



UNESCO INTERNATIONAL COMMUNITY ON
OPEN EDUCATIONAL RESOURCES

Access to Open Educational Resources

Report of a UNESCO OER Community discussion

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Part One. Issues

1. The meaning of access

The first week of the discussion concerned access issues. This chapter begins the discussion by asking ‘What is access?’ The following two chapters discuss access issues in detail and provide a classification, and then imagine a super-accessible OER, the ‘SuperOER’.

1.1 What is access?

The topic of the community discussion was **access to Open Educational Resources**. More fully, it was concerned with OER access **issues, barriers** and **solutions**. Broadly speaking, there is a resource (the OER itself) and somebody who wishes to access that resource (the user). Between them, potentially, there are barriers:

oer | user

In the first part of the discussion, the community examined the barriers that prevent successful access to OER. But before coming to that, it is helpful to examine briefly what we mean by the terms **Open Educational Resources, access** and **barrier**.

1.2 Open Educational Resources

The issue of what constitutes an Open Educational Resource was raised several times. For instance, it was highlighted that OER encompasses a broad range of resources, not just course-related materials:

I get the impression that many participants are thinking of ‘OER’ as on-line university courses. The definitions are generally much broader (e.g. Wikipedia) spanning individual images, text sections, video clips, modules, courses, entire curricula, FLOSS for education, etc.

Many of the definitions go beyond content, as demonstrated by the definition in Wikipedia, mentioned above:

Open educational resources include:

- *Learning content: full courses, course materials, content modules, learning objects, collections, and journals.*
- *Tools: software to support the creation, delivery, use and improvement of open learning content including searching and organization of content, content and learning management systems, content development tools, and on-line learning communities.*
- *Implementation resources: intellectual property licenses to promote open publishing of materials, design-principles, and localization of content.¹*

The William and Flora Hewlett Foundation definition concludes that OER:

¹ http://en.wikipedia.org/wiki/Open_educational_resources

... can include full courses, textbooks, streaming videos, exams, software, and any other materials or techniques supporting learning.²

The community focused on the issue of **access to resources**, rather than looking at the vast range of issues around **access to education**. However, in as much as resources are relevant to education, the discussion was relevant to access to education as well. More importantly, many of the access issues discussed are also directly relevant to open education, and may help to inform the discussion around **access to open education**.

Similarly, the discussion focused on **open** resources, although the barriers identified may prevent access to other resources, irrespective of whether they are closed or open, commercial or non-commercial. Why focus on barriers to open resources? Barriers to accessing open resources are particularly tragic, because these resources would otherwise be fully available. For this reason it makes sense to focus specifically on access to **Open** Educational Resources.

1.3 Access: who is accessing what resource?

Access is the means, place, or way by which a thing may be approached (Webster's Revised Unabridged Dictionary), the right to use or look at something (Cambridge Advanced Learner's Dictionary), the right or opportunity to use or benefit from something. Access involves a subject and an object: a person who accesses a resource.

It was agreed that the community should aim to make as few assumptions as possible as to who, what and where the personal and resources may be, or the location of the person accessing those resources. Importantly, in the first week of the discussion, the following issue was raised:

The barriers to access that have been mentioned so far, mostly focus on those barriers that prevent 'users' in developing countries from accessing materials that were produced in developed countries.

In the context of international development, there can be an implicit assumption that frames 'access' as a problem of consumers in the South that are unable to access materials produced in the North. However, access issues are more complex than this. It is equally justified to ask, what are the barriers that prevent users in developed countries from accessing, say, African OER?

Many of the barriers that are discussed in this report cut both ways. Indeed, it may be harder to access Southern materials than those produced in the North. There is no question that it would be very valuable to make Southern materials more easily available in the North, as well as to be able to share materials 'South to South'. This is not to say that access barriers are symmetric. There are, of course, additional and more significant barriers to access in the South, such as a lack of basic infrastructure or funding.

Indeed, it could be argued that general access discussions focus primarily on North-North access barriers, and that there is a tacit assumption that South-South access issues are broadly the same. But 'access', in a limited North-North way, fails to include some North-South issues, not to speak of South-North and South-South issues. It thereby misses many important questions. Unsurprisingly, given the profile of the community, North-South and South-South barriers, such as the digital divide and bandwidth, featured strongly in the discussion, while these are often only discussed in passing in the literature on access.

² <http://www.hewlett.org/oer>

1.4 Barriers to access – and to other activities

... many OER initiatives can be characterised as unidirectional broadcasters, which is not a bad thing per se, since it can have certain benefits. However, it is also important to look for alternative models of communication and the respective infrastructure. Do we look for radio receivers or do we look for telephones? Do we want consume OER or do we want to 'rip, mix and burn'? As educators, we cannot only teach reading, we also have to teach (and therefore do) writing.

Clearly, considering barriers to 'access' only does not constitute the whole picture, because barriers to access may also be barriers to other activities. Two quotes highlight this:

*[Barriers to access] is an important perspective, but it leaves out the barriers to *participation* of people and institutions from developing countries in the OER movement. By participation I mean, publishing local materials, rather than just translating and adapting imported ones. The question then becomes, what are the barriers that prevent 'users' in developed countries from accessing African OER?*

Coming back to the discussion, we have talked about 'barriers to access', that is to say: 'Go once from the North to the South' (or, as you raised, once from the South to North). But participation also means collaboration.

