



Educational Research and Innovation

Open Educational Resources

A CATALYST FOR INNOVATION



Centre for Educational Research and Innovation



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Dominic Orr, Michele Rimini and Dirk Van Damme

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Foreword

Open educational resources (OER) are rapidly becoming a major phenomenon in education across OECD countries and beyond. Initiated largely at the level of institutions by pioneers and technology advocates, the OER community has grown considerably over the past ten years and the impact of OER on educational systems has become an issue of public policy. The open education community is increasingly well organised and enjoys support from various institutions and foundations. National governments have developed, or are in the process of developing, open policies to support access to and use of OER.

It is the task of the OECD Centre for Educational Research and Innovation (CERI) and the OECD Directorate for Education to help policy makers and other stakeholders to confront challenges and benefit from new developments in the educational domain for better policies on improving teaching and learning.

This report follows earlier work by CERI on OER, which resulted in the publication *Giving Knowledge for Free* in 2007, and an OECD country questionnaire on OER-related policy and activities in 2012. It seeks to provide a state of the art review of evidence on OER practice and impacts, and evaluate the remaining challenges for OER entering the mainstream of educational practice.

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Executive summary

Education is the key to economic, social and environmental progress, and governments around the world are looking to improve their education systems. The future of education in the 21st century is not simply about reaching more people, but about improving the quality and diversity of educational opportunities. How to best organise and support teaching and learning requires imagination, creativity and innovation.

Open education resources (OER) are teaching, learning and research materials that make use of tools such as open licensing to permit their free reuse, continuous improvement and repurposing by others for educational purposes. The OER community has grown considerably over the past ten years and the impact of OER on educational systems has become an issue of public policy. This report aims to highlight state of the art developments and practice in OER, but also to serve as a basis for exchanges and discussions that lead to cross-country peer learning on how to improve teaching and learning.

Key potentials of OER

Three key potentials of OER have been highlighted in this report:

- Digital technologies have become ubiquitous in daily life and OER can harness the new possibility afforded by digital technology to address common educational challenges.
- OER are a catalyst for social innovation, which can facilitate changed forms of interaction between teachers, learners and knowledge.
- OER have an extended lifecycle beyond their original design and purpose. The process of distribution, adaptation and iteration can improve access to high-quality, context-appropriate educational materials for all.

OER contribute to key educational challenges

This report focuses on the contribution of OER to six key educational challenges that concern education systems today. The challenges concern teaching and learning, cost containment, the distribution of high-quality educational resources and reducing the barriers to learning opportunities, which together can improve the quality and accessibility of teaching and learning provision.

- ***Fostering the use of new forms of learning for the 21st century***

New forms of learning are required to provide learners with a learning experience that better facilitates personal development and success in a knowledge society. These include the use of approaches to learning, which involve learners as a community in the development of their own learning materials and the support of other learners. The possibility to easily adapt and share OER supports this objective.

- **Fostering teachers' professional development and engagement**

Teacher development and engagement has been shown to be key to effective learning. The adaptability of OER allows teachers to revise and tailor their educational resources to provide a better fit to the educational environment in which they are teaching. It is also expected that this opportunity can lead to a higher level of collaboration between teachers.

- **Containing public and private costs of education**

Higher levels of participation in education systems across the world lead to a challenge for cost sharing between public budgets and private households to cover the costs of high-quality learning materials. OER offer the possibility of reducing these costs through developing, sharing and updating resources more cost effectively.

- **Continually improving the quality of educational resources**

The dynamics of a knowledge society lead to three challenges for educational resources: they must reflect new developments in the subject area they cover, they must reflect new learning theories in order to better support high-quality learning, and they must be fit for purpose for the expected learning outcomes and the heterogeneous group of learners who are using them. The adaptability of OER offers the possibility for keeping educational resources at pace with these dynamics.

- **Widening the distribution of high-quality educational resources**

High-quality resources for education are being produced and used in some educational institutions, for some groups of learners and in some countries. The ability to share OER offers the possibility of breaking down boundaries to high-quality provision by ensuring a more even distribution of high-quality educational resources. This can build bridges between countries, between informal learning and formal education and facilitate lifelong learning.

- **Reducing barriers to learning opportunities**

Many learners are excluded from high-quality learning opportunities because of the requirements of place, time and pace of learning. OER offered as digital resources enable the extension of educational resources beyond a set place and time of provision, and allow provision at an appropriate pace for the learners.

What policy can do

This report argues that policy support is necessary for OER to reach their full potential as a social innovation. To this aim, policy makers should focus on the following four areas for activity:

- **Existence and discoverability of OER**

Policy can support OER use through mandating or encouraging its production. If there is currently no OER, or not enough, governments may change the funding of educational resources or change the regulations for their production and use. One way of centralising and focusing efforts on the use and sharing of OER is to provide a central repository for openly licensed educational materials or to support efforts to make existing OER more discoverable. Nevertheless, making OER available does not ensure that they are used.

- **New role of teachers**

Flexible access to high-quality educational materials is positive for learners, but they will require new support services to fully benefit from the use of OER. This leads to a new role for teachers in the learning situation. Furthermore, teachers and instructors require support as

they develop new skills and overcome motivational and organisational barriers to sharing or collaborating through OER. These changes should be reflected in teacher training and continual professional development courses.

- ***New quality assurance procedures***

Policy makers can change the framework conditions of formal educational settings by modifying rules, promoting new tools and reassigning the division of labour for the production of high-quality educational resources. OER provide flexibility and adaptability, which enable educational resources to change over time and in different contexts. However, this flexibility presents a challenge for many existing quality assurance procedures, which assume a hierarchical structure of quality control and relatively static educational materials. New systems of quality assurance are necessary.

- ***More research necessary***

There are gaps in research on use and adaptation of OER. Policy makers should promote and fund evidence-based research for policy and practice on how OER are produced and how they are used in certain contexts and by certain actors in the education system (teachers, instructors and learners).

Chapter 1

Open educational resources (OER) in educational policy and practice

This chapter introduces OER in the context of educational policy and practice. In the first section it compares and contrasts OER to other commonly discussed innovations in education: learning objects, digital learning materials, open data, Massive Open Online Courses (MOOCs), and open education. It then goes on to explain how OER provide a special type of innovation potential capable of supporting new forms of teaching and learning. In contrast to other analyses of OER, this report takes the view that OER should be considered in the context of key challenges for educational systems today. Six key educational challenges are therefore identified and the possible contribution of OER to solving them briefly sketched.

Main policy messages

OER can solve educational challenges. OER can contribute to solving the educational challenges related to: learning for the 21st century, fostering teachers' professional development, containing educational costs, continually improving the quality of educational resources, widening the distribution of high-quality educational materials, and breaking down the barriers to high-quality learning opportunities. Of particular importance among these challenges are teachers' development and educational costs.

OER as a special type of innovation. The potential of OER is determined by the way they are used. They may simply be used as a substitute for existing proprietary materials, saving some costs and improving distribution reach, but they can also lead to a full redefinition of the teaching and learning environment. This is dependent on the people using them and the policy support provided.

Contextualising OER

Digital technologies have become ubiquitous in daily life and are both drivers and facilitators for change in education sectors. Education has the social function of fostering the next generation's development and prosperity on an individual and societal level, and a change to how people carry out their lives now and in the future must be reflected in the education system. The openness of open educational resources (OER) helps education systems to become more dynamic, which can help make them "future proof".

Digital technologies have the potential to improve education and enhance teaching and learning processes. A recent OECD report on innovative learning environments by the Centre for Educational Research and Innovation (CERI) stated, in reference to educational reform, that "powerful information and communication technologies can recast all of the elements of the [pedagogical] core" (OECD, 2013: 194).

However, innovative practice must be crafted and developed in a receptive educational environment. In the past, innovations using digital technology have been criticised for their "technology-first" approaches that start from the potentials of technology instead of the needs of the education setting (OECD/Selwyn, 2010). These technology driven approaches have been said to frequently fail to encompass the whole learning environment, but focus instead on micro-level teaching and learning experiences.

The CERI report on innovative learning environments (OECD, 2013: 84) states that, for innovation in education to be most effective, the following aspects much be taken into account:

- *Organisational structure:* Reform entails reflecting on the organisational units and the structures and dynamics of their interconnections. This is highly relevant in the educational field, where educational provision is often organised depending on divisions of responsibility. For example, in the school sector it is about the division of responsibilities for teaching and content between the teacher, the school, the school district authority and the ministry of education. In such a setting, building exclusively on bottom-up or top-down reforms is unlikely to be successful.
- *Networking and sharing knowledge:* As first explored comprehensively in Castell's work on the network society (Castells, 2004), networking – which is now further facilitated through social media – enables actors to move beyond the limitations imposed by the capacities of single professionals or organisational units and to create scale in learning and action in more organic ways (e.g. outside of formal hierarchies). Innovation that harnesses these new opportunities will benefit from the exchange of knowledge and practices on how to successfully implement reforms.

- *Engaging in and exploiting research and development*: Following the empirical turn in educational research over the last 15 years, there is a greater understanding in many countries of the potential of research to support the development of strategies for effective teaching and learning. This research particularly emphasises the need to use diverse strategies for teaching and learning in different circumstances.

Using different technologies can only occur within a setting that reflects on and harnesses these three aspects. This means that even if this report is focused on OER – i.e. on educational resources and particularly educational media – it will attempt to keep in focus the interaction of organisational processes and infrastructure, the means of using networks and collaboration, and insights (given and missing) from research.

Defining OER

For the purpose of this document, open educational resources (OER) are defined as teaching, learning and research materials that make use of appropriate tools, such as open licensing, to permit their free reuse, continuous improvement and repurposing by others for educational purposes.

This definition is based on the common definitions in reference to OER used by CERI in previous publications, the William and Flora Hewlett Foundation, and the United Nations Educational, Scientific and Cultural Organization (UNESCO) (further information is provided in Box 1.1).¹

The focus of OER is on the possibility of taking original work from other providers and being able to adapt and repurpose it to produce a new learning resource. In this sense, open means free to access and free to change. It is for this reason that one of the central characteristics of an OER is the liberal licensing (e.g. through Creative Commons), which facilitates this process.

Box 1.1. Defining open educational resources

OECD-CERI definition

“Open educational resources are digital learning resources offered on line (although sometimes in print) freely and openly to teachers, educators, students, and independent learners in order to be used, shared, combined, adapted, and expanded in teaching, learning and research. They include learning content, software tools to develop, use and distribute, and implementation resources such as open licenses. The learning content is educational material of a wide variety, from full courses to smaller units such as diagrams or test questions. It may include text, images, audio, video, simulations, games, portals and the like.”

William and Flora Hewlett Foundation definition

“OER are teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use and repurposing by others. Open educational resources include full courses, course materials, modules, textbooks, streaming videos, tests, software, and any other tools, materials or techniques used to support access to knowledge.”

Whilst these definitions differ slightly, they both highlight the necessary condition of educational materials being free to access and open for (re-)use and repurposing (combining, adapting, expanding and putting to a new purpose) in order for them to be considered OER. In the case of the William and Flora Hewlett Foundation definition, there is explicit mention of the requirement for the resources to have been licensed to permit free and adaptive use, whereas the CERI/OECD definition focuses on the condition that such free and adaptive use should be possible (which may also be a technical issue). In both cases, the list of examples of educational resources shows variety without limiting what type of educational resources OER can be, although with the CERI/OECD definition there is an expectation that OER will be digital learning resources (even if they may be accessed off line later).

Sources: Hylén, J. et al. (2012), “Open educational resources: Analysis of responses to the OECD country questionnaire”, <http://dx.doi.org/10.1787/5k990rjhvtlv-en>; Hewlett Foundation website: <http://www.hewlett.org/programs/education/open-educational-resources>.

The general characteristics of OER are:

- They can be any type of learning resource used in an educational setting.
- They are often, though not exclusively, offered in a digital format.
- The digital format allows the reuse, sharing, adaptation and repurposing of the resource for a different educational setting than the original one.

What OER are and are not

OER are not just “stuff on the web”

It can be seen from the definitions above that OER can be a wide variety of educational resources – full courses, course materials, modules, textbooks, streaming videos, tests, software – which are usually offered in a digital format. As OER can be many types of resources, the question often asked is: what is the difference between “stuff on the web” and OER (Thomas, 2010)? Or more specifically, when is a Wikipedia page an OER?

A Wikipedia page is open according to the most extensive definition of open. It is also a resource. However, it can only be an OER if it is used within a specific learning arrangement as an educational resource (Falconer et al, 2013: 63): “An OER can be a course, unit, lesson, image, webpage, exercise or multimedia clip, but it must have a specified pedagogical purpose/context” (McGreal, 2014: 51). That said, Wikipedia does have an explicit educational programme, which promotes the use of Wikipedia content in educational settings.²

Similarly, there is the question of whether open data is an OER. Whilst open data may allow reuse, sharing, adaptation and repurposing, it is a source of information, but its purpose is not directly educational. In this sense, it is not automatically an OER. However, open data may be used as an educational resource in a learning setting; in this case it would be OER.

OER are different from “learning objects”

The constituent difference between OER and other elements of digital learning is their openness and lack of restrictive copyright, which facilitates the reuse and repurposing of the educational resources (Butcher and Hoosen, 2012). This leads to the benefits of sharing and collaboration: “A major promise of OER is that the creation and refinement of both learning content and the underlying pedagogical approaches can benefit from the distributed co-creation model enabled by open licenses. In principle, a rich developer base facilitates the creation of resources” (Tuomi, 2013: 70).

The idea of facilitating the sharing of digital resources is not new, and it is a characteristic of information materials offered in a digital format that they can be easily distributed with negligible costs once they have been developed. In the early 2000s, instructional designers were focusing on the development of reusable learning objects (RLO), which were defined as “any digital resource that can be reused to support learning” (Wiley, 2000). This recognised the power of open source, “object-oriented” programming and hoped that its use would make the production of high-quality learning resources more effective and efficient.

In contrast to RLO, however, OER advocates and practitioners prioritise the potential for sharing existing content over the design of context-neutral modules for learning. In other words, it is argued that whilst the RLO developments were focused on the technical side of instructional design, OER are much more focused on simply how to make existing content more open for access and therefore more portable (Kernohan and Thomas, 2012; Lane and McAndrew, 2010: 960). It is hoped that more openness will lead to a process of evolution, where even less predictable changes may occur

(Fulantelli et al, 2008). To quote John Robertson: “If I was trying to capture the difference between RLOs and OERs in a sentence, I’d say something like: people sharing what they’re doing [= OER] vs. people creating particular stuff to share [= RLO]” (Robertson, 2010).

OER are different from digital learning materials

Since sharing and reuse is such an important aspect of OER, it has become common to pay attention to the “four Rs” of OER (Hilton et al., 2010; Wiley, Bliss and McEwen, 2014; Wiley, 2009):³

1. Reuse – to use the work verbatim. This is essentially an issue of easy access to existing materials. In the context of OER, it is assumed that access will be free at the point of entry. This marks a difference to the classic proprietary model, where access to a resource (e.g. a textbook) is only granted after payment.
2. Revise – to alter or transform the work.
3. Remix – to combine the work (verbatim or altered) with other works.
4. Redistribute – to share the verbatim work, the reworked work or the remixed work with others.

The potential for access to resources, but particularly for revision, remixing and redistribution, is usually severely limited by standard intellectual property rights. In most education settings, there are special agreements for a more liberal use of educational resources than in private settings (e.g. for photocopying from copyright-protected textbooks or novels), but these often offer limited use and can be complicated. Recognition of this issue has led to the more flexible approach to intellectual property rights by Creative Commons, which encourages producers of new and existing media resources (including OER) to use its transparent licences to communicate the potential for revision, remixing or redistributing work and regulate in what contexts it is possible (e.g. allowing commercial use of a work or not).

OER are seldom Massive Open Online Courses (MOOCs)

In many cases, current discussions on educational reform – particularly in higher education – have moved from OER to MOOCs. Both are related to general policies of open education and reform, but there are three general differences:

1. **Use of term “open”.** The term “open” is used in connection with MOOCs to simply mean free to access and use. In reference to OER, the term means that OER has properties that allow it to be free to access, but also free to reuse, revise, remix and redistribute. This redistribution of a revised resource may lead to it also being repurposed and used in a new educational setting (e.g. developed for vocational training, but used in a school).
2. **Form of resource.** Unlike MOOCs, an OER is very often not an entity. It is defined by its licence and open properties, but not by its form, i.e. by being a digital course for high-scale usage. The section above stated that an OER is a non-specific educational resource and can be many things, including a full course. MOOCs are designed as full courses (i.e. with full learning environments), meaning that they combine content with discussion forums and assessment tools.
3. **Audience.** The question of audience is related to the orientation towards the teacher or learner. OER are frequently focused on teachers who will use the adaptability of the resources to create their own materials, or integrate the OER into their own learning environment. This is not the case with a MOOC, which is a ready-to-go course aimed at learners. For this reason, MOOCs are frequently considered a disruptive technology, whereas OER are more frequently seen as a way to enhance and augment existing learning environments. OER can

be a catalyst for innovation within the current education system and a means to unlock latent potential. The Hewlett Foundation says that the lockbox on education can be broken through the use of OER (The William and Flora Hewlett Foundation, 2013).

Despite these differences, overlaps between OER and MOOCs exist. If an OER is conceived as a full course, it can be termed a MOOC, and if a MOOC has an open licence, it may be seen as an OER. The big three MOOC providers (Coursera, edX and Udacity) and some of the new MOOC providers such as FutureLearn in the United Kingdom, MiriadaX in Spain, and Iversity in Germany, do not provide their courses by default with a liberal usage licence. However, open licences are used by some MOOC provider networks (e.g. the pan-European OpenupEd partnership of primarily open universities) and some individual universities add a Creative Commons licence to their MOOC landing page to clarify that the content of their MOOC is both free to access and open to download and repurpose. Similar to OER, MOOCs can be used as either replacements for courses or – increasingly – as an element of blended learning, which helps the teacher by freeing up time for more intensive supervision (Jacqmin and Belleflamme, 2014) and so becomes only one element in the learning environment.

OER are one element in open education

The term open education is being increasingly used, especially in connection with the European Union's programme "Opening up Education" (European Commission [DG EAC], 2013). However, open education has long been an umbrella term for efforts to make education open to everyone and break down boundaries to access and success. In the 2007 Cape Town Open Education Declaration, it is made clear that open education is a more generic term than open educational resources, which are only one part of the concept (Open Society Institute/Shuttleworth Foundation, 2007):

"...open education is not limited to just open educational resources. It also draws upon open technologies that facilitate collaborative, flexible learning and the open sharing of teaching practices that empower educators to benefit from the best ideas of their colleagues. It may also grow to include new approaches to assessment, accreditation and collaborative learning."

The Cape Town Declaration is, however, pretty vague on what open education could stand for exactly. In an attempt to provide a clearer conceptual and analytical framework, Mulder and his colleagues have developed a reference model which they call the "5COE model" that stands for "Five Components for Open Education" (Mulder and Janssen, 2013; Mulder, 2013, 2015). 5COE contains two components on the demand side of education and three components on the supply side. They argue that all five components should be considered in the description of the extent of openness (or permeability) in the whole learning setting.

From the demand side, it is expected that education is open to: 1) the requirements and individual needs of learners and to 2) the requirements of the labour market and society in general. This has been a common goal of the classic "open universities" in the United Kingdom and the Netherlands, for instance. However, "Opening up Education" calls for this approach to be widely adopted in all areas of educational provision.

This type of openness calls for changes to the content, the teaching process and the support services offered to learners, i.e. to the supply side. The 5OE models sees 3) OER as the kingpin in this change. It is the adaptability of educational materials which improves fitness for purpose, and in turn encourages and facilitates changes to 4) learning support services and to 5) teaching efforts.⁴

Interestingly, Mulder argues that in all components the level of openness among educational provisions can be varied among providers which can be desirable in terms of fitness for purpose. The one which can exception concerns educational resources that should be fully open, because of the benefits that can be derived from OER for all learners, all teachers, all educational institutions, as well as for governments and society at large. This underlines the special position that OER holds in distinction to open education.

The following publication is focused on OER. However, seeing OER in the context of Mulder's model for open education highlights that OER are only interesting in the context of Wiley's recent question: What can be done in the context of open which could not be done before? (Wiley, 2015) That is to say that the learning opportunities for learners and the support services offered digitally, through other learners or through teachers determine the impact on learning outcomes, which OER can eventually have.

OER as a special type of innovation in the teaching and learning environment

OER have the potential to reform aspects of educational provision. However, their development is dependent on people and practices. In classic innovation literature, the diffusion of an innovation develops over time across five major user groups – innovators, early adopters, early majority, late majority and laggards – until market saturation is achieved. The market is usually seen as the selection mechanism that determines whether an innovation achieves saturation or not. OER, however, do not fit into this view of innovation for various reasons.

Benefits of OER determined by how they are used

The first difference is that OER are determined by the way they are used and by their integration into an educational environment. Wiley compared OER to a toothbrush, which only provides the potential to improve dental hygiene when it is used (Thomas, 2010; Wiley, 2011).

There are two parts to the integration of OER into an educational environment: 1) how OER are originally used and 2) how their use changes depending on the people using them, their goals and context.

In their first use, OER are embedded into a specific teaching and learning environment to fulfil a function. The use of instructional technology is usually classified by its purpose regarding the existing teaching and learning environment in which it is used. The SAMR-model developed by Puentedura (2006) constitutes a framework that can be applied to how OER are being used in teaching and learning. It has four stages and can be adapted to the OER context as below. In each case, the innovation potential of OER is clearly different.

- *Substitution*: The OER replaces a similar learning material allowing for the same functionalities.
- *Augmentation*: The OER constitutes an improvement in terms of previous learning materials' efficacy.
- *Modification*: The OER enables a substantial learning activity redesign compared to the previous learning material.
- *Redefinition*: The OER allow for new forms of learning that were previously unavailable within the previous teaching and learning configuration; they redefine the pedagogical approach.

A second (or follow-on) use relates to the three Rs following reuse – revise, remix, redistribute. In each of these cases, the way the OER is now being used may change again. This means that the analogy of the toothbrush is limited, since the “object” too can be transformed. For these reasons it is hard to talk of direct impacts of OER, as they can be so multifarious over time and place.

Open resources already exist but are not recognised as OER

The second contrast to the classic idea of an innovation is that to a certain degree OER-like materials already occur, but they are not seen as such. Clarifying to what extent educational resources with an open character – i.e. based on using openly licensed materials – are already being used, would further encourage the practice, sharing and exchange between practitioners. An impact

study in the United Kingdom used the analogy of OER as an iceberg. It found that many teachers (in this case in higher education) were reusing existing content, but the use was kept private and “invisible” to others, with “official” OER practice only representing the visible peak above the waterline (Pegler, 2014; Thomas, 2011; White, 2010).

OER can be seen as leading to a social innovation. According to Murray et al., social innovations can be defined as: “new ideas (products, services and models) that simultaneously meet social needs and create new social relationships or collaborations. In other words, they are innovations that are both good for society and enhance society’s capacity to act.” (Murray, Caulier-Grice and Mulgan, 2010). In this way, measuring the impact of OER is not simply about whether OER are being produced or used, but whether they are having a transformative effect on the way teachers and learners collaborate.

OER can also lead to a process of iterative innovation, as their prolonged lifecycle ensures that original educational resources and their application are further developed and improved as they pass to different users. It has been shown that this type of innovation can be particularly effective as it can be better integrated into specific contexts and follows a bricolage approach (where the user tinkers with existing elements of a system), rather than a breakthrough approach (Garud and Karnøe, 2003; Gundry et al., 2011). Andrews states that such successful iterative innovations will often focus on a problem to be solved instead of a solution given (Andrews, 2013).

Aligning OER to key educational challenges

Whilst innovations may begin with a new procedure or product without a definite application, policy development always starts by defining a problem and proposing an intervention that it expects will solve the problem. In many cases, both the problem and the proposed intervention are competing for attention and funding with other problems and interventions.

This report identifies the types of challenges that prevail in education systems at present and asks how OER can contribute to solving them. In each case, discussions and references to practical cases in the respective chapter highlight the challenges that need to be overcome for OER to fully realise their potential.

Six key educational challenges are highlighted and OER analysed in their context. The challenges concern teaching and learning, cost containment, the distribution of high-quality educational resources and reducing the barriers to learning opportunities, which together can improve the quality of teaching and learning provision.

- ***Fostering the use of new forms of learning for the 21st century***

New forms of learning are required to provide learners with a learning experience that better facilitates personal development and success in a knowledge society. These include the use of approaches to learning, which involve learners as a community in the development of their own learning materials and the support of other learners. The possibility to easily adapt and share OER supports this objective.

- ***Fostering teachers’ professional development and engagement***

Teacher development and engagement has been shown to be key to effective learning. The adaptability of OER allows teachers to revise and tailor their educational resources to provide a better fit to the educational environment in which they are teaching. It is also expected that this opportunity can lead to a higher level of collaboration between teachers.

- ***Containing public and private costs of education***

Higher levels of participation in education systems across the world lead to a challenge for cost sharing between public budgets and private households to cover the costs of

high-quality learning materials. OER offer the possibility of reducing these costs through developing, sharing and updating resources more cost effectively.

- **Continually improving the quality of educational resources**

The dynamics of a knowledge society lead to three challenges for educational resources: they must reflect new developments in the subject area they cover, they must reflect new learning theories in order to better support high-quality learning, and they must be fit for purpose for the expected learning outcomes and the heterogeneous group of learners who are using them. The adaptability of OER offers the possibility for keeping educational resources at pace with these dynamics.

- **Widening the distribution of high-quality educational resources**

High-quality resources for education are being produced and used in some educational institutions, for some groups of learners and in some countries. The ability to share OER offers the possibility of breaking down boundaries to high-quality provision by ensuring a more even distribution of high-quality educational resources. This can build bridges between informal learning and formal education and facilitate lifelong learning.

- **Reducing barriers to learning opportunities**

Many learners are excluded from high-quality learning opportunities because of the requirements of place, time and pace of learning. OER offered as digital resources enable the extension of educational resources beyond a set place and time of provision, and allow provision at an appropriate pace for the learners.

The significance of the educational challenges for justifying public policy support for OER

In August and September 2014, governments were asked to respond to a CERI/OECD questionnaire on how they support and facilitate the development and use of OER in all education sectors (see Chapter 11). The survey collected the responses of 33 countries: 29 OECD member countries and 4 accession and key partner countries (Brazil, China, Indonesia and Latvia). The results indicate a clear policy support for OER, with 25 countries reporting having a government policy to support OER production and use (see Chapter 11 for discussion).

The survey asked policy makers to state which arguments associated with OER (all related to the six key educational challenges) were most prominent in debates and documents related to their country's policies. Such policies could be legislation, regulations, direct or indirect funding programmes, codes of practice or guidelines, and information campaigns. The countries were asked to provide examples of these policies.

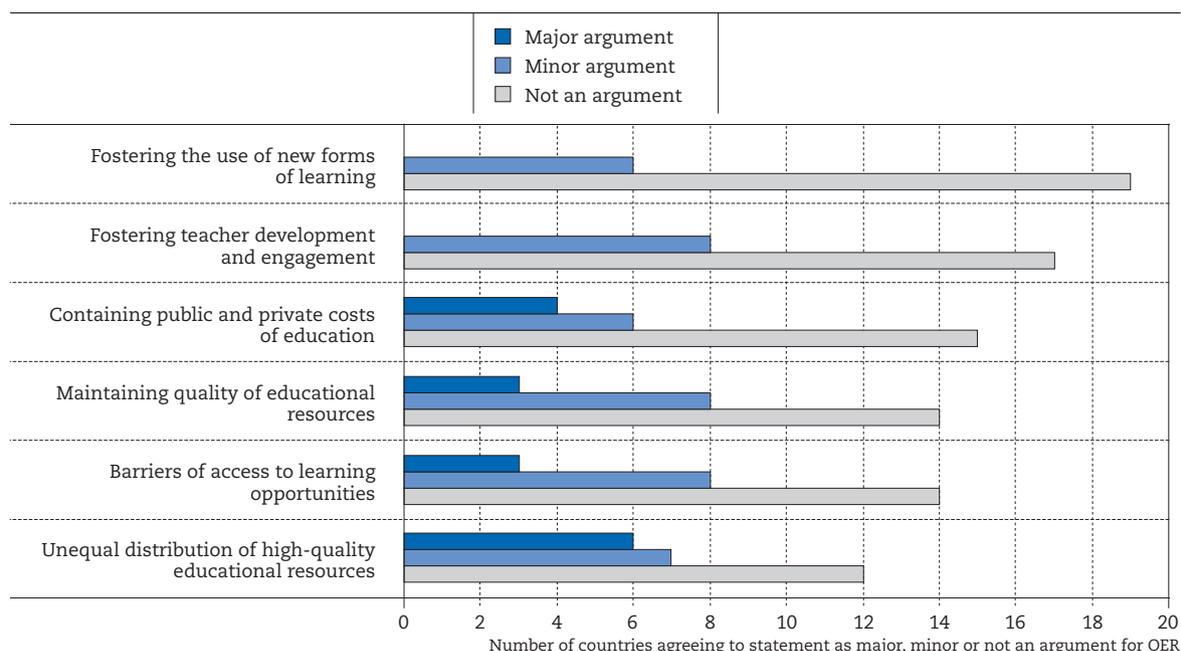
The results show that the respondents from a large majority of countries see the arguments related to teaching and learning as central to the enactment of OER-related policies in their countries. Of the 25 countries with explicit OER policies, only 6 stated that new forms of learning was a minor argument in connection with OER policy in their countries, and only 8 said the same for teacher development. None of the countries stated that supporting new forms of teaching and learning was not an argument related to OER policy (see Figure 1.1).

There was less consensus regarding cost containment: many countries viewed it as central, but four said that it was not a relevant argument at all (Belgium [Flemish community], Denmark, Finland and Germany).

Of particular interest were opinions regarding unequal distribution of high-quality educational resources, which is often seen as a major persuader for the use of OER as open access and open licensing are expected to simplify the diffusion of good quality learning materials. Even though half of the respondents did see this as a major argument, the remaining respondents saw it as minor or not relevant. This is in contrast to the 2012 OECD survey of governments on OER policy, where the most frequently cited policy reason for OER activities was the desire to increase access to high-quality learning materials (Hylén et al., 2012: 16).

An explanation for these findings could be that it is difficult to see the argument of distribution of resources separately from those for maintaining high-quality resources and reducing barriers to access. Offering three separate items may have split the vote to some degree. Another explanation could be that many respondents saw distribution as an issue for developing countries rather than their own – as the argument for diffusion of good quality education materials has often been framed in such a manner in the past. Chapter 7 makes a case for this issue being relevant to all countries due to sectorial and institutional stratification in all education systems.

Figure 1.1. **Which key educational challenges are associated with public policy support for OER production and use?**



Note: Only countries with OER-related governmental policies (n=25).

Source: Authors based on analysis of CERI/OECD government survey, Chapter 11.

The government survey provides justification for discussing OER from the perspective of the six key educational challenges as it shows that these challenges are important for countries. Each of the subsequent chapters in Part I of this report (Chapters 3-8) looks at one of these key educational challenges and contrasts potential and practice to formulate policy messages. The question of concrete policy support measures mentioned in the government survey and elaborated and discussed by the countries that took part in the international policy seminar is explored in Chapter 11. This also includes the finding that most of the countries surveyed that do not have a national policy for OER are active in policy support at some (often regional or institutional) level.

Notes

1. See also: http://wiki.creativecommons.org/What_is_OER%3F, <http://www.hewlett.org/programs/education/open-educational-resources>, <http://www.unesco.org/new/en/communication-and-information/access-to-knowledge/open-educational-resources> and http://en.wikipedia.org/wiki/Open_educational_resources
2. See <http://outreach.wikimedia.org/wiki/Education/About/Overview>.
3. In 2014, Wiley added a fifth R – Retain, as in the right to retain an educational resource. See Chapter 8 for discussion.
4. In the model, the five components are called: Open educational resources (OER); Open learning services (OLS); Open teaching efforts (OTE); Open to learners' needs (OLN); Open to employability & capabilities development (OEC).

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Chapter 2

Open educational resources (OER) as a catalyst for innovation

This chapter focuses on the type of innovation potential inherent in OER for improving teaching and learning and how this potential can be harnessed. Based on the analyses in the other chapters of this report, it formulates 11 specific policy considerations, which should be used to guide decisions by policy makers, and goes on to recommend specific policy actions in four key areas: supporting the provision of OER; supporting the use and adaptation of OER; adapting framework conditions for teaching and learning accordingly; and supporting further research on use, adaptation and sharing of OER.

