Exploring the Business Case for
Open Educational Resources

Prepared by Neil Butcher and Sarah Hoosen
for the Commonwealth of Learning

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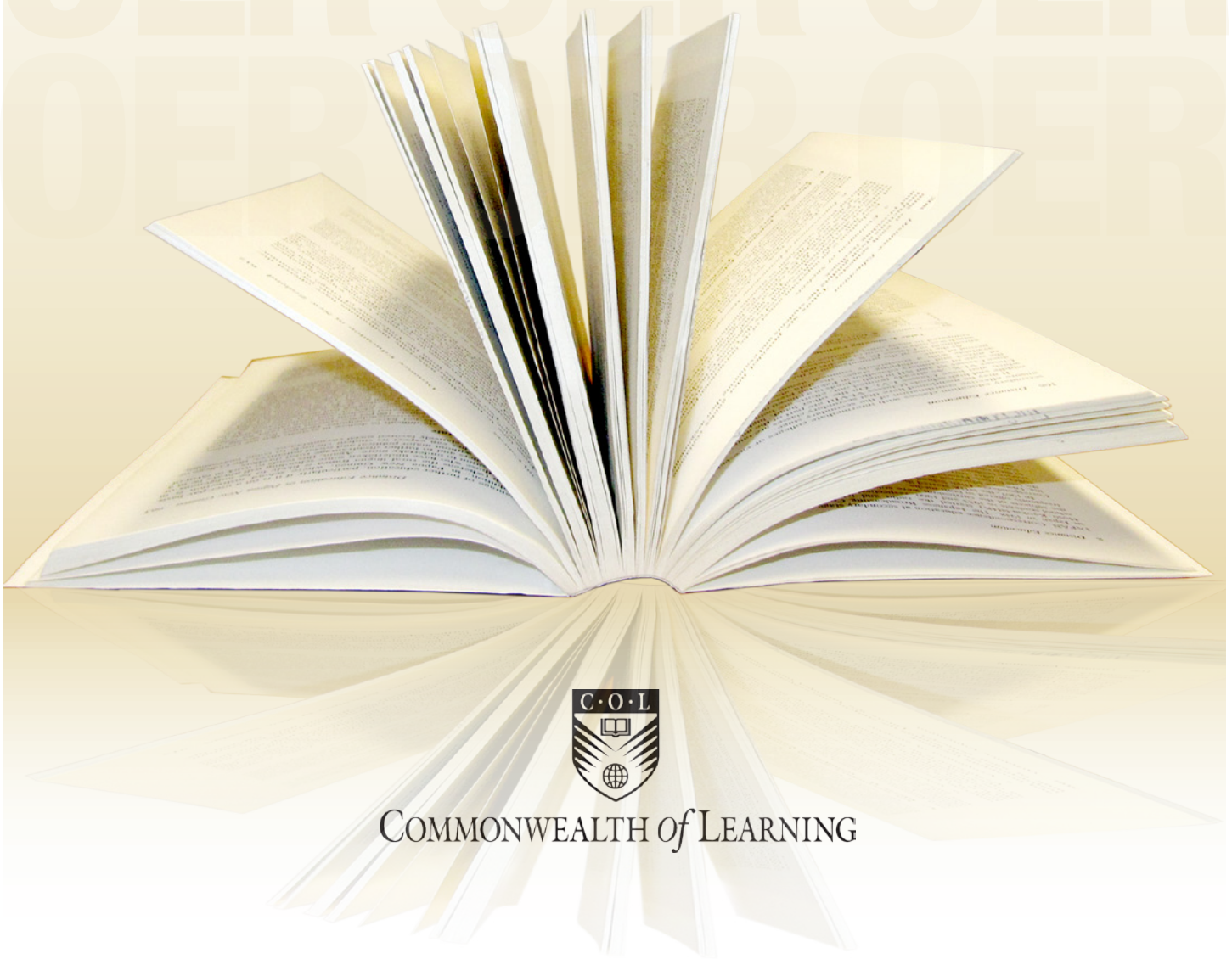## COMMONWEALTH *of* LEARNING

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The Commonwealth of Learning (COL) is an intergovernmental organisation created by Commonwealth Heads of Government to encourage the development and sharing of open learning and distance education knowledge, resources and technologies.