This can be approached in a different way, by asking whether providing access to content is as important ultimately as developing skills to develop content. Both, however, are necessary. Access to existing content is an important first step for developing new content – especially for developing new content *efficiently*. For instance, the UK Higher Education system draws on existing encyclopedias, rather than developing new encyclopedias themselves. Others should also be able to benefit in this way. But, ultimately, participation and collaboration may be far more important than simple one-way access. And many of the barriers to access identified during the discussion are also barriers to participation and collaboration.

Finally, if participation and collaboration are to take place, content needs to be relevant:

I'd like to introduce another 'barrier to access', which is 'access in terms of relevance'. It's really just another slant on some of the issues already discussed (around adaptation/remix/re-use), but I do think it's relevant. If there was more participation and collaboration, then OERs could be made more relevant.

In summary, while we sometimes pursue narrow notions of 'resources' as 'content', and 'access' as access to consuming this content, the broader issues need to be kept in mind.

2. Classification of access issues

2.1 The classification

The community began by surveying a broad range of access issues. The discussion was introduced as follows:

Although our initial interaction on the issue started with the consideration of limited or no connectivity, lack of electricity was identified as an even more basic barrier to access to OER. However, there are many other potential barriers or constraints and it will be useful to identify the range of them, for there are emerging solutions or approaches that would mitigate the problems. Developers of OER will benefit from having these in mind – donors and other agencies may be able to contribute to addressing them.

In response to this, a large range of access issues was put forward. Later in the week, it was proposed that we classify the issues, and a discussion on the classification followed. The report will start with the classification, so that the issues can be presented according to the classification.

Purpose of classification

The first step in any classification process is to identify and understand the purpose of the classification. What is the purpose in this case?

This question was raised early in the discussion. Why develop a classification? The following reasons were put forward:

- To help identify the issues that this community could address and those that should be left to others.
- To determine whether they are hard or easy to fix, i.e. ‘This issue has a clear, easy to implement, acceptable solution’ compared to ‘This issue doesn’t have a clear solution, or would take a very long time to fix’.
- To determine whether a particular issue is important, i.e. whether finding a solution is of high priority.
- To group issues that may have similar solutions.

For this report, the purpose of the classification is to group issues strategically, according to possible solutions, with a particular view to issues that could be addressed within the community (or other established OER communities, such as the OpenCourseWare Consortium (OCWC) or WikiEducator).

Classification of access issues

An important division of potential barriers is into ‘social’ and ‘technical’ barriers, as it informs the type of solution proposed:

I classify them into two: social barriers and technical barriers which are mostly due economical reasons. For social barriers, ... cultural obstacles ... fear of the unknown ... lack of awareness ... no institutional or national champion to drive the initiative. For technical barriers (which I think is mostly due to economic reasons), I consider the following ... infrastructure requirements / bandwidth ... lack of skills to use or innovate or to localize the contents.

Another commentator made the distinction between challenges due to the (technical) nature of the content and challenges due to the wider educational context:

This of course does not speak to the many challenges that have been cited in this discussion related to the nature of content (open formatting, granularity, bandwidth, use of 3rd party/proprietary content, etc.), institutional incentives and culture (tenure and promotion, lack of trust, etc.), understanding of OER, and skills needed to effectively modify and reuse content for local contexts, but it does at least point us to the potential importance of focused and thoughtful faculty development, mindful learning design and content creation (tagging, consistent use of open licences, ease of accommodation for disabilities and language, etc.).

These broad classifications of potential barriers can be subdivided according to different types of access:

- Social, awareness, policy, attitude, cultural:
 - Access in terms of awareness (lack of awareness as a barrier to OER)
 - Access in terms of local policy/attitude (do attitudes or policies pose barriers to using OER?)
 - Access in terms of language (how well does the user understand/speak the language of the OER?)
 - Access in terms of relevance (is the OER relevant to the user?)
- Legal:
 - Access in terms of licensing (is the licensing suitable?)
- Technical: provision of OER:
 - Access in terms of file formats (are the file formats accessible?)
 - Access in terms of disability (does the OER meet WAI accessibility criteria?)
- Technical: receiving OER:
 - Access in terms of infrastructure (lack of power/computers makes access hard)
 - Access in terms of internet connectivity/bandwidth (slow connections pose a barrier to access)
 - Access in terms of discovery (if the OER is hidden, not searchable, not indexed, it will be hard to find)
 - Access in terms of ability and skills (does the end user have the right skills to access the OER?)

An important secondary classification, in order to determine importance, is to ask which are barriers to both North-South and South-North sharing, and which barriers also apply to participation and collaboration. This was articulated by one participant as the distinction between access to content and access to production facilities (and the ability to adapt and re-use content):

I ... want to paraphrase them as the difference between the access to products (OER, OCW) and the access to the means of production (e.g. production and publication facilities, editorial support units, etc.). Means of production go far beyond mere internet connection and bandwidth. With respect to accessibility to the means of production, the infrastructure e.g. of institutional repositories differs strongly from infrastructure e.g. for WikiEducator. One limits access to facilities for members of the institution only, while the other provides equal access to more participants (if they have [an] internet connection). However, sometimes it can be necessary to restrict access to some elements of production facilities (e.g. to secure the integrity/stability of a product).