“Underlying the success of openness for education is the opportunity for experimentation and innovation.”
(Weller, 2014: 202)

Education is rapidly becoming the main determinant of an individual’s economic success, employment and income, and its outcomes impact on many other domains of social life including health and democratic engagement. The OECD Centre for Educational Reform and Innovation (CERI) views OER as a central catalyst that can improve and rejuvenate education systems. The future of education in the 21st century is not simply about reaching more people, but about improving the quality and diversity of educational opportunities. How to best organise and support teaching and learning requires imagination, creativity and innovation, and policy makers and practitioners are looking around the world to find the best possible solutions. CERI has identified OER as a social innovation that can help create spaces for experimentation and innovation that leads to the improvement of educational provisions and learning opportunities.

Policy framework for OER

This section entitled “policy framework” looks at how OER should be viewed within a policy context. It answers the question: What characteristics make OER useful to improving teaching and learning provision?

OER as a special type of innovation for education

Policy consideration 1: OER should be seen as a social innovation that can be used as a catalyst for experimenting with new forms of collaboration between teachers and learners.

Digital technologies have become ubiquitous in daily life, and the need for change in educational sectors is directly linked to the prevalence of digital technologies. Education is responsible for fostering the next generation’s development and prosperity on an individual and societal level, and a change to the way that people live their lives now and in the future must be reflected in education systems. OER can harness new possibilities afforded by digital technology to address common educational challenges.

In this way, OER can be seen as leading to a social innovation. Social innovations usually occur in the non-market sector (i.e. they are not governed by the profit motive). According to Murrey et al. they can be defined as: “new ideas (products, services and models) that simultaneously meet social needs and create new social relationships or collaborations. In other words, they are innovations that are both good for society and enhance society’s capacity to act” (Murray, Caulier-Grice and Mulgan, 2010). The impact of OER is not simply measured by whether OER are being produced or even being used, but whether they are having a transformative effect on the way teachers and learners collaborate.

OER as one element in the educational enterprise

Policy consideration 2: The impact of using OER will depend on the purpose for which the OER is being employed within the whole learning setting. Employing OER to simply replace other education resources (e.g. textbooks) may increase access and reduce costs for learners, but will have a minimal impact on the learning setting and on final learning outcomes.

OER is only one element in the educational ecosystem. According to the framework developed by CERI, innovative learning environments are made up of the interaction of four components: educators and learners, and content and media technologies (resources) (Istance and Kools, 2013). OER thus constitutes one component (media technology), which presents the content. The other elements – teaching and learning – may be more or less open, i.e. non-exclusive and adaptable. In his concept of open education, Mulder speaks of open teaching efforts (OTE) and open learning services

(OLS) and argues that their openness must also be considered within the context of OER (Mulder, 2015). This interplay between media technology, content, teachers and learners also determines the purpose of the OER.

The SAMR-model developed by Puentedura (2006) to describe the use of instructional technology constitutes a framework that can be applied to how OER are being used in teaching and learning. It has four stages and can be adapted to the OER context as below. In each case, the innovation potential of OER is clearly different.

- *Substitution*: The OER replaces a similar learning material allowing for the same functionalities.
- *Augmentation*: The OER constitutes an improvement in terms of previous learning materials' efficacy.
- *Modification (redesign of the learning activity)*: The OER enables a substantial learning activity redesign compared to the previous learning material.
- *Redefinition (of the pedagogical approach)*: The OER allow for new forms of learning that were previously unavailable within the teaching and learning configuration.

OER have an extended lifecycle

Policy consideration 3: OER enable iterative improvements, which can improve the adaptability and anti-fragility of an educational system. However, this is dependent on the process of adaptation really happening.

It is only by using OER in new ways that their full potential will be unlocked. The possibility to continually change and adapt an existing resource and to put it to new uses is unique to resources that have the property of “open”. Open in this sense means that the resources do not have an inherent end. They need not follow the typical path from design to obsolescence, and adaptations and repurposing can lead them from one phase of maturity to the next. This characteristic gives them an important role in helping the educational enterprise become resilient (Weller, 2014) or anti-fragile (Taleb, 2012), i.e. to be able to benefit from changes to content, context, and teaching and learning strategies.

OER can also lead to a process of iterative innovation (i.e. a repeated process of small improvements), as their prolonged lifecycle ensures that original educational resources and their application are further developed and improved as they pass to different users. At the same time, this social innovation requires users to adopt these new practices – otherwise they remain untapped potentials.

OER facilitate widening the distribution of high-quality educational resources

Policy consideration 4: The ease of distributing OER can facilitate access to high-quality educational resources for all. For this to occur, it is likely that the OER will have to be adapted to their new setting. Redistribution efforts can work against silo-thinking about the provision of quality learning materials in education, which often compartmentalises educational sectors, tracks and institutions.

The ease of distributing OER can facilitate access to high-quality educational resources, which may otherwise be restricted in their distribution between institutions, between countries and between formal, non-formal and informal learning settings. The open properties of OER also facilitate adaptation to specific learning contexts. For example, access to laboratory simulations in other institutions or on line can be further augmented if teachers add supporting materials to the learning settings in their own classrooms or seminars. Whenever educational materials are adopted across geo-cultural boundaries, there is evidence that extensive adaptation to the local setting is necessary, and that it does occur.

The extended lifecycle, ease of distribution and adaptability of OER make the boundaries between formal educational settings and non-formal, informal as well as adult and lifelong learning more permeable. However, this issue was not ranked highly in the government survey on public support for OER (carried out during this study, see Chapter 1). This may be an expression of “silo-thinking” that is common in educational systems (Plotkin, 2010: 5), where lines are often drawn between educational sectors (e.g. vocational and academic tracks) or low and high-ranking institutions.

Policy objectives for OER

This section entitled “policy objectives” looks at the objectives that should be followed in order to make full use of the potential of OER. It answers the question: What goals should a policy have which aims to support the improvement of teaching and learning through OER?

Aligning OER to key educational challenges

Policy consideration 5: OER can only reach their potential in the mainstream if they clearly address the policy challenges faced by today’s education systems. The focus should not be on what OER can do, but rather which policy challenges OER can contribute to solving.

This report looks at how work on OER can become sustainable and scalable, and how it can enter the mainstream. In many cases, OER can be typified as an innovation that is being taken up by groups of people engaged in education across the world, in all types of education settings. Where certain types of OER have entered the mainstream, e.g. in the domain of open textbooks in the United States, it is clearly meeting an educational need.

Andrews states that successful iterative innovations will often focus on a problem to be solved instead of a solution given (Andrews, 2013). This report investigates the potential and practice of OER within the context of six educational challenges:

- Fostering the use of new forms of learning for the 21st century.
- Fostering teachers’ professional development and engagement.
- Containing public and private costs of education.
- Continually improving the quality of educational resources.
- Widening the distribution of high-quality educational resources.
- Reducing barriers to learning opportunities.

In the government survey on public support for OER, respondents were asked to state how important these six challenges were for the justification of OER policy measures in their countries (major argument, minor argument or not an argument). The main emphasis of OER policy support in the majority of countries was on how OER could help face the challenges of improving teaching and learning, followed by the challenge of cost containment.

Ensuring the sustainability of OER initiatives

Policy consideration 6: Both initiators of OER activities and their sponsors, which may be government or philanthropists, should build sustainability into their strategic models for OER. Many cases show that over time, successful initiatives tap into multiple income streams, whilst assuring that the core OER are provided free of charge. The success of OER also requires proprietary providers to react. From a policy perspective, it is necessary to review whether OER provisions offered by proprietary providers are sustainable over time.

Keeping OER activities sustainable over a long period of time is key to ensuring their impact. Once (re)using OER has become a mainstream activity, many of the additional costs of OER activities will become redundant as they are absorbed by the educational system and replace other costs (this is especially true for current developments to the textbook market in the United States) (Nomura, 2014). Nevertheless, when reviewing current activities there is an opinion that many OER initiatives have relied too heavily on seed-funding (i.e. one-time funding) from governments or philanthropists without looking to the future. Similarly, OER originating from the enthusiasm of a community of volunteers face the challenge of keeping up the initial momentum and ensuring the maintenance of a certain level of quality, while also reaching out to a broader audience.

Government funding has an important role to play as the central procurer of educational materials, as a source of funding for special initiatives, and as a central determinist of framework conditions (including quality assurance procedures). It is therefore important to look at the funding and cost-recovery models being used by OER producers to cover initial production costs and maintenance costs over time.

Some OER initiatives have made a transition to a business funding model, with additional revenue streams being secured to ensure sustainability over time. There are also examples of institutional models, where the costs of OER are absorbed into the general budget of an institution on the assumption that the investment will lead to new revenues at a later stage. Looking at practical examples leads to the conclusion that many more mixed-funding models will emerge where OER is just one part of the digital learning offer from repositories and service providers. It is also possible that proprietary providers will integrate OER into their offerings.

Integrating OER into the whole learning setting

Policy consideration 7: In many cases it seems that the full potential of OER to support new forms of learning is not being achieved. This requires OER to be pedagogically integrated into the whole learning setting. Whilst changing the whole learning setting may not be appropriate or feasible in many cases, it is also not necessary. Instead it would still be beneficial to create spaces within the curriculum for this collaborative type of learning.

New forms of learning are required to provide learners with a learning experience that better facilitates personal development and success in a knowledge society. These approaches can be facilitated by involving learners as a community in the development of their own learning materials and the support of other learners.

A review of the literature leads to the conclusion that OER can foster new forms of learning, and their openness facilitates different forms of integration into various learning settings. Evidence suggests that OER are usually implemented in order to augment existing settings rather than to redefine teaching and learning. As with other digital media, such a redefinition requires pedagogical changes and not simply the use of new educational resources, i.e. a reconfiguration of the teacher-learner interaction or the learning support structures.

Supporting teachers

Policy consideration 8: Teacher collaboration can be fostered through developing, revising and sharing OER together. Just as forming communities can support learners, communities of practice can support teachers as learners as they develop new skills and overcome a reluctance to share or collaborate.

Teacher development and engagement has been shown as being key to effective learning. The adaptability of OER allows teachers to revise and tailor their educational resources to better fit the educational environment in which they are teaching. It can also lead to a higher level of collaboration between teachers in producing materials for their lessons or lectures, which is key to teachers' professional development (Vieluf et al., 2012).

Collaboration around OER production and application must be explicitly supported to have the greatest effect. At present, OER usage is mostly based on “just-in-time” enhancements instead of more strategic, reflective integration. Although reflective integration can be achieved after concerted institutional efforts, a change to the community culture is necessary to ensure collaborative development and the sharing of OER by teachers as there is often a reluctance to share or collaborate in open networks.

Supporting learners

Policy consideration 9: Using digital and adaptable OER provides new learning opportunities for commonly under-represented learner groups who struggle with the constraints of time, place and pace of learning. In relaxing the constraints, new learning opportunities can only be fully utilised if learner support as a whole is reconsidered, e.g. to compensate in new ways for missing personal interaction between teacher and learner in a formal setting. Both peer-to-peer and professional support from teachers trained for these new environments can make an important contribution.

Many learners are excluded from high-quality learning opportunities because of the three classic elements of the pedagogic situation: place, time and pace. Freeing instruction from these constraints has the potential to provide many people with new flexible learning opportunities.

Breaking down barriers to accessing education must be thought of as a process of widening participation in education rather than simply widening its audience. After overcoming the constraint of time, appropriate support structures must be set up to foster dynamic interaction and ensure the social experience of a community of practice in the design of an asynchronous learning environment (i.e. one in which time and place may be different for learners and for instructors). This is important as evidence shows that interaction-poor learning environments lead to poor learning results. To overcome the constraint of place, additional layers of support are necessary, i.e. pedagogical, personal, peer-to-peer and professional support, to enable the inclusion of potential learners from deprived areas and/or excluded communities. The adaptability of resources and their delivery can help overcome the more subtle barrier to opportunity of appropriateness and pacing.

Saving costs

Policy consideration 10: The OER contribution to cost containment is particularly large, if it is replacing a standardised proprietary product on a large scale. Using OER to explicitly augment or redefine a learning setting may not result in cost savings. At the same time, the adaptability of OER means that they can have a long lifecycle between design and decline and the longer this is, the more likely a cost saving will eventually occur.

Higher levels of participation in education systems across the world lead to challenges in cost sharing between public budgets and private households to cover the costs of high-quality learning materials. This is particularly the case since the 2008 global financial crisis, which continues to constrain public and private budgets. For this reason, it is necessary to look to more efficient forms of creating and delivering educational content.

OER offer the possibility of reducing costs through sharing and updating resources more cost effectively than traditional propriety-content models (e.g. in the school textbook market). The costs of new educational resources can be kept low by reusing existing resources from other producers (the reuse first principle). This cost saving is most evident for textbooks, which are widely used as a basis for learning at all educational levels across the world. Their substitution by open, digital formats can lead to cost reductions and an increase in the new textbook’s relevance. Initial production costs for different types of OER, however, may be the same or higher than for the proprietary products they are replacing. This means that there will only be savings if the distribution and the lifecycle of OER are extended.

Improving the quality of educational resources

Policy consideration 11: OER provide flexibility and adaptability, which enable educational resources to change over time and in different contexts. However, this flexibility presents a challenge for quality assurance. There are two ways to deal with this – to promote the acceptance of a beta-quality principle, which assumes that a resource is never fully complete, or to fix a resource at a certain stage of maturity and assess it on the basis of standardised quality criteria.

The dynamics of a knowledge society lead to three challenges for educational resources: they must reflect new developments in the subject area they cover, they must reflect new learning theories in order to better support high-quality learning, and they must be fit for purpose for the expected learning outcomes and the heterogeneous group of learners who are using them. The adaptability of OER offers the possibility of keeping educational resources at pace with these dynamics.

Improving the quality of OER was rated the least relevant policy challenge in the government survey on public support for OER. This may be because it is too inherent, i.e. not seen as a challenge in itself, but in relation to good quality teaching and learning, or there may be problems associated with quality in OER.

The flexibility of use and reuse and the openness of the OER production process and its ensuing lifecycle lead to a new challenge: how to assess quality with appropriate criteria. A central concept, which uses the dynamic nature of OER, is to identify releases of OER as beta versions, with the assumption that they will be changed and developed by other users over time. However, a condition of the effectiveness of such open procedures is the extent of real dynamism within the producer/user community. Additionally, user surveys show the scepticism of users regarding products created by others. Alternatively, open processes could be used to create OER, but then the OER could be fixed at a certain stage of maturity and assessed for fulfilment by standardised criteria. This approach is often taken for educational resources, which need to be closely aligned to standard curricula.

Policy interventions to support OER

This section entitled “policy interventions” looks at the concrete actions that should be used by policy makers to full use of the potential of OER. It answers the question: Which interventions should take priority in supporting the improvement of teaching and learning through OER?

OER can help policy makers address key challenges faced by their education systems. However, policy support is necessary if OER are to develop their full potential for improving teaching and learning. Problems include the fact that many innovations related to OER are too insular, too short term and do not gain enough attention. Policy support has a role in improving this situation.

This report advocates integrating OER into everyday practices in the educational field. This requires both supporting decentralised initiatives of engaged teachers and learners and making central changes to the framework conditions (regulations, quality assurance mechanisms, etc.) of teaching and learning. The following four areas for policy interventions have been drawn from a review of international policies and practices of governments across the world, and the CERI policy seminar held in January 2015 (see Chapter 11). In each case, policy options are identified without a preference for which works best but with a focus on an integrated strategy for policy interventions. These are based on the 11 preceding policy considerations.

Establish repositories and support the provision of open licence materials

OER production and use can be supported through policies that mandate or encourage its production. If there is currently no or little OER, governments can change the funding of educational resources or change the regulations for their production and use. One way of centralising and

focusing efforts on use and sharing of OER is to provide a central repository for openly licensed educational materials.

Policy options related to the provision of OER:

1. *A soft approach to the issue in policy terms starts from the view that OER already exist and that the most important thing is to establish one location in which they can be stored in order for them to be better discovered by others. Policies can facilitate the establishment of a central repository for OER or a platform that collects links to OER and stores them in various repositories (i.e. a meta-repository or referatory).*
2. *The most direct way to ensure the production of OER is to provide direct funding for new educational materials, which should have the characteristics of OER.*
3. *Existing educational materials can be reviewed and their licences changed in order to make them OER. However, this practice may lead to tensions or require new agreements with commercial publishers.*
4. *A general change to the regulations governing educational resources may increase the availability of OER. One option is to set a regulation that all publically funded materials should be OER by default. Alternatively, the regulation could state that new educational resources should be based on existing OER, where possible (reuse first principle).*

Establish new communities of practice within the teaching body to encourage OER production and use

OER offer new ways of using learning materials to support learning, but making OER available does not guarantee they will be used. Policy support needs to remove obstacles and encourage the use of OER by teachers and instructors, who can be supported through interventions in various dimensions of their teaching practice. If policy does not support the use of OER, OER-related activities will be too dependent on the individual motivation of teachers (Schuwer, Kreijns and Vermeulen, 2014). Establishing and supporting a community of practice around OER is therefore essential.

Policy options related to encouraging the teaching body to use OER:

1. *Make working with OER an important element in teacher training programmes. This should encompass both initial teacher training and specific modules on producing and working with OER as part of ongoing professional teacher training. Courses may be stand-alone or have a general focus, for instance, student-centred learning. OER should be used as a distinct part of this training.*
2. *Provide intensive training to a small number of teachers and instructors on how to get the best out of OER and then set up a system that enables this knowledge to cascade into other teachers' and instructors' practice. The "trainers" in this case may be given an award or special status in order to encourage them to take part in such an activity.*
3. *Set up a national competency centre that offers a central place for advice and training to teachers and instructors.*
4. *Launch an information campaign and release guidelines that encourage teachers and instructors to use OER in their teaching provision and, if necessary, change regulations to make this possible.*

Change the framework conditions of formal educational settings by modifying rules, promoting new tools and reassigning the division of labour

Framework conditions affect the activity of teachers and instructors, so changing them at different policy levels could promote the production and use of OER. Interventions could encourage

and incentivise certain behaviours within instructors' normal teaching practice or modify their reaction to new opportunities (e.g. by changing quality assurance or procurement measures).

The level at which policy initiatives can and should be implemented will differ between countries and education sectors, depending on the division of regulative and operational responsibilities in an education system. Public policy formation will be shaped by considerations on what should and can be done on national, state, city and/or institutional levels, and how this presents new opportunities or challenges in connection with the respective higher or lower administrative levels of responsibility. In general, there are two broad approaches to policy interventions: top-down or bottom-up (Cerna, 2013). The nature of OER as a catalyst for innovation at different levels means that public policy should focus particularly on joining bottom-up initiatives to top-down facilitative measures.

Policy options related to framework conditions for OER:

1. *Public policy focuses on helping bottom-up initiatives reach scale. This approach has the advantage of being able to benefit from the self-directed motivation of the initiators and their networks (Cerna, 2013: 18-19). One policy consequence of this approach is that initiatives are frequently only supported by public policy and funding for a limited period of time. Bottom-up initiatives are therefore often not taken to scale and integrated into the main public arena, but are expected to sustain themselves in the medium- to long-term (OECD, 2009: 72).*
2. *Public policy intervenes directly in order to push OER practice from the top down. This approach has the advantage of public policy being able to take into account all the success factors considered necessary for good practice, so it should afford a more systemic approach. It is also particularly appropriate in situations where the practice is considered by many in the field as contentious or of little value. However, this approach has a tendency to neglect the importance of local factors for success (Cerna, 2013: 18-19).*
3. *In recognition of the various aspects of teachers' lives that govern their use of educational materials to improve teaching and learning, a combination of both top-down and bottom-up approaches may be more appropriate – although not easy to get it right. This approach in the educational field has been called the “ecosystem approach” (Figgis et al., 2007).*

Promote the provision of more research on how OER are produced and used in certain contexts and by certain actors in the education system (teachers, learners and prosumers)

Research has a double function in terms of policy: it can be used for campaigns to persuade key actors in the education system to get involved in OER production and use, and it can be used to support policy decisions by providing insights into and a better understanding of the activity system around OER. Despite positive developments regarding educational research in the efficacy and adoption of OER, highlighted in the OER Research Hub Evidence Report from 2014 and Hilton's Review Project (see Chapter 11), research on usage, adaptation and sharing of OER remains weak. This is a key area that requires direct public support from policy – both enforcing the need for research and promoting research through funding programmes.

Policy options related to research on OER:

1. *Require that all publically funded OER projects are accompanied by evaluative research that identifies their impacts, and sponsor this type of research for initiatives not funded through public grants. This research could be action research by those implementing the project and/or external evaluative research carried out by third parties.*
2. *Foster broader research on the practices made possible through OER and their contribution to improving teaching and learning.*

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Chapter 3

Fostering new forms of learning for the 21st century

This chapter looks at how open educational resources (OER) can facilitate learning that is appropriate for the 21st century. There is a high expectation that OER will lead to pedagogical change and more learner-centred experiences. The four cases of OER used give evidence for how it can support peer learning between learners and the individualisation of the learning experience. The closing section discusses the pedagogical challenge associated with using OER to their full potential.

Main policy messages

OER can foster new forms of learning. This can address the challenges of living and learning in an increasingly knowledge-based society. By virtue of their openness, OER may be integrated in different forms and in various learning settings. Current evidence suggests that they are usually implemented in order to augment existing settings rather than redefining teaching and learning practices.

OER as a facilitator for new learning situations. As with other digital media, redefinition requires larger pedagogical changes than merely the use of new educational resources. Some approaches have partially solved this challenge by shifting attention from the content of a specific OER to its capacity as a facilitator or catalyst for new learning situations (e.g. WikiSeats and the cMOOC approach).

Policy challenge

Whilst the notion of 21st century skills is broad, it encompasses an array of competencies that can be classified into cognitive, intrapersonal and interpersonal skills (National Research Council, 2012). Knowledge-based workers should be able to “generate and process complex information, to think systematically and critically, to take decisions weighing different forms of evidence, to ask meaningful questions about different subjects, to be adaptable and flexible to new information, to be creative, and to be able to identify and solve real-world problems” (Dumont and Istance, 2010).

Knowledge-based societies require individuals to act upon their knowledge to produce new things, to know when and how to learn as well as how to learn with others (Aikenhead, Orpwood and Fensham, 2011). Moreover, as the European Centre for the Development of Vocational Training states in its skills prognosis for 2020, learners must acquire the skills to enable them to retrain later in life as it can be assumed that the labour market’s dynamism will require new skills (Cedefop, 2010).

Education design should respond to the challenges of equipping students with 21st century skills and reaping the benefits of technological change. In the context of the shift towards a knowledge-based society, education plays a pivotal role in empowering people with adequate competencies to deal with degrees of uncertainty and continuous change. To achieve this aim, education will have to harness more advanced forms of learning (Dumont, Istance and Benavides, 2010).

Potential solution

According to the OPAL study (Andrade et al., 2011), educators, policy makers and institutional leaders largely agree that the use of OER: 1) leads to pedagogical changes (69%); 2) shifts education provision from content- to activity-based learning (62%); and 3) shifts the role of learners from passive receivers to active producers (64%). These results are based on an online survey administered in 2010 to educational practitioners in higher education and adult learning across the world (final sample N=581; 79% from EU member states).

Potential put into practice

- *Using Khan Academy materials to support peer-to-peer learning:* The integration of materials from the Khan Academy into mathematics lessons at primary and secondary schools in California was analysed as part of a study (Murphy et al., 2014). Khan Academy¹ materials for learning are offered on line and via YouTube and can be accessed as OER. They were used to improve the learning environment and make it more personal in Californian schools and led to increases in students’ engagement, according to the study. Additionally, the evaluators

concluded that “several teachers commented on the peer learning that had developed in their classrooms as a result of allowing students to both work independently and assist their peers as they worked through the Khan Academy problem sets” (ibid.). However, the study also highlighted feedback from teachers using this combination of materials that they found the resources most effective for high achieving than low achieving students (ibid.).²

- *Using a digital course to support hybrid forms of teaching and learning:* Logic and proofs, the digital course by the Open Learning Initiative, has been used by more than 5 000 students for credit at various Higher Education Institutions in the United States. In an impact study, the efficacy of the learning materials as both substitution and augmentation of on-campus course provision was investigated. The study found the fully digital course to be more inclusive as it seemed to allow certain learner groups more flexibility in pacing and intensity than the presence based course. One case study showed how some learners had been able to accelerate their learning through the hybrid offer of online and on-campus learning elements (Schunn and Patchan, 2009).
- *Using an unusual catalyst to stimulate problem-based learning in academic courses:* In the case of the resource called WikiSeats, teachers can use a special bracket and instructions to encourage their students to build their own chairs, and can then build the planned learning content around this experience. The special bracket for a chair is called a “Catalyst” and is provided copyright-free to users. So far, 1 600 Catalysts have been downloaded. Although as they can be copied, this number is likely to be only a proportion of the total number of brackets that have been produced. In this example, remixing means using the WikiSeat Catalyst to stimulate different forms of learning in different settings. Redistribute means to inform others about how the WikiSeat has been used and thus stimulate new ideas. According to the project leaders, the Catalyst has been integrated into courses for mathematics, science, English, social studies, elementary class (general purpose common class where one teacher teaches all subjects), humanities, woodworking and technology. However, the open nature of the initiative leads to incomprehensive statistics on usage. In one instance, a 10th grade teacher used this to provide an innovative course on American Literature. The students were asked to design and produce a chair and then describe and interpret the process of production. Despite the innovative approach, the teacher managed to align this course with the common core curriculum for American Literature (Colombo, 2013).
- *Augmenting the learning resource through peer production:* OpenLIVES, sponsored by JISC UK funding,³ was a project which ran for 14 months (Nov. 2011 – Jan. 2013) and involved collaboration between linguistic departments at three English universities – Leeds, Portsmouth and Southampton. It is a learning resource in the form of videos, audio files and documents that presents the real lives of Spanish immigrants to the United Kingdom in their historical and biographical contexts. Different universities have integrated it into their programmes in order to redefine the learning experience of their students. At the University of Southampton it was used in a research skills module, at the universities of Portsmouth and Leeds as a module on languages for professional communication. Students are expected to add to the resources through their own coursework, which can then be uploaded to the United Kingdom repository for educational resources related to humanities, the Humbox.⁴ The interaction with existing and the production of new information materials provided a new element to the learning environment of the students, with one commenting: “I have really enjoyed the OpenLIVES module as it has given us, the students, an opportunity to do our own primary research and genuinely engage with the issues we are studying. Having more academic and creative control over our own education is extremely stimulating and motivating.” (final year undergraduate at Leeds). Despite the project funding ending, the resource is still being actively used (Borthwick, 2012).

Understanding the potential for impact

The existence of digital educational materials does not necessarily lead to the adoption of a specific pedagogical model. This is especially the case with OER, which can be small or big in scale (Weller, 2010) and used in various learning settings. As noted by Tuomi (2013) and Gordon (2014), it is possible to implement a wide range of pedagogical models through OER due to its characteristics of open access, reuse and repurposing that allow individual and distributed learning models. The cases presented above show the potential of OER to be used to substitute, augment, modify or redefine the learning space.

Each case also highlights the goal of changing the accessibility of learning resources in order to give students more active roles in their own learning. For the first three initiatives, low-cost access to learning materials (to a course, a video-based resource or a blueprint for the “catalyst”, respectively) facilitated their use. In each of these cases, remixing refers to the educational setting in which the specific resource is used. For WikiSeats, the learning environment is altered so much by the new learning resource that it can be called redefined. For OpenLIVES, the learning resources themselves are augmented incrementally by participating students. In this case, remixing of the resources is itself an educational aim of the OER.

In line with this selection of cases, a study from Falconer et al. on OER initiatives in Europe argues that, in many cases, OER publishing initiatives in adult, and especially higher education, tend to be content- and teacher-focused (Falconer et al., 2013: 38) The study suggests that this may limit their use for more expansive learning concepts. An evaluation of the use of digital resources for learning in Norway (Creelman and Reneland-Forsman, 2013: 45) also came to a similar finding.

Pedagogical challenge

In existing education settings, there are some traditions and ways of working that even learners are reluctant to change. The final publication from the CERIO/OECD “Connected Minds” project stated that young people’s expectations as learners in relation to technology use in formal education seem not to be changing dramatically, and these learners are not always comfortable with innovative educational uses of technology despite the social media and digital practices they otherwise engage in as young people (OECD, 2012). Echoing this finding, a study in British higher education concludes that both traditional and non-traditional students⁵ continue to rate face-to-face forms of learning higher than any other form (NUS UK, 2014: 28).

This is not to say that these learners do not want technology to be used, as they do expect it to be: 1) a source of engagement to make learning more interesting and relevant; 2) a means to make school work more convenient; and 3) a means to make it more educationally productive (Istance and Kools, 2013).

With a critical view on the existing expectations of OER, Panke and Seufert see too little attention being paid to its pedagogical side on a discursive level (Panke and Seufert, 2012), which could account for the discrepancy between expectations and reality. Creelman and Reneland-Forsman further say that the arguments in favour of OER have paid too much attention to the possibilities of access to digital resources without considering the consequences for learning design in order to secure the successful completion of courses (Creelman and Reneland-Forsman, 2013).

In the study in British higher education, a participant summed up the experience as follows: “You miss the physical human interaction. I like that, so being constantly on line for this stuff, I would just get bored of it. I would do other things. I need to have the traditional resources and then kind of integrate the OERs. I need that balance. If my learning was predominantly blogs, podcasts and lecture notes, I would probably not even pursue the degree; I would get so frustrated with how it was structured.” (NUS UK, 2014: 74)

Drawing upon a concept from Michael Moore (1993), Creelman and Reneland-Forsman (2013) point to the so-called “transactional distance”⁶ expressed by the study participant above and usually created by online learning. This gives the learner more autonomy, but leads to the challenge of bridging the distance between the now more autonomous learner and the learning goals (Creelman and Reneland-Forsman, 2013). Furthermore, a study from Barnard-Brak et al. showed that simply immersing the learner in an online learning environment does not lead to the development of the self-regulatory learning skills necessary to cope with this new learning environment. For this reason, it is argued that the development of these skills must be explicitly supported in order to fully profit from the more open learning environment (Barnard-Brak, Lan and Paton, 2011; Fontana et al., 2015).

Panke and Seufert look at the downside of this learning environment from another perspective. In view of the learners being partly saddled with the design of their own learning environment (design-in-use), they ask, in reference to cognitive load theory (Mayer, 2011; Sweller, 2011), whether this is “a waste of cognitive resources that could be better spent on actual information processing?” (Panke and Seufert, 2012). *Often the debate between the efficacy of constructivist, learner-centred situations versus direct instruction (with a lower cognitive load) focuses on the trade-off between motivating students to learn and explore versus learning discrete knowledge.*

A way of overcoming the challenge of creating a balanced learning environment is offered by Dron and Anderson, who have called the situation of a learner in a very open learning environment “agoraphobic” for the learner if not supported sufficiently (Dron and Anderson, 2014). Anderson developed the concept of the interactional equivalency theorem, which focuses on the interaction of the three key elements of a learning environment: teacher, student and content. The theory says that “deep and meaningful learning” is supported as long as one of three forms of interaction is at a high level: student-teacher, student-student and/or student-content (Anderson, 2003; Miyazoe and Anderson, 2010). Therefore, the interaction between the teacher/instructor and the student would be less important if the interaction between students/learners or between the student and content (i.e. an adaptable learning) were strong.

This may be a dilemma for OER, as high-quality instructional design requires a close focus on the types of learners who are targeted by a particular learning object. The argument in favour of OER is, however, that the openness of the design is based on the principle that many different users can access and use the resource. On this basis, a resource will not be tightly focused on a specific user group or usage situation. This could also be the reason why OER are largely implemented as add-ons to existing learning environments – at least by those who adopt OER from other contexts.

High level student-student interaction can be a way of harnessing the benefits of OER while reducing the challenges to successful learning. Facilitating a community of learners around the educational resources themselves can enrich the learning experience and ease the burden on the individual learner. This concept is inherent in George Siemens and Stephen Downes’ learning approach “connectivist pedagogy”, which prioritises learning between learners over learning propositional (descriptive) knowledge, and is often associated with OER. The learning object in this case is simply a stimulus for learning between different learners. The pedagogical concept often takes the form of a so-called cMOOC (emphasising connectivism as opposed to more closed xMOOCs) and foresees flexibility and openness in the learning process itself: “There are four easy steps: aggregate, re-mix, re-purpose, feed forward” (Downes, 2012: 479). The difference is that in this case it is not content (i.e. the OER) that is aggregated, remixed, repurposed and fed forward, but connections between people and information resources (Yeager, Hurley-Dasgupta and Bliss, 2013).