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1.1 Global Trends and Challenges in Education

In today's knowledge society, knowledge and skills play a major role in reducing poverty and promoting growth. The future of countries is increasingly dependent on the knowledge, skills, and resourcefulness of their people. Education is of vital importance in the knowledge society, as a source of basic skills, a foundation for development of new knowledge and innovation, and an engine for socio-economic development. It is, therefore, a critical requirement in creating knowledge societies that can stimulate development, economic growth, and prosperity (Butcher, 2010). This has resulted in educational institutions around the world striving to satisfy an ever-increasing demand for education in response to a growing and urgent need to train, retrain, and continuously refresh the knowledge and skills of each nation's workforce in an increasingly globalised knowledge economy. Whilst systems worldwide have expanded significantly in making progress towards basic education for all (EFA) and achieving universal primary education, countries continue to face challenges of expanding access to education, improving quality, and ensuring equity, particularly in higher education. As developing economies require skilled personnel, access has become an increasingly important issue (Altbach & Peterson, 1999).

Whilst there is an unprecedented demand for access to higher education, most governments also face challenges in providing the necessary support to public institutions (Power, 2000). There is much debate about how to fund expanding academic systems, with current approaches emphasising the need for students to at least share the cost of instruction. This new thinking, combined with constrictions on public expenditures in many countries, has created financial problems for institutions and education systems (Altbach & Peterson, 1999). Although an educated population is a key factor in enhancing economic productivity and creating a knowledge economy, it is an expensive undertaking. Academic systems and institutions have tried to deal with these financial constraints in several ways. Loan programmes, the privatisation of some public institutions, and higher tuition fees are among the alternatives to direct government expenditure. In many parts of the world, including several major industrialised nations, conditions of study have deteriorated in response to financial constraints. Enrolments have risen, but resources, including teaching staff, have not kept up with needs. Academic infrastructures, including libraries and laboratories, have been starved of resources, and reduced funds are being spent on basic research (Altbach & Peterson, 1999). The results — deterioration in average quality, continuing inter-regional, inter-country, and intra-country inequalities, and increased for-profit provision of higher education — are recognised as having serious consequences, particularly for developing countries and disadvantaged groups (Power, 2000).

Faced with funding shortfalls, many educational institutions are looking to new markets and adopting a more market-orientated approach to offset their operational costs (Harsh & Sadiq, 2002). Open and distance learning (ODL) is increasingly being seen as a strategy to tackle the challenges of access, quality, and equity. Many countries are deploying ODL models to meet the growing demand for education, embracing ODL as a cost-effective and efficient means of increasing access to education. Its promise and possibilities are also being explored and implemented by many contact universities faced with the same kinds of technological advances, constraints, dynamics, and challenges as those that have caused traditional distance education institutions to turn to ODL models of provision. In addition, information and communication technology (ICT) has created a revolution in ODL by offering new and more flexible learning opportunities, providing tools needed to extend education to under-served geographical regions and groups of students, and empowering teachers and students through improved access to information.

ICT refers to technology that is used in the manipulation, storage, and conveyance of data through electronic means (OpenLearn, n.d.). ICT allows for exponential increases in the transfer of data through increasingly globalised communication systems, connecting growing numbers of people through those networks. It reduces entry barriers for potential competitors to traditional education institutions by reducing the importance of geographical distance as a barrier, by reducing the overhead and logistical requirements of running education programmes and research agencies, and by expanding cheap access to information resources. The availability of digital libraries, mailing lists, and online classes impacts on the way education is delivered, particularly at a distance. eLearning continues to grow in importance in different parts of the world. Indeed, some educational planners see it as one of the few relatively unrestricted avenues for innovation in teaching and learning.

Whilst the dominant focus has historically been on eLearning, use of ICT for management, administration, and research is also increasingly recognised. Technological change has brought — and continues to bring — profound changes in the roles that researchers, funders, research institutions, publishers, aggregators, libraries, and other intermediaries play in disseminating and providing access to quality-assured research outputs, in their goals and expectations, and in the services they provide and use (S. Hall, 2010).