Finally, it should be noted that, while this classification provides a useful conceptual framework for this report, it is not the only possible system or measure for accessibility.

2.2 Overarching access issues

Having presented a broad classification for the issues, the report now moves to the issues themselves. As discussed in the first chapter, there are narrow and broad views one can take regarding the meaning of ‘barriers to OER access’. Initially, the community took a broad view and identified overarching issues.

Overarching issues

First, if content is not made available as **open** content, it cannot be used freely:

I think that making the content available (OPEN) to all is the first barrier to use.

Another overarching issue is that of available funding:

One key obstacle to African participation in OER has been the lack of funding. The most successful international OER projects have all received substantive grants, often in the millions of US\$, to create the infrastructure and capacity to publish educational resources openly. It is not possible for African universities, given the lack of capacity and resources mentioned by others, to fully participate in this movement without financial support.

Of course this lack of funding is the root cause of many of the other issues discussed:

I ... wanted to make sure that we don't ignore the elephant that is standing in the corner: lack of capacity and bandwidth (as examples) are also related to lack of funding to pay for capacity and bandwidth.

This brings us to infrastructural issues, particularly ‘gross’ infrastructural issues, such as lack of information and communication equipment, lack of electricity – even lack of peace. All of these are barriers to accessing education in general, as well as barriers to accessing and developing OER:

Infrastructure: *Most of Africa suffers from poor infrastructure due to lack of physical facilities, electricity and transportation. To this end, a respondent from Nigeria stated the following, "in my university, there are infrastructural limitations; students often have to sit on windows or squat by doors to receive lectures. Furthermore, our public power supply is epileptic and there seems to be no solution for this at the moment". There are also places where there are no roads to facilitate communication and telephones are a luxury to many. In addition, lack of ICT policies within governments make it difficult to supply bandwidth and connectivity. These infrastructural barriers therefore militate against advancements in accessing digital learning resources.*³

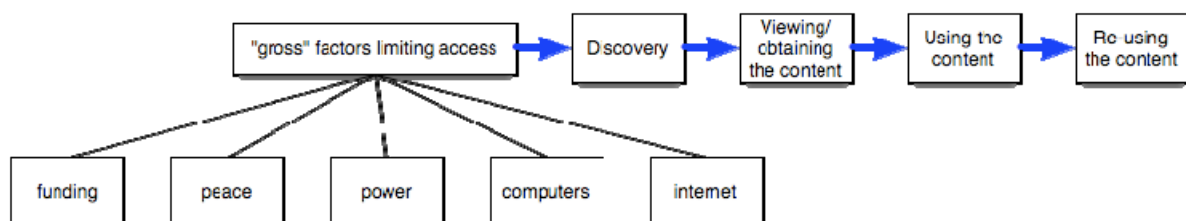


Figure 1. The content access chain (modelled on the bandwidth management chain⁴)

³ Rasugu, P. 2006. Laying the foundations for Open Educational Resources in higher education in Africa: a survey on perceptions of African academics. Project report submitted to the University of Southern Queensland, Australia as the final assignment for a Masters degree.

⁴ See <http://www.apivate.org/> for more on the bandwidth management chain.

Lack of access to computers or to a reliable power supply is one set of barriers linked to poverty. Participants also highlighted the following barriers to OER as outcomes of poverty:

- distance from local telecentres or Internet cafes (in areas where personal computer purchase and an Internet subscription are beyond the means of most people);
- time available (where pay is low, people may work two or three full-time jobs to earn sufficient money to live. Time spent creating or accessing OER may be a luxury that they cannot afford);
- opposition of family or friends (this was thought to affect women in particular, who may be told that they should tend to cooking, cleaning and caring for their families when not out at work).

Overarching issues: the case of the Zimbabwe Universities ICT Consortium

At what level does access need to be addressed? To what extent are individuals empowered to make a change? In the Zimbabwean Universities ICT Consortium university ICT heads came together to chart a unified path for the servicing of the ICT needs of universities, other tertiary institutions, schools and the community.

The consortium met and produced a detailed document as a blueprint. It considered the individual university environments and the overall Zimbabwean environment, the needs, expectations and the roles universities could play in affording access to knowledge and knowledge creation. The goal was to consider the obstacles of the varying digital divides and to find ways of overcoming them.

The project proposal was sent to vice chancellors and the ministry responsible for higher education. It contained the network design, the equipment, the local university-developed ERP, required skills, skills retention and the budget. It also assigned responsibilities to each university in the consortium.

The main issues relating to access and connectivity were:

- Internet access – if the government were to waive its licensing requirement, there would be enough resources to design and build an academic backbone network.
- Bandwidth – collectively the overall budgets were enough to obtain good bandwidth provision, though individually institutions were getting mediocre service.
- Technical constraints – different universities were facing different issues, but collectively there was enough skill available.
- Access to information was highlighted as a challenge due to a host of reasons.
- Human resource development.