Notes

1. <http://www.khanacademy.org>.
2. Along these lines, the United States Department of Education has launched a USD 3 million randomised-control trial to gauge the effectiveness of Khan Academy materials. This federal research tender to specifically study the use of Khan Academy's online tutoring library, with a focus on community college math classes, was granted to WestEd's Science, Technology, Engineering, and Mathematics division and will be implemented from the start of the 2015-16 school year.
3. JISC (Joint Information Systems Committee in the United Kingdom) decided to fund a large number of small initiatives rather than a few large initiatives. For this reason, many programmes were developed during the funding period (2009-2012).
4. <http://humbox.ac.uk/>.
5. The study defines traditional students or studying modes as, for example, full-time study and face-to-face learning contexts, and non-traditional students or studying modes as, for example, part-time learning (NUS UK, 2014: 11).
6. Transactional distance refers to the theory of instructional space between instructors and learners in an educational setting, especially in distance education. According to Michael Moore, transactional distance is a "psychological and communication space to be crossed, a space of potential misunderstanding between the inputs of instructor and those of the learner". If learning outcomes in any distance education course are to be maximised, transactional distance needs to be minimised or shortened (Moore, 1993).

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Chapter 4

Fostering teachers' professional development

This chapter recognises that teachers and instructors are provided with new opportunities through open educational resources (OER). However, there is evidence that teachers require support to learn the necessary skills to benefit from the new degrees of freedom in designing relevant instructional materials. The four practice cases highlight different ways to support teachers, but also show that concerted efforts are needed to get beyond the self-motivated few. A key question for OER in teaching is the extent to which they are integrated into the curriculum. This chapter closes with a look at the alignment of OER in the design and delivery stages of educational provision.

Main policy messages

Collaboration around OER is essential. If teachers are to use information and communication technology (ICT) and to provide more learner-centred instruction, they need new tools and new skills, access to ICT and the competence to use technology in the classroom. Meeting their professional development needs is a precondition for their capability to impart 21st century knowledge and skills to their students. Collaboration around OER production and application must be explicitly supported for greatest effect.

Change the community culture around sharing. At present, much OER usage is based on “just-in-time enhancements” instead of more strategic, reflective integration into the curriculum. Whilst more reflective integration can be achieved after concerted institutional efforts (e.g. U-Now), a change to community culture is necessary to ensure collaboration and sharing of OER by teachers. This is because teachers and instructors often show a reluctance to share or collaborate in open networks.

Communities of practice can support teachers. Just as forming communities can support learners, communities of practice can support teachers as learners as they develop new skills and the confidence to share and collaborate on developing new educational materials and integrating them into the formal educational setting. Even so, just-in-time integration remains a major contribution to enriching the learning environment and should also be supported.

Policy challenge

Teachers are increasingly expected to provide more learner-centred forms of instruction through the use of digital technology. However, enabling teachers to provide students with adequate competencies for coping with a fast changing world has become a major challenge for education systems. Whilst routine, rule-based, compartmentalised knowledge is easiest to teach, it has become less relevant to the skills and competencies required of citizens in the 21st century (Schleicher, 2012).

Expert teachers are a prerequisite for the implementation of a challenging curriculum that stimulates higher order learning (Darling-Hammond and Post, 2000; McKinsey, 2007). They need to become actors of innovation in education who support knowledge and competence transfer between knowledge domains and creativity. New instructional technology can help, but research on media and technology over the last three decades has shown that the existence of technology does not facilitate new forms of learning on its own (OECD, 2014: 174; Selwyn, 2010). Stimulating learning through digital resources requires teachers to become “digital natives” in order to harness the new technological developments for better teaching (Atkins, Roberts and Higdon, 2013; Bates, 2015).

The recent OECD Teaching and Learning International Survey (TALIS) report showed that teachers in lower and upper secondary schools cited the issues of ICT and using new technologies in class as significant professional development needs (OECD, 2014: 109). This means that they are currently unable to harness the full potential of new technologies for improving teaching and learning. Alongside professional development in a formal setting, establishing communities of practice among teachers to facilitate collaboration and exchange can help teachers improve their teaching practice and overcome individual challenges (Vieluf et al., 2012: 34). This collaboration is seen as an important way of improving teaching and learning by avoiding the “silo model of education”, where innovations remain in individual classrooms and are not spread (Plotkin, 2010: 5).

Potential solution

The main users of OER are often teachers and instructors, whilst learners often benefit indirectly through an OER-enhancement of their learning environment. OER are flexible learning materials

that can be developed by collaboration between teachers and then adjusted to each teacher's individual teaching style and context. These degrees of freedom in designing relevant instructional materials can contribute to a greater sense of ownership and engagement of the teacher regarding his or her class. OER offer the potential to support both aspects – teacher engagement and their use of technology – and taken together, these enable creativity in teaching and learning (Lane and McAndrew, 2010).

Potential put into practice

- Creating OER from learning modules within a university:* The BERLiN project (Building Exchanges for Research and Learning in Nottingham) aimed to publish 360 credits of the United Kingdom's University of Nottingham's teaching and learning material as OER in order to investigate the development and use of OER issues faced by higher education institutions (Beggan et al., 2010). The project, which ran in 2010, was part of a series of continuing initiatives at the university to publish OER in its own repository: *U-Now*. In a survey of academics (n= 90; 6% of all university academics) as part of the project, the respondents showed an increased interest in using and publishing their own OER following the project. Whilst 70% of respondents said that they had not used OER in the past, only 14% said that they did not plan to use OER in the future; similarly, whilst 68% said that they had not published OER in the past, only 17% said that they did not foresee publishing OER in the future (Beggan et al., 2010: 23). Two of the ensuing recommendations for practice were to both raise awareness in educational institutions of the opportunities provided by OER and to offer institution-wide support. The authors also recommended that a clear reward structure for promoting excellence in teaching should be introduced in the English higher education system. Improving teaching and learning is often neglected by academics, who often see research excellence as a more important measurement for success.
- Professional training for teaching and learning with OER:* The OpenLine project provided seed-funding for the development of an open, five week long Massive Open Online Course (MOOC) entitled "First Steps into Learning and Teaching" offered by the United Kingdom's Oxford Brookes University (Roberts, 2012). It is a small-scale MOOC, which had over 200 registrations in 2012 and 60 constant participants throughout the course duration, with 14 undertaking the assessment and receiving a certificate. Participants were from 24 different countries including Australia, Canada, India, South Africa as well as many European countries and the United States. The participants explicitly learn how to integrate OER into their own lectures and courses and all resources used for the project are either OER from third parties or developed specifically for the course, but released with an open licence for reuse and repurposing. The course is now an element of the Oxford Centre for Staff and Learning Development (OCSLD) and can lead to an accredited Post-Graduate Certificate in Teaching in Higher Education. The course can be classed as a redefinition in comparison to other forms of professional teacher training as the blended learning format allows the participants to profit from the experiences and competencies of the other participants. It is supported through individual and group work and discussions on digital media (Moodle and blogs) and ends with an obligatory synchronous series of sessions.
- Exploring reuse of teacher training materials in an international context:* The DeFT project on Digital Future in Teacher Education has the explicit goal of training teachers at primary and secondary school levels to use digital technology in their lessons. It is run by Sheffield Hallam University and the University of Sheffield in the United Kingdom (Gruszczynska, Merchant and Pountney, 2013). The training uses an open textbook format with dynamic elements, which focus more on pedagogical rather than technical experience of using digital technology in school.¹ The project leaders from Sheffield Hallam University carried

out an add-on project to investigate the possibilities and constraints of reusing the materials in other national settings. For this project, they worked with three European universities – Akademia Gorniczo-Hutnicza (University of Science and Technology, Krakow, Poland), Katholieke Hogeschool Limburg (Limburg Catholic University College, Diepenbeek, Belgium) and Hogeschool van Arnhem en Nijmegen (University of Applied Sciences, Nijmegen, Netherlands) (Gruszczynska and Pountney, 2013). Results of the evaluation on the practicability of using the open textbook highlighted the need for adaptability, the need to translate the resource into another language, and the need to align the resource to a national curriculum, if the school system is structured around such a framework. The main impact of the project, according to the project participants, however, was more indirect – it was having the opportunity for knowledge and experience transfer rather than the possibility to adopt specific content.

- *A meta-repository for OER related to teacher training:* The project Share.TEC, which ran between 2008 and 2011 and was co-funded by the European Union, started out from the recognition that teaching can be improved through better exchange of experiences and materials across European countries. Its aim was to foster innovation in teacher training, and its target group were teacher trainers and teachers engaged in pre-service education and the continuous professional development of teachers (Bocconi, Earp and Sarti, 2011; Stefanova et al., 2011). The meta-repository aimed to connect to multiple repositories for teacher training-related materials in order to provide one central access point. In this context, special attention was paid to highlighting the pedagogical context of the OER in the metadata. In their final report, the project leaders stated that the ultimate success of the meta-repository was conditional on the active involvement of users and the engagement of existing professional communities and other stakeholders across Europe. At completion of the project's official project cycle, the meta-repository contained 26 000 materials. Following the end of the funded project lifecycle, the Share.TEC database was passed on to the University of Sofia St. Kliment Ohridski in Bulgaria that developed the portal. It is now largely used internally.

Understanding the potential for impact

The four cases above highlight the challenge and potential for using OER to support teachers' initial training and professional development, especially with regard to digital technology and the use of more interactive forms of learning.

The aim in all cases – whether direct or indirect – is to establish a community around and for OER. The BERLiN study showed that this can begin by raising awareness for the possibilities of OER within a single institution. The Share.TEC initiative highlights that without such a community, these and similar initiatives are likely to fail (see Chapter 9). A further example of the support provided by communities is the project “Teachers Advancing Common Core Learning” (TACCL) from Institute for the Study of Knowledge Management in Education (ISKME) in the United States, which addresses teacher isolation by building networks of collaborators around implementing the Common Core curriculum.²

Grade of curricular alignment

The role that OER plays in a teacher's or instructor's teaching and learning provision differs as the flexibility of OER means that many levels of integration are possible. Armellini and Nie (2013) provide a framework within which to view OER integration, which shows the timing of the integration of the OER (at delivery vs. during the design stage) and the adaptation of the OER (no change, i.e. as-is vs. repurposed). For instance, OER use may be planned in advance and the OER repurposed and used to design a full course curriculum (top right-hand corner), or used spontaneously, e.g. just-in-time use of a YouTube video during regular classes (bottom left-hand corner) – see Figure 4.1 below.

Figure 4.1. **Curricular alignment and adaptation of OER**

Integration into curriculum	During design	Planned enhancement	Strategic enhancement
	During delivery	Just-in-time enhancement	Reflective enhancement
		As is	Repurposed
		OER use	

Source: adapted from Armellini and Nie (2013), "Open educational practices for curriculum enhancement", <http://dx.doi.org/10.1080/02680513.2013.796286>.

In their study of OER reuse in United Kingdom higher education, Armellini and Nie (2013) examined how frequently OER was integrated in different ways. The authors reported similar findings to a study by the Open Education Quality Initiative (Andrade et al., 2011): the smaller the OER, the more likely they are to be integrated into an existing curriculum and to produce immediate teaching and learning enhancements (Weller, 2010). This finding is reinforced by the recent OER impact study in Community Colleges in the United States, where videos and images were found to be the most widespread types of OER (Farrow and Daly, 2014; FTI Consulting, 2015: 32). The type of minimum integration of existing OER in the bottom left-hand corner of Figure 4.1 remains an important first step in the context of the use and promotion of OER. Littlejohn et al. (2014) argue that reusing OER for more deliberate application will only become feasible after strategic efforts have been made to successfully change community cultures (see Chapters 9 and 11).

Notes

1. <http://www.digitalfutures.org/>.
2. <http://www.iskme.org/our-work/teacher-practice-network-project-teachers-advancing-common-core-learning>.

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Chapter 5

Containing educational costs

This chapter looks at the common expectation that open educational resources (OER) lead to cost savings for private households and the public purse. It differentiates between initial development costs and maintenance costs once an OER has been developed and is being used. The development costs may be the same, higher or lower than the original educational resources they are replacing – depending on what the OER are being used for. Maintenance costs can be low, but are dependent on maintenance being coordinated and happening. Examples are given of countries that have been liberalising their procurement strategies for educational resources in the expectation that OER will help save costs without a negative impact on quality. The practical cases of OER use presented in the chapter further emphasise the cost-saving potential of reusing and widely distributing existing resources.

Main policy messages

OER can reduce education costs. Higher levels of participation in education systems across the world lead to challenges of how to share the cost of high-quality learning materials between public budgets and private households. OER offer the possibility of reducing costs through sharing and updating resources more cost effectively, for example by reusing existing resources from other producers (the reuse-first principle).

Initial production costs for OER vary. Cost savings are most evident for textbooks, which are widely used as a basis for learning at all educational levels across the world. Their substitution by open, digital formats can lead to cost reductions and, additionally, an augmentation of the fitness for purpose of the new textbook. However, the initial production costs for different types of OER may be the same or higher than for the proprietary products they are replacing, with savings only accruing if the lifecycle of OER and distribution are extended.

Policy challenge

With growing participation rates at all levels of education, there are concerns for the efficiency and affordability of educational resources. In OECD member countries, the increase in per-student educational expenditure for all services at pre-tertiary education levels was 17% on average between 2005 and 2010; for tertiary education it was 8% (OECD, 2013). Among OECD partners and developing countries, expected rates of growth in participation, along with the squeeze of public budgets and private household income at least since the financial crisis of 2008, are major challenges to making the provision of good quality education affordable.

Potential solution

OER can help solve the issue of affordability of resources by addressing the costs of learning materials. These costs are spread differently between private households and public budgets depending on the country and educational level. In many countries, the expense of educational materials is funded by public budgets for the lower educational levels (primary schooling and sometimes secondary schooling) and funded privately at higher levels (sometimes secondary schooling and always at tertiary level) (Hylén et al., 2012). This means that reducing the costs of educational materials can benefit the public purse in some cases and private households in others. In the case of textbooks required for certain learning situations, the state often intervenes by negotiating preferential rates for the purchase of the books.

The potential of OER for containing or reducing the cost of learning materials is especially high in the case of textbooks. This is significant as a recent OECD report reported that the use of textbooks as a basis for instruction in eighth grade mathematics and science is increasing, with an average absolute change of 15% points between 2003 and 2011 in OECD countries (Vincent-Lancrin et al., 2014).

An earlier Centre for Educational Research and Innovation (CERI)/OECD survey on OER highlighted the three main expectations of OER cost-efficiency as (Hylén et al., 2012):

- Reduce students' direct education costs without imposing further burden on public education budgets.
- Significantly increase the number of students who access and benefit from high-quality educational content in a variety of learning environments.

- Decrease the amount of time and money spent on course development, while also increasing the quality of coursework overall, by allowing teachers and learners to reuse and remix content.

In a study investigating the perceptions of OER in higher education in the United States (Allen and Seaman, 2012: 11-12), nearly two-thirds of institutional academic leaders surveyed believed OER have the potential to save them time and money in developing new learning resources.

Potential put into practice

- *Collaborating in the creation of OER materials for the containment of educational costs:* Two universities in Ghana have collaborated with other higher education institutions in Africa and North America to try and contain educational costs as their student numbers increased. The initiative brought together expertise from around the world to create a series of innovative health related OER materials using Creative Commons licensing. The objective was to contain educational costs in the health sciences at both universities, without compromising quality (Donkor and Tagoe, 2010). The success of the initiative was due to the facilitated OER-based teaching of scientific processes, as well as clinical demonstrations through the use of images, animations, narrated videos, interactive cases and self-assessment quizzes, all of which were previously unavailable.
- *Developing an OER-based “living curriculum” to reach rural populations:* The “Mission 2007 Training Commons” national initiative of the Indian government created a completely new OER-based “living curriculum” by developing four freely available and open training modules to train 600 000 future telecentre managers, who could then use their training to serve the diverse needs of their respective communities. Training Commons is an example of the cost containment and cost-saving potential of OER as it facilitates the provision of educational resources and services to populations beyond formal educational settings, and at scale. This OER initiative allows the most effective use of expertise already available in the country by specifically fostering collaboration between educational practitioners and establishing long-term partnerships between four training organisations in India. The project leaders put special emphasis on individual authorship, face-to-face interaction and email communication as a way of directing workflow and securing a work-centred and cost-effective approach (Petrides, Jimes and Chin, 2008).
- *Implementing a collaborative creation process to reduce initial development costs:* The “Everything Maths & Science” initiative¹ of the Free High School Science Texts (FHSST) project (now Siyavula Education) in South Africa responds to the national need to reduce educational costs by allowing content to be freely accessed (reduction of learners’ costs) and by reducing the initial development costs through a collaborative creation process. The OER are distributed nationwide and their main educational purpose is to augment the functionalities of traditional textbooks. The resources are collaboratively authored, curriculum aligned and free to access, reuse and redistribute for all teachers and learners. These leads to reduced development costs and a wide distribution.
- *Applying a “reuse first” strategy to reduce development costs while fostering communal stewardship:* The BCcampus Geography Open Textbook Sprint at the University of British Columbia in Canada responds to the regional need to create a previously unavailable geography textbook for first year university students, while containing its production costs by applying the BookSprint method of fast-paced production.² The initiative follows the long-term goals of production and maintenance cost containment and communal stewardship in the authorship of regional learning materials through the collaboration of educators and technologists from across institutions in British Columbia (Lalonde, 2014).

Understanding the potential for impact

Three of the four cases presented here show how reuse of existing materials in the first instance (reuse first) can lead to accessing materials at a low or negligible cost. The initial development costs in the third case (FHSST) were covered indirectly through voluntary contributions from academics, and the main cost savings are achieved through the wide distribution of the textbooks and the low costs for updates and modifications. In all of the cases, OER changes the lifecycle and ease of distributing the educational resources.

The cases illustrate that in order to investigate cost containment or reduction it is important to differentiate between the various costs for the provision of and access to learning resources, the actors involved, and the types of learning resources, as well as the purpose of the OER within the whole learning environment. The provision of and access to learning materials affect the budget of different actors, namely government, learners and their families, and publishers. As they often all bear some of the costs, it is important to understand how OER could be differentiated, particularly with respect to:

- Initial development and production costs
- Maintenance and further development costs
- End-user costs

The significance of any cost reduction also depends on how the OER is being used in the specific learning environment. First, it may be used simply as an additional resource to enhance the existing learning arrangement. In this case, the OER provides the opportunity to enrich the learning environment at minimal cost. Second, it may be used to substitute an existing element in the learning environment, for example when a textbook-like OER is used to replace the existing proprietary textbook. Since elements in the provision of this resource cost less than a proprietary textbook, this type of OER can provide a cost saving alongside some enrichment through, for example, interactive elements of the resource. Third, it is possible to use a full-scale OER course to completely replace and redefine the existing learning environment. In this case, the savings in distribution and access costs may be outweighed by the need for supplementary support structures that were not necessary in the original learning environment. This may be the case when supplementary educational supervision becomes necessary to ensure successful completion of a course in a very different learning environment. This issue tends to confront Massive Open Online Courses more often than OER, as OER are more often used as an addition to rather than replacement of a larger learning environment (Griffiths et al., 2014).

Initial development and production costs

The initial production costs of OER may be the same (e.g. for a textbook) or higher (e.g. for a stand-alone course) than for previous resources. In general, therefore, producers confront the challenge of covering the initial costs of production by identifying the longevity of the resource (de Langen and Bitter-Rijkema, 2012; Downes, 2007). Additionally, the openness of the resource means that it is possible to offer it to a greater number of users, thereby reducing the unit costs (Butcher and Hoosen, 2012; Hilton and Wiley, 2011).

OER allows bottom-up initiatives, where teachers collaborate and co-create educational content, to flourish. This is the case with the Free High School Science Texts (FHSST) in South Africa, BookSprint in Canada and Training Commons in India, where iterative processes of content development and division of labour were based upon the expertise of authors (ISKME, 2008). In the case of FHSST, the authors offered their contribution voluntarily, thereby making sizable savings in the development phase possible. The underlying incentives for taking part in these projects may be an improved reputation through awards and field excellence recognition.

Maintenance and further development costs

New releases of OER incur minimal additional costs as adaptation of the original resource is expected and allowed. This means that the end price for learners of an updated OER is negligible (Senack, 2014). This advantage has been utilised in the so-called BookSprints, which use fast-paced production based on available materials (reuse first) to generate updated educational materials. In the case of BCcampus, adaptation actually led to the development of a new book that filled a previous gap but was based on existing materials.

In Poland, development of the national OER scheme for school textbooks was driven by the recognition that the books being used in schools were outdated and that OER provided an effective way to keep them up to date (Sliwowski and Grodecka, 2013: 15–16). However, the potential benefit of lower development costs is limited by the extent of necessary redevelopment. In the case of the Ghanaian universities, lecturers were surprised at the time and effort required to develop course materials based on existing ones (Donkor and Tagoe, 2010: 8). This is a hidden cost of using OER developed by others to create new learning resources.

De Langen and Bitter-Rijkema (2012) argue that the sustainability and maintenance of up-to-date resources is dependent on the existence of a community of users. On this basis, an analysis of sustainable OER initiatives (Chapter 10) should start from the concept of value networks (Benkler, 2006), where the interaction between users and producers constitutes a value in itself.

Costs to the end-user and public procurement

In countries where families were majorly hit by the 2008 financial crisis (e.g. Greece, Italy, Portugal, Slovenia, Spain and the United States), the issues of learning material costs and subsidised provision have become more relevant in recent education policy debates. For example, the Spanish Ombudsman (Becerril, 2013) reported that between 2008 and 2012, government subsidies for basic education textbook provision declined by 45% (on average between those provided by the central government and the autonomous communities or local authorities), thus threatening the principle of equality of access to learning opportunities. Italy has recently modified its legislation on textbook adoption to reduce the annual financial burden incurred by families when purchasing textbooks (MIUR, 2014).

It is promoting the adoption of collaboratively created learning resources through the “Book in progress” initiative.³ Textbooks are being written by 800 teachers in a coordinated national network and made available in print and digital form and it is estimated that the cost saving could be as much as EUR 300 per student in secondary education, as stated by the school principal leading the initiative during a recent radio interview (Radio24, 2014).⁴

A similar issue is faced in Brazilian higher education, where a study from the Brazilian Institute for Consumer Protection in 2008 showed that the average cost of learning materials for first year college students at public teaching institutions was around USD 1 000 (Butcher and Hoosen, 2012: 17). Another study conducted by the Research Group for Public Policies for Access to Information (GPOPAI) at the University of São Paulo found that for 75% of students enrolled at the university, the cost of professional textbooks was higher than their family’s monthly income (ibid.). These figures account for the existence of OER initiatives in the region focusing particularly on textbooks (Dos Santos, 2011).

In the United States, the average college student reportedly spends between USD 600 (Consortium Florida Distance Learning, 2012) and USD 1 200 (Senack, 2014) a year on textbooks, and around two-thirds of students considered not buying the required textbook because of high costs (Consortium Florida Distance Learning, 2012; Senack, 2014). This is particularly significant for the community college sector, as:

- Community colleges are generally seen as providing higher education for non-traditional and otherwise excluded student groups.

- Learning forms at community colleges are particularly focused on the use of textbooks so the reduction of end consumer costs to students would have a particularly significant impact on affordability.

In recognition of these issues, there is a growing body of literature investigating the savings incurred by students when they are able to opt for OER in the form of open textbooks (Allen, 2010; König, 2013; Senack, 2014; Sliwowski and Grodecka, 2013).⁵ Hilton et al. provide evidence on the cost effectiveness of mathematics open textbooks in a community college (Hilton et al., 2013), with findings showing that OER allowed for substantial cost savings to students, while faculty was generally satisfied with the quality of materials. Similarly, Wiley and Hilton performed a cost comparison between open and proprietary textbooks to assess the cost-saving potential of OER in secondary education. The average cost saving amounted to 40% in the first year and up to 50% in the second year of the experiment (Wiley and Hilton, 2012). These results take into account the time spent by teachers in adapting the content to their specific needs, as well as the printing and shipping costs, compared with the cost of adopting proprietary textbooks.

Government interventions may be through direct procurement or through changing the framework conditions of the production and use of educational materials (Chapter 11). In 2012, Nebo school district in Utah trialled open textbooks as a cost-saving strategy. An empirical study found little performance difference between pupils using open textbooks and those using commercial textbooks – in some cases there were even performance gains (Robinson et al., 2014). Following the success of this pilot scheme, Utah decided to roll this programme out state wide in 2013.

The 2009 American Recovery and Reinvestment Act in the United States required that all resources created using USD 2 billion in grant funds be released under a Creative Commons Attribution licence. The purpose of this open policy was to make education more affordable for students and ensure that publicly funded resources are freely and openly available to the public, who had paid for them through general taxation.

In Italy, a 2014 ministerial circular on textbooks adoption (MIUR, 2014) repealed the compulsory adoption of textbooks and supported teachers' co-creation of educational content, while also lowering the price ceiling for textbooks in secondary education by 10%. In addition, this legislation repealed the provision that prevented publishers from updating their textbook content more than every five years. This new regulation is part of a greater ministerial commitment towards school digitalisation (Avvisati et al., 2013).

The evidence from the cases described highlight how OER can help to contain and even reduce the costs of educational learning resources. While OER encompasses a wide range of educational materials, cost containment initiatives put a particular emphasis on textbooks, where the argument for changing the framework of how educational materials are purchased is particularly strong.

In educational settings where OER are being used to augment or modify a learning environment, a direct cost comparison is more difficult. On the assumption that much of this material is available as “stuff on the web”, the question is the opportunity costs for teachers and instructors of adapting this to their specific learning context.⁶ The example from Ghana provides a reminder that this cost may be relatively high and should be considered when planning OER initiatives.

The cost of creating new resources is still significant with OER, although much OER content is being developed and provided in the non-market sector, which keeps costs low. Moreover, the cost of developing new resources based on existing OER is likely to get lower as the freedom to remix and redistribute will remove the transaction costs arising from copyright restrictions and will allow for faster modifications and adaptations, especially when materials are delivered in a digital format – as highlighted by the BookSprint example from Canada. At the same time, this new lifecycle of educational resources can lead to new issues for quality assurance over an educational resource's lifespan as dealt with in Chapter 6.

Notes

1. www.siyavula.com/.
2. www.booksprints.net/about/ According to the website: “A Book Sprint brings together a group to produce a book in 3-5 days. There is no pre-production and the group is guided by a facilitator from zero to published book. The books produced are high-quality content and are made available immediately at the end of the sprint via print-on-demand services and e-book formats.”
3. <http://www.bookinprogress.org/>.
4. This estimate results from subtracting the estimate price of OER-based learning resources (EUR 50) from the price ceiling set by government for secondary education learning resources (EUR 350).
5. See also interactive online tool that assists in calculating the potential for cost reduction through open textbook according to specific context conditions: <http://openedgroup.org/calculator/index.html> and impact.lumenlearning.com.
6. A recent study has made the same argument for integrating MOOCs into normal learning situations to produce hybrid learning environments (Griffiths et al., 2014: 26).

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Chapter 6

Improving the quality of educational resources

This chapter investigates how open educational resources (OER) can help facilitate the continual improvement of educational resources. This is largely made possible through the adaptability of OER. The presented cases show that the flexibility of OER leads to the need to rethink quality assurance mechanisms. The final section of the chapter discusses the possibilities of using both more open quality assurance mechanisms and applying standards to ensure that what is learnt using OER is recognised in formal education.

Main policy messages

OER keeps resources up to date. Keeping up with the rate of new knowledge and new learning theories to serve a heterogeneous group of learners is a challenge and a necessity in the fast-paced 21st century. OER offer adaptability for keeping educational resources up to date and fit for their current purpose, as well as flexibility of use and reuse.

Assessing OER quality can be a challenge. However, the openness of the OER production process and its ensuing lifecycle lead to a new challenge – assessing quality with appropriate criteria. A central concept, which makes a virtue of the dynamic nature of OER, is to see releases of OER as continual “beta versions”, with the assumption that they will be changed and developed by other users over time. However, user surveys show the scepticism of users regarding products created by others. A condition of the effectiveness of open procedures is, therefore, the extent of real engagement and commitment within the producer-user community.

Various initiatives attempt to ensure OER quality. Alternatively, open processes could be used to create OER, but then the OER could be fixed at a certain stage and assessed for fulfilment by standardised criteria. Various initiatives for curating and guiding quality in producing OER and for assigning use-related meta-tags exist, including an initiative in the United States to ensure alignment to the standards of the common core curriculum.

Policy challenge

Educational resources face three key quality challenges: 1) how to keep up with knowledge development; 2) how to reflect new learning theories; and 3) how to improve services to heterogeneous learners.

Potential solution

OER can address these challenges through their adaptability, which facilitates the dynamic development of learning resources so that the best and most suitable resources can be offered. As stated by Wiley, it is not necessarily the open licence that guarantees the resource will be fit for purpose, but how the original resources can further be adapted with the aim of improving learning (Wiley, 2013). McGreal further specifies the criteria of openness that leads to quality improvements as: timeliness (including the possibility to easily update information), accessibility, usability across networks and devices, and shareability (McGreal, 2013).

However, a problem with OER is that they are frequently decentralised resources, which is a challenge for the hierarchical management of updates and a common argument used against OER by the publishing industry (FEP, 2012). The dynamic characteristics of OER lead to questions regarding how the process can be made transparent and how quality can be maintained over time. Wiley (ibid.) argues that open resources, such as Wikipedia, do not appear to suffer from inaccuracy in content and when they do, can be corrected quickly. Therefore, openness should lead to continual improvement.

Richter and Veith argue that a key success factor of OER is that they can be found and reused by anyone anywhere in the world in whatever educational context, which changes the traditional lifecycle of learning resources as a single-source production. As OER are continuously being improved, remixed, repurposed and eventually republished, there is no point in time when they reach their “peak of maturity” (Richter and Veith, 2014: 206).

McAndrew at the Open University in the United Kingdom argues that special concepts of quality in relation to OER are required. To a large extent, this recognition has grown out of the early practical

OER experience of checking though content shared via the university’s repository OpenLearn (presented in more detail below). Due to this at times “frustrating” process, OpenLearn eventually adjusted its workflow to allow the release of “beta content” before final corrections had been made (McAndrew, 2011). While this approach arguably poses a risk to the overall culture of quality, it also fosters less formal models of learning following the “permanent beta philosophy”, which McAndrew argues is inherent to the concept of OER.

Camilleri et al. argue that the dynamism of OER leads to a stronger requirement of trust between producers and users of OER, and that it is necessary to work on creating such networks of trust (Camilleri, Ehlers and Pawlowski, 2014):

“The determination as to the quality of open education (whether materials or practices) will depend on the judgements of two overlapping trust-networks. The first is the open network of users, reviewers and teachers working together for quality improvement of resources, teaching and learning. The second is the existing trust-network in place in the publishing industry and in formal education.”

Potential put into practice

- *Creating an experimental community to enhance the relevance and impact of resources:* As an educational website, the OpenLearn initiative (mentioned above for its “beta content” approach) set out as an experiment to explore how to offer free content. The initiative’s virtual learning environment now offers over 400 structured study units to students via the “LearningSpace” as well as an area for experimentation, called “LabSpace”, where educational practitioners can download, amend and adapt both current and archived course materials. OpenLearn is an example of the quality improvement of educational resources, as it allows practitioners to form their own areas within the LabSpace to personalise the materials, which increases the relevance of the content for specific learning communities (e.g. non-traditional learners). It also allows for the testing of course ideas and the development of materials based on user feedback. All OER can be reused in alternative educational settings, repurposed for a local context, and translated and built upon to form a larger open repository of derivative educational materials. The initiative thus responds to the need for a collaborative community to improve the quality and relevance of educational materials, as well as the need to adapt learning materials to specific educational contexts/settings to enhance their usefulness and impact (McAndrew et al., 2008).
- *Improving targeted searches to raise quality in teaching:* The Open Tapestry¹ platform provides tools for users to author learning resources and develop course materials, as well as to create and share modules – “tapestries” – from content that is already available on the web. It allows users (mostly instructors) to tailor learning resources to their specific educational settings quickly and efficiently. Open Tapestry currently holds about one million resources with a strong focus on higher education learning materials. While the use of open content is encouraged within the context of the platform, users also have the possibility of creating closed spaces for their institutions/organisations. Open Tapestry has repository-like features as open content repositories can be searched, metadata harvested, and resources uploaded by users. As a way of collecting metadata for all types of resource of various unit size or granularity (e.g. individual videos vs whole courses made up of various media resources), Open Tapestry provides indexing fields based on the Learning Resource Metadata Initiative (LRMI) metadata (presented below). However, Open Tapestry has found that users have tended not to fill these in. To encourage users to complete these fields in the future, Open Tapestry is currently focusing on ways to provide targeted searches for particular audience groups or use-cases (Campbell, 2014).

