potential and, more importantly, the impact on other factors like the throughput rates of students in these institutions. If this potential can be more highlighted and other challenges like the financial sustainability of OER projects can be more successfully tackled in the future, OER can shift from its current peripheral status to a mainstream practice.

Furthermore, it is safe to conclude that the implementation of OER projects is still at an early adoption stage, especially in developing countries. There is still a lot of work that needs to be done in these countries before OER can be used to its full potential and live up to its promises for poorer regions of the world. We identified some of the major issues that affect developing countries in particular. These include more general problems with infrastructure, internet connection, ICT literacy and funding but also institutional problems like a lack of OER repository awareness, policies and training for creating OER resources with standardized licensing.

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¹<https://free-and-open-technologies.github.io>