Universities have the potential to be key drivers in local content production and dissemination. Another important element was gender imbalance. ICT cannot be a men-only club: gender issues need to be considered as part of all initiatives.

Unfortunately the proposal document did not have an impact, and it is important to reflect on why this is the case. Key questions one might ask include:

- Why is the digital/access divide still widening when academic ICT leaders are willing to work together?
- Why is it that finance was not highlighted as the primary issue when heads of ICT met, but became an issue only when it came to remuneration and skills retention?
- Why is it that the requests and views of ICT professionals were not acted on?

Primary vs. secondary barriers

Focusing more narrowly on OER, there are still some issues that are more important than others – some issues are ‘primary’ while others are ‘secondary’. For instance, if a resource does not have a suitable open license it cannot be used; other issues preventing access will not matter. Similarly, localization is important, but if a user cannot access the content in the first place, then having the

ability (or skill) to adapt content to the local context is irrelevant. Someone with no books at all might be quite happy to get hold of a book, even if it is not perfectly adapted to his or her local context.

Where (either in developing countries or in ... North American countries) the cost of educational materials such as textbooks or videos blocks access to a knowledge base, having access is a more primary issue than the ability to localize.

Primary issues may be particularly important in blocking participation and collaboration. However, it should be remembered that even primary issues, such as lack of bandwidth, can be mitigated by cleverly designing discovery and resource access.

Finally, to return briefly to the last quote, what does ‘having access’ really mean? Access is not a clear-cut issue. It is not a question of either having access or not having it at all. There are degrees – shades – of accessibility in between. Accessibility has different dimensions; dimensions that this report will visit in turn.

2.3 Access issues to do with awareness, policy, attitude, culture

The discussion of individual issues that follows uses the classification of different types of access barriers presented in the previous section.

Access in terms of awareness

Case study: lack of awareness and the lack of a critical mass of experts

A head of ICT in an institution with a severe shortage of learning materials, observed that students and lecturers were not aware of the availability of open resources. However, highlighting the existence of useful courseware and other OER did not lead to change. The key issues preventing access remained a general lack of awareness about the existence of OER. The non-existence of a critical mass of OER experts prevented the training of teaching staff and a lack of skills to find, adapt, use and create OER.

As the story above illustrates, there is not enough awareness of OER. Individuals may not be aware of the existence of OER, the range of OER available – even the concept of OER itself.

Many people ignore that they have the opportunity to improve their knowledge freely through OER. They look very astonished when you ask them what they know about OER. ... I would like you to take ignorance as a serious barrier to OER.

Access in terms of attitude

Resistance to using resources developed by others, a fear of openness, and a fear of the new or unknown can be barriers to many. Lack of support in the form of an institutional or national champion can be an additional barrier, especially in the face of resistance and negative attitudes. These issues were articulated very widely, by participants from many different regions and cultures.

Fear of losing financial gain: in recent decades, there has been (as there is in most developed countries) fierce competition for the decreasing education dollar. In some states, some educational areas were supposed to finance themselves from the money they made – in most cases, delusional. So there is extreme unwillingness to share anything that might be financially rewarding – at least on the part of managers.

Fear of not being 'good enough': if you share what you have done, your contribution may not be worthwhile; you may be exposed as being less experienced and/or less 'educationally sound' than other contributors. ... I believe it is a real disincentive where competition between providers means they are all spruiking [promoting] themselves as being 'world class'...

Access in terms of policy

An important policy issue is that sites that enable sharing of content (such as YouTube, which has a large amount of educational content) may be banned or censored in some institutions and countries. For instance, because of its appeal to younger people, YouTube may be considered a good medium for delivering content aimed at students. While this may be true, some institutions block access to YouTube, for fear of distracting or inappropriate content. Policy of course does not just concern particular sites. It is also relevant for a computer network as a whole and, in particular, bandwidth use.⁵

Policy can have an enabling function directly related to OER, for instance by setting policies to encourage OER use, or to publish learning materials as Open Educational Resources or research outputs in Open Access journals or repositories.

Access in terms of language and culture

Language is a barrier to accessing OER. One participant had this to say about working in a university in a non English-speaking country:

English Language is a barrier as well. 90% people can not read, write or speak English.

Lack of OER in local languages may be a particular barrier for speakers of some minority languages.

Of course, understanding a language is about more than just being able to translate words and phrases:

I would add one additional barrier that is a variant on language: understanding and feeling comfortable with the mental models, terminology, idioms and contextual examples of the OER. This could be referred to as a cultural barrier.

This leads to the related issue of localization:

... it struck me again how the learning objects are tied to the local culture. Illustrative examples and exercises in topics such as math and science are based on an assumption that the learner is familiar with our subway system, our popular culture, our local food, our winter based sports, and especially our idioms, metaphors and similes. Translation is going to take far more than translating the words and sentences. The learning objects will need to be localized as well.

Finally, the distinction should be made between the language of the resource itself and the lack of metadata in a particular language (which reduces searchability).

2.4 Legal issues and access in terms of licensing

In many ways open licensing has become synonymous with Open Educational Resources. Today's users are more likely to be suspicious of something that calls itself 'open' but is all rights reserved

⁵ A list of characteristics of good bandwidth management policy can be found in the open book, *How to accelerate your internet* (<http://wiki.bwmo.net/moin/English/Chapter2>).