- *Central initiative to ensure quality of OER:* The Open, Transferable and Technology-enabled Educational Resources (OTTER) Project by the University of Leicester (2009-2010) gathered, collected and created OER based on existing teaching materials across a wide range of disciplines within the university. The project aimed to respond to the need for improving the quality of teaching and learning by making the learning environment more stimulating, while simultaneously fostering collaboration and the sharing of resources within the university (Witthaus and Armellini, 2010). To achieve this, the project developed and implemented a rigorous workflow process for transforming teaching materials into high-quality, freely accessible and open educational resources. This ensured both the abundance of OER and their individual quality.
- *Testing the recognition of OER-based learning in formal settings:* The OERTest project ran between 2011 and 2012 and worked with four universities (United Nations University, University of Granada, Open University of Catalonia, University of Edinburgh) to develop guidelines for the recognition of OER-based learning (Camilleri et al., 2012). The project found that even among co-operating universities there were issues around recognising learning that had happened outside of their control. These were, however, not specific to OER-based learning, but common problems with recognition of learning across countries, often found, for example, with the Erasmus student mobility scheme.² The main authors are continuing their efforts in a new project entitled Virtual Mobility Passport (VMPass), with a large part of the project based on creating a common dialogue on how to agree on recognition.³

Understanding the potential for impact

The cases above highlight that understanding the issues pertinent to the quality of OER requires a differentiation between the various dimensions by which OER can contribute to improving educational resources, and how the quality of OER themselves can be ensured, namely:

- keeping educational resources up to date
- enhancing the learning environment
- providing quality assurance mechanisms
- aligning OER to common standards.

Keeping educational resources up to date

A recent survey of around 8 000 school teachers in the United States found that science and mathematics classes across grade levels are likely to be using textbooks published in 2006 or earlier (in high schools, over half of the books used were at least this old) (Horizon Research, 2013: 20-21). This creates challenges in subject areas where the content requires, or would at least benefit from, frequent updating. In the United States, a quality improvement initiative to introduce Common Core State Standards (CCSS) for mathematics and English has been adopted by 43 states.⁴ This initiative requires that educational materials are updated and new materials introduced. The huge cost of this reform can, in part, be contained through the extensive use of OER. The K12 OER Collaborative, led by 12 states and supported by Creative Commons, the Learning Accelerator and Lumen Learning, has been developed to build common core aligned educational resources⁵ that are licensed by Creative Commons Attribution (CC-BY 4.0).

Polish digital textbooks released on open licences have been supported since 2012 by the “Digital School” government initiative. The reason behind this was that private publishers were using new releases of textbooks to keep the market buoyant, which minimised the reuse of existing textbooks and led to higher costs for users with minimal qualitative benefits (Sliwowski and Grodecka, 2013: 14-15). The

BookSprint method of fast-paced book production (presented in Chapter 5) is another way of regularly updating open textbooks.

Enhancement of the learning environment

In many cases, the quality of the learning environment itself is enhanced by the additional use of OER. A recent report in France looked at the opportunities of providing some educational resources for schools in digital format to replace the dependence on textbooks or enhance the learning environment (Leroy, 2012). The report highlights initiatives such as *lelivrescolaire*,⁶ established in 2009 with the aim of developing digital, interactive and customisable textbooks for colleges. The textbooks are written by a community of authors and are freely available under a free license for all media (print versions are sold). If OER are offered with a fine granularity (i.e. as videos or quizzes), they can be flexibly joined with other resources or materials to reflect a diversity of teaching and learning methods.

A study in England on higher education showed that the choice for OER was based on relevance and the teachers' assessment of pedagogical fit (White and Manton, 2011: 17-19). Two interviewees in the study stated that "...a lot of the OER I grab off the web is to allow me to explain things in a visual or in an interactive way so that they [students] can interact with things." And, "I want something to support me, like a video clip, which I won't have the time to do or probably the expertise to do [...]" (ibid.) In such cases, the discoverability of appropriate resources is more important than curriculum alignment.

Metadata and alignment to common standards

Additional studies have supported the need for user-centred mechanisms to ensure that searches do not rely too much on technical metadata (Atenas, Havemann and Priego, 2014: 38). The Learning Resource Metadata Initiative (LRMI) aims to enhance end-user search and the discovery of educational resources by creating user-centred metadata that helps potential users assess how fit for purpose resources are. The initiative has developed a common metadata framework for describing learning resources on line with the aim of ensuring a more successful and qualitatively richer search experience for educators, learners and researchers. OER that is assigned metadata can be better aligned to specific types of usage, which facilitates integration into the learning environment.⁷

An alternative way of ensuring that OER are fit for purpose is to align them with common learning standards used in an education system. Although this does not ensure the quality of the materials themselves, it does make clear in which context they are meant to be used. This method has been applied to secure usability in the Dutch repository for school materials called Wikiwijs, which are aligned to learning outcome plans (Wikiwijs program plan 2011-2013, 2011). In the United States, the Common Core State Standards refer to the expected outcomes in mathematics and English in all states that have agreed to use them.⁸ In practice, this has been used in the Khan Academy's repository for educational resources, which has a section on the alignment of OER to the Common Core.⁹

The organisation Achieve, a non-partisan organisation from the United States and focused inter alia on providing states with technical assistance for developing accountability systems in the educational sector, has developed evaluating criteria for OER based on the issue of alignment to central standards and certain characteristics of individual resources (Achieve, 2011). The standards are designed to evaluate the potential of an OER learning unit to fulfil the following purposes:

- degree of alignment to standards (in this case CCSS standards)
- quality of explanation of the subject matter

- utility of materials designed to support teaching
- quality of assessment materials
- quality of technological interactivity
- quality of instructional and practice exercises
- opportunities for deeper learning
- assurance of accessibility.

Some of these purposes will be more relevant to OER than others, and some will not be relevant at all. The rating scheme differentiates between the grades superior, strong, limited, very weak/none, and not applicable (see Box 6.1 to see how the grade superior is used). They have been used, among other things, to help Washington State evaluate the OER available for secondary schooling.¹⁰

However, such systems will only work with an active community of producers and users annotating and describing the OER. Experts interviewed for a study on usage and quality (Atenas and Havemann, 2014) argue that “OER repositories should require the barest minimum of metadata [because] every additional field makes it less likely OER will be deposited and released”. Another expert stated that “metadata was the death of learning objects” (ibid: 38). The case of OpenTapestry presented above showed that users seldom use the metadata fields provided.

Box 6.1. Rubric II: Scoring guide for grade “superior”

“An object is rated superior for explanation of subject matter only if all of the following are true:

- The object provides comprehensive information so effectively that the target audience should be able to understand the subject matter.
- The object connects important associated concepts within the subject matter. For example, a lesson on multi-digit addition makes connections with place value, rather than simply showing how to add multi-digit numbers. Or a lesson designed to analyse how an author develops ideas across extended text makes connections among the various developmental steps and purposes the author has.
- The object does not need to be augmented with additional explanation or materials.
- The main ideas of the subject matter addressed in the object are clearly identified for the learner.”

Source: extract from Achieve (2011), *Rubrics for Evaluating Open Education Resource (OER) Objects*, Achieve, <http://www.achieve.org/files/AchieveOERRubrics.pdf>.

Quality assurance mechanisms

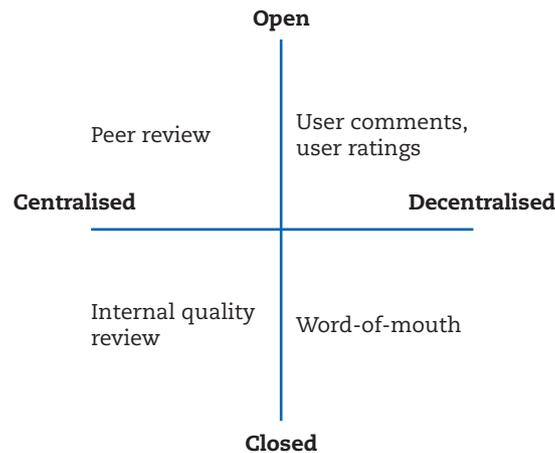
In a recent study from the United Kingdom, a high share of academics expressed concern over quality as a barrier to using OER (Atenas, Havemann and Priego, 2014: 37). A further survey by the European Open Educational Quality Initiative (OPAL) also found that mistrust of the quality of other users’ OER was a major barrier to use (Andrade et al., 2011). Although there has been a lot of research on quality procedures for OER, it clearly remains a challenge.

In order to typify quality assurance mechanisms for OER, Hylén (2006) developed a four-field matrix that differentiates between two sets of poles: decentralised versus centralised and open versus closed procedures (see Figure 6.1).

A survey of teachers familiar with OER found that they usually searched for resources based on word-of-mouth from colleagues and the use of organisations (and repositories) with a good reputation, although many also simply found them through browsing the Internet (Clements and Pawlowski, 2012). The respondents favoured qualitative evaluation from other users over rating schemes, which identifies the need for building communities of trust to encourage the sharing of

OER. This leads many analysts to conclude that whilst the most potential for OER quality assurance systems may be in open decentralised procedures (top right-hand corner of Fig. 6.1), trust between members of a community of users is still a major factor and must be built up.

Figure 6.1. **Dimensions of quality assurance regarding OER**



Source: Hylén, J. (2006), *Open Educational Resources: Opportunities and Challenges*, <http://www.oecd.org/edu/ceeri/37351085.pdf>.

A survey of higher education staff in British Columbia came to similar conclusions through qualitative interviews. One respondent expressed the usefulness of such quality filtering as follows: “[...] I guess if people in the field, people that I trust, other institutions that I trust have looked at something. So this is where I guess it might [...] be useful to have best practices, groups perhaps that would get together and look at what is out there and what is good and what is absolute rubbish ‘cause there’s a lot of stuff out there that you really don’t want to touch, but it takes time to sift through it. ‘This is good. This is not good’.” (Porter, 2013: 102).

This is the approach used in the OpenLearn case above, and also, for example, by the Merlot repository.¹¹ A further example of large-scale practice and the challenges of such open systems for quality control and updates is Wikipedia, where information resources are published even before they have been through an official quality assurance procedure (arguably similar to the Open University’s “beta content” approach).

A 2009 study in the United States showed that while college students use Wikipedia as a source, they only rate its credibility as moderate (Lim, 2009). One of the ways in which articles are marked for necessary improvement and updates is through “clean-up tags” that highlight areas of a text requiring attention – the first one having been used in 2004 (Anderka, Stein and Busse, 2012). A longitudinal analysis of the English language Wikipedia shows that 70% of the tags have been fixed and that, on average, the improvement process took five months with one-third of fixes occurring within the first week. Articles of a particularly high quality are classed as “good articles” (GA) or “featured articles” (FA), according to specific Wikipedia criteria that are judged by editors. Currently about 0.1% of all Wikipedia articles have this status. Work is progressing on using algorithms to provide automatic indicative classifications to assist this process (Warncke-Wang, Cosley and Riedl, 2013).

Similar work has been proposed for the Merlot collection of OER by Rodriguez et al. who suggest using the standard statistics available in the repository to calculate a “relevance indicator” (Rodríguez, Dodero and Alonso, 2011). A variation of this was also used in the Dutch Wikiwijs repository, which developed a quality certification system that allows (trusted) third parties to recommend specific

objects to their audiences (Wikiwijs program plan 2011-2013, 2011: 6). As with metadata usage, all of these more open forms of quality assurance require an active commitment of users, and repositories that have the functionality to collect and use usage data.

The OTTER project at the University of Leicester used fixed quality criteria for OER from the outset to ensure that feedback loops were programmed into OER provision to enable improvements and updates (Comrie, 2010). This approach is taken in an even more comprehensive and systematic manner in the context of the new Z-Degrees of Tidewater Community College in Virginia state in the United States. Since 2013, the college has a policy for the use of OER and particularly for the designation of certain courses as “Z-Degrees” (Tidewater Community College, 2015). This policy states that OER-based courses cannot be developed or taught by academic staff, who have not undergone a training course at the college, learning outcomes must be specified and successful delivery reviewed regularly using learning analytics. Any changes to an accredited course of up to 10% of the content leads to the requirement for a renewed quality assurance review.

Recognition

Formal recognition of learning with OER between institutions would be useful for OER (see Chapters 7 and 8), but remains problematic. This is because formal assessment frequently relies on a fixed assessment of grades of performance against set content and an agreement of grades and criteria between learning providers. This is particularly challenging in the context of more open quality assurance mechanisms for OER. The OERTest project and VMPass have been trying to balance some closed elements of assessment with open elements of learning content, but argue that more dialogue and collaboration between learning providers will be necessary to make this successful.

On a more local scale, a pilot initiative based on the Saylor.org repository of OER-based courses in the United States has already achieved some formal recognition for independent learners in collaborating colleges through course alignment on the content-side and independent assessment (Hilton et al., 2014).

In the context of competency- and outcome-based learning, which argues for the separation of content and the assessment of what competencies rather than content have been learnt (or even can be demonstrated), the problem of recognition is likely to be reduced.

Notes

1. www.opentapestry.com
2. The Erasmus Programme is a European Union student exchange programme established in 1987. Students who join the Erasmus Programme study at least 3 months or do an internship for a period of at least 2 months to an academic year in another European country. Formally, the Erasmus Programme guarantees that the period spent abroad is recognised by their higher education institution when they come back, but this recognition remains an issue unless the programmes at the domestic higher education institution and abroad are well aligned (Ferencz, Hauschildt and Garam, 2013).
3. <http://vmpass.eu/the-project/overview-of-the-project/>
4. www.corestandards.org/standards-in-your-state/
5. <http://k12oercollaborative.org/>
6. <http://lelivrescolaire.fr/>
7. <http://www.lrmi.net/about>

8. For states and timeline for implementation visit: www.corestandards.org/standards-in-your-state/
9. www.khanacademy.org/coach-res/reference-for-coaches/other-reference-materials/a/common-core-map
10. <https://digitalllearning.k12.wa.us/oer/review/2014/report/rubrics.php#a0>
11. www.merlot.org/merlot/index.htm

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Chapter 7

Widening the distribution of high-quality educational resources

This chapter investigates how open educational resources (OER) can facilitate a wider distribution of higher quality education resources. While this topic may not be at the top of governments' agendas, the practical cases highlight how OER can give access to virtual laboratories, but also contribute to breaking down disparities in educational resources between countries, between educational institutions in the same country, and between formal, non-formal and informal learning settings. Studies and concrete cases show that the adaptation and augmentation of educational resources made possible by OER are necessary to ensure successful integration into new educational settings.

Main policy messages

OER is easy to distribute. Adequate educational resources have an impact on the overall performance of the education system, but the distribution of resources may be unequal at the institutional and national levels, as well as between formal, informal and non-formal learning settings. The advantage of OER is the ease of their distribution – both because of online distribution and open licensing. Their open properties facilitate sharing and adaptation to specific learning contexts. In this way the distribution and use of high-quality educational materials can be significantly widened.

OER is often adapted across geo-cultural boundaries. Access to laboratory simulations in other institutions can be further augmented if teachers add their own supporting materials for their classrooms or seminars. When educational materials are adopted across geo-cultural boundaries, there is evidence that extensive adaptation to the local setting is necessary – and that it occurs.

OER make boundaries more permeable. The extended lifecycle, ease of access and distribution, and adaptability of OER make the boundaries between formal education settings and non-formal, informal, and adult and lifelong learning more permeable (as shown by the United Kingdom’s Bridge to Success programme).

Policy challenge

The unequal distribution of educational resources relates to considerations of effectiveness, efficiency and equity. Results from the Programme for International Student Assessment (PISA) survey of pupils’ scholastic performance on mathematics, science and reading highlight that the educational resources available in a school tend to be related to the pupils’ overall performance. One-third of the variation in mathematics performance in PISA across OECD countries can be explained by differences in principals’ responses to questions about the adequacy of instructional materials (e.g. textbooks, science laboratory equipment), even after accounting for differences in economic wealth of the respective countries (OECD, 2013: 43). In high-performing PISA countries, it was found that high-quality learning resources were distributed more equitably between schools.

The unequal distribution of resources is a multifaceted phenomenon. First, it is relevant at the institutional level as different educational institutions in the same national education setting often have different resources available, based on variations in funding, institutional profiles and the competencies and interests of the teachers working there. Second, it is relevant at the national level as the amount of investment in education differs between countries. Third, a majority of educational resources are developed in the context of formal learning settings, which raises the question of whether they could also be used in informal and non-formal learning environments to increase permeability between the sectors.

Potential solution

OER can address the unequal distribution of resources by facilitating the sharing of quality learning materials through networks and repositories. In addressing this policy challenge, OER can work against “silos of knowledge” (Plotkin, 2010: 5), regardless of whether these stem from differences between educational institutions, countries, or formal, informal and non-formal learning settings. In each case, the sharing of resources made possible by OER is most valuable when the resources are released as full OER that allow not only reuse but also remixing and repurposing.

Potential put into practice

- *Using virtual laboratories to compensate for a lack of physical infrastructure:* The PhET interactive simulation environment developed at the University of Colorado aims to provide students

with equipment that is usually unavailable so that they can perform science experiments and simulations. The simulation environment consists of interactive, research-based simulations of physical phenomena for elementary through to university students. The simulations have open licenses (CC-BY) and are presented as individual exploratory environments rather than courses, so that each computer simulation can be easily integrated into various classroom activities. The National Science Foundation in the United States reported that “PhET simulations have been used over 60 million times and are available in 65 languages with 22 full website translations” (Ferrante, 2012). The geographical and institutional reach of this initiative is a remarkable example of how place constraints can be overcome using digital technology and open licensing regimes.

- *Using OER to share high-quality courses and materials among institutions:* The Indian Institutes of Technology (IITs), in partnership with the government of India and in the framework of the National Project for Technology Enhanced Learning (NPTEL), have made all of their engineering and technology courses available as OER in an effort to consolidate the IITs’ high-quality learning materials. These open resources are currently being used by students and faculty in over 500 institutions to enhance the quality of their learning and teaching (Krishnan, 2013). NPTEL was conceived to fill the gap in teaching and learning quality between first, second and third tier institutions of higher education in India, and now allows previously excluded engineering students to benefit from quality educational resources. Students with limited Internet availability may take NPTEL classes at an equipped NPTEL centre. The NPTEL’s ongoing efforts to break the lectures up into smaller units will further facilitate content reuse and remixing.
- *Adapting educational materials from developed countries to a new context:* The University of Malawi developed two OER pilot projects in the framework of its teaching activities in the fields of nursing and agriculture. The development of these two OER responded to the need to cope with an increasing demand for higher education while having limited access to both physical and human resources for its delivery. It addressed these challenges by adapting high-quality educational resources from the United States. For the midwifery course, the project team decided to source OER directly from institutions rather than generally available online repositories (Ngalande, 2010), and benefitted from Michigan State University materials. The content underwent several phases of adaptation, including reworking to fit the Malawian context and a new approach to problem-based learning to better suit the specific pedagogical context. Similarly, the pilot textbook for communication skills at the College of Agriculture is based on collected material from web repositories and has been adapted to the context by including relevant examples. Adapting the materials to the Malawian context spurred a subsequent adaptation of the communication skills textbooks at the University of Jos in Nigeria, where the examples in the textbooks were replaced with those relevant to Nigeria, and a part of the pedagogical model was redefined (Dooga, 2011).
- *Expanding the array of available materials and integrating them into instructional practices:* TESSA OER¹ is the fundamental element of a broader project developed by the Open University in the United Kingdom in collaboration with 13 African partner institutions. The project addresses the lack of adequate structures and programmes to train teachers in Sub-Saharan Africa. It consists of a collection of 75 modular and adaptable OER units for primary school teacher training that have been translated into four languages: Arabic, English, French and Kiswahili. The OER are freely available to all teachers in the region (TESSA, 2012). Although the extent of use varies between the involved institutions, TESSA OER are mainly used as a supplementary resource for teacher education within already existing programmes. A more structured approach involved staff collaboration for the purpose of integrating the materials into existing curricula, while paying attention to the specificities of

the already existing print resources. Another more modular approach consisted of adopting small parts of TESSA OER in a flexible teaching situation with just-in-time adaptation to the immediate context (Harley and Barasa, 2012). According to one institution involved, “TESSA has contributed to producing quality teachers [...] who are able to select or assemble and use appropriate learning resources, including technology, to address the learning needs of all students” (TESSA, 2012). The reach of TESSA OER is expanding beyond the boundaries of the original partner institutions and countries, for example, to the Mauritius Institute of Education (OER Africa, 2014).

- *Using OER to educate parents and teachers:* The Davalgaa national project in Mongolia² developed and collected OER through a platform to inform both parents and teachers about state of the art knowledge in early years child development (Norjkhlorloo and Porter, 2013). The corresponding OER textbook, *Deciding Age*, is a framework for both teachers and parents to gain a common understanding of good practice for child development. The project aims to use OER to bridge the gap between formal kindergarten and primary school instruction received by Mongolian children, and further illustrates what children can learn through homework when guided by their parents. The OER included in the Davalgaa platform have also been used to contribute to a more structured national preschool curriculum through the integration of existing high-quality resources from countries around the world. These materials were subsequently combined with the newly developed OER for best fit. The newly available resources allow teachers to agree on a set of common practices for instruction and further provide them with opportunities to develop their competencies and soft skills (ibid.).
- *Using OER to prepare adults for (re-)entering educational settings:* In the context of the Bridge to Success (B2S) initiative,³ online courses in mathematics and study skills, which had originally been developed at the Open University in the United Kingdom, were remixed for an audience in the United States and made available as OER. The initiative was developed collaboratively by the Open University, the University of Maryland and the Massachusetts Institute of Technology, and was designed to: 1) encourage and assist underachieving students, out-of-school adults as well as the long-term unemployed to enrol in or return to a structured learning environment; 2) enable them to pursue advanced qualifications; and 3) provide them with further training opportunities to pave the way to success in their chosen careers (Falconer et al., 2013; Coughlan et al., 2013). The OER were created in the form of open online courses and include one course on teaching strategies to enable effective learning, and two on successful learning strategies targeted directly at students. The OER were subsequently used in a variety of ways (e.g. as supplementary materials, in drop-in labs, during face-to-face sessions) in over 16 US-based institutions including high schools, colleges and universities, as well as in projects to help the long-term unemployed (Coughlan et al., 2013).

Understanding the potential for impact

There is evidence that OER are being used to even out the differences in the quality of educational materials between countries, institutions and learning settings. In the cases presented above, new distribution routes led to new questions such as how to make it easier to find OER and how to test and prove their quality. These issues are central to unravelling the potential of OER for equalising the quality of learning materials (see Chapter 6).

Breaking down barriers between institutions

The cases of PhET’s virtual simulations and the NPTEL highlight how OER can help reduce differences between institutions in terms of physical infrastructure and learning materials. Virtual laboratories and simulations allow students to benefit from the lab experience without the need

for direct access to a physical infrastructure, typically available only in a few institutions. Although online laboratories do not have to be offered in an open format for them to have this benefit, their provision in the form of OER can lead to a wider participation and higher levels of student and teacher engagement. In the specific case of laboratories, there is the potential for teachers to add new supporting materials to available experiments. As a practice example of OER integration, the PhET experience illustrates the feasibility of facilitating co-operation and the exchange of high-quality materials between institutions.

Breaking down barriers between countries

One key argument in favour of OER is that existing high-quality educational resources in one country or region can be passed on to another country or region. This avoids high development costs for the latter and allows for the original resources to be adapted to the new context (language, culture, etc.) on the basis of the flexibility afforded by the openness of the resources (Johnstone, 2005). At the same time, the adoption (and adaptation) of OER from one context by another leads to certain challenges (especially in the context of developing countries), which may not have been evident while the OER was used in its original context. Willems and Bossu (2012) emphasise the importance of the contextualisation and localisation of the content for effective reuse. They argue that repurposing content in, for instance, developing countries requires an additional localisation effort that aims to reflect the specific geographical and cultural context without incurring the risk of providing less relevant education and training to the communities.

However, a survey of African educators found that there were additional inhibiting factors for developing countries (Unwin et al., 2010): the limited autonomy of teachers in choosing educational resources; teachers' unfamiliarity with concepts of student-centred learning (which were often the basis of the original OER); language barriers as most OER are in English, which can lead to misinterpretations and incorrect translations; a lack of technical resources; and uncertainties regarding the quality of the OER. In the case of the University of Malawi, one of the adaptations made was to use existing OER to create a paper textbook as the available digital resources required a stable Internet bandwidth, which was unavailable at both the university and the students' homes. Addressing inhibiting factors, the evaluation report of one of the pilots states:

“The creation of the multimedia components was hampered by a lack of the right equipment (e.g. digital camera, digital video camera, software, etc.). Also power interruptions and intermittent Internet connectivity did not help. In the future, we need to incorporate the capital items in the project budget. Besides the hardware and software, there needs to be additional focus on providing human capacity for creating the multimedia objects.” (OER Africa, 2009).

On the supply side, the KA Lite project, run by the Foundation for Learning Equality from California in the United States, has the goal of “bringing the power of online learning to the offline world.”⁴ The Foundation provides solutions for distributing and hosting OER – like the Kahn Academy materials – via low-bandwidth and offline channels.

Research emphasises the challenge of selecting from the plethora of existing educational materials (Levey, 2012). A special analysis recently showed that most searches for OER occur in the English language, which may well be a restrictive factor in itself (Cobo, 2013; Zourou, 2014). The issue of finding and selecting suitable OER was tackled in the field of agriculture in Africa through a special English language handbook created to ease the search and selection of materials (Levey, 2011). However, finding resources does not secure adoption. A recent study of acceptance and use of OER in Tanzania showed that one of the determining factors for use was “effort expectancy”: the acceptance to adopt and use OER depends on whether instructors believe using OER will be easy and free of effort (Mtebe and Raisamo, 2014). The OER Africa initiative, established by the South African

Institute for Distance Education (Saide), has played a major role in working on this issue to facilitate the use of OER in Africa by building supporting networks and by supporting proof-of-concept initiatives (OER Africa, 2013).

Breaking down barriers between formal, non-formal and informal learning

While there is no final definition for formal, non-formal and informal learning (OECD, 2010), the latter two can generally be understood as any learning experience outside of the formal structures of a learning institution (Rogers, 2004). If formal learning must be considered as a sub-set of a greater learning environment that includes non-formal and informal elements, then the boundaries become more blurred, highlighting the potential for a greater permeability and exchange of learning materials between formal, non-formal and informal educational settings.

The open licensing of OER allows for content to be revised and remixed to suit an endless variety of educational settings and learning environments. The provision of high-quality OER could contribute to a smoother bridging between informal learning and formal education, thereby using the opportunities for broader learning experiences outside the system and a “second chance” for access into the formal system.

The cases presented in this chapter illustrate how OER are used in a variety of learning settings to break down the boundaries between formal, non-formal and informal education while – in some instances – simultaneously serving the needs of adult and lifelong learners. In the case of the Davalgaa project on child development in Mongolia, the use and creation of OER facilitated the inclusion of parents into their children’s formal early childhood education, while also extending expert knowledge and recognition of good practice in the children’s informal learning environments. Similarly, the “Bridge to Success” initiative highlights how OER can be used to prepare people who find themselves outside of a formal learning setting to successfully and confidently transition to a college environment, pursue advanced qualifications and be successful in their chosen careers (Coughlan et al., 2013).

Notes

1. www.tessafrica.net/.
2. <http://davalgaa.mn/>.
3. <http://b2s.aacc.edu/>.
4. <https://learningequality.org/ka-lite/>.

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Chapter 8

Reducing barriers to learning opportunities

This chapter considers the new learning opportunities made possible through open educational resources (OER). Technology-enhanced learning allows mode, place, time and pace of learning opportunities to be varied, and OER enables the simple adaptability of educational resources, as shown by the cases presented in this chapter. The discussion section highlights how for OER, as with other educational resources, the interaction between people, information and instruments must be considered to achieve successful outcomes. For this reason, the concept of “inclusive” or “universal” design that aims to match learners’ abilities with their opportunity for learning is presented.

Main policy messages

OER can help achieve “non-discriminatory access” to education. Participation in education is one of the most effective means of overcoming socio-economic barriers. However, access to education may be limited by a number of factors – poverty, rural settings and a lack of flexible delivery options.

Support structures are necessary. Freeing instruction from the constraints of time, place and pace has the potential to provide new learning opportunities for many. Breaking down barriers to accessing education must be thought of as a process of widening participation in education rather than simply widening the audience. After overcoming the constraint of time, appropriate support structures must be set up to foster dynamic interaction and to ensure the social experience of learning is embedded in the design of an asynchronous learning environment. This is important as evidence shows that interaction-poor learning environments lead to poor learning results.

The adaptability of OER can overcome boundaries. To overcome the constraint of place, additional layers of support are necessary, i.e. pedagogical, personal, peer-to-peer and professional support, to enable the inclusion of potential learners from deprived areas and/or excluded communities. The adaptability of resources and their delivery can help overcome the more subtle barriers of appropriateness and pacing (as shown in the case of the Leadership Public Schools). Finally, the application of universal design principles will make OER not only more accessible for those with disabilities, but will improve their accessibility in general, particularly if all subsequent iterations of an OER respect these principles.

Policy challenge

The high returns of education for a variety of social life outcomes (i.e. employment, earnings and health) are well known. Participating in education programmes is therefore seen as one of the most effective ways of overcoming socio-economic barriers, especially for people from disadvantaged backgrounds. The issue of access to formal education is both quantitative and qualitative question: it is about increasing the number of people who have the opportunity to learn in formally recognised settings, and increasing the specific opportunities for people whose circumstances tend to lead to low levels of participation in education. The factors contributing to low levels of participation in education are similar in developed and developing countries. Household surveys collected in 63 developing countries revealed that poverty and rural residence are the main factors behind children remaining outside of the education system (United Nations, 2013). In developed countries, poverty is often cushioned by social welfare systems, however, opportunities for learning are often limited due to the constraints of place, time and pacing of knowledge acquisition (Müller and Repo, 2013).

Potential solution

OER can help to achieve “non-discriminatory access” to education. This has social, cultural, economic, technical and individual dimensions, as explored in the “capability approach” developed by Sen and Nussbaum (Tuomi, 2013)¹ that focuses on what people are able to do and sees poverty as capability-deprivation. OER offered in a digital format enables a three-dimensional flexibility for learners and reaches out to anyone and everyone interested in learning by removing the constraints of time, place and pacing associated with traditional forms of formal education (Lane, 2008; Gordon, 2014). As further noted by Lane, socially excluded groups and communities would benefit most from the availability of more flexible opportunities to access learning resources. According to de Langen and Bitter-Rijkema, the removal of economic and ownership barriers through OER allows learners to access the learning resources they need to nurture their individual personal and professional competencies (de Langen and Bitter-Rijkema, 2012).

Potential put into practice

- Using OER in an asynchronous learning environment to remove constraints of time:* The European Open ED project, which focused on designing open educational environments for participatory learning, provides an insight into asynchronous OER-based learning environments in the context of developing countries (Meiszner, 2011). The project offered an open online preparatory course on “Business and Management Competencies in a Web 2.0 World” via the United Nations University Network. The course had high participation rates from students across Africa with high attendance throughout the entire course period. Offered entirely on line, Open ED redefined the boundaries and interactions of traditional business management courses at universities. It was provided as a fully flexible learning environment where the learner could select which module to take and tailor it to his or her specific needs. In some cases, interaction with other learners led to learning a topic or acquiring a skill that was not initially planned for by the course designers. A student from the United Kingdom, for instance, took the course to acquire project management skills and reported having learnt an equal amount about intercultural differences and soft skills (Meiszner, 2011).
- Mediating the use of OER to remove constraints of place:* The OpenLearn platform from the Open University in the United Kingdom illustrates how to effectively address barriers to learning opportunities by integrating different types of support into one complete learning environment (Lane, 2008). The platform provides OER content together pedagogical support to learners through exercises for each learning unit, while personal support is facilitated through the encouragement of self-reflection, in-text guidance and tracking of learning activities. Peer-to-peer support is enabled by a variety of online communication tools, such as presence-aware instant messaging, video conferencing, blogging and forums. Finally, direct professional support is offered on which resources to use and how. One example of how these support tools can determine the effectiveness of OER is illustrated in the case of Leasowe, a town on the North coast of the Wirral in the United Kingdom that is isolated from amenities and services and has large areas of deprivation. The Leasowe Development Trust provides a range of services, including Open University courses, to residents of the area. It uses the OpenLearn platform to help introduce people of all ages, and who mostly have few or no formal educational qualifications, to the idea of academic study and the practice of online studying. Practitioners in Leasowe who have used OpenLearn report a growth in confidence among students, as well as an improved ability to apply critical thinking according to the instructions given (Lane, 2008).
- Redesigning OER to remove constraints of pace:* Leadership Public Schools² is a network of four charter high schools that predominantly serve low-income students in the San Francisco Bay area. The network’s objective is to ensure that their graduates are well prepared to enter and complete college. A majority of students within the network enter high school with an academic achievement level that is below average, meaning that the network needs to help students catch up on two years of missed academic content for every year spent at the charter school. To tackle this, teachers and other academic staff, as well as those responsible for steering the network, continuously analyse student needs and adapt the curriculum accordingly. For example, when they realised that the vocabulary used for existing textbooks was too advanced for their students (partly due to students being English learners), they looked for alternative materials. Louise Bay Waters, the superintendent of Leadership Public Schools, suggested using the high-quality textbooks provided by the CK-12 Foundation in the United States free of cost and under an open license.³ On this basis, the network was able to create unique materials for the specific context and needs of their students. The product is a series of tailor-made college access readers that are equipped with embedded

vocabulary support to help students develop reading comprehension while learning grade-level content (Schmidt, 2014). In 2012, the pass rate of Leadership Public Schools students was 89% in Mathematics and 87% in English Language and Arts, compared to state wide benchmarks in the California High School Exit Exam of 84% and 83%, respectively. OER in this context have been instrumental in breaking down the barriers to accessing education for disadvantaged learners, particularly in regards to language and the constraint of pacing.