Ubiquitous and ever-opening access to information creates a need for skilled workers who can transform information into meaningful, new knowledge. The potential of ICT to tackle key socio-economic challenges, and thereby impact on development, has led many countries to invest heavily in it, placing ICT at the centre of their development strategies, particularly in higher education (Butcher, 2010, p. 9). The growth of knowledge societies has placed increasing emphasis on the requirement to ensure that people are information literate, and therefore education systems are faced with a need to provide formal instruction in information, visual, and technological literacy, as well as in how to create meaningful content with today's tools. However, it is important to consider expanded definitions of these literacies, definitions that are based on mastering underlying concepts rather than on specialised skill sets. Education systems need to place increased emphasis on key basic and advanced skills if they are to produce skilled people to meet changing economic demands (Levy & Murname, 2006). Critically, ICT is valuable as a *means* to achieve genuine knowledge societies. Thus, education systems are faced with a need to provide formal instruction in information, visual, and technological literacy, as well as in how to create meaningful content with today's tools.

Accompanying this has been growing recognition of the importance of lifelong learning, which is regarded as a requirement to keep pace with constantly changing global job markets and technologies. Education is viewed as not limited to formal education in traditional structures, but

as also encompassing the broader societal learning necessary for development (Butcher, 2010). Lifelong learning is essential both for closing existing equity gaps and for enabling adults to adapt to a changing workplace. Lifelong continuous learning is no longer a choice but a necessity, both to empower a person's well-being and inclusion in twenty-first-century society and to support individuals in meeting the requirements for their professional performance. In addition, traditional school-based, formalised learning formats are no longer capable of adequately accommodating the complete range of learning needs (de Langen & Bitter-Rijpkema, 2012).

Another trend is the increasing privatisation of educational goods and services. For example, in North America, the education and training industry is the fifth largest export and accounts for nearly ten per cent of GDP (Power, 2000). In Africa, there has been rapid growth in the number of private and distance learning tertiary institutions. This growth has been attributed partly to existing public institutions no longer being able to cope with increasing populations and an accompanying growth in demand for education (Barasa, n.d.). Some countries also see a trend towards private tutoring. In countries like Japan, Mauritius, and the Republic of Korea, more than half of students in secondary school receive private tutoring. Likewise, in Indonesia, of the roughly 3,000 higher education institutions in the country, only around 500 are public. Such growth seems to be a social response to inadequacies in government support for education, and can lead to further exacerbation of social inequalities and polarisation (Power, 2000).

One of the national challenges, particularly for developing countries, is to provide high-quality, relevant education that is applicable to future labour markets and to developing the knowledge society (Schwartzman, 2003). Thus, content in education programmes, at both school and university levels, needs to be appropriate and continuously updated to respond to global changes and to equip students with skills for participating in the knowledge economy. This challenge is occurring in a context of increasing student enrolments, whilst it is essential to maintain or improve quality standards and relevance of courses. This situation highlights the need for increased investment in curriculum/course design and development, and the need for better quality materials as part of a broader process of improving education programmes.

1.2 The OER Value Proposition

> For the first time in human history we have the tools to enable everyone to attain all the education they desire. (Wiley, Green, & Soares, 2012)

Within the above context, the concept of open educational resources (OER) has gained significant currency around the world, becoming a subject of heightened interest in policy-making and institutional circles as many people and institutions explore its potential to contribute to improved delivery of education and tackle some of the key problems facing education systems. OER refers to educational resources that are freely available for use by educators and learners without an accompanying need to pay royalties or licence fees. The term was first adopted at UNESCO's 2002 Forum on the Impact of Open Courseware for Higher Education in Developing Countries. The Commonwealth of Learning (COL) has adopted a wide definition of OER as "materials offered freely and openly to use and adapt for teaching, learning, development and research". Whilst OER are mainly shared in digital formats (online and offline), OER can also be in printable formats (Commonwealth of Learning, n.d.). The COL/UNESCO *Basic Guide to OER* refers to OER as:

Educational resources (including curriculum maps, course materials, textbooks, streaming videos, multimedia applications, podcasts, and any other materials that have been designed for use in teaching and learning) that are openly available for use by educators and students, without an accompanying need to pay royalties or licence fees. (Butcher, 2011, p. 5)