2.5 Technical access issues: provision of OER

The discussion of access issues now turns to ‘technical’ barriers to access. The solutions to the barriers presented in this section are principally on the provider rather than the user side. That said, the distinction between provider and user issues is overly simplistic. Many ‘provider issues’ can be mitigated on the user side and vice versa.

Access in terms of file formats

Some formats are more accessible than others. The following statement was made with regard to adaptation/remixing, but it applies equally well to simply using the content in the first place:

... more of the material [should] be made ‘easily remixable’. This is not only a matter of licenses, but of file formats, etc. Already, people who translate OERs into Chinese are complaining about receiving PDFs with graphs and illustrations – if they had access to the original PPTs, they could much more easily change the language, or reuse parts. In this regard, sites like WikiEducator, Connexions and Open University, that presents the material in HTML, XML, Wiki markup or other ‘structured’ ways, are preferable – but of course, this must be weighed against the desire to make a lot of material available quickly.

Ensuring greater access through the provision of resources in easily accessible file formats is the responsibility of the provider. They have access to the raw materials and can make additional formats available. It is harder for the user – particularly the non-specialist user – to mitigate this.

Access in terms of disability

Physical, emotional and learning difficulties provide a series of complex challenges in [the] developed and developing world. The technology can overcome barriers (speaking web pages, Braille printers and so on). This requires good design and thought. In the UK Techdis <http://www.techdis.ac.uk> has done some really useful work.

Disability access is a well-recognised issue, at least in the global North. A number of governments have developed policies relating to disability access, while guidelines, such as those of the Web Accessibility Initiative (WAI⁹), are well established. In many ways it would be unacceptable for a public institution to publish a website that did not meet WAI standards. In developing countries, however, where web penetration is so much lower overall, there may be less awareness of disability access issues.

Access in terms of discovery

If it is hard to search for and find resources, then it follows that it will be hard to access them. Resources need to have good metadata and need to be indexable. However, even if OER has good metadata, differences in curricula can make it hard to search across resources from different education systems:

... the differences in curriculum making it difficult to get the precise information you need ...

⁸ See, for example, tools to support the development of libre knowledge resources (http://www.wikieducator.org/Libre_Knowledge_Resources_Development_Cycle) or the OER life cycle (http://www.wikieducator.org/OER_Handbook/educator/OER_Lifecycle). For related discussion, see the copyright and open content licensing section of the UNESCO OER Toolkit (http://oerwiki.iiep-unesco.org/index.php?title=UNESCO_OER_Toolkit/Copyright_and_Open_Content_Licensing).

⁹ <http://www.w3.org/WAI/>

This is a provider-side issue, although it also speaks to the need for standards and general OER infrastructure.

Access in terms of ability and skills (available to the end user)

There needs to be a match between the skills required to access an OER, and the skills that the user has at their disposal at a particular moment in time (i.e. ‘Is the content in a format that users are likely to be familiar with, or one that they will find hard to use?’). This is relevant for use and reuse of content:

A lack of local skills and knowledge for adapting and revising OERs is a significant barrier. Without these skills, OER cannot be localized and made appropriate for use by the local community.

Another quote, from a report by Philise Rasugu, illustrates this further:

***Computer Literacy:** Majority of students and teachers are not computer literate and those who have the opportunity to use OERs have very low computer literacy levels. One respondent stated that "unfortunately the majority of students are not computer literate, the curriculum is country based and there is very little country-based information available for the students. Mostly one gets information on how the developed countries are operating since our country is currently recovering from civil war." And apparently, they live in remote rural areas where computers, like in many remote parts of Africa, are unheard of.¹⁰*

This is a user-side issue, although providers can take care to make their resources as easy-to-use as possible.

Access in terms of design information provided with the resources

Of course the ‘ability and skills’ the end user needs are (to some extent) mitigated by the information provided with the resource. That is to say, if only the (bare) resource is made available, it can be hard for a user to know what to do with it – where, when and how to use it. If additional information is shared, such as the learning design or production notes, then the resource will be easier to use. Moreover, this additional information offers a blueprint for creating similar resources.

We have found a lot of interest in using OER as a route to sharing the learning design (or should that be teaching design?) of how to structure online resources. Most materials do not explain how they are meant to work so someone who wants to reuse or change has to first be a learner. If there were an overview or consistent way to show designs then more reuse may take place.

2.6 Technical issues: reception of OER

Access issues in terms of infrastructure

Lack of access due to poor infrastructure was flagged early in the discussion as an overarching concern. Inadequate infrastructure is a particularly severe problem in sub-Saharan Africa:

... upon further probing on how often they used/accessed OERs, a significant 55.8% indicated that they had occasionally or never used OERs, this was largely attributed

¹⁰ Rasugu, P. 2006. Laying the foundations for Open Educational Resources in higher education in Africa: a survey on perceptions of African academics.

to the technological or/and infrastructural challenges that African academics face. And thus, it can be concluded that OERs are largely underutilized in Africa.¹¹

Participants touched briefly on non-digital distribution of OER for regions and groups without access to computers or Internet access. Methods include distribution through paper, television or radio. They are important where digital access is not available, although even they can be difficult to access for some:

Traditional resources (e.g. paper, traditional books etc.) are very expensive as compared to digital media (ebooks, audio and video material etc.).