Understanding the potential for impact

Flexibility of learning opportunities

Freeing instruction from the constraints of time, place and pace does not automatically lead to meaningful learning opportunities for residents of deprived areas or for those with low-income levels. As stated by Lane: “Having an open door does not mean that new learners will pass through it, or that they stay inside the system for long” (Lane, 2011). For this reason, inclusion is not so much about “widening the audience” as it is about “widening participation” in education (Lane and van Dorp, 2011). As an analysis of Australian OER policy and practice shows, this difference is not always considered and with this the benefits of OER for social inclusion neglected (Bossu, Bull and Brown, 2012).

In an asynchronous learning environment, interaction between people, information and instruments is essential for ensuring successful outcomes (Atkins, Brown and Hammond, 2007). An interaction-poor learning environment has been shown to lead to poor results (Corbett, 2001). Barnard-Brak, Lan and Paton (2011) studied the behaviour of a cohort of first-generation online learners and found that self-regulation skills, which are particularly important for online courses, do not simply emerge from studying on line, but are a precondition for well-directed learning. Similarly, Wegerif (1998) underlines the importance of the social experience of learning in computer-based and online settings, where learners have to interact within a community of practice in order to be successful (Lave and Wenger, 1991).

Learners from under-represented or disadvantaged groups are more likely to have difficulties in using self-regulating skills, which implies that asynchronous learning settings are sub-optimal for tackling their specific needs. However, good design and a holistic consideration of the learning environment can overcome such limitations, as shown in the case studies above. The interactional equivalency theorem from Anderson says that “deep and meaningful learning” is supported as long as one of three forms of interaction is at a high level: student-teacher, student-student or student-content (Anderson, 2003).⁴

Following analysis of the cases presented above, it appears crucial to understand how asynchronous learning environments can be designed and developed together with appropriate support systems. In the Open ED case, high participation rates from African students were characterised by a lack of active participation, meaning that learners were not engaged in discussion forums or other forms of collaboration. Successive stakeholder consultations suggested that “one of the reasons for such high drop-out or passive participation rates might be explained by a lack of skills required for participating in this type of online course; for example being skilled in using ICT or having sufficient self-study capabilities” (Meiszner, 2011: 17). Discussions with African educators supported this conclusion, suggesting that a balance of on- and offline support and supervision was necessary (ibid).

Asynchronous learning with OER, therefore, may be highly ineffective if these additional barriers are not tackled with appropriate systems of pedagogical, personal, peer and professional support (Mulder, 2012, 2015). Without these forms of support, OER will likely fall short of alleviating barriers to education for under-represented groups.

Unlimited access to learning resources

The open textbook initiative from Flatworld Knowledge⁵ and the Virginia State University conducted a comparative study of two groups of learners – one provided with standard proprietary learning materials and one with open textbooks. Results showed that the group with open textbooks obtained slightly better results,⁶ which led to the conclusion that allowing students to store and have unlimited access to materials on any device of their choice changed the value proposition: the value of the resources to the students was now the unlimited access to the relevant information, which was no longer encapsulated in one textbook (Feldstein et al., 2014).

The findings from this study led one of its authors, and leading thinkers within the international OER community, David Wiley, to add a fifth ‘R’ to his 4-Rs concept (reuse, revise, remix, redistribute): the right to ‘retain’ learning resources (a right that is not given in the context of regular Massive Open Online Courses)⁷ (Wiley, 2014). The ability to retain learning resources will become increasingly important as many commercial content providers are moving to subscription or leasing models, which block access to learning content after a set period. Because OER are either in the public domain or have a Creative Commons licence, learners and teachers can keep OER indefinitely.

Accessibility for “disabled” learners

Barriers relevant to disabled persons should be considered in the context of OER: removing time and place constraints is not enough if, for instance, a blind person cannot access the content of the resource itself (Gruszczynska, 2011; National Instructional Materials Accessibility Standard, 2010).

A recent analysis using the accessibility standards developed by WC3 (the Web Content Accessibility Guidelines 2.0 criteria – WCAG)⁸ looked at the accessibility of Spanish language OER for persons with disabilities. The authors considered the accessibility of a number of repositories offering Spanish language content (Navarrete and Luján-Mora, 2014),⁹ and highlighted OER Commons as a positive example, even though some accessibility issues remain. As a web repository of open instructional materials, OER Commons was developed to help curriculum experts and educators discover OER and collaborate around the use, evaluation and improvement of the resources. In comparison with other OER platforms that offer content for Latin America and the Caribbean according to the WCAG, OER Commons appears to best serve the needs of visually and auditory impaired learners in and from these regions, which are also affected by high levels of poverty and social exclusion. According to the evaluation report by Navarrete and Luján-Mora, OER Commons has a clear search facility that allows learners to navigate across educational levels and use Boolean operators such as “and”, “or” and “not” to filter their search (Navarrete and Luján-Mora, 2014). In addition, the website provides accessibility information about the resources. OER Commons fulfils the accessibility criteria for students with visual and auditory disabilities for its web pages, but the offered videos, animations and PDF files do not meet the requirements for visual accessibility (ibid.).

Improving accessibility is a key concept for all instructional design and indeed there are some approaches, which argue that accessibility improvements benefit all users and not just those who are targeted as “disabled” and having accessibility problems. The concept of universal design reflects this and can be applied to learning environments (Hehir, 2009; McAndrew and Gruszczynska, 2013; Rose and Gravel, 2010). The Universal Design for Learning Framework from National Center on Universal Design for Learning in the United States sees the primary barrier to fostering good learning in the one-size-fits-all approach.¹⁰ This inflexibility can lead to unintentional barriers to effective learning: “Learners who are ‘in the margins’ such as learners who are gifted and talented or have disabilities, are particularly vulnerable. However, even learners who are identified as ‘average’ may not have their learning needs met due to poor curriculum design.” (National Center on Universal Design for Learning website, n.d.).

This concept is being applied to OER by the Flexible Learning for Open Education (FLOE) project, hosted by the Inclusive Design Research Centre (IDRC) in Canada. The designers call it “inclusive design”, but it has the same goal as universal design, and describes disability accordingly: “The IDRC reframes disability within the design context. Rather than a personal characteristic or a binary state (disabled vs. non-disabled), disability is framed as: a mismatch between the needs of the individual and the design of the product, system or service. With this framing, disability can be experienced by anyone excluded by the design.”¹¹

Notes

1. The “capability approach” is an economic theory conceived in the 1980s as an approach to welfare economics. The approach’s core focus is on what individuals are able to do. Poverty in this context is understood as capability-deprivation. The capability approach is predominant as a paradigm for policy debate in human development where it inspired, for example, the creation of the UN’s Human Development Index.
2. www.leadps.org/.
3. <http://www.ck12.org/>.
4. Miyazoe and Anderson extend this position to further cover teaching (teacher-student, teacher-content, teacher-teacher) and teaching and learning (content-student, content-teacher, content-content) (Miyazoe and Anderson, 2010): “Teacher-teacher and content-content interaction may sound counter-intuitive at first look; however, the recent emphasis on faculty and professional development in education is a familiar example for teacher-teacher interaction to improve teaching, and consequently, the students’ learning. Also, the recent intelligent programs that compile information on specific individual learning styles such as unit study progress and scores, and that propose a customized study plan may be a familiar example of preinstalled content-content interaction before student-content interaction.”
5. Flatworld Knowledge is no longer an OER as it changed business model in January 2013 to a copyright regime. However, the resources mentioned here should be still available under an open licence at saylor.org/books as the Creative Commons licence is irrevocable.
6. A more rigorous study using Lumen books led to similar findings (Robinson et al. 2014).
7. Wiley particularly criticises loan-schemes for school textbooks for the same reasons, as the learner is expected to return the book (i.e. the source of information) at the end of a learning period (e.g. an academic year).
8. Web Content Accessibility Guidelines define how to make Internet content more accessible to people with disabilities. The Guidelines aim to cover accessibility issues for a wide range of disabilities, including people with visual, auditory, physical, speech, cognitive, language, learning, and neurological disabilities. www.w3.org/standards/webdesign/accessibility.
9. OER Commons, OpenCourseWare Consortium and OCW Universia.
10. www.udlcenter.org/aboutudl.
11. <http://idrc.ocad.ca/index.php/resources/idrc-online/library-of-papers/443-whatisinclusivedesign>.

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Chapter 9

Research on open educational resources (OER) and the challenge of the extended lifecycle

This chapter investigates research challenges specific to OER. Reviews of existing research have concluded that there have been insufficient analyses of the use, sharing and adaptation of OER. This chapter will cover three sources of information about OER usage, sharing and adaptation patterns: 1) automatic tracking of usage in OER repositories; 2) user surveys and 3) qualitative studies. The potential of each of these information sources is examined and the real benefits in practice are presented. The main purpose is to examine the research potential of each of these information sources and how they can be combined to provide more insight into the practices of OER use, sharing and adaptation.

Main policy messages

More research on OER is required. Adaptability and the extended lifecycle are the two main benefits of OER, but they also make their impact difficult to study. To understand how OER can succeed, more research and evaluation of successful initiatives are necessary to find the best ways to achieve widespread adaptation and reuse of existing OER.

Challenges to tracking OER usage exist. Whilst OER repository managers recognise the benefits of tracking OER usage, they are confronted with two main challenges: 1) many users of OER are not registered members of a platform, which means that their activities cannot be tracked extensively; and 2) some or all of the extended lifecycle of an OER happens outside of the repository in which the resource was originally found.

User surveys can capture information on users. User surveys have the potential to capture information on user practices but are confronted with the almost insurmountable challenge of recruiting a representative sample of users. Nevertheless, user surveys do provide indications that OER have an extended lifecycle and sharing and adaptation do occur frequently.

Communities of practice foster sharing. Qualitative research based on activity theory provides a broader insight into what inhibits or fosters the sharing and adaptation of OER. Research finds that the communities of practice necessary for the development and sharing of OER are often at least partly closed to outsiders. This suggests that OER sharing – until it reaches common practice – is reliant on closed or semi-closed communities of practice, which inhibit some of the user diffusion that might be expected. The challenge is to inject permeability into these community structures in order to promote a more dynamic and extensive practice of sharing.

The research challenge

As already noted, the key traits of OER are that they are open to access and open to adaptation; the latter being unique to open practices (as in open source programming).¹ If OER are to make the transition from having innovation potential to being well integrated into common educational practice, many more and many different users need to take up this form of open practice (Weller, 2014). The more that different types of users are integrated into the practice of using OER, the richer that OER will become over their lifecycle of production, sharing and adaptation. This process has been termed “generative diffusion” of innovation, i.e. the same innovation has impact across the board, but instead of being replicated, it is adapted to new contexts (Murray, Caulier-Grice and Mulgan, 2010: 82).

This report argues that OER should be considered a social innovation which can only be successful if it leads to new social practices (Howaldt and Schwarz, 2010). There is criticism that many social innovations focus too much on production and not enough on use, as outlined in a report by Murray et al.: “The promotion of social innovation has tended to focus on the supply side and how innovations can be diffused among service providers through experts, intermediaries, and collaboration. However, we argue that the design of services should start from the user, and that its diffusion should be approached from the perspective of users, not least because they are in many cases also co-producers” (Murray, Caulier-Grice and Mulgan, 2010: 85).

Over the past few years, the United Kingdom’s Open University’s OER Research Hub² has established itself as a facilitator and supporter of research initiatives across the world. In a recent report it concluded that not enough research on OER is being carried out, and that it is often based on small-scale initiatives of persons involved in OER project themselves (de los Arcos et al., 2014). Exceptions to this trend are becoming more frequent as shown by Hilton’s Review Project on OER

research.³ At the same time, Hilton also notes that most of this serious research focuses on OER as a replacement technology and not on answering the question of what new practices OER lead to:

“In each of the studies reported above [i.e. on the website], OER were used in a manner very similar to the traditional textbooks they replaced. We look forward to reviewing empirical articles describing the learning impacts of open pedagogies.”

With a focus on research that accompanies OER initiatives, a recent Europe-wide review of OER in adult education concluded (Falconer et al., 2013: 32):

“Many initiatives collect download statistics and use Google Analytics, but have very little information on the ways in which users are using OER, or of why users do not come flooding to repositories.”

Describing the OER lifecycle

One of the outstanding characteristics of OER is their lifecycle (Fulantelli et al., 2008). Due to the openness and adaptability of the resources, they will often have an extended lifecycle in a way that other closed and more tightly controlled educational resources do not. The lifecycle of an open educational resource can be described in three stages:

1. Original production of a resource by a certain producer.
2. Ascription of a resource to a particular use and (at least implicitly) to a particular user group.
3. Adaptation of a resource. This adaptation can take two main forms:
 1. The adaptation of the resource by changing the ascription, i.e. repurposing the resource for an alternative use or an alternative group of users, thereby returning to phase 2.
 2. The adaptation of the resource by changing its content or the content with which it is used, thereby creating a new product and returning to phase 1.

Figure 9.1 below illustrates this iterative process. The real dynamic of this process is determined by people sharing and redistributing OER so that they reach a larger and broader group of users and potential adaptors.

Figure 9.1. Iterative process of OER production and reproduction

Process	Outcome	Person(s)
1. Production	Product (OER)	Producer
2. Ascription	Metadata	Producer User
3. Adaptation	Metadata New product	User Producer-User ("prosumer")

Content can be adapted through revision or remixing. Revision is based on the original product (i.e. OER), whereas remixing combines different products or works. Revision, therefore, produces an OER that is likely to be an improved version of the original OER, whereas remixing is likely to result in a completely new OER.

This iterative process involves the producers and users of OER in different ways. The producer, who makes the original product, is likely to provide the first description of an OER through free text

and ascribe metadata according to various schemes (e.g. Learning Resource Metadata Initiative – see Chapter 6). In addition, many host repositories allow users to add metadata and annotations to describe the resource and how it can or should be used (e.g. lower secondary schooling for the field of biology). Annotations may also be added to only a part or parts of an OER (e.g. on specific “pages” of a book).

User ascription to a certain usage may signify an adaptation from the original purpose (repurposing type a). If, however, a user is involved in a more fundamental adaptation of an OER that results in the production of a new OER (repurposing type b), this person is acting both as a user and a producer (often called a prosumer).

OER are often placed in online repositories for ease of access and distribution. Initiatives to track OER usage along their lifecycle are confronted with the challenge that the initial repository used to distribute the OER may not be where iterations, such as adaptation and/or improvement, take place.

Figure 9.2 sets out a general scheme for the likelihood of a particular process in the OER lifecycle taking place within the same repository, starting from the original upload. As the major argument in support of OER is ease of redistribution, the programmatic assumption is that the producer of an OER uploads it to a repository in order for it to be redistributed.

Figure 9.2. **Scheme – likelihood of iteration in same repository**

Process	Likelihood of process occurring in original repository	
Upload of OER to repository	High	
Ascription of OER to use and user	High	
Adaptation of OER:		
– Repurposed	High (if change to metadata)	Low (if change to product)
– Revised	High	
– Remixed		Low

Even though this is a general scheme that may not mirror reality in all instances, it shows the potential for capturing and tracking usage data within a repository. Information on, for example, the type of person making changes to a resource may be available as soon as users log in to a repository.

The scheme identifies that it is unlikely that a repository will capture the repurposing of an OER if a product has substantially changed during its lifecycle. Substantial changes include a change in the digital format of a media file or changing the format from digital to non-digital (as shown in the case from Malawi, Chapter 7); a simplification of the language used; or changing exemplary practice cases in an OER to tailor it to the specific context of use (as shown in the case of Leadership Public Schools, Chapter 8).

The scheme furthermore shows that remixing OER to create an entirely new product is unlikely to occur within the original repository as this usually involves bringing together OER elements from various sources, including other repositories. Both quantitative surveys of users and qualitative studies can capture detailed information on who the users are and which processes (e.g. remixing) they undertake in connection with OER.

The potential of automatically tracking user behaviour

Users of OER generally search and retrieve OER from digital repositories on the web. These may be repositories from particular institutions, for particular services or covering particular fields. The repositories may be specifically for educational needs, or more general digital repositories of resources that can be used for education, such as Wikipedia, YouTube or Flickr. Some of these repositories directly contain OER, while others, also known as meta-repositories or registries, contain links to OER in other places on the web. Each of these repositories presents, to some extent, the opportunity to track the volume of traffic to, from and within their site.

Automatic tracking built into the repositories helps to make the processes of sharing, adapting and (re)creating OER visible. This is of interest to stakeholders who are funding or indirectly supporting OER initiatives, and it is important for users, producers and prosumers as the information is likely to encourage more people to share adaptations of original OER.

In 2012, OER tracking was still judged to be in its infancy due to the dynamics surrounding OER use and reuse. However, Thomas et al. state that “while it is true that no single approach will capture all use and reuse of a resource, and that some use will be hidden from all reasonable attempts at tracking, there is still more to be lost than to be gained from making no attempts to track the use and reuse of open educational resources” (Thomas et al., 2012: 82).

Following a review of the European situation, a recent EU report stated that currently there is “no way to track the quantity or quality of reuse or repurposing of learning objects” (Camilleri, Ehlers and Pawlowski, 2014: 45). This suggests that there is work to be done in the area of usage tracking within OER practice, and that a greater understanding of the challenges of tracking OER use is needed.

A short survey of tracking in OER repositories

In mid-August 2014, a survey of 20 questions was sent out to 121 OER repositories across the world in order to better understand the practice of tracking. The repositories addressed by this survey were chosen first from the list of OER compiled by Atenas (Atenas, 2014). Additionally, the survey aimed to include some repositories with mixed resources – i.e. both OER and non-open resources – as they may have different tracking practices that could motivate the discussion around tracking for all repositories. Twelve responses were tendered within the short time given (the deadline was mid-September).

The responses from a variety of repositories (see Table A9.1, in Annex A9) across the world highlighted a general reluctance to require users to log in. Delta University of Technology (Netherlands), for instance, said that the repository does not require a login as “we aim to have our materials accessible as openly as possible.” Jorum (United Kingdom), said: “We have found that by reducing barriers to access/reducing authentication requirements, the use of Jorum services increases.”

However, there were a few exceptions. In the cases of SNAR (Faroe Islands), Metodický portál RVP (Czech Republic) and Maknaz (Saudi Arabia), the respondents signalled that login was required to access the comments functions or learning analytics. This may be a way forward for other repositories, i.e. to keep standard access free of login, but to add functions that are only accessible to those who log in. As the respondent from Maknaz stated: “The users require a login to access most of the OERs. This helps us to analyse patterns of the access and usage. Our system is still under development. We plan to have a robust tracking system to track the usage of OERs, by which we intend to enhance the value and usage of OER.” This approach, which is systematically followed by the Khan Academy’s portal (Box 9.1), seems to be unusual at present for most OER repositories.

Box 9.1. Tracking by the Khan Academy web portal

The Khan Academy is a non-profit organisation created in 2006 by Salman Khan to provide “a free, world-class education for anyone, anywhere”. The organisation produces micro-lectures released via YouTube. The Khan Academy web portal integrates video lectures, practice exercises and tools for educators into planned lesson paths. The Khan Academy learning materials meet OER criteria as content is released with an open Creative Commons licence (CC-BY-SA) on the Khan Academy portal, and videos on YouTube (where they are hosted). The lack of restriction on access, use and reuse of the resources provided has led to the learning materials being integrated into existing learning settings, such as classroom learning, with the goal of providing learners with more individualised learning beyond the normal limitations of the classroom (see case in Chapter 3).

Although openness is actively supported by the Khan Academy, the main strategy of the organisation is to provide a well-structured and interactive learning environment on their own web portal. This leads to a rather closed and top-down approach to learning resource production and quality assurance, which is unusual for OER-based initiatives. With the objective of improving the learning experience of users and making it more effective, the Khan Academy uses learning analytics, which cannot be implemented without effective tracking. Tracking is also used to better understand users’ learning paths so that resources and the learning environment can be improved.

The potential of user surveys

Usage tracking within a repository is generally very limited as even with registered users, only search behaviour, downloads, and perhaps reviews can be seen. The really interesting usage – what teachers and learners actually do with OER to aid learning – almost invariably happens outside the repository and will only become visible if users redistribute the OER back into the repository or post an account of their use. User surveys have the advantage over automatic tracking of being able to cover the following key questions:

1. Who are the OER users? (e.g. personal and socio-demographic characteristics)
2. How do they use OER? (e.g. in what learning environment)
3. Do they adapt OER for other purposes? (e.g. create a new OER from one or more existing one/s)
4. Do they share OER with others, especially through uploading them to a repository or similar?
5. Do they also share the adapted OER with others?

There are two main types of survey:

- Surveys that focus on users of a particular service or repository.
- Surveys that focus on a particular group of (potential) users, e.g. non-traditional learners or learners enrolled at a particular educational institution.

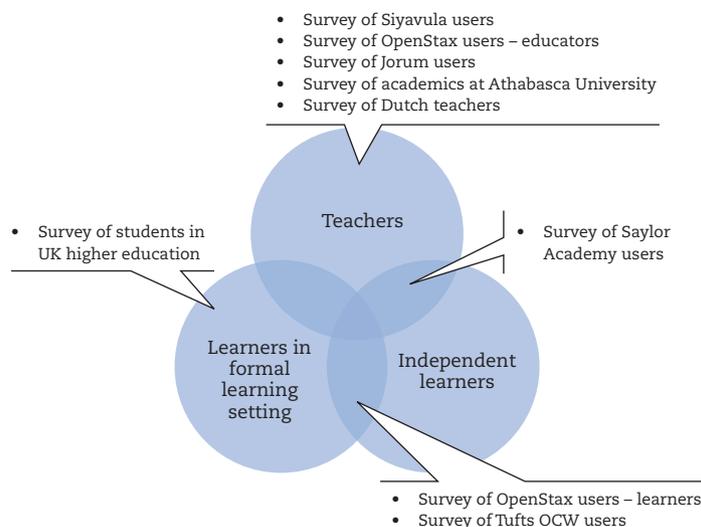
In general, a survey will try to recruit a subgroup (sample) of potential addressees to participate in the survey. The difficulty of this task depends on the group of addressees that the survey is targeting:

- *Users of a particular service (e.g. repository):* Obtaining a balanced sample may be difficult, and the survey will not be able to generalise the findings to those who do not use the repository. The problem of sampling for this group is that sufficient information about all of the users is necessary in order to draw a sample. Unless this is captured by the repository in some way (e.g. through tracking), such information is not likely to be available. For this reason, the sample is unlikely to be representative of the total population of users since these two groups (subgroup of total population and total population) cannot be directly compared on any standard variables.

- A *particular group of (potential) users*: Sampling is likely to be easier as some information (e.g. via administrative statistics) on this population will already exist (e.g. the total share of non-traditional students in a national system). Sampling is most feasible when this group of (potential) users is limited by geographical boundaries (e.g. all potential users in Germany). However, most OER services are not limited to a geographical boundary, which makes drawing a representative sample of all (potential) users difficult. An additional problem is that the object of investigation – the OER – must be described in sufficient detail for the survey respondents to meaningfully answer the questions on OER use. For instance, there is a risk that the respondents may be answering with digital educational resources rather than OER in mind.

The remainder of this chapter highlights the central findings of implemented surveys, which are used as practice examples throughout this report. For the analysis of the survey data, surveys were categorised based on the user groups they captured – see Figure 9.3 below. The very nature of OER being open to access, and also open to adapt and to (re-)use for different purposes means that OER may be used by more than one user group. The three main groups of user are: learners primarily in a formal learning setting (e.g. enrolled in school or university), independent learners (e.g. those working primarily without being enrolled in a formal learning setting), and teachers at primary, secondary or tertiary education level. However, users of a particular OER or OER service may belong to more than one of these user groups.

Figure 9.3. **Categorisation of OER surveys**



What can we learn from practice and where are the gaps?

The review of well-known surveys (see Table A9.2 in Annex A9) shows the prevalence of low respondent numbers and the use of convenience sampling⁵ for recruiting survey respondents, which are significant weaknesses in the surveys. Whilst low respondent numbers simply requires more effective recruitment, the use of convenience sampling can only be improved through combining the automatic tracking of some basic user characteristics and sample recruitment.

a) Surveys of learners in a formal setting

- *Students in United Kingdom’s higher education* (NUS UK, 2014): The National Union of Students in the United Kingdom, with the support of the Higher Education Academy (a governmental

body), carried out a representative survey in order to better understand how tertiary education students, a main user group of OER in the United Kingdom, viewed OER. The survey split the respondents into two groups of similar size – traditional and non-traditional students. Non-traditional students had at least one of the following characteristics: enrolled at the Open University UK, enrolled for part-time studies, and/or aged 25 or over. The survey asked students to define OER in a free text box: 23% of traditional and 14% of non-traditional students managed to identify most OER features. Almost all students identified open access and distribution as key features of OER. However, less than one-fifth of traditional students and only 6% of non-traditional students identified all characteristic features of OER. This does mean that the ensuing questions on OER in the survey lack reliability due to the students' very broad understanding of OER (i.e. they are likely to have mixed up OER with their understanding of digital media used for educational purposes in general).

The key results regarding usage were: students felt that OER improves the quality of their learning experience (60%) and gives them the opportunity to improve their grades (50%). They appreciate OER for providing access to content at home and the opportunity to grasp complex subject matter. Regarding their own sharing practices, students stated that they are very likely to share good OER that they have found (64% of traditional students and 61% of non-traditional students). Around 45% of students from both groups also agreed or strongly agreed that they would share resources they had created. Regarding how students see academics' practices of sharing: 52% of traditional students and 54% of non-traditional students stated that they value academics who integrate other people's or institutions' OER into their own materials more than academics who do not. Furthermore, 61% of traditional and 60% of non-traditional students value academics who make their materials openly available more than academics who do not. These assessments echo a perception that is common in academic research practice: that sharing through peer review is a positive activity that improves the reputation of researchers whose work is used by others.

b) Surveys of learners in a formal setting and independent learners

- *OpenStax College openly licensed textbooks – learners' survey* (Pitt, 2014b): The OpenStax initiative grew out of the Connexions OER repository at Rice University, a private research university in Texas, USA. Started in 2012, it aims to provide free textbooks in major course areas (e.g. statistics, physics, chemistry) to over 10 million tertiary education students. The materials are currently used by 489 colleges in the United States. In 2014, OpenStax started a new initiative to provide textbooks targeted at upper secondary schooling. Nearly two-thirds of the respondents to the learners' survey were between the ages of 15 and 18, and four-fifths were younger than 24. Despite the textbooks being intended for use in formal settings of early stage tertiary education, 18% of the user-respondents had already obtained a Masters' degree and 30% of respondents had not finished upper secondary schooling. This highlights the envisaged spill over of OER from the original formal setting (first years of tertiary education) into other formal or non-formal learning settings. The fact that two-thirds of respondents (63%) said they were using the resources for personal development supports this assertion.
- *Tufts OCW (Open Courseware)* (Tufts, 2011, 2012): This repository from the private research university Tufts University, in Medfield (United States), was established in 2005 and aims to distribute free and open content to as many people as possible. It does not provide credit for taking courses nor access to university staff. The repository had around 650 000 visits in 2012, with approximately half of the visitors situated in North America and one-quarter in Asia. In 2011 and 2012, the repository carried out a short pop-up questionnaire of its users, which appeared when users accessed the repository. In both years, around half of the

respondents classified themselves as self-learners and one-third as students in a formal setting, which fits with the portal's mission. The three most frequently chosen reasons for visiting the portal in both years were: personal learning, planning course of study, and to complement a course being taken in another formal setting. Regarding the benefits of the course, respondents agreed most strongly that the resources increased their interest in the topic area and supplemented their existing knowledge.

c) Surveys of independent learners and teachers

- *Saylor open licensed course materials – users' survey* (Farrow, 2014): The Saylor platform currently contains 317 courses, chosen based on subject areas that have high enrolment figures in higher education in the United States and for which there is subsequently a high demand. The service is particularly focused on non-formal learners. The materials are peer reviewed, but the site provides no direct pedagogical support for students. There is no obligation to register in order to use the site. Registered users, however, can take automated examinations at the end of their courses and obtain a digital portfolio of what they have achieved.⁶ Respondents to the user survey were recruited through a pop-up survey upon logging in.

Only 42% of the respondents were from the United States, which indicates a high level of usage of the repository from outside the country. In keeping with Saylor's mission, only 16% of the survey respondents were in formal learning settings, with most being non-formal learners. Two-thirds of the respondents (64%) were currently in employment. The main motivations for using the site were the opportunity to study at no extra cost (91%) and the desire to have a learning experience (76%). Of those in formal education, over half stated that the participation in Saylor courses increased their enthusiasm for their studies and their interest in the subject studied. More than one in ten users of the site (11%) were teachers who stated that usage of the materials provided inspiration for their own lessons (72%), broadened their coverage of the curriculum (55%), and broadened the range of teaching and learning materials they used (57%). Nearly half of the teachers also stated that studying the Saylor materials helped them develop their own teaching (44%). No information was obtained on users' adaptation of the Saylor materials for their own purposes.

d) Surveys of teachers

- *Siyavula openly licensed textbooks and associated services* (Pitt, 2014c): This non-profit organisation based in Cape Town, South Africa, provides openly licensed textbooks, particularly in the subject areas of mathematics and science. The textbooks are provided in many media formats in order to increase their accessibility and are aimed at learners in primary and secondary education, with a particular focus on upper secondary level. Since 2011, around ten million hardcopies of the textbooks have been distributed throughout South Africa and the website has around 800 000 learners reading its content each month. The survey of users of Siyavula services particularly captured those users who have closest contact with the enterprise: well-qualified educators largely from private independent schools that have the technical and digital infrastructure that enables them to profit most from Siyavula products in their various media formats. The sample is therefore not representative. The user-respondents stated that the Siyavula products enabled them to broaden their coverage of the set teaching curriculum (65%) and inspired them to new ideas (71%). Although the OER were mostly used to supplement other materials (58%), one-third of respondents had made changes to the textbooks for their own use and 15% of user-respondents had created their own OER and uploaded them to a different repository.

- *OpenStax College openly licensed textbooks – educators’ survey* (Pitt, 2014a): Respondents to the survey of educators using OpenStax stated that they used OpenStax textbooks as a supplement to other materials (96%), to gain new ideas and inspiration for their own practice (80%), and to offer a broader range of materials to learners (76%). On the matter of adaptation, 90% of respondents stated that they had made changes to the textbooks for their own use. Regarding general practice in the context of OER, one-third of respondents stated that they had added resources to a repository in the past and a smaller share (14%) had also created their own OER and uploaded them to a different repository.
- *Users of Jorum* (Burke, 2014): This repository for British further and higher education contains around 16 000 OER and had approximately 400 000 views in 2014. The site is open to any user, however, uploads are largely by users from within British tertiary education as most of the United Kingdom-based OER projects deposit their final products in this repository. The split of content between higher and further education is roughly 80% to 20%. This small user survey from 2014 (first of a planned annual survey) showed that 40% of respondents were from further education institutions, which may be an indication of the possibilities offered by OER for dissemination across educational sectors (i.e. from higher to further education). The large majority of respondents were not teachers or academics, with 42% of them librarians and 16% from e-learning support services. This reflects the role of libraries and e-learning support centres as internal disseminators of information and advisors at their respective educational institutions within British higher education. No information was contained on their adaptation practices.
- *Survey of academics and staff at Athabasca University, Canada* (Mckerlich, Ives and McGreal, 2013): Athabasca University is a distance educator for higher education with 40 000 students enrolled (equivalent to around 8 000 full-time students). The institution employs 1 300 staff, of which around 200 are academic staff. The university has a strong focus on using OER for its course provision. The survey of staff was introduced as a possible long-term monitoring tool for OER familiarity, creation and use. It elicited 154 responses, with 75% of respondents involved in course design and delivery as academics or course developers. Unsurprisingly, given the mission of the university, only 11% of respondents were unfamiliar with the term “open educational resources”, and 41% of respondents said that they use OER, with the most common formats being scholarly journal access, videos, images, textbooks and audio files. Almost one-third of respondents (29%) stated that they create OER, with the most common formats being tutorials, quizzes, audio, video, images, group lessons and textbooks. Mckerlich et al. (ibid.) suggest using the ratio of use to creation of OER as a benchmark for the intensity of OER creation and use. In the case of the Athabasca University, which has a strong focus on OER and open practices, the ratio is 29:41, which equals 71%.
- *Survey of teachers and academics in Dutch education sector* (van Acker et al., 2014): This survey covered a representative sample of teachers and academics in the Dutch education sector based on simple demographic characteristics: 47% of the sample worked in primary education, 42% in secondary education and 11% in higher education. The study focused on the sharing of OER (loosely defined in the study as “digital learning materials”) and differentiated between sharing OER via the Internet and sharing interpersonally with colleagues from the same institution. It found that 50% of educators shared digital learning materials interpersonally, and 25% shared them via the Internet (e.g. through a repository). For frequent sharers: 20% of teachers shared digital resources frequently within their institution (at least several times a month), and only 10% via the Internet. Resources shared included their own tests, their own texts, other people’s texts with adaptations or their own images, and presentations. Resources were least likely to take the form of audio or video fragments.