Participants also stressed that infrastructure is not a black and white issue; it is not a question of ‘no access’ vs. ‘full access’:

[Poverty] ... is not the same as the technical access issues. In most developing countries, access is extremely expensive, and educators mostly have to use computers on their own time (and budget). In consequence, they have to make radical choices about how they use the internet: browsing and experimentation are often not options.

More often than not, the problem is not solely that there is no infrastructure. Instead, it is a lack of infrastructure combined with a lack of appropriate OER for resource-poor environments. With good bandwidth, a user can wait for a large resource to load or download. However, with poor infrastructure that same resource will be inaccessible. It is important to note that there are two possible solutions: the OER community can call for improvements to the infrastructure; but it can also call on producers to reduce the size of resources or to make alternative formats available. So, although this is more a user-side issue, it can be mitigated in part by the provider.

Access in terms of internet connectivity and bandwidth

Access in terms of internet connectivity and bandwidth featured strongly in the discussion. The main issues are that:

- there is little bandwidth;
- where bandwidth is available, it is expensive;
- bandwidth is often poorly managed.

Case study: the challenge of access in Eritrea

In promoting computer education in Eritrean schools and colleges, the contributor was faced with the challenges of lack of electricity, connectivity, teacher training, or capacity for maintaining devices. As an Assistant Professor of Education in Eritrea, the contributor's experience was to sit for hours in front of computers in internet cafes waiting for websites to open. While cities, such as Asmara, offered some access to internet, small towns and remote areas remained cut off from the world wide web in spite of there being computers in many locations. These challenges, affecting the equality of connectivity and access, continue to divide our world. We need to find more viable and sustainable solutions to develop access to educational resources.

In the context of OER, these issues are particularly tragic because, as this participant from Rwanda pointed out, these resources have been made freely available to be used – in some cases with little need for further adaptation or translation:

¹¹ Ibid.

One of the barriers of using OERs in central and southern African universities is the issue of BANDWIDTH. They must pay very expensive for that and they have no money or/and the national authorities do not understand enough the importance and benefits of OERs for their education and do not consider them as a national priority. The good thing is that these universities use European languages and don't need translation in their native languages. OERs can just be adapted to the local environment without translating in African languages.

The following story from Aptivate,¹² a UK-based NGO that works on ICTs and development in several African countries, highlights an additional issue for low bandwidth environments.

Case study: the need for bandwidth management

An often overlooked point in institutional Internet accessibility is bandwidth management. It is true, as a discussion contribution from Rwanda reminded us, that bandwidth is particularly expensive in Africa. African universities typically pay thousands of dollars a month for the same capacity connection as a US user might pay \$20 for. But whatever size the connection (however much bandwidth there is) it needs to be well managed. An unmanaged network of computers connected to the Internet will quickly become clogged with viruses, spam, peer-to-peer traffic and other useless traffic. This means there is no capacity left to access useful things like OER.

A few years ago, Aptivate were working in Ghana to improve the usability of a free journal access portal. In one research institution they realised that the main reason their network was performing so poorly was that it was flooded with viruses. Working with their staff to put tools in place, we were able to improve the speed of the connection by a factor of 15.

A 2006 African Tertiary Institution Survey found that almost 2/3 of universities practice little or no management of their connections. Universities have a hard time retaining skilled staff; there has been a lack of awareness among management and funders as to the need and means to build up good network administration and policy, less training than required and, to some extent, tools are expensive and/or very difficult to use.

Managing bandwidth well helps to make internet connections more effective for academic purposes, and enables OER to be accessed more effectively.

This is an important issue, perhaps particularly because it receives far less attention. Connectivity is not just a question of the absolute bandwidth available, but also of how that bandwidth is managed.

This comment, from a participant working in Mexico, makes a similar point:

... we often restrict ourselves to think only about the 'physical bandwidth' to a certain location, and neglect to think about all the other factors that can impede transfer speed. I have similar experiences from a computer lab in a village in Mexico – I have never seen so many and [such] fierce viruses in my life, busy spamming thousands of emails across the world, on a tenuous and expensive satellite link.

The following quote makes an additional point:

The flip side of the bandwidth problem is that OER resources are not often designed to work well over low bandwidth connections. Users sometimes give up after 'bandwidth heavy' sites (lots of images, flash and less than critical scripting) keep crashing or are prohibitively slow to load.

¹² <http://www.aptivate.org/>

Bandwidth is thus *not* just a user-side issue. Lack of access due to lack of (affordable) bandwidth is compounded by providers, who fail to make resources available in low bandwidth friendly formats:

If OER projects want to be helpful for developing countries ... there is a crucial need to develop resources accessible in low bandwidth ... and by low ... I mean almost dial-up! Also, the emergence of the use of cellphones can contribute ... but this is the reality of just a handful of countries. I hope OER developers keep this in mind ...

This view also received support from a participant in Brazil:

I would like to enthusiastically embrace the idea of working harder on bandwidth management. The Aptivate guidelines are very useful and edifying,¹³ and more effort should go into making resources usable in low bandwidth environments (which is after all the target audience of this group).

Indeed, the issue of bandwidth drew comment from participants from all over the globe, eager to share their stories:

Working in ICT at a developing world university/academic institution comes with many challenges restricting access. It is always difficult to set up the right infrastructure and design the right and the best bandwidth utilisation plan. (Zimbabwe)

Whenever I send the web sites of free available e-resources to our students, teachers and researchers they complain that they could not download the materials because of slow internet or some times non accessibility. (Pakistan)

Last time we participated on the identification of OER materials but what we faced was the trouble of having access to internet connectivity. Sometime back some schools had internet connectivity with the local ISP but what we discovered was that to maintain this connectivity was an issue and it became extremely expensive and at the moment some schools cannot even afford to continue to have this connectivity. Some have been disconnected. ... If by chance you go to an internet cafe here in Zambia, the time you log in and the time you start accessing the internet you will discover that you may spend a lot of money because some of the internet cafes connectivity is very slow. No wonder people can't afford to utilise the resources from the internet. (Zambia)

There are institutions in developing nations which cannot afford dedicated bandwidth and have to share bandwidth to reduce costs; there are those that have to contract out their bandwidth and even website management. In situations like these, such institutions have no control over the bandwidth and thus cannot control the rate at which viruses attack not only their sites but through the sites their systems. (Nigeria)

... not to forget the issue of the bandwidth, which is much exaggerated by the cost. It is quite often to loose connection in a University because of the high bill to be paid. (Sudan)

With reference to bandwidth, this is an ongoing issue for teaches in my project. They cannot download videos, or watch them, because the CTC where they go to use the Internet has measured service via satellite, and once the bytes are used in a month, service is shut down until the bill is paid. This is a major impediment and also affects

¹³ Aptivate's Web design guidelines for low bandwidth environments can be accessed at <http://www.aptivate.org/webguidelines/Home.html>.

regular attendance at the CTC because freedom of usage and availability is placed in doubt. (Guatemala)

Finally, as US-based participant reminded the group that low bandwidth can also be an access barrier in remote rural areas in developed countries. The ‘digital divide’ generally brings to mind the gap between developed and developing countries. But it may also evoke the gap between urban and rural areas within a country:

In some informal research I did on bandwidth management in developing countries because there was an interest at my institution in establishing elearning classes with African institutions, I read a number of documents on difficulties in access due to low bandwidth. I was struck by the number of times it was mentioned that viruses, spam, etc. took over the desktop because there weren't any technically trained administrators on board who knew how to repair and maintain the system. Another problem was that well-trained network administrators quickly left for better jobs. Funders did not seem to include ongoing training of network support in their workshops. Where funding is concerned, the result is that the investment will then look wasted, for reasons that could have been avoided. Interestingly, in the US, these same issues can affect colleges and internet cafes (however few) in rural areas. In my experience, the dichotomy between ‘developed’ and ‘developing’ sometimes ignores similar problems in access and technology usage that can afflict both.

To summarise the argument:

- There is low bandwidth in the global South (often slower than dial-up, around 20kb/s).
- Bandwidth is much more expensive in the South than in the North.
- Institutional bandwidth provision is not optimised. Many improvements could be made by improving local networks.
- Resources are not provided in low bandwidth friendly formats. Often the websites that point to resources are not low bandwidth friendly.
- Internet access may not be desktop-based, but may be via mobile phone.
- The issue affects large parts of the global South, as well as some rural areas of the global North.

It is worth noting that while improvements in bandwidth are under way, it is likely to take a substantial time before the South catches up, particularly in rural areas (referred to as ‘last-mile delivery’).

In conclusion, the discussion highlights that bandwidth constraints are a primary barrier to OER access. Other factors are undoubtedly important but, at the moment, a large proportion of potential creators and users of OER are struggling with low bandwidth. One reason that OER providers make resources available is to support international development goals. Yet many resources do not meet low bandwidth accessibility criteria. While there is growing awareness of low bandwidth issues, this awareness is yet to penetrate the OER community.

3. The SuperOER

Having discussed various barriers to access, participants were asked to consider the idea of a ‘super-accessible’ OER and to describe its qualities. What would such an OER look like in terms of accessibility? The ideas did not have to be realistic. Discussion participants were invited to ask ‘What if?’ and put forward ambitious ideas. The superOER idea was a helpful lead into the more structured discussion of solutions presented in the second part of this report.

As a first summary, it was suggested that a superOER would be something that:

- *is easily downloadable*
- *I can use offline*
- *is truly platform independent*
- *I can use on all the available mobile devices*
- *is relevant*
- *can be easily modified.*

The super-accessible OER is **incentivised**:

Poverty has been raised as an important issue, so my super-accessible OER has a financial incentive: Every time you access it, you get \$1.

The super-accessible OER is **movable**:

It's a resource that I can move between a blog, a wiki, a static web-page at the click of a button. For example, someone published a short course on public health management as a set of pages in a Mediawiki. I import it into my Wordpress blog and add pages to it, then re-publish it into my university's learning management system. Finally, I burn it onto a CD so that I can send it to some of our distance education students, who lack access to the Internet. All of this, just by clicking export and import.