The study found that one of the main reasons for sharing was the teachers/academic's belief that they had something of value to share, a construct that the authors of the study termed "knowledge sharing self-efficacy". The authors also noted that there was a high share of educators with an intention to share, but only a weak correlation between the characteristics of educators intending to share and those that actually share learning materials. The authors concluded that the findings suggest a cultural change to foster the value of sharing may be necessary to encourage sharing behaviour.

Interpretation of survey results

There are caveats to interpreting the survey results due to problems with the various samples used in the surveys. However, some patterns can still be identified.

The surveys of students and independent learners give an impression of why learners use OER. The main arguments emerging from the surveys of students in the United Kingdom, learners using OpenStax and those using Tufts OCW were that OER *support personal learning and supplement knowledge* from other areas. When asked about the benefits of using Saylor Academy OER, over half of the learners who were concurrently enrolled in formal learning settings at higher education institutions stated that the resources increased their enthusiasm for their studies and their interest in the area studied.

The surveys that focused on particular services (OpenStax, Tufts OCW, Saylor Academy) had a high share of independent learners. While it is to be expected that there will be a high share of non-formal learners using Tufts OCW and Saylor Academy, where these learners are the main focus group, it is interesting to note that OpenStax, which focuses on the early years of tertiary education, appears to be used by much younger and much older students than envisaged (over half of the respondents were studying at the Master's level or had not left school yet). This is a strong argument for the distributive benefits of releasing educational resources as OER.

Statistics for the creation of OER were captured in the surveys from Siyavula, OpenStax and Athabasca University. The two textbook repositories reported that around 15% of users created their own OER. Athabasca University's figures were twice as high at 29%, which is unsurprising as the university has a focus on OER. It is interesting to note that for Wikipedia, 31% of its active users (i.e. users who have performed an action in the last 30 days and who make up less than 1% of all Wikipedia users) make contributions to the encyclopaedia, but only 8% do this regularly (van Acker et al., 2014). Although this makes the ratio of 15% look relatively high, as the adaptation, improvement and redistribution is a central tenet of OER, the ratio should ideally be higher than for an encyclopaedia, where the bulk of users are meant to be passive readers.

Siyavula and OpenStax showed high levels of adaptation: 33% and 90% respectively. The United Kingdom's student survey found that students appreciate academics' open practices, with around half of the students surveyed stating that they valued academics who integrate other people's or institutions' OER into their own materials more than academics who do not. Furthermore, well over half of the respondents stated that they *value academics who make their materials openly available* more than academics who do not.

The survey of Dutch educators differentiated between sharing (and adapting) OER with colleagues at the same institution, which was termed "interpersonal sharing" and sharing via the Internet, i.e. digital sharing. The analysis showed that 50% of the surveyed teachers share interpersonally, but only 25% share via the Internet. This highlights a reluctance of educators to share educational resources unless they see value in the resource being shared digitally: "knowledge sharing self-efficacy". The authors noted, however, that they did not investigate the possible effects of communities of practice on rates of sharing. Such research is more feasible in the form of a qualitative study.

The potential of qualitative studies on the practice of sharing by teachers and academics

If OER are extensively integrated into the learning setting (see Chapter 4), they can lead to a new type of teaching and learning. This is a challenge for educational research, but one that is familiar to research on distance education. In his review of online distance education, Saba notes a growth in the application of qualitative research as a reaction to a predominantly quantitative approach where “distance education is not examined on the basis of its own merits. In contrast, it is looked at in comparison to other forms of education, such as face-to-face classroom instruction, on-campus education, and so forth” (Saba, 2014). He says that this comparison has not led to any significant findings for educational practice.

Knowledge sharing is a key element to the dynamic nature of OER: creation, sharing and repurposing. In a review of research on knowledge sharing (Wang and Noe, 2010: 126), Wang and Noe argue that future research on knowledge sharing should bring together quantitative and qualitative approaches and contributions. They say that many existing studies in the field are quantitative and pay too little attention to the underlying structures and mechanisms that can influence sharing. They argue that more qualitative research is necessary in order to better understand practices and to design new quantitative research.

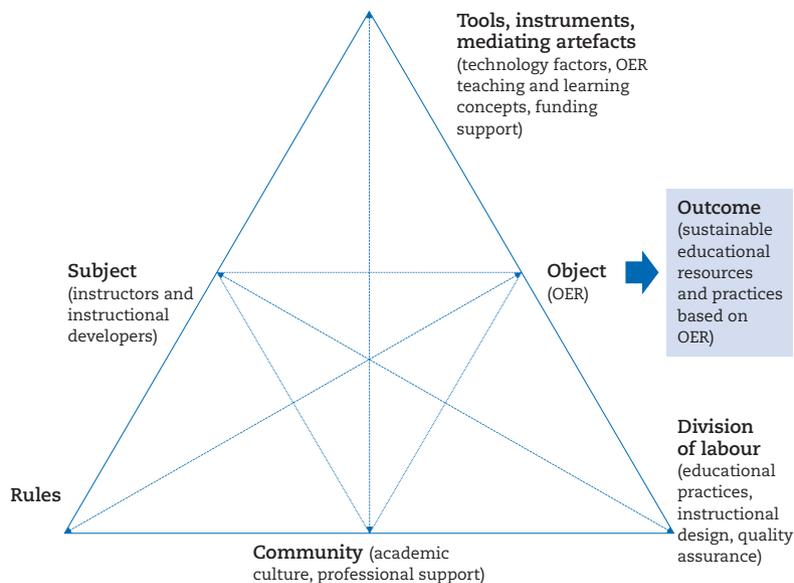
The most common framework used for discussing the development of OER sharing is Engeström’s activity theory, which takes a more holistic view of human activities (Engeström, 2001, 2011).

What makes this approach particularly useful is the possibility to focus on OER development and sharing as an outcome that is influenced by the inter-relations of various activities. The approach starts out from the understanding that the production of an outcome (e.g. the practice of sharing) involves a process between a subject (e.g. an academic) and an object (e.g. a learning resource), which is mediated by a socio-cultural context. The socio-cultural context is made up of tools, on the one hand, and rules, community and the division of labour, on the other. This construct is termed an activity system. “Activity systems are socio-cultural settings where community members (subjects) work on some sort of object or problem space, transforming it into an outcome using tools which may be technological (such as software) or conceptual (such as pedagogic theory). The tool-mediated action may be constrained or enabled by implicit and explicit rules and the broader social context (community) within which the activity takes place. Labour is divided among the community members’ (roles).” (Littlejohn et al., 2014).

It has, among other things, been applied to the conceptualisation of the UK Open University’s OpenLearn (McAndrew, 2011; McAndrew et al., 2009), to learning materials in a South African university (Hodgkinson-Williams and Paskevicius, 2012), to developing OER for adult learners in Europe (Falconer et al., 2013) and by academics in Canada (Porter, 2013).

For his analysis, Porter translates the Engeström triangle of activities into the OER context – see Figure 9.4 (Porter, 2013: 141). The activity theory approach starts off from the assumption that a certain configuration of the activity system exists. However, this configuration can be disturbed by an emergent contradiction, which is caused by a reform. A simple example would be that of educators (subjects) who are used to producing (and using) commercial textbooks (objects) to support the attainment of learning objectives (outcomes). For this, they use specific tools within a context of rules (e.g. only accredited books), a collective community (e.g. other teachers) and with a certain division of labour (e.g. production of the textbook by a publisher with the support of selected authors). Changing the object to an OER (e.g. an open textbook or even alternative educational resources) can lead to disruptions due to the contradictions, for instance, of a new definition of the community of practice or new definitions for quality assurance. The activity theory approach thus provides an insight into the inhibitors and enhancers for sharing OER, construed as an innovation and therefore an emergent contradiction to common practice. Policy interventions can help to change this configuration or help to deal with new challenges resulting from the new configuration (Chapter 11).

Figure 9.4. Activity theory approach for OER practices



Source: Adapted from Porter (2013), *Exploring the Practices of Educators Using Open Educational Resources (OER) in the British Columbia Higher Education System*: 141.

Lessons learnt

Activity theory was also extensively used to analyse the practice of sharing OER in a study on British higher education in the framework of a large-scale, nationwide programme to release OER from universities across the United Kingdom (UKOER), which ran between 2009 and 2012 (Littlejohn et al., 2014). This study focused on the role of communities of practice in encouraging collaboration and sharing between academics to develop OER.

The study identified significant tensions between the twin goals of open release (worldwide instead of only to a certain group of users) and open development (in a collaborative fashion cutting across traditional geographic, institutional, and disciplinary boundaries, etc.). Tensions arose around tools due to the use of different technologies; around the concept of dynamic adaptation instead of more controlled static resources (with discrete versioning) (see Chapter 9); and around rules, community and division of labour in relation to the assignment of roles for developing and assessing the quality of OER.

The survey of Dutch educators (above) showed that academics are reluctant to share and use other people's work, even though this practice is appreciated by students (as shown in survey of British students). However, Littlejohn et al.'s (2014) research showed that academics felt reusing others' content reflected poorly on their own expertise and academic identity. This accounted for a reluctance to share and adopt other people's work on their part. One solution to this emergent contradiction, which Littlejohn et al. have observed, has been the release of resources on closed platforms that are only accessible to a certain community of users and that provide a certain exclusivity and safety for experimentation.

However, Littlejohn et al. (2014) consider this solution restrictive as it generates a new barrier to openness. They found that communities with common values and ways of doing things were most able to adapt to change. In the case of the United Kingdom's OER programme, many of these communities of practice were formed around projects. These communities achieved adaptation

through a partial opening of their practices, for instance by working less hierarchically or releasing OER in repositories meant for certain user groups. In this way, they also managed to keep some elements of their closed community intact. For this reason, the authors conclude that the biggest challenge to practices that enhance sharing and adaptation of OER lie in the issue of how to achieve diffusion across communities.

For this reason Littlejohn et al. suggest that membership of communities of practice should be more fluid, with new members entering and old members leaving in order to keep the boundaries more permeable. This can be seen with communities that combine around projects. The challenge with making membership more fluid is to enable some stability at the same time, as too much instability will inhibit new practices forming around the new tools or ways of working.

One solution to this challenge is presented by the Free High School Science Texts (FHSST) project and the later practices of Siyavula for the production of additional open textbooks (see Chapter 10). Although OER in this case are also entirely peer-produced texts, the responsible community of practice is centred around a South African non-profit organisation, Siyavula, which systematically recruits contributors for specific tasks and centrally integrates their inputs (Benkler, 2006: 101). This structure has led to the national success of this initiative within South Africa.

Littlejohn et al. (2014) highlight that an alternative approach to more fluid membership of communities is to make communities broader, pointing to the OER characteristic of adaptability and the principle that they can be perceived by different user groups as relevant objects for different reasons. In this context, OER are “boundary objects” (Star and Griesemer, 1989), around which different communities can collaborate to work on the same object for different end-uses or end-users (see Pawlowski, 2012). Along these lines, Benkler makes the case for working with OER that can be used by many different user groups (Benkler, 2006: 101). A recent survey of Community Colleges in the United States showed the predominance of such OER, with videos and images found to be the most widespread types (Farrow and Daly, 2014). However, the Catalyst from WikiSeats, which encourages various types of learning around the practical problem of creating a stable stool, is perhaps the best example of such a boundary object and how it can foster innovation (see Chapter 3).

Combining approaches to confront the research challenge

The argument that OER will become richer if an increasing amount of different types of users are integrated into the practice of using and adapting OER leads to the challenge of trying to capture these new groups. This chapter has focused on the central characteristics of OER – adaptability and extended lifecycle – and found considerable gaps in the available studies. It argues that OER tracking, though seldom used extensively in practice, could provide a basis for more representative quantitative surveys on use, reuse and adaptation by different user groups. At the same time, it finds that quantitative approaches will struggle to capture and understand the extended lifecycle of OER, which leaves qualitative research with an important role to play.

It is especially important to better understand the differences between active and passive OER users. As passive users are less likely to respond to an OER survey, or even recognise the term OER, they are likely to be under-represented in any survey. This does not mean, however, that they do not benefit from OER, but they are unlikely to adapt OER for reuse and redistribution. As Weller states, they are likely to be “consuming rather than creating and sharing” (Weller, 2014).

The optimistic view is that passive users can be “infected” by the OER “bug” and will become active prosumers at a later date. Research taking this view should look into drivers that can foster this development, and how to remove inhibitors. The more pessimistic view would be that the majority of users will remain passive. Research taking this view should focus on how to make OER transparent (e.g. through ascriptions in a repository), how to use standardised information and

quality assessments to foster discoverability and use, and how to promote trust in OER even if they have not been created by a member of a person's own (local) network (see Chapter 6).

Notes

1. But not common to MOOCs – Massive Open Online Courses.
2. <http://oerresearchhub.org/>
3. <http://openedgroup.org/review> (status on: 18.05.2015).
4. Information largely based on a telephone interview with Jessica Yuen, head of staff at the Khan Academy, 28 August 2014.
5. According to Wikipedia: “Accidental sampling (sometimes known as grab, convenience or opportunity sampling) is a type of nonprobability sampling which involves the sample being drawn from that part of the population which is close to hand. That is, a population is selected because it is readily available and convenient. (...) The researcher using such a sample cannot scientifically make generalizations about the total population from this sample because it would not be representative enough.”
6. For a new initiative on formal recognition by higher education institutions see Hilton et al. (2014).

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Annex A9. Surveys referenced in Chapter 9

Table A9.1. Results of short survey of OER containing repositories (August-September 2014)

Name	Country	Brief description	Unique visitors per month	Comment on need for login to resources	Comment on need for surveys
Delft Open Courseware	Netherlands	Repository of all open courseware from Delft University of Technology. All of which are available under a CC NC-BY-SA 3.0 License.	Approx. 25 000.	No login required, we aim to have our materials accessible as openly as possible.	We do not have regular surveys, but have carried out two user surveys in the last 7 years.
Economics Network	United Kingdom	Small local repository for the topic area of economics, 95% OER.	Approx. 1 500.	No login for most materials, yes for assessment questions (because these come with answers), approx. 1% of users login.	No survey of users.
Jorum	United Kingdom	100% OER repository for materials from UK higher and further education.	We do not collect this data as we do not require authentication.	No. JISC is committed to an Open Access agenda. We have found that, by reducing barriers to access/ reducing authentication requirements, the use of JISC services increases.	First user survey just completed, planned to be annual survey.
Kursnavet	Sweden	Registry containing 100% OER in the area of upper secondary and adult education.	Approx. 8 000.	No. The hub is free to use for anyone.	No.
Maknaz	Saudi Arabia	National repository for learning objects. Currently in development. Approx. 20% OER.	n/a	The users require a login to access most of the OERs. This helps us to analyse patterns of the access and usage. Our system is still under development. We plan to have a robust tracking system to track the usage of OERs, by which we intend to enhance the value and usage of OER.	Not yet, but in planning. Focus will be to evaluate the ease of access, quality and reusability of OER.
Matemática Multimídia	Brasil	100% OER. Teaching materials for mathematics.	Approx. 8 000.	No login required. We want no obstruction whatsoever for the teachers to get access to the resources.	No.

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Name	Country	Brief description	Unique visitors per month	Comment on need for login to resources	Comment on need for surveys
Materiale-plattformen	Denmark	33% OER. Materials for school teachers.	Approx. 30 000 (respondent noted: number probably overestimated).	No. It must be as easy as possible to retrieve the descriptions of the resources and eventually the free resources.	Irregular surveys.
National Science Digital Library	United States	Registry. Refers to open digital resources, but not necessarily to OER.	No data.	No login.	Irregular surveys
Open Education Consortium	United States	Registry. Refers to OER open courseware from member organisations.	Approx. 25 000.	No login.	Annual survey.
Metodický portál RVP (Method portal OER)	Czech Republic	90% OER.	Approx. 75 000.	No login. Users are only required to log in if they want to upload and comment directly on materials.	Irregular management-focused survey on overall quality of OER, technical support and development of (new) tools, new ideas.
SNAR	Faroe Islands	95% OER.	Approx. 3 000.	No, at the moment it is not necessary to log in. However, resources that save personal answers from students, etc. need the user to log in. So we expect to use the login function more in the future.	We plan to do this in the future, but have not found an easy way to implement it. We use Google Analytics, and have to learn how to carry out regular surveys and decide what is important for us to know to improve our resources.
UNITRACC	Germany	No OER. Most resources are free to access, but not to modify. UNITRACC provides up-to-date information from the world of the sewer and pipeline construction including various technical books, documentations and virtual construction sites.	Approx. 14 000.	Around 80% of users log in.	Yes. Focused on structure of the learning content and use of the web platform.

Table A9.2. **Main details of surveys of OER usage included in the analysis**

Target group	Number of respondents	Sampling method	Year of study	Key questions covered			
				Users of OER	Use of OER	Adaptation of OER	Sharing of OER through uploading
Surveys focused on users of particular services							
Users (educators) of Siyavula Open Textbooks	89	Convenience sample recruited via social media	2014	•	•	•	•
Users (educators) of OpenStax College	77	Convenience sample	2014	•	•	•	•
Users (students) of OpenStax College	49	Convenience sample (3 targeted institutions, but 80% of final sample recruited through newsletter)	2014	•	•	•	•
Users of Saylor Academy	3 101	Convenience sample of users of Saylor.org recruited through a pop-up on login for registered users	2013	•	•	–	–
Users of Jorum	80	Convenience sample recruited via newsletter, social media, etc.	2014	•	–	–	–
Users of OCW Tufts, Tufts University	1 026	Pop-up survey for users	2010	•	•	–	–
	1 522		2011	•	•	–	–
Surveys focused on particular target groups							
Students in UK higher education	2 807	Representative sample of UK students	2012	•	•	–	•
Dutch educators in primary, secondary and tertiary education	1 568 (11% working in tertiary education)	Representative sample of Dutch teacher population recruited via online panel	2013				•
Users of OER for adult education and lifelong learning	86	Convenience sample recruited through social media and snowballing	2012	•	•	•	•
Academics at Athabasca University, Canada	154 (return rate 12%)	All staff and faculty members invited	2013	•	•	–	–

Chapter 10

Securing the sustainability of open educational resource (OER) initiatives

This chapter considers the sustainability challenges for OER initiatives. A conceptual model is presented that distinguishes between three models of cost recovery: philanthropy (and government support), community and revenue. In each case the challenge of sustainability, methods of covering initial and maintenance costs, and measuring success are presented. The role that government plays in providing funding and setting up favourable conditions for recovering costs using the three models is explored. Exemplary cases of OER initiatives are then presented and their cost-recovery models are highlighted.

Main policy messages

OER funding models are important. If OER practice is to move into the mainstream, the challenges of economic sustainability and coping with scale must be solved. It is, therefore, important to look at the funding and cost-recovery models being used by OER producers to cover initial production costs. These are community (non-market) production, donation and grant models, and revenue models that often combine free with revenue-generating products or services.

Short term funding holds challenges. Many OER initiatives originate from contributions by philanthropic foundations or government funding and are inevitably confronted with the question of what will happen to their resources and operation when these funding streams come to an end, or when the initiative needs to go to scale.

Mixed-revenue models are emerging. Some OER initiatives have made a transition in their funding model to a business model, with additional revenue streams being tapped to secure sustainability over time. Additionally, there are examples of revenue-driven organisations (especially publishers) producing OER in order to stay innovative and attractive to their major market. In general, it is expected that many more mixed models will emerge, where OER will be just one part of the digital learning offer.

The sustainability challenge

Challenges to sustainability occur if the resources initially used to cover costs are not sustainable in the long-term. OER initiatives have often been donor-driven (either through philanthropy or government), with funding offered as one-off seed-funding (Butcher and Hoosen, 2012). The issue of economic sustainability arises when this funding comes to an end, and OER organisations need to develop strategies to continue their operations.

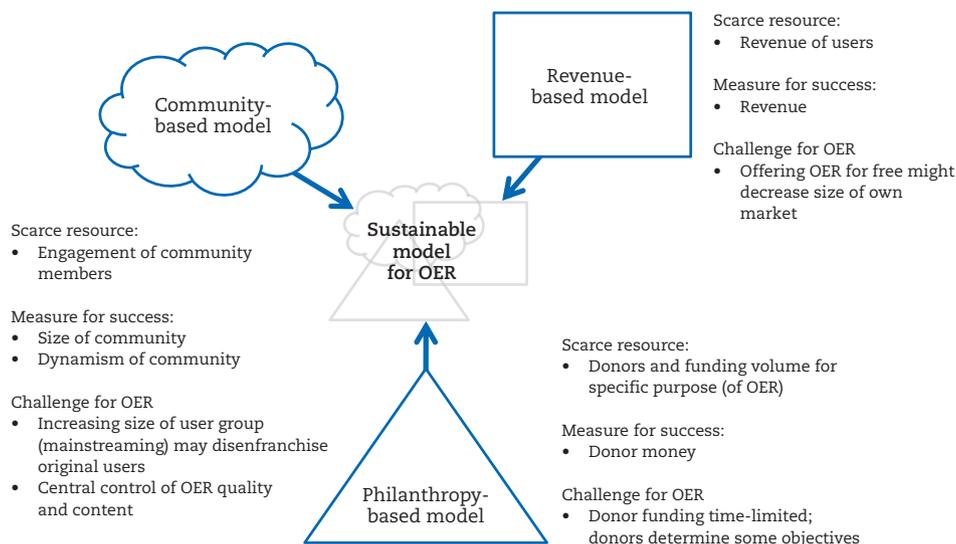
Similarly, OER originating from the enthusiasm of a community of volunteers face the challenge of keeping up the initial momentum over time and ensuring the maintenance of a certain level of quality. Furthermore, whilst sustainability of the OER initiative may be best achieved through scaling up and reaching out to a broader audience, this may put further strains on the original community of volunteers behind an initiative.

Three conceptual models for cost recovery during the economic lifecycle of OER

OER production and delivery can be implemented by diverse actors who bear the costs of different stages in the OER lifecycle: design, development, maintenance and decline. As explored in Chapter 5, it is useful to distinguish between initial development and production costs, and the costs of maintenance and further development, adaptation or curating. The challenge for OER organisations is to find strategies that allow them to recover these costs systematically and create a sustainable model for OER. These costs can be recovered using financial means or in-kind through the dedication of time and donation of resources.¹

As a special type of social innovation, OER have the option of gaining sustainability through avoiding costs on the basis of donations. In this sense, *community-based models* leverage the engagement of community members to keep the OER viable over an extended period of time.

Models that rely on a financial mechanism for cost recovery can be *revenue-based models* and *philanthropy-based models*. With revenue-based models, sustainability depends on the revenue that the OER ecosystem is capable of generating; and with philanthropy-based models, sustainability depends on the overall donations and grants that an organisation can raise. Figure 10.1 below summarises the differences between the funding models.

Figure 10.1. **Conceptual scheme for the basic models of cost recovery available to OER initiatives**

The community-based model

In the community-based model, OER creation may occur through the initiative of a small group of educators who decide to share their own educational materials. This process will have been planned to varying degrees from the outset. The existence of community-based models for the co-creation of educational materials is widely documented in the literature on the innovative impact and adoption of educational technology (de Langen and Bitter-Rijkema, 2012; de Langen, 2011, 2013). According to the model, a broad community of users (mainly teachers, but also students) creates and maintains the OER, thereby assuming the role of both producer and consumer – also known as a prosumer.

Making it sustainable

The key challenge in a community-based model is to maintain a broad and active community of users and contributors that keep the community alive and the resources up to date. This means that it is important to maintain consensus on the goals and activities of work between the partners in the community. De Langen highlights the importance of partnership within a community, seeing the persistence of a common value-network between the partners as fundamental to the sustainability of OER activities (de Langen, 2013).

OER initiatives in the community-based model may seek to create network effects for users, which is where the value of a product to its users increases with the number of other users of the product (OECD, 2012: 8). This is especially appropriate to OER, where new users can also become new producers. However, aiming to scale up and reach out to new community members may lead to the original community members feeling disenfranchised through their loss of influence and the dissolution of driving social norms shaping the original community (see also Chapter 9 on communities of practice).

Covering the costs of initial development and production

In a community-based model, the financing necessary to cover the initial development and production costs is limited. Each member of the community contributes to the creation of the OER by voluntarily offering his or her time, knowledge and self-produced content. The indirect costs of

participation in the community is additional time spent on this activity of OER development and the opportunity cost of not carrying out other remunerated activities (such as being a paid author of a commercial textbook or learning assessment tool).

Covering the costs of further maintenance and adaptation

In a community setting, maintenance and adaptation costs are usually initially borne by the community itself, if these do not imply substantial additional financial outlays. The costs of subsequent adaptations to an OER by other communities can be regarded as new development costs incurred by a new community. This gives rise to cascade effects where each community potentially dedicates a relatively short amount of time and minimum resources to adapting an OER to the local context and keeping it up to date (e.g. this is the concept of the Book Sprints mentioned in Chapters 5 and 6).

Measures of success

Within a community setting, economic sustainability is inextricably related to both the size and degree of activity in the community, both of which can be taken as measures for success. With a community-based OER, the interaction between users and producers leads to positive network effects, which makes the product or service, but also the network, more useful and valuable – the larger and more dynamic, the better.

The dynamism and commitment of a community is very important for economic sustainability, as the nature of OER requires a certain degree of active participation in adopting, adapting and keeping the resource up to date and context-relevant. This degree of activity can be assessed either from a horizontal perspective, which specifically focuses on the degree of activity within the existing community of users; or from a cascade perspective, which focuses on subsequent adaptations of the OER by different communities than the original (Wiley, 2007). With the cascade perspective, the economic sustainability of the OER depends mostly on the extent and breadth of its usage. As illustrated in Chapter 9, this type of evolution is very difficult to track and it is therefore difficult to assess its economic sustainability.

The revenue-based model

The revenue-based model can be found where resource creation is the result of an established organisation's clear strategy. This model can represent a challenge to OER ideals as it implies costs associated to the use of OER – and OER are often defined as free to use and reuse, not simply free to access. To keep the use of the OER itself free, revenue must be generated from additional features or services that can be combined with the OER (e.g. counselling, learning management systems or even certification).

One alternative is for revenue to be generated indirectly through advertising on the platform offering the free OER. Increasingly, however, the “freemium” model is being used, where one set of users gets free access to use materials, whilst another pays for certain additional services tagged onto the main services or products (Dholakia, 2006, Froberg, 2009).

Making it sustainable

In the revenue-based model, organisations attempt to generate sufficient revenue in one area to enable them to cover (cross-subsidise) the costs of providing the OER. This means that the other products or services they are providing must be of high value to the consumer and sufficiently different to the free OER so as to avoid diminishing the organisation's core business through its free OER offering. This is commonly done by offering something of higher value to the user than the free offering (e.g. more support or chance to combine open resources with assessment tools). Over time this difference must be maintained.

The use of advertising for OER is a less common way of raising revenue, as there is a high risk of disenfranchising users by showing them adverts considered to be of low relevance. Advertisers may initially be attracted to OER platforms due to high user numbers, but the click-through-rate may be more decisive for the sustainability of advertising revenue.

Covering the costs of initial development and production

Recovery of initial production and maintenance costs can be achieved through a combination of financial flows. Initial development and production costs of OER for a new venture could be covered by seed-funding or venture capital on the assumption of future revenue. For established organisations, equity may come from internal cross-subsidies.

Covering the costs of further maintenance and adaptation

The revenue-based model is usually focused on sustainability over time, since the high demand for OER is being used to drive the revenue in other parts of the business. This means that the costs of maintenance and adaptation are more likely to be secured than in the other two models of community-based and philanthropy-based revenue. At the same time, this link is only as strong as the connection between the provision of OER and the share of original users who then move to the premium service or who follow links from the OER platform to the advertisers. If there is enough of this activity, there will be a high incentive for the OER organisation to keep the OER up to date.

Measures of success

The main metric for success is the amount of revenue generated, either through the sale of premium features, or through the sale of advertising space within the content or platform. These metrics cannot be disentangled from the dynamic of scale.

In a freemium model, the amount of revenue generated by the premium feature depends on the percentage of people willing to pay for it. In the advertising model, the amount of money that advertisers will be willing to pay to have their commercial embedded in the OER or shown on the OER platform will depend on the projected usage or viewing figures, and the click-through-rate to their adverts. An indirect measure of success, therefore, is increasing or at least maintaining scale.

The philanthropy-based model

This model is reliant on sufficient philanthropic organisations deciding to support OER and offer grants or donations to projects or organisations that fulfil their funding criteria.

There are a number of leading philanthropic organisations that have funded OER initiatives. These include the William and Flora Hewlett Foundation, the Shuttleworth Foundation, the Bill and Melinda Gates Foundation and the Open Society Institute. Governments have also provided seed or institutional funding for certain OER initiatives.

Making it sustainable

As donations for OER are often provided for a certain period of time, the key sustainability challenge for OER organisations in the philanthropy model is to secure a continuous and sufficient stream of donations. In addition, the acceptance of donations or funding by an organisation may imply a commitment to focus on the specific interests of the philanthropic programme of the donor. In this way, philanthropic support is similar to the support of governments (see below), but the focus of the support may be more specific, such as using OER to improve knowledge about specific diseases in specific regions of the world.

Covering the costs of initial development and production

Where a philanthropic organisation provides special funding as part of its programme for OER, this will also cover the initial development and production costs, and perhaps include infrastructural support. Where an organisation uses philanthropic support to fund ongoing OER activities, the initial costs may be covered by the organisation as a precondition for such support.

Covering the costs of further maintenance and adaptation

Organisations may combine different strategies to cover their operating costs and specifically target potential donors. For example, they may seek specific grants from non-profit foundations, but also systematically approach corporations and reach out to their corporate social responsibility strategies. Additionally, they may seek funding through crowd-funding campaigns, where individual users are invited to contribute to this form of collective support.

Measures of success

In a philanthropy-based model, the long-term sustainability of OER operations is achieved by systematically raising donations from a broad range of sources. While the critical metric for success is the amount of collected donors' money, it is also the level of coherence between the objectives of an OER's impact and the individual donor organisation's goals.

A large-scale operation particularly allows organisations to reach a critical mass for crowd-funding campaigns and, most importantly, is likely to facilitate an increase in the diversity of funding sources and therefore decrease the risks of sudden stops in donations.

Institutional model as a hybrid model

When OER are offered in the framework of the existing educational offering of an established institution, there may be both revenue and philanthropy-based models in use. Such a hybrid model can be termed an institutional (sometimes called mission-based) model. A higher education institution, for example, may want to expand its reach beyond its physical boundaries and benefit from the marketing effect of OER. This additional offering is expected to attract more revenue-paying students and/or additional funding in the form of donations. As a result, the key metrics for measuring the OER's success in terms of sustainability are both income revenue and the attainment of philanthropic financial support.

Another hybrid model is the conversion model, which has a revenue focus. The aim of this model is to move a segment of users away from the free offering to an existing paying service within the institution. In this sense, it is similar to the freemium model. However, the interaction with the free offering may be much more superficial, with the free element simply being used as a marketing vehicle for the main paying service – this is sometimes called the “showcase” argument (OECD, 2007).

An institution may also use its free offering to access philanthropic financial support that would otherwise not be available.

The role of government

The rationale for public intervention

Governments may get involved with the provision of OER materials in order to secure broad access to high-quality educational resources for all of its citizens. Governments are most likely to intervene in existing provision in order to help initiatives become sustainable over time. Such an

intervention will be determined by the government's assessment of the effectiveness and value-for-money of OER, especially in comparison to existing proprietary offers.² Six specific educational challenges governments may consider as reasons for supporting OER are highlighted in Chapter 1.

Covering the costs of initial development and production

As shown in the analysis of the government surveys and the discussion of specific policy options in Chapter 11, government support may be direct (supporting production) or indirect (supporting use). This means that it may provide funding and training to kick start community-driven models, or seed-funding for revenue-driven models. Indirectly, it could also, for instance, change tax regulations to make giving donations more attractive for private enterprises.

Covering the costs of further maintenance and adaptation

Unless it directly runs an OER development programme, government often reduces its involvement after providing seed-funding for an initiative. It may, however, intervene by supporting OER organisations in subsequent stages, or by providing technical assistance available to all OER initiatives. Government could use its influence to promote the creation, adaptation and use of OER, for example, through supporting teacher training in the use and adaptation of OER (see Chapter 11). In addition, whenever OER are used as a replacement for traditional forms of educational materials (e.g. textbooks) and public procurement mechanisms are in place, government may take responsibility for ensuring the maintenance and adaptation of materials over time.

Measures of success

With overall responsibility for the efficient and effective operation of education, governments will be focused on the impact of OER practice, rather than the sustainability of individual operations. The frequency and quality of creation and use of OER will be the criteria for measuring the success of its operations. It may frequently review these in order to ensure the sustainability of OER over time.

Sustainability in practice

The cases below serve as useful examples from the field. They have been classified according to their key funding model, although, as the descriptions show, most are reliant on various sources of cost recovery.

Community-based models

- Sésamath was founded in 2001 as an association of mathematics teachers with the goal of sharing materials and knowledge about mathematics through the Internet.³ It has evolved into an online platform covering a wide array of educational materials including textbooks, exercises and learning platforms from primary to upper secondary education. The resources are tailored to individual students, classes and individual teachers. Sésamath acts as a portal where the user can find third party content to supplement his or her own resources. In 2013, Sésamath and its website received approximately 15 million visitors (Sésamath, 2014). Educational content is released under a Creative Commons (CC-BY-SA) license. Sésamath maintains its status as non-profit association that follows the principles of a community-based model to cover its initial development costs.

Individual professors offer their time and effort to create pedagogical resources in mathematics. Successively, the resources are submitted to a discussion forum and undergo several rounds of comments from other professors until they are released on the Internet and

then tested in the classroom. This iterative process generates feedback loops that are then integrated into the resources through different rounds of improvements. The association's operating costs are covered by a mix of instruments that depend on the type of service offered by the association. Sésamath has partnered with a couple of publishers to offer low-cost printed textbooks (Sésablog, 2013), thus leveraging the publishers' commercial force and generating revenue through royalty agreements. The association reports that this mechanism allows the recovery of 90% of Sésamath's costs (ibid.). In addition, the association is entitled to public support from different public constituencies at local, regional and national level. The association also relies on voluntary donations from individuals and institutions.

- The LivreScolaire platform is a collection of 16 digital textbooks for grades 6 to 9 covering subjects such as mathematics, French, history and geography, and English.⁴ Conceived by a group of retired teachers, LivreScolaire leverages a broad network of 1 000 teachers and educators across French secondary education institutions to collectively create and curate the resources. The results of this co-creation process are then released in digital and printed formats. The digital interactive editions are released under a Creative Commons license (CC-BY-NC-SA), preventing the materials from being repurposed for commercial exploitation. The printed editions are, however, released under a traditional copyright regime and sold at market price. Access to the digital edition's full features requires users to register and is validated only when the user is recognised as a teacher working in a French educational institution.

The economic sustainability of the LivreScolaires platform is based on a mixed model of cost recovery. The initial development and production costs are primarily covered by the voluntary contributions of the teaching community and some equity investment (amounts are not publically disclosed). Maintenance and other operating costs are covered by the revenue accrued from the sale of printed materials (not an OER) in line with a freemium model approach.

- Siyavula Education provides openly licensed, collaboratively authored textbooks in mathematics, science and technology for grades 4 to 12 in the South African school system.⁵ The platform includes three textbook series: the Thunderbolt Kids, specifically designed for teaching science and technology for grades from 4 to 6; Curiosity, designed for science in grades 7 to 9; and Everything Maths and Science for grades 10 to 12. These books are based on community production and are supplied for free. The Thunderbolt Kids (nine million copies) and Everything Maths and Science (one million copies) series have been distributed throughout the nine South African provinces with the help of the Department of Basic Education. The Everything Maths and Science series is the result of the alignment of the Free High School Science Textbooks (FHSST) initiative to the national curriculum standard.

In addition to textbooks, Siyavula offers a premium service platform called Intelligent Practice, functioning as both a learning activity and a learning management system. The Intelligent Practice platform, which is revenue-based, had 120 schools sign-up across six provinces in its first year of operation (2013). FHSST was originally created as a non-profit entity with the vision of drawing on volunteers to create one high school textbook for science (ISKME, 2008) and benefitted from the philanthropic aid of the Shuttleworth Foundation in the form of seed money (Horner, 2011). Subsequent revisions of FHSST materials were accumulated and revised by a group of volunteers when the initiative captured the attention of the Department of Basic Education. The initial development costs were thus covered using the principles of the community model and leveraging some seed money.

In addition to the voluntary contributions of the authors, subsequent textbooks modifications, once integrated into Siyavula, were sponsored by private entities and foundations such as Sasol Inzalo in the case of the Thunderbolt Kits series, while government provided logistic

support. The introduction of the Intelligent Practice platform in 2013 generated an additional source of revenue by charging schools for use.

Philanthropy-based models

- Khan Academy is a non-profit organisation that aims to provide a free world-class education for anyone, anywhere through educational videos released under a CC-BY-NC-SA license, now backed up by learning analytics on its own website.⁶ Khan Academy offers more than 6 000 instructional videos and 100 000 practice problems covering the subject areas of maths, biology, physics, chemistry, economics and finance, among others. Khan Academy is now in the process of developing structured learning paths following the example of the already existing Algebra Mission. These predetermined paths are expected to facilitate more effective learning. The platform currently reaches more than 10 million students per month and has 350 000 registered teachers from across the world. The Khan Academy employs approximately 60 full-time and between 40 and 70 part-time employees.

Khan Academy was founded after Salman Khan who, whilst trying to combine his full-time job in the finance industry with his commitment to helping his cousins in India with mathematics tutoring, decided to place his lessons on YouTube. The organisation was incorporated in 2008 as a not-for-profit enterprise and was initially financed through the founder's savings. Later it received a donation from a private investor and then larger philanthropic grants in 2010 from Google (USD 2 million) and the Bill and Melinda Gates Foundation (USD 1.5 million), which facilitated setting up a functioning organisation. The translation and adaptation of Khan Academy's content into Spanish was funded by a large grant of the Carlos Slim Foundation in 2013 (Dolan, 2013). Khan Academy relies on a group of donors to sustain its operation costs including corporate partners such as Oracle and the Bank of America. Khan Academy's strategy could be regarded as a model completely relying on philanthropy, where a top-down approach facilitates the control of the content's quality and the creation of a well-defined product. The commitment to open licensing secures the organisation's access to philanthropic donations.

- The PhET Colorado Builders platform provides free, interactive, research-based simulations of physical phenomena for elementary through university students.⁷ The simulations are provided as individual exploratory environments rather than courses, so each computer simulation can be integrated into various classroom activities. All PhET simulations are freely available from the PhET website and are easy to use and incorporate into the classroom under a CC-BY licence. According to the latest figures, the 125 mathematics and science simulations have been used 60 million times and translated into 22 languages (Ferrante, 2012). PhET simulations were initially created in 2002 by Physics Nobel Prize winner Carl Wieman, who used money from a grant from the National Science Foundation, the Kavli Foundation, and a portion of his Nobel Prize money to set up the initiative. These philanthropic donations addressed most of the initial development costs. Subsequent rounds of donations covered the operating costs. These were initiated by numerous philanthropic foundations including the William and Flora Hewlett Foundation and the O'Donnell Foundation, in addition to the King Saud University, and high net-worth individuals. Recurring donations from private donors or companies are systematically encouraged. In addition, PhET has launched crowd-funding campaigns targeting specific initiatives. These include, for example, a campaign to raise USD 500 000 to create guidelines for teachers on how to best integrate the simulation into their learning activities.
- OER Commons is a free teaching and learning network, bringing together over 50 000 educational resources available for anyone to use.⁸ The resources are particularly tailored for teachers in upper secondary schooling and cover subjects such as arts, business, humanities, mathematics and statistics, science and technology, and social sciences. The

content is mostly released under a CC-BY-NC-SA license, however, in some instances, materials adopt traditional copyright regimes. OER Commons was launched in 2007 by the Institute for the Study of Knowledge Management in Education (ISKME). The initial development costs were covered by donations from the Hewlett Foundation and the Ford Foundation to partially cover some of the operating costs. In addition, ISKME offers premium training services through its Teachers as Makers Academy in line with a revenue-based freemium approach to the delivery of open content.

Institutional models

- MIT OpenCourseWare (MIT OCW) is an initiative of the Massachusetts Institute of Technology (MIT) that aims to put all of the educational materials from its undergraduate- and graduate-level courses on line, under a CC-BY-NC-SA.⁹ Launched in 2002, this initiative is commonly seen as the first example of OER as it is currently known. As of March 2014, the website contained 2 206 courses run by 601 (i.e. 66% of) MIT tenure track faculty members covering the whole span of MIT courses.

The initial development costs were covered by donations from the William and Flora Hewlett Foundation and the Andrew W. Mellon Foundation, with additional institutional funding from MIT, which considered MIT OCW a strategic initiative to enhance MIT's offering through technology (Abelson, 2008). The development costs covered the translation of all courses into a digital format. MIT OCW's annual operating costs amount to USD 4 million of which MIT continues to pay half. The remaining half is covered by corporate sponsors and individual donations. In addition, OCW receives commission from online retailer, Amazon, for referring visitors to its online bookshop (Attwood, 2009). MIT OCW's approach to sustainability is best described as an integrative model, where the organisation employs a variety of methods such as donations and advertising to sustain its operations. At the same time MIT OCW is an integral part of MIT's educational delivery strategy and in line with an institutional model, whereby OER generate indirect marketing revenues by attracting additional students to the institution.

- OpenLearn is an educational website from the United Kingdom's Open University.¹⁰ It was launched by the university in October 2006 to provide free access to its educational materials released under a CC-BY-NC-SA license. Its virtual learning environment offers over 400 structured study units to students, supported by a number of learning and communication tools via its LearningSpace area. Each year, course extracts and informal learning materials are visited by over 5 million people (Perryman, Law and Law, 2013), and since its launch the website has received 27 million visits. The initial development costs were covered by donations from the William and Flora Hewlett Foundation. Once the grant budget was spent, OpenLearn was formally integrated into the activities and strategic priorities of the Open University as part of its commitment to widening participation. It is an example of an institutional model as its operating costs are mainly covered by the Open University's budget. In line with the expected outcome of the showcase argument for institutional support of OER, OpenLearn was reported to have generated 7 700 sign ups to fee-paying Open University places in 2009 (Perryman, Law and Law, 2013).
- OpenStax College, part of the OpenStax platform, is a non-profit organisation committed to improving student access to quality learning materials. The organisation started as a spin-off from Rice University.¹¹ The initiative currently covers college degree textbook materials in subjects such as biology, physics, sociology, statistics and economics. The content is released under a Creative Commons CC-BY license, which allows users to redistribute, revise, remix and repurpose the content. OpenStax College is now planning to expand its textbook offering to upper secondary education.

OpenStax (formerly Connexions) was launched in 1999 as an online platform for the free exchange of learning materials using a community-based model approach. The organisation benefitted from the contribution of several philanthropic organisations, including the William and Flora Hewlett Foundation, to cover its initial development costs. Rice University was the initiative's institutional sponsor. Successive development costs, including the rebranding into OpenStax, were also mainly funded by donations. Since 2012, OpenStax has adopted a mix of revenue models to cover its operating costs. These include the payment of a market price for the supply of printed copies and a premium interactive e-book version. In addition, when a user proceeds to downloading the selected content, he or she is invited to donate a sum to contribute to the initiative sustainability. In 2014 OpenStax entered into a partnership with the OER-focused learning facilitators Lumen Learning to provide faculty training and support services to the institutions adopting OpenStax textbooks. These are likely to be offered for a fee (Boyd, 2014).

Revenue-based models

- Flooved is an online education platform that provides free education to a global audience by providing online lecture notes, handouts, and study guides that cover undergraduate courses in subjects such as mathematics and physics.¹² Founded in 2012 by two entrepreneurs, the name is inspired by the Latin for “stream of books”. Flooved has students registered from over 40 countries, across all continents, and works with the world's leading universities. According to the latest figures, the platform has reached 38 000 students and 800 contributing professors, and the total number of available resources is 1 600. The platform asks professors to submit their lecture notes and other materials and encourages the adoption of Creative Commons. Once the content is updated, the platform takes care of curating. Professors are entitled to ask for the deletion of their content if they deem it appropriate. Approximately a third of the content comes from other OER platforms.

The original vision behind Flooved was to become like the music-streaming service Spotify in the field of educational materials and sell subscriptions for a flat fee of GBP 20 a month, or GBP 200 for the year (Page, 2012). In June 2013, the company decided to switch business model and embraced an open access approach due to the difficulties encountered in negotiating licensing agreements with some established publishers (Fitzgerald, 2013). The initial development costs were covered by donations from venture capitalists, who have contributed approximately GBP 500 000 (ibid.) to the start-up launch. While the idea of following a Spotify-like subscription model was subsequently abandoned by the founders, the issue of generating revenue to cover operating costs is still in discussion. As a for-profit company, Flooved follows a model where revenue will come from a mix of freemium and advertising. As stated in the platform's Q&A section: “We will make our money through limited advertising (approved advertisers only), student recruitment (with the student's consent) and eventually premium features such as the ability to set up study groups and integrate with universities virtual learning environments”.

- The case of Flatworld Knowledge illustrates how the quest for sustainability may lead the original organisation to abandon OER as a way of delivering content.¹³ Flatworld Knowledge started in 2007 when the founder sought to create a series of peer-reviewed open textbooks for college available on the company's online platform. The initial development costs were covered by private equity investors, who subsequently intervened to finance further developments and the expansion of the product offering. Among the investors who further supported the initiative, Bertlesmann and Random House publishing, together with a venture capital firm, provided USD 15 million in total (Purkiss, 2011).

Flatworld Knowledge envisaged a revenue-based freemium model to recover its operating costs. The company offered a basic online edition of its textbooks for free and charged market prices for hard copies: approximately USD 30 (Joyner, 2013). In 2013 the company decided to abandon a model of free provision and open licenses and became a low-cost publisher. According to one of the funders, this choice was dictated by equity and sustainability reasons as the company saw a decline in the number of students purchasing premium features (Howard, 2012).

Transitioning towards mixed models

The cases presented in the previous section highlight how OER organisations seek alternative ways to cover their operating costs and, in some instances (e.g. Flooved), to generate profits for their stakeholders. While some of these organisations retain pure donation/sponsorship models (e.g. the Khan Academy and the PhET Colorado Builders), others have undergone some process of transition across models to guarantee more stable revenue sources.

This transition is evident in the case of the FHSST initiative in South Africa, which was started as a community of volunteer teachers who decided to work together and develop free textbooks in mathematics and science. The result of this collaborative effort was the creation of two textbook series called “Everything Math” and “Everything Science”, both freely released in the public domain. However, the positive reaction of the South African Department of Basic Education, among other factors, led to the establishment of Siyavula as an OER publisher. The founder explains their mission as follows (Horner, 2011):

“...We will add value to the work of our volunteers by providing the structure to ensure that their contributions add up to a coherent whole and by dealing with all the bureaucracy that needs to be navigated to ensure that their contributions have the maximum possible impact. Orders for books via the approved list would then carry a mark-up which would go to Siyavula’s running expenses but would still pass on the massive savings to the schools”.

In the case of Siyavula, the route to sustainability, therefore, involves applying a mark-up to the sale of print copies and a fee for training teachers on how to use the resources (*ibid.*). In 2013, Siyavula launched a premium service, the Intelligent Practice platform, thereby embracing a freemium model.

In France, the teacher non-profit association, Sésamath, had a similar transition process. A community-based approach through a community of committed teachers was used to cover the initial development costs. This was then complemented with the addition of a revenue stream from the sale of printed copies of materials. In addition, an institutional fee was requested to cover the operating costs of the mathematics virtual laboratories. Flatworld started as an OER initiative, but has since transformed into a low-cost publisher solely reliant on sales revenues.¹⁴

Some OER initiatives have relied on a transition process to both institutional and donation support. In these cases, although the economic sustainability model is based on donations, the scale of the initiative encourages the voluntary financial participation of corporate sponsors and single users. In the case of PhET Colorado Builders, MIT OCW and Khan Academy, these donations could be regarded as forms of indirect payment. With individual sponsorship, some users pay the content’s price for the whole user community, whereas corporate sponsorship is usually about the sponsor displaying corporate social responsibility and benefiting from indirect marketing through being associated with a positive product or service.

Transition in other industries

The advent of the Internet and the digital economy (DeLong and Summers, 2001) has led several industries to offer their products (or services) in digital formats for free or for a nominal price

(Anderson, 2009). This development has stimulated an overall review of business models and value proposition in industries such as software, telecommunications, music and gaming, while also prompting a high degree of dynamism among incumbent and newly entrant firms. The challenge of offering products and services for free, while remaining economically sustainable through innovative business models, is therefore not only specific to OER, and is already causing reactions in other industries. It is therefore useful to briefly explore similar experiences.

OER literature has often drawn a parallel between OER and the open source movement for software creation as both are based on the idea of a community of engaged individuals who collaborate closely to create and constantly improve their artefacts for reasons that go beyond financial rewards (Jacobs, 2014). Lerner and Tirole have argued that in the open source movement, these individuals have tended to be sophisticated and pragmatic (Lerner and Tirole, 2003):

“the greatest diffusion of open source projects appears to be in settings where the end users are sophisticated, such as the Apache server installed by systems administrators. In these cases, users are apparently more willing to tolerate the lack of detailed documentation or easy-to-understand user interfaces in exchange for the cost savings and the possibility of modifying the source code themselves.”

One reaction to this low user-friendliness, according to Lerner and Tirole (2003), is to mix open source and proprietary provisions:

“The recent popularity of more liberal licenses and the concomitant decline of the GNU license are related to the rise in the ‘pragmatists’ influence. These individuals believe that allowing proprietary code and for-profit activities in segments that would otherwise be poorly served by the open source community will provide the movement with its best chance for success.”

As recently argued by Jacobs in a blog post on OER sustainability, the key success factors for open source software’s widespread diffusion were the support of private enterprises, backed by a strong community of volunteers (Jacobs, 2014). According to Jacobs, 80% of financial support to the open source operating system Linux, for example, comes today from companies like Google and Samsung (see Benkler, 2006).

There has also been the rise of the “collaborative economy” (Stokes, et al., 2014), where individuals decide to exchange goods they own, typically a car or an apartment, for a rental price. The practice of subletting accommodation for short periods of time is long-standing, however, the Internet has facilitated it significantly, particularly by allowing the exchange of information on places, such as recommendations on quality from other users. Websites such as Couch Surfing have taken a non-monetary approach, where people belonging to a community freely host other members with the expectation they will be hosted in the future. This community model has reached the mainstream recently with Airbnb, where users pay a below-market price for renting their accommodation and other users’ recommendations provide a certain justification for the given price (Botsman, 2014). The introduction of a price in this case both enlarged the market (with price as a signalling mechanism), and enabled the provider (Airbnb) to offer additional services, such as insurance, to facilitate the relationship between buyer and seller, thereby (ultimately) mainstreaming the practice of sharing accommodation.

Relevance for OER

The examples of open source software and the accommodation industry illustrate some of the possible options for OER sustainability and mainstreaming. The elements highlighted by Jacobs as key success factors in the case of open source software (community and commercial donations) are part of the OER ecosystem, however their impact on OER economic sustainability has yet to

be fully realised. According to Wiley, for example, the likelihood of commercial support for OER by established publishers is very low (Wiley, 2014):

“Publishers will never put OER at the core of their offerings, because open licensing – guaranteed non-exclusivity – is the antithesis of their entire industrial model. Some playing around in the supplemental market is the closest major publishers will ever come to engaging with OER.”

Jacobs argues that the breadth and depth of the OER community looks pale in comparison with the community of programmers behind the open source movement. According to Jacobs, most of the teachers are not also authors or editors, but simply end-users who adopt already packaged materials for their regular classroom instruction. As discussed in Chapters 6 and 9, the sustainability of OER is dependent on raising quality and involving more users in the praxis of development and use of OER.

Towards an integrated framework for OER sustainability

The conceptual models presented at the beginning of this chapter have helped to illustrate the basic options for OER economic sustainability. However, the evidence collected through the cases above has pointed towards the need to consider the OER economic sustainability challenge from an integrated perspective. Within an integrated framework, the elements of community, philanthropy, revenue and government converge.

The resulting OER ecosystem foresees the co-existence of community- and revenue-based mechanisms (as in the Lelivrescolaire and Siyavula initiatives) that jointly ensure the initiatives' economic sustainability. Similarly, government plays a role in either facilitating the OER's diffusion (Siyavula Education) or in sustaining the initiatives directly (Sésamath) or indirectly (OpenLearn). In the case of Sésamath all the elements of the OER ecosystem (community, philanthropy, revenue and government) contribute to its sustainability.

OER and the publishing industry

Both digitalisation and OER come together to drive innovation in the educational publishing industry. A recent report from Nomura Equity Research (Nomura, 2014) on the performance of Pearson publishing house says that the company needs to think about strategies to reduce its exposure to the print market where publishers make most of their revenue (40% in the case of Pearson, 60% for Cengage and approximately 65% for McGraw Hill Education) as its value is expected to decline in the future based on the increased use of OER as a replacement technology.

Established publishers are thus confronted with the Innovator's Dilemma (Christensen, 1997): the inability to cope with innovations that may disrupt the current business models of a company or a business area. This means that in many cases, large established companies refrain from embarking on innovation strategies that may endanger their current products. In essence, their current profit maximisation strategies are overly reliant on the need to satisfy existing customers with improvements on mainstream products and the need to deliver positive cash flows to investors. These factors often prevent established companies from adopting risky disruptive innovations to secure their future business.

Feldstein argues that publishers are beginning to realise that their old business model is broken and closer attention must be paid to how to use OER to stay in business (Feldstein, 2014a). While the transition to the provision and adoption of free digital content appears to be a long and uncertain process, educational materials providers such as Pearson and Macmillan are already envisioning strategies to offset the decline in print revenue and incorporate OER in their product offering.

Pearson's BlueSky project, for example, can be seen part of Pearson's strategy to respond to the OER challenge.¹⁵ Launched in 2012, it stands out as an attempt to blend freely available OER with

Pearson's proprietary books and services. The BlueSky platform enables users to merge both OER and proprietary materials – similar to Lerner and Tirole's argument for the pragmatic approach to open source. Pearson has partnered up with Gooru, an OER repository, to address the issue of OER content's discoverability. Similarly, Macmillan has hired the CEO of an e-book company and allocated a budget of USD 100 million to building innovative businesses within Macmillan, which could ultimately undermine its existing business as a whole (Griffith, 2013).

Some commentators have depicted these moves as a way for publishers to stop educators from switching wholesale to OER content and preserve a little book-related revenue. An OER strategy could then be seen as a move towards an Amazon-like monopolistic experience, where a teacher or learner defaults all their activity to a common provider of both content and their user experience (Cairns, 2012). This concern is also echoed by the OER community, where scepticism exists regarding Pearson's long-term intentions. According to Hill, the OER community fears that the BlueSky platform would redirect educators' attention away from OER back to Pearson's proprietary materials (Hill, 2012). However, this is not certain, and there may be benefits of having such large players in the area, such as with IBM and the open source Linux platform (Benkler, 2006: 58).

Feldstein recently argued that both commercial publishers and OER are "losing the battle" for the textbook market as publishers have an outdated business model, and OER have not yet found a functioning model and lack the appropriate sales and marketing channels (Feldstein, 2014b). A couple of examples, notably the one of Sésamath in France in the previous section, have illustrated how OER and publishers can come together and leverage their respective strengths to successfully approach the market. In this sense, given that educational materials are very seldom offered in non-regulated and competitive markets, governments, publishers and OER providers may want to engage in partnerships for the creation and maintenance of OER and other types of proprietary materials to ensure OER's economic sustainability – thus maintaining an innovative educational materials ecosystem.

Notes

1. A project launched in spring 2015 by Paul Stacey from Creative Commons turns this question around. Its aim is to present an open business model canvas, which poses questions for OER initiatives that can lead them to an appropriate and sustainable business models. See: https://docs.google.com/document/d/16XMIIvy_cz191l6KosgUMFtUK7lTdlzKme3WskwiuSA/edit?usp=sharing (accessed 16.10.2015).
2. Government has a role to play as a central procurer of educational materials, a source of funding for special initiatives, and a central determinist of framework conditions. Although reviewing the role of government in this context, the following chapter does not look in detail at one model, which assumes that OER will reach the mainstream directly; the so-called "substitution model" discussed by Dholakia et al. (Dholakia, King and Baraniuk, 2006; Dholakia, 2006). This model argues that replacing an existing technology means that the cost savings for government, institutions and the public can be utilised for covering the costs of the new technology. This is an important argument. However, it would require large-scale market analyses to back it up. The broad scope of this report, which covers – but does not systematically differentiate between – cases from across the world, different educational sectors and different types of OER, makes this approach unfeasible. Additionally, since much of the analysis in previous sections of the report has shown that OER are used particularly to augment teaching and learning, it remains most appropriate at the present to focus on how OER initiatives sustain the capacity to create, distribute and maintain OER (the latter question often gaining less attention than the former) for use and re-use.
3. <http://www.sesamath.net/>.

4. <http://lelivrescolaire.fr/>.
5. www.siyavula.com/.
6. www.khanacademy.org/.
7. <http://phet.colorado.edu/>.
8. www.oercommons.org/.
9. <http://ocw.mit.edu/index.htm>.
10. www.open.edu/openlearn/.
11. <http://openstaxcollege.org/>.
12. www.flooved.com/.
13. www.flatworldknowledge.com/.
14. Interestingly, while the organisation shifted away from OER, the textbooks kept the original open licensing regime as the Creative Commons license are irrevocable. The materials are currently available in other repositories such as Saylor.org.
15. In 2015 rebranded as “Pearson Collections”, see: <http://www.pearsonhighered.com/collections/>.

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Chapter 11

Public policy interventions to improve teaching and learning through open educational resources (OER)

This chapter identifies that the potential of OER can only be achieved through explicit policy support in the areas of production, use, reuse and adaptation of OER. This requires support in four areas: material support, information and training campaigns as well as changes to some regulations governing teaching and learning practices. The findings are based on background research before and discussions at the CERI/OECD Policy Seminar entitled “OER support through policy – exchange and discussion of good practices”, held in January 2015.

Main policy messages

Policy support for OER is essential. OER can help policy makers address key challenges faced by their education systems. However, policy support is necessary if OER are to develop their full potential for improving teaching and learning. Integrating OER into everyday practices in the educational field requires both supporting decentralised initiatives of engaged teachers and learners, and central changes to the framework conditions (regulations, quality assurance mechanisms, etc.) of teaching and learning. Reviewing international policies and practices of governments from across the world highlights specific policy options for ensuring the production and effective use, reuse and adaptation of OER. Policy support is recommended in the following four areas:

- Help establish repositories for OER and support the provision of open licence materials.
- Help establish communities of practices within the teaching body to encourage production and use of OER, and support the establishment of new teaching practices.
- Change the framework conditions of formal educational settings, by modifying rules, promoting new tools and reassigning the division of labour (e.g. for production and quality assurance).
- Promote the provision of more research on how OER are produced and used in certain contexts and by certain actors in the education system (teachers, learners and prosumers).

Policy framework

Three key potentials of OER have been highlighted in this report (see Chapter 1):

- Digital technologies have become ubiquitous in daily life and OER can harness the new possibility afforded by digital technology to address common educational challenges.
- OER are a catalyst for social innovation, which can facilitate changed forms of interaction between teachers, learners and knowledge.
- OER have an extended lifecycle beyond their original design and purpose. The process of distribution, adaptation and iteration can improve access to high-quality, context-appropriate educational materials for all.

To achieve these three key potentials, specific policy approaches and policy support are required (see Chapter 2):

Policy approach:

- OER can only reach their potential in the mainstream if they are clearly framed within the policy challenges for today's education systems. An appropriate policy framework starts out from key educational challenges and uses OER to help solve them.
- Both initiators of OER activities and their sponsors, which may be government or philanthropy, should build sustainability into their strategic models for OER.

Policy support in specific areas:

- Flexible access to high-quality educational materials is positive for learners, but they will require new support services to fully profit from the use of OER. This leads to a new role for teachers in the learning situation.
- Teachers and instructors require support as they develop new skills and overcome motivational and organisational barriers to sharing or collaborating through OER.

- OER provide flexibility and adaptability, which enable educational resources to change over time and in different contexts. However, this flexibility presents a challenge for many existing quality assurance procedures, which assume a hierarchical structure of quality control and relatively static educational materials. New systems of quality assurance are necessary.
- There are gaps in research on use and adaptation of OER. More research is necessary.

The results of the CERI/OECD government survey carried out as part of the report (see Chapter 11) indicate a prevalence of policy support for OER among the countries across the world: out of 33 countries, 25 reported having a government policy to support OER production and use – see Table 11.1. It is also notable that those countries with no national policies still have OER-related activities in their countries.

Table 11.1. **Countries reporting to have government policies to support OER production and use**

Government policy?	Countries
Yes	Austria, Belgium (Flemish community), Brazil, Canada*, China, Czech Republic, Denmark, Estonia, Germany*, Finland, France, Indonesia, Israel, Iceland, Italy, Korea, Netherlands, Norway, Poland, Portugal, Slovenia, Spain, Turkey, United Kingdom, United States
No	Australia, Japan, Luxembourg, Latvia, New Zealand, Slovakia, Sweden, Switzerland

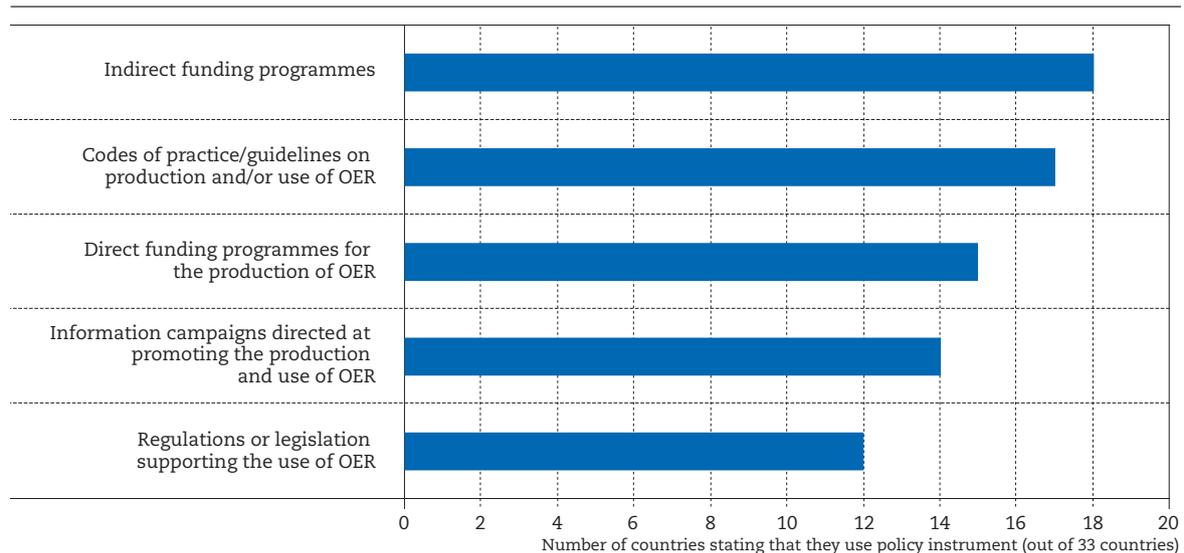
* In the cases of Germany and Canada there are only initiatives on Länder/province level at this time.

Source: CERI/OECD government survey, Annex A11.

What policy can do

According to Bemelmans-Videc, Rist and Vedung, there are three general types of public policy instrument that governments can select from to enact their policies. These are: regulations, economic means and information (Bemelmans-Videc, Rist and Vedung, 1998: 33). Findings from the CERI/OECD government survey show that indirect funding programmes are the most frequently used instrument to support OER production and use, followed by codes of practice/guidelines and direct funding programmes – see Figure 11.1.