Building on that, the super-accessible OER is **portable, transferable and customisable**:

... particularly the issues of portability (downloadable, offline use), transferability (easy import/export), and customizability within a standards-based framework.

The super-accessible OER is **printable**:

... it should be easy to move to print media and produce a well formatted printout as well.

The super-accessible OER is **fast**:

With a poor connection at school and no (or very few) computers, not even the most devoted and engaged teacher pay the minutes in a lan house to wait until the screen unfreezes or spend hours to convert files from one platform to another.

The super-accessible OER is **bandwidth aware**:

When accessing or downloading the super-accessible OER, it knows what bandwidth is available, and transforms itself according to available bandwidth.

The ideal OER would also help users and institutions download appropriate resources and manage bandwidth and caching.

The super-accessible OER is **easy to find**:

Accessibility means also finding the resource. Having it both categorized (taxonomy) and tagged (folksonomy) and being able to retrieve them through search from interconnected platforms (instead of visiting each one or having just one) would be a bonus.

The super-accessible OER is **machine readable**:

The super-accessible OER is not just discoverable and sharable by humans, but is also automatically discoverable and sharable ('discoverable by machines'). In other words, the super-accessible OER announces itself (in a 'machine-readable' way) and makes itself available to OER platforms and portals, enabling discovery, collaborative filtering, recommendations.

If it is machine readable the super-accessible OER can be **cached and mirrored automatically**. It is fast, discoverable, and can be easily filed within local collections of resources:

Accessibility for me means, not wasting time, and for that, I would love some good search engine for OERs, specially scientific ones, that understands formulas and text and allows me to search for ideas that are being taught and developed and are related to what I am learning or investigating, maybe by semantic web technologies. Utopian accessibility would also come with one user interface for all objects available, everything downloadable with one click, and everything automatically classified in my hard drive once downloaded.

I was thinking that one thing that would be really nice is if all OER platforms and OERs could talk to each other and interact through tags and categories/plugins. Wordpress users for instance have access to all posts and have suggestions on what to read that might relate to the subject. If one could invent some sort of OER plugin or widget that any of us could install on OS platforms (+ blogs and wikis) and activate it with a special tag every time we create material and decide to make it OER, then this resource would stay with us and also be automatically sent to more centralized platforms.

The super-accessible OER can **transform itself into appropriate formats**:

The ideal OER platform would allow the contributor to submit media in as few formats as possible and would then automate the transcoding into a variety of forms for various users.

The super-accessible OER is **easy to adapt**:

... one should create and produce rather than be told about. It's not the static OER per se (result/artefact) but the process of looking for it, adapting it, remixing with other materials and creating a new one that counts and 'developing' countries should be developing and not just using developed materials. ... Frozen structures format our way of thinking/seeing thing, limiting creativity and innovation. ... People learn by

seeing what others are doing and adapting this to their taste/cultural characteristics and needs (stereotyping: tropical countries favour colours, while Northern countries favour a minimalist and cool design).

The super-accessible OER has **clear terms of use**:

If the metadata of the OER provides the terms and conditions of the license of use (legal terms) will be a plus for the final user.

Does not automatically assume existing Intellectual Property concepts are viable for this distribution, because this distribution will provide fair remuneration for the creators of work on the OER space. CC license support for each object, LOM and Dublin Core metadata, print view, 'send to wiki' capability, WCAG and XHTML compliance, and IMS/.zip file import/export, ... new IMS Common Cartridge and Wordpress import/export functionality, ... publishing to static HTML ... mobile device support ...

The super-accessible OER is accessible to those with disabilities:

We need to remember what are needs of disabled people. WAI http://en.wikipedia.org/wiki/Web_Accessibility_Initiative set of guidelines version 2.0 recently proposed: <http://www.w3.org/TR/WCAG20/> definitely is important to understand accessibility issues.

The super-accessible OER is **easy to use**:

Fluid/clean design and navigation on platforms were mentioned as well so people do not spend too much time, overwhelmed by the amount of text or sidetracked by links that do not lead them to their objective.

The super-accessible OER is also **easy to learn from**:

... the OER should be responsive to the learner's needs and preferences. This means that characteristics such as the following would transform to match the learner's individual needs:

- *the presentation (e.g., large print, high contrast, small screen version, low bandwidth version, etc.)*
- *the organization and navigation structure (e.g., serial presentation, hierarchical, list of links, etc.)*
- *augmentative material and tools (grammar checker, captioning, description, background material, language supports)*
- *localization*
- *method of control (without mouse or pointer, large buttons and input fields)*
- *learning approach (external vs. internal rewards, etc.)*

This has been implemented in a number of learning object repositories and is supported by the ISO 24751 'AccessForAll' standard (e.g., <http://www.atutor.ca/atutor/content.php>). Part of this is dependent on a collection of equivalent content (best created by pooling resources from many sources with informative metadata), authoring tools that support the creation of transformable OERs and learning management systems that match the needs of the learner with the best available OER or OER configuration.

Finally, a participant proposed that the superOER should have the following characteristic:

[The super-OER is recognised by the] United Nations ... as a part of the method for transmitting knowledge.

And linked to this:

The super-OER complies with the Convention for Human Rights.