Figure 11.1. **Types of policy interventions to support OER production and use**

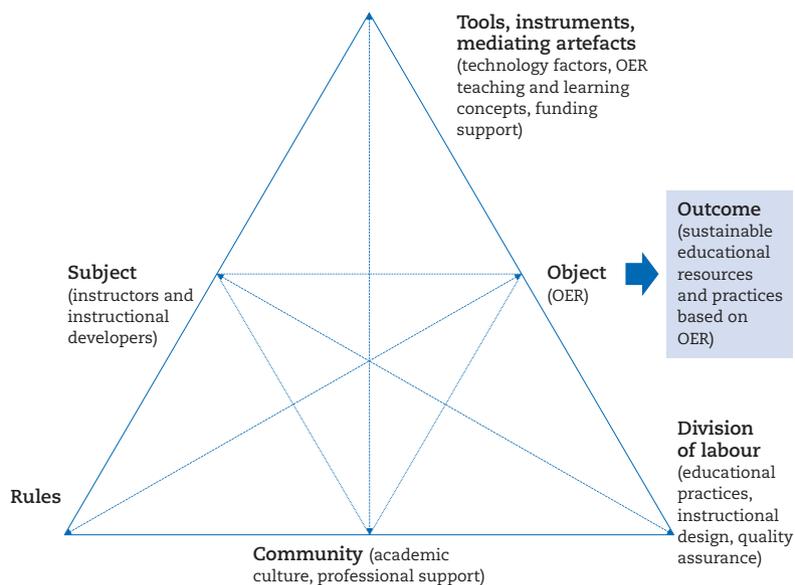


Source: Authors based on analysis of CERI/OECD government survey, Annex A11.

Eleven out of twenty-five countries reported often combining the promotion of indirect funding programmes with the dissemination of codes of practices and information campaigns.

Engeström’s activity theory can help to understand how governments can apply pressure to encourage the use of OER through direct or indirect policy instruments (Blin and Munro, 2008; Engeström, 2011; McGill et al., 2013; Russell and Schneiderheinze, 2005; van der Westhuizen and Basson, 2011). The activity theory approach assumes that an activity system is made up of the interaction between a subject and an object in order to produce an outcome. This interaction is mediated by a community, and constrained or facilitated by rules, tools and the division of labour – see Figure 11.2. This approach recognises that the introduction or promotion of OER changes the educational setting – something that the “technology-first” approach has traditionally neglected as key to successful reforms in education (Selwyn, 2010).

Figure 11.2. Activity theory approach for OER practices



Source: Adapted from Porter (2013), *Exploring the Practices of Educators Using Open Educational Resources (OER) in the British Columbia Higher Education System*: 141.

An example of the activity theory in relation to OER would be that of educators (subjects) who are used to producing and using commercial textbooks (objects) to support the attainment of learning objectives (outcomes). For this, they use specific tools within a context of rules (e.g. only accredited books), a collective community (e.g. other teachers) and with a certain division of labour (e.g. production of the textbook by a publisher with the support of selected authors).

Changing the object to an OER (e.g. to an open textbook or even alternative educational resources) can lead to disruptions due to the contradictions it causes in the old activity system. For instance, the OER (object) can be more quickly updated (due to new tools), but there is no set system of quality assurance (division of labour and the regulations concerning use may be unclear). Teachers uncomfortable with this new activity system will be reluctant to use the OER or will tend to use the OER as if it were still a proprietary textbook. Policy interventions can help to change this configuration or help teachers and instructors to deal with the challenges of a new system.

The four areas for policy support highlighted at the start of this chapter can be translated into specific policy actions, each related to different points in the activity system:

- **Help establish repositories for OER and support the provision of open licence materials.** This ensures that OER are available and discoverable as new ‘tools’ to support improvements in teaching and learning.

- **Help establish communities of practices within the teaching body** to encourage production and use of OER and support the establishment of new teaching practices. This ensures that the available OER are being used and helps teachers and instructors to adapt to their new role in the learning situation.
- **Change the framework conditions of formal educational settings** by modifying rules, promoting new tools and reassigning the division of labour (e.g. for production and quality assurance). This ensures that the necessary adaptations to the activity system are made in order to fully benefit from the new opportunities and challenges presented by OER.
- **Promote the provision of more research on how OER are produced and used** in certain contexts and by certain actors in the education system (teachers, learners and prosumers). The previous policy actions should be informed by research to evaluate the impact of changes and develop new interventions.

Learning from practice

The remainder of this chapter explores government activity in the four areas of OER policy support.

Help establish repositories and support the provision of open licence materials

Policy can support OER use through mandating or encouraging its production. If there is currently no OER, or not enough, governments may change the funding of educational resources or change the regulations for their production and use. One way of centralising and focusing efforts on the use and sharing of OER is to provide a central repository for openly licensed educational materials or to support efforts to make existing OER more discoverable. In this way, policy interventions change the “mediating artefacts” in the activity system and change rules of OER production and use.

Policy options:

1. **Facilitate the establishment of a central repository for OER or a platform that collects links to OER and stores them in various repositories (i.e. a meta-repository or referatory).** This soft approach to the issue starts from the view that OER already exist and that the most important thing is to establish one location where they can be stored in order for them to be better discovered by others.
2. **Provide direct funding for new educational materials that have the characteristics of OER.** This is the most direct way to ensure OER production.
3. **Review existing educational materials and change their licence in order to make them OER.** This practice may lead to tensions or necessitate new agreements with commercial publishers (see Chapter 10).
4. **Regulate that all publically funded materials should be OER by default.** Alternatively, the regulation could state that new educational resources should be based on existing OER, where possible (“reuse first” principle).

Policy in practice:

The most common practice among governments appears to be setting up a repository for OER. Examples of such repositories can be found in many countries, including Wikiwijs¹ in the Netherlands, Jorum² in the United Kingdom, the National Digital Learning Arena (NDLA)³ in Norway and the Eduthek⁴ in Austria. Wikiwijs and Jorum contain almost exclusively OER content, whereas NDLA and Eduthek contain a mixture of both OER and proprietary materials. This is also a policy decision.

The focus exclusively on OER is about showcasing OER. The goal of Wikiwijs was to mainstream OER by making it available directly in the repository and by referring to other sources. Although proprietary materials could also be included from the beginning, the default setting for search activity is freely available, open licensed materials and all communication focuses on OER. In the United Kingdom, most of the content stems from earlier projects funded through a government programme run by Joint Information Systems Committee (JISC) and the Higher Education Funding Council for England (2009-2012).

Alternatively, the idea behind mixed content (OER and non-OER) is to encourage more dynamism and competition in the production of good quality educational materials, as in the cases of NDLA and Eduthek. The OER work here is an addition to cover areas not covered in the marketplace and is a catalyst for proprietary suppliers to improve their offering. However, it can also be used as the basis for new educational materials (analogue to open source programming), which may then be sold on the open market. Recycling on the market is allowed in Norway, where NDLA is based, but in Austria, where Eduthek is based, OER may not be used in commercial settings (i.e. CC NC).

In many cases, the production of OER is supported directly by policy in order to ensure sufficient stock. For instance, in Spain, the federal government published a public tender of EUR 4 million in 2014 for the creation of OER. The allocation of funding is 60% for the creation of OER for preschool and special needs education, and 40% for secondary education OER materials.⁵ In 2014, British Columbia, Canada, also announced a similar call for tender, with the goal of producing open textbooks.⁶ In Austria, the government recognises that although a great deal of e-content is freely available, it is not also open and extendable in the sense of OER. For that reason, the government has set up an e-learning school cluster project with the aim of developing short digital learning units that can be made available as OER to the members of the cluster project, and then distributed more broadly through the Eduthek platform.

In Norway, the government decided in 2007 that students in upper secondary education should be provided with free educational materials (OECD, 2009: 101).⁷ The Norwegian Ministry of Education and Research allocated EUR 5.5 million to projects related to the development of digital learning resources in upper secondary education.⁸ This funding was also meant to lay the ground for the introduction of free learning resources, which have now been released on the National Digital Learning Arena (NDLA) platform under liberal Creative Commons licences.⁹ Currently, the NDLA uses approximately two-thirds of its funding to procure digital materials on the open market and invests one-third in paying participating teachers' salaries for the development and quality assurance of OER.

Instead of completely developing new educational materials, public policy may take the view that it is more efficient to convert existing educational materials into OER. In 2013, the department for educational technology within the Ministry of Education in Israel issued a tender to have all textbooks with copyright owned by the Ministry transformed into digital format and released under an OER license. This type of activity leads to a change in the division of labour common in the production of educational materials, whereby the publishers usually remain responsible for the quality of the materials and for updating them based on any changes to the curriculum. In the case that the state acquires educational materials as OER, it will have to consider whether it also needs to ensure that the materials remain up to date (see framework conditions below).

The practice of publically supporting the production of new OER and converting existing resources to OER has led to conflicts with commercial publishers. In Norway, publishers complained that the public support of OER has unfairly reduced the size of their market.¹⁰ Similar debates have been had in Poland in the context of its digital school initiative, which aims among other things to replace copyrighted textbooks with OER (Sliwowski and Grodecka, 2013: 31), and in Germany, although here the practice of publically supporting OER has not yet been realised (Dobusch, Heimstädt and Hill, 2014). However, as public money must be spent efficiently and the development of educational materials can be seen as a core part of educational practice itself, such complaints often do little to discourage governments

promoting the use of OER. In the case of Norway, the NDLA actively encourages proprietary content providers to base their content on already existing materials in the NDLA (reuse first).

The procurement of OER may be part of a greater initiative, rather than an exclusive activity. For example, the Trade Adjustment Assistance Community College and Career Training Program (TAACCCT) grant programme in the United States (Department of Labor)¹¹ aims to promote innovative partnerships between community colleges and employers. Since 2010, all three rounds of the TAACCCT programme have required TAACCCT grantees to make all grant-funded curricula and training materials OER by licensing them with a Creative Commons license. As stated in the legislation: “Work that must be licensed under the CC-BY includes both new content created with the grant funds and modifications made to pre-existing, grantee-owned content using grant funds. This license allows subsequent users to copy, distribute, transmit, and adapt the copyrighted work (...).” Similarly, the Ford Foundation, William and Flora Hewlett Foundation and the Bill and Melinda Gates Foundation (among others) now require grant holders to release their works with a Creative Commons licence to allow reuse and adaptation.

Help establish new communities of practices within the teaching body to encourage production and use of OER

Making OER available does not ensure that they are used. Furthermore, OER offer new ways of using learning materials to support learning (see Chapters 3 and 4), which can be a challenge for teachers and instructors. Policy support can help remove obstacles and encourage the use of OER by teachers and instructors. As a review of the Wikiwijs platform in the Netherlands concluded, if policy does not support increased use, OER-related activities are too dependent on the individual motivation of teachers (Schuwer, Kreijns and Vermeulen, 2014). Efforts to establish and support a community of practice around OER are central in this context (see Chapter 9).

Policy options:

1. **Increase importance of OER in teacher training programmes.** This should encompass both initial teacher training and offering specific modules on producing and working with OER as part of ongoing professional teacher training provisions. Courses may be stand-alone or have a general focus on, for instance, student-centred learning, but also include the use of OER as a distinct part.
2. **Provide intensive training to a small number of teachers and instructors on how to get the best out of OER.** Following this training, set up a system that enables this knowledge to cascade into other teachers’ and instructors’ practice. The “trainers” in this case could be given an award or special status in order to encourage them to take part.
3. **Set up a national competency centre.** This centre could offer a central resource of advice and training for teachers/instructors.
4. **Launch an information campaign and/or release guidelines** that encourage teachers and instructors to use OER in their teaching provision and, if necessary, change the regulations in order to allow this to happen.

Policy in practice:

A central question when considering how to support teachers in their use of OER is whether the support should be focused solely on OER or on a more general issue that includes OER as part of didactical tools used by teachers. Policy experiences suggest that if activities are too focused on OER they may not adequately engage teachers.

In the case of the Czech Republic, for instance, supporting the production and use of OER is a by-product of a more general strategy to improve teachers' professional development.¹² The Metodika II initiative (2008-2013) aimed to train teachers to use several forms of didactical methods, to share experiences and to become lifelong learners. The initiative particularly focused on providing systematic support for teachers using digital learning resources (many of which were OER). It also created a central electronic platform for sharing teaching materials and professional experiences.¹³

Similarly, in the case of Poland's digital school initiative (Sliwowski and Grodecka, 2013),¹⁴ a lot of the work centred on improving the mathematics scores of Polish school pupils. Project Maths in Ireland had the same objective. This required new learning materials, which the initiators determined could be best supplied through OER, but still required teacher engagement. As one of the initiators of the Polish case states: "The main teaching aid is a teacher's brain".¹⁵

One method of ensuring change in teaching practices used in Poland and Ireland is to change the examinations (i.e. the envisaged outcomes of their activities). Making examinations more focused on reasoning instead of recall, and on competences instead of discrete knowledge had a positive "wash-back" effect on the motivation of teachers to change their practices.

In Austria and Germany, the new focus on learning competencies instead of discrete knowledge at school is seen as a justification and an enabler for more focus on OER. However, the courses offered to teachers still need to be recognised by them as relevant to their daily work. The Project Maths seminars in Ireland have tried to address this by asking teachers to bring their own problems to the seminar so that they can be dealt with as part of the seminar programme. This helps to bridge the gap between the seminar and daily work.

In the United Kingdom and Washington State in the United States, attempts at cascading acquired knowledge and experience on OER to many people new to the topic plays an important role in bridging the gap between learning about and undertaking new teaching practices. In the case of the United Kingdom's OER programme (2009-2012), one major strand of the funding scheme was dedicated to projects focused on the activity of cascading (Gruszczynska, 2012). It argued that OER production and use could be improved by taking a reflexive pedagogical approach where teachers and instructors review their own activity system.¹⁶ In Washington State, the OER initiative of the Office of Superintendent of Public Instruction provides special grants to schools, which are then expected to operate as role models for other institutions.¹⁷

Wikiwijs in the Netherlands (Wikiwijs program plan 2011-2013, 2011)¹⁸ was conceived as a one-stop-shop for OER materials training and advice. Initially, teacher support was focused on assisting interested teachers, and online courses, developed by the National Institute for Curriculum Development, offered advice on how to develop and use OER. These courses could be used by teachers for self-study or in online groups. In a second stage, the initiators began offering offline courses in schools and colleges to try and reach other teacher groups.

Recognising the need to support education resource developers, who may have little previous knowledge of OER, the Open Professionals Education Network in the United States¹⁹ supports grantees of the TAACCCT programme to meet the programme requirements for developing OER and exchanging experiences. It is operated by Creative Commons and funded by the Bill and Melinda Gates Foundation.

A less direct way of supporting OER development and use (i.e. soft governance) is to launch an information campaign. The survey response from Australia highlighted that the introduction of codes of practice/guidelines and/or information campaigns for OER will be a key policy initiative in the near future. This approach presumes that giving teachers information and the opportunity (through changing regulations and division of labour) to use OER will lead to increased OER practice. This type of approach is often taken with the introduction of Internet platforms for OER, which are often subtitled "for teachers, from teachers". However, the arguments for including teaching

training and the provision of new expertise for teachers and instructors generally conclude that a soft touch is insufficient if OER use is to become a common practice among teachers.

In 2010, the New Zealand government recommended the use and production of open licence works in all areas of public life, including education (New Zealand Government, 2010). However, there has been criticism that this opportunity was not taken up by teachers and schools without additional support.²⁰ It is for this reason that information campaigns and changes to regulations are rarely used alone. As shown by the results of the government survey in Figure 11.1: countries often combine the promotion of funding programmes for the production and use of OER (direct and indirect) with the dissemination of codes of practices and information campaigns.

Change the framework conditions of formal educational settings

Framework conditions affect the activity of teachers and instructors, so changing these by modifying rules, promoting new tools and reassigning the division of labour, may serve to promote the production and use of OER. As well as making new activities possible, these interventions can also encourage and incentivise certain behaviours within the activity system, or modify the activity system as a reaction to new opportunities (e.g. by changing quality assurance or procurement measures).

An important issue concerns the level at which policy initiatives can and should be implemented. The difference between countries and educational sectors is related to the division of regulative and operational responsibilities in an education system. In this sense, public policy formation will be shaped by considerations on what should and can be done on national, state, city and/or institutional levels, and how this presents new opportunities or challenges in connection with higher or lower administrative levels of responsibility. In general, there are two broad styles of policy approach: top-down and bottom-up interventions (Cerna, 2013).

Policy options:

1. **Help bottom-up initiatives reach scale.** This approach has the advantage of being able to benefit from the self-directed motivation of the initiators and their networks (Cerna, 2013: 18-19). One policy consequence of this approach is that initiatives are frequently only supported by public policy and funding for a limited period of time. Therefore, bottom-up initiatives are often not taken to scale and integrated into the main public arena, but are expected to sustain themselves in the medium- to long-term (OECD, 2009: 72).
2. **Push OER practice from top-down.** This approach has the advantage of public policy being able to take into account all the success factors considered necessary for good practice, so it should afford a more systemic approach. It is also particularly appropriate in situations where the practice is considered by many in the field as contentious or of little value. However, this approach has a tendency to neglect the importance of local factors for success (Cerna, 2013: 18-19).
3. **Connect top-down and bottom-up policies.** In recognition of the various aspects of teachers' lives that govern their use of educational materials to improve teaching and learning, as highlighted by the activity theory, a combination of both top-down and bottom-up approaches may be more appropriate – although it is not easy to get it right. This approach has been called the “ecosystem approach” (Figgis et al., 2007).

Policy in practice:

With the assumption that OER is a grass roots innovation and in recognition of the many small OER initiatives across the world, it may seem most appropriate to take the bottom-up approach. In

this context, policy would focus on information and encouragement rather than negative sanctions. Individuals and groups of teachers or instructors can be supported through recognition or funding, or through the alleviation of conditions that restrict the opportunities for experimentation with new education materials. Promotion of this practice is often linked with the expectation that other as yet non-active persons will adopt OER practice once they see what their peers are doing. This was the driving idea behind the OER programme in the United Kingdom (2009-2012), which aimed to support many small projects instead of a few big ones.

A bottom-up approach is taken in New Zealand, which has three major initiatives to support OER. Creative Commons Aotearoa is currently undertaking a campaign to encourage school Boards of Trustees (the governing body for schools in New Zealand) to adopt Creative Commons licensing for works produced by teachers.²¹ Digital New Zealand, led by the National Library of New Zealand, collaborates with 160 partners to provide easy access and discoverability for digital content, some of which is Creative Commons-licensed.²² The Open Education Resources university (OERu)²³ initiative, led by Otago Polytechnic, aims to provide free learning opportunities using courses based entirely on OER, with pathways to formal academic credit recognition.

An absence of specific OER policy does not mean that there is no OER practice. In Japan, which to date has had no national level discussion or initiative to promote OER, some initiatives or projects related to OER have been implemented by universities or institutions such as the Japanese Open Courseware Consortium. A broader practice, which has developed with a minimum of direct government intervention, can be found in Finland. *Avoimet oppimateriaalit ry* (the Finnish Association for Open Educational Resources) was founded in September 2012 by teachers and financially supported through European Social Funds.²⁴ Its main purpose is to increase the recognition and adoption of OER in Finland. In 2013 it organised a weekend-long event (called a hackathon) to create a mathematics book for upper secondary education (*Vapaa matikka*), to be used under Creative Commons license. In October 2014, the association created an e-magazine for sharing peer-assessed OER.

Singularly top-down approaches to supporting OER development are infrequent and depend on the distribution of responsibilities for educational materials and the centralisation of educational practice. This is becoming rare in the school sector and is even rarer in higher education or continuing professional training. In this context, what constitutes the top needs to be defined.

In a federal system, the highest level for many policy activities is the state level, even though the federal level can also have some influence. In Canada, Germany and the United States, the difference between state and federal becomes evident. For instance, Washington State in the United States has a statewide strategy on promoting the use of open textbooks, OER, and the use of standard quality criteria.²⁵ It has teamed up with 11 other federal states with similar programmes to promote and plan the development of OER for primary and secondary schooling in the areas of mathematics and English.²⁶ This interstate initiative purposely does not involve the federal level due to concerns that it may make the initiative too political and detract from the educational goals themselves. In Germany, the federal and state (*Länder*) levels are currently working jointly on a position paper on the place of OER in the German education system. At the same time, a number of states – for instance Berlin and Brandenburg – are already actively supporting the use of OER, for example, through changing the way that educational materials are accredited for use in school lessons.

In the case of Australia, the introduction of codes of practice/guidelines and/or information campaigns for OER are planned as key policy initiatives. The National Copyright Unit is developing a policy proposal that recommends the adoption and implementation of a government OER policy. At present, policy makers are undecided on whether such an OER initiative should initially be pursued on a national basis through the Department of Education, or by a state or territory willing to take the lead.

Top-down strategies can support the use of OER by defining a new way of teaching or a new way of examining, which in turn entails or encourages the use of new educational materials. An example of this is the Common Core curriculum for mathematics and English, which has been widely adopted in the United States' federal states. In the case of Washington State, the school districts are responsible for deciding which educational materials they use. However, the state education agency has been given responsibility for "identifying and developing a library of openly licensed courseware aligned with the common core state standards (...)" and encouraging school districts to adopt these materials.²⁷

Encouraging teachers and instructors to use and adapt OER is central (see Chapters 4 and 9). In the case of the Netherlands, the Wikiwijs platform was considered the foundation around which practice would be built. However, an evaluation of the platform emphasised the importance of policy to support implementation. The evaluation states: "for both school management and teachers, adopting OER is not a natural thing to do" (Schuwer et al., 2014). This leads to the conclusion that interventions beyond bottom-up support and encouragement are necessary.

Policy intervention is about creating an appropriate ecosystem. Even if the current framework conditions do not prohibit the use of OER, they may create tensions that limit the use of OER in practice. One of the problems associated with OER is that the innovative potential is centred on both process and content, and that these two aspects contain a certain contradiction between them, whilst equally overlapping. To illustrate: OER facilitates direct collaboration between teachers in different settings through the development and adaptation of educational materials. Studies suggest that such collaboration will increase the professionalism and improve subject and pedagogical knowledge of teachers in the process (see Chapter 4). This process is made possible by the resulting educational materials being continually adaptable by modification and iteration.

At the same time, there is an expectation that collaboration will lead to an improved quality of the educational materials themselves. If the focus of educational materials and how they are evaluated remains on content (see Chapter 6), this must be evaluated as a discrete process in a formalised structure. This calls for a hierarchical process that defines set criteria and set persons who evaluate the fulfilment of these criteria at a certain point in time. It also requires the educational resource to be fixed and no longer adapted – otherwise it would have to be re-evaluated against the set criteria. Having such procedures makes it easier for the state to recognise the use of OER-based content in school lessons, for instance, and may make it easier for certain teachers and instructors to use the OER as they have confidence in the content. However, with this system the process of continual adaptation by modification and iteration is stopped.

Changing the ecosystem in which the OER are used is, therefore, the only way to alleviate this inherent contradiction, which may otherwise constrain the use of OER by individuals and the unfolding of strong communities of practice. One of the objectives of the Washington State initiative is to move OER from being the "scary choice to the safe choice".²⁸ However, this is not easy. Washington State reviews and evaluates OER materials. This is possible as the OER in this case tend to be for whole course programmes (i.e. have a low-level of granularity). In the case of NDLA in Norway, where the content is of a much smaller granularity in general, review and evaluation have largely been achieved through a two-layered approach to OER production and quality assurance. OER is produced by private companies and "editorial staff", who are teachers receiving a small remuneration for their work. In addition, any user can upload new or remixed materials and the only quality control is other users' comments. In this way, the NDLA mixes a closed-centralised component with an open decentralised component in its quality assurance approach (see Chapter 6). This is the type of balance that policy support must attempt to achieve through packaging reform interventions into one cohesive whole (Bemelmans-Videc, Rist and Vedung, 1998).

Promote the provision of more research on how OER are produced and used

Research informs policy development in two ways: it can be used for campaigns to persuade key actors in the education system to get involved in OER production and use, and it can be used to support policy decisions by providing insights into, and a better understanding of, the activity system around OER.

Policy options:

1. **Require that the impacts of all publically funded OER projects are evaluated.** Sponsor this type of research for initiatives not funded through public grants. Research could be action research by the implementers of the project and/or external evaluative research carried out by third parties.
2. **Foster OER research.** Foster broader research on the practices made possible through OER and their contribution to improving teaching and learning.

Policy in practice:

Although much of the existing research has focused on investigating individual OER projects or initiatives, broader research on OER is also required. Over the past few years, the Open University's OER Research Hub²⁹ has established itself as a facilitator and supporter of research initiatives across the world. In their recent report, the OER Research Hub concluded that not enough research on OER is being carried out, and that it is often based on small-scale initiatives of persons involved in OER project themselves (de los Arcos et al., 2014).

However, broader research efforts do exist. In the United States a large-scale study of the use of Khan Academy resources in schools across the country was carried out by the Stanford Research Institute (SRI) in 2014 (Murphy et al., 2014) with funding from the Bill and Melinda Gates Foundation. In the academic year 2015/16, a large-scale evaluation of the effectiveness of Khan Academy's resources in improving community college students' algebra achievement will be carried out by WestEd, which is funded by the US Department of Education.³⁰ Such studies are important, although they tend to have a narrow focus of OER as a substitute for existing educational materials.³¹

Research is useful for advocacy of OER. However, many studies currently focus on contrasting OER with more traditional educational resources, such as textbooks. There remains little research on how OER are used, adapted and reused in various educational settings to create new types of learning opportunities (see Chapter 9). In the United Kingdom's OER programme (2009-2012) each funded project was required to undertake an impact study. On the basis of these studies, a meta-study was carried out on the impact of all OER-related projects during the funding period (McGill et al., 2013). This led to an analysis of communities of practice around OER and how to support them (Littlejohn et al., 2014). This programme was not continued and its legacy was left to the communities of practice, which were cited in the research as being too frail (in many cases) to be sustainable.

Packaging policy interventions for educational improvement through OER

The participants of the CERIOECD policy seminar emphasised that OER can only be one element in a country's educational strategy, and that it is most likely to play a key role when it can be attached to a larger framework of educational reform – this is referred to as “packaging” (Bemelmans-Vidéc, Rist and Vedung, 1998). In the countries represented at the seminar, policies to support OER were embedded in larger educational reforms, frequently implementing more student-focused learning in the areas of science, technology, engineering and mathematics (STEM).

The drive for governments, therefore, is not necessarily to support OER on its own, but to support good quality teaching and learning through the use of OER. In other words, the focus of governments is

more on what educational systems need and the role OER can play in achieving this – and less on what policy support OER might need. This change of perspective is an important step towards mainstreaming OER. Explicit policy support (as framed by the activity system) that integrates OER into the common discourse and everyday practices of teachers and learners in the education field makes it more likely that a high proportion of teachers and learners will fully use OER to their greatest potential.

Notes

1. www.wikiwijsleermiddelenplein.nl/.
2. www.jorum.ac.uk/.
3. www.NDLA.no.
4. www.schule.at.
5. www.boe.es/boe/dias/2014/07/10/pdfs/BOE-A-2014-7305.pdf.
6. www.newsroom.gov.bc.ca/2014/05/free-online-textbooks-developed-for-skills-training.html.
7. www.regjeringen.no/nb/aktuelt/free-and-open-learning-and-research-in-n/id475303/.
8. www.regjeringen.no/nb/dokumenter/digitale-laremidler-i-videregaende-oppla/id91754/.
9. www.NDLA.no.
10. Discussed at annual meeting of the Federation of European Publishers, Krakow, 19 September 2014. The meeting was attended by Michele Rimini, OECD.
11. www.doleta.gov/taaccct/.
12. www.msmt.cz/file/3081_1_1/.
13. The repository for OER can be found at: <http://rvp.cz>.
14. <http://cyfrowaszkola.men.gov.pl/>.
15. Source: presentation from Zbigniew Marciniak (Polish Ministry of Science and Higher Education) at the CERI/OECD Policy Seminar.
16. <http://cascadeoer2.pbworks.com/w/page/31686928/Cascade%20tools%3A%20Existing%20resources%20to%20support%20OER%20release>.
17. <http://digitalllearning.k12.wa.us/oer/grants.php>.
18. www.wikiwijsleermiddelenplein.nl/.
19. <https://open4us.org/>.
20. <http://creativecommons.org.nz/2014/06/taupaki-school/>.
21. <http://creativecommons.org.nz/2014/06/taupaki-school/>.
22. www.digitalnz.org/about.
23. <http://oeru.org/>.
24. <http://avoimetoppimateriaalit.fi/in-english/>.
25. <http://digitalllearning.k12.wa.us/oer/>.
26. <http://k12oercollaborative.org/>.
27. <http://apps.leg.wa.gov/rcw/default.aspx?cite=28A.300.803>.

28. Source: presentation from Karl Nelson (Director of Digital Learning, Washington Office of Superintendent of Public Instruction) at the CERI/OECD Policy Seminar.
29. <http://oerresearchhub.org/>.
30. www.wested.org/study-khan-academy-on-community-college-students-algebra-achievement/.
31. See also the Review Project led by John Hilton III, which provides “a summary of all known empirical research on impacts of OER adoption”. The coordinator states: “In each of the studies reported (...), OER were used in manner very similar to the traditional textbooks they replaced. We look forward to reviewing empirical articles describing the learning impacts of open pedagogies.” See: openedgroup.org/review (status on: 19.03.2015).

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Annex A11. Government survey on OER policy support

Survey focus and execution

In August and September 2014, governments were asked to respond to a CERI/OECD questionnaire on how they support and facilitate the development and use of OER in all education sectors.

The survey was loosely based on a previous OECD survey (Hylén et al., 2012), but was more tightly focused on the issues most relevant to the current phase of OER development. It focused on three issues: 1) whether OER-related policies are being enacted by governments; 2) what arguments are commonly used to support these policy measures; and 3) what instruments or combinations of instruments are being used. In this, it took the definition of public policy from the work of Bemelmans-Videc, Rist and Vedung, who define public policy instruments as “concrete and specified operational forms of intervention by public authorities” in order to effect social change (Bemelmans-Videc, Rist and Vedung, 1998: 4).

Questions from the survey

The full survey, including design, may be obtained from the OECD on request. Below are the questions used in the survey:

- B1. Is OER production and/or use supported through policy-level interventions at governmental level in your country? [Yes/No]
- B2. Which educational sectors are covered by these OER-related policy-level interventions? [ISCED levels; multiple responses possible]
- B3. What policy interventions are used to support and facilitate OER and their use? [Instruments named; multiple responses possible]
- B4. Looking at the policy interventions undertaken in your country to support and facilitate OER production and use, please rate the national relevance of the objectives listed below by ticking the appropriate box. [Six educational challenges used in this report; respondents choose whether major, minor or not an argument]
- B5. In addition to policy-level interventions at governmental level or despite the lack thereof, what other types of OER initiatives are ongoing in your country? [Initiative types named; multiple responses possible]
- B6. More generally, is information and communication technology (ICT) in education being supported through policy-level interventions at governmental level in your country (irrespective of support or not of OER)? [Yes/No]
- B7. Which educational levels are covered by these ICT-related policy-level interventions? [ISCED levels named; multiple responses possible]

- B8. If the answer to Question B1 is 'No', are there any indications that your country will develop a dedicated policy intervention on Open Educational Resources in the near future (1-2 years)? [Instruments named; multiple responses possible]
- B9. If the answer to Question B1 is 'No', please elaborate on the reasons for lacking OER policy interventions and/or the barriers to be overcome. [Open response question]
- C1. Please provide more detailed information below on the interventions mentioned in your response to Question B3 (ideally you should briefly describe at least three of the main interventions). [Outline for responses provided]

Use of results

The survey collected the responses of 33 countries: 29 OECD member countries and 4 accession and key partner countries (Brazil, China, Indonesia and Latvia). The results indicate a clear policy support for OER, with 25 countries reporting having a government policy to support OER production and use.

The survey results provided a mapping of the current efforts of governments around the globe to support and facilitate the development and use of OER in all educational sectors, i.e. schooling, vocational training, tertiary education and lifelong learning (used in Chapters 1 and 11).

They also provided a rich basis for dialogue and exchange between policy makers in different countries on how best to support OER, which was used for the OER Policy Seminar held in January 2015 at the Paris headquarters of the OECD (see Chapter 11).

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Educational Research and Innovation

Open Educational Resources

A CATALYST FOR INNOVATION

Education is the key to economic, social and environmental progress, and governments around the world are looking to improve their education systems. The future of education in the 21st century is not simply about reaching more people, but about improving the quality and diversity of educational opportunities. How to best organise and support teaching and learning requires imagination, creativity and innovation.

Open education resources (OER) are teaching, learning and research materials that make use of tools such as open licensing to permit their free reuse, continuous improvement and repurposing by others for educational purposes. The OER community has grown considerably over the past 10 years and the impact of OER on educational systems has become a pervasive element of educational policy

This report aims to highlight state of the art developments and practices in OER, but also to demonstrate how OER can be a tool for innovation in teaching and learning.

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