Kanwar, Kodhandaraman, and Umar (2010) note that OER are generally understood as (1) free and freely available, (2) suitable for all levels of education, (3) modular, (4) reusable, and (5) online. They base this definition on the assumption that OER will be small, reusable learning objects located in online repositories that institutions can access, adapt, and construct as courses. However, they also note that the notion of OER has evolved and changed (Kanwar et al., 2010). For example, the term OER is also synonymous with open courseware (OCW), although the latter may be used to refer to a specific, more structured subset of OER. The OCW Consortium defines open courseware as "a free and open digital publication of high quality university-level educational materials. These materials are organised as courses, and often include course planning materials and evaluation tools as well as thematic content" (OpenCourseWare Consortium, n.d.). Another related concept is open access (OA) publishing. This usually refers to research publications released under an open licence. Especially in higher education, there is an overlap between OER and OA, as research publications typically form an important part of the overall set of materials that students need to access to complete their studies successfully, particularly at postgraduate level (Butcher, 2011).

The concept of OER has partly gained momentum in recognition of its potential to contribute to creating a revolution in education. One of the key principles underlying OER is the right to education for all, and the consequent goal to make information and knowledge more relevant, accessible, and useable for the good of the public who want to consume this knowledge (Butcher, 2011). OER opens up numerous possibilities for adapting existing resources to create a better fit with local contextual and cultural needs, as well as with the accessibility needs of learners, thereby increasing access to education. In particular, it is regarded as providing great benefits for the global South (the countries of Africa, Central and Latin America, and most of Asia) in expanding access to education. By removing economic and ownership barriers, OER enables people across continents and organisations to get the education they need to transform their talents into personal and professional competence (de Langen & Bitter-Rijpkema, 2012). Its transformative potential is theoretically realised in the ease with which resources, when digitised and openly licensed, can be shared freely via the Internet (Butcher, 2011).

However, despite this potential, some have argued that OER is still mainly created in the developed world. There are concerns that the dominance of developed countries over the production of OER risks relegating developing countries to the role of mere consumers (Kanwar et al., 2010). OER initiatives are beginning to emerge in the developing world — such as Sakshat in India, the China Open Resources for Education initiative, the OER UCT (University of Cape Town) project in South Africa, and the Vietnam OpenCourseWare initiative — but these are regarded as exceptions (de Langen & Bitter-Rijpkema, 2012). In addition, it remains true across the wider research that most of the barriers to using OER are either the same as or a consequence of more generic barriers to accessing and using technologies for learning (Bacsich, Phillips, & Bristow, 2011).

Kanwar et al. (2010) point out that the role of OER is increasingly changing from principally a teaching resource to a learning resource, reflecting wider educational trends towards more learner-centred models (and lifelong learning); thus, students now constitute the majority of users of OER rather than teachers and institutions. This often happens without the involvement of educational

institutions. A case in point is the Khan Academy, a non-profit online education platform where students of all ages can view ten-minute lessons on mathematics, the sciences, finance, and history. Their approximately 3.5 million users per month (Wired Academic, 2011) include middle and high school students, homeschoolers, college students, academically advanced students, autistic students, retirees, classroom teachers, and teacher training institutions (iLearn Project, n.d.).

OER is also regarded as offering the potential to build capacity by providing institutions and teaching staff access, at relatively low cost, to the means to create and adapt high-quality teaching and learning materials. It can be harnessed to develop competence in producing educational materials and carrying out the necessary instructional design to integrate such materials into high-quality learning programmes. This facet of OER use recognises that whilst teaching staff are expected to have the knowledge and skills to teach in a broad spectrum of subjects, they often lack the time to revisit and modify curriculum and educational materials on a regular and systematic basis. OER is believed to provide an opportunity to engage higher education faculties, academics, and teachers in structured processes that build capacity to design and deliver high-quality education programmes without increasing cost (Butcher, 2011).

Furthermore, as Butcher (2010) explains, the principle of allowing adaptation of materials provides one mechanism amongst many for constructing roles for learners as active participants in educational processes, who learn best by doing and creating, not by passively reading and absorbing. Content licences that encourage activity and creation by learners through reuse and adaptation of that content can make a significant contribution to generating more effective learning environments (Butcher, 2010).

At the institutional level, it has been argued that the transparency provided by OER (where resources produced by staff are shared openly) places social pressure on institutions and teaching staff to increase quality, allows them to better coordinate curricula, and provides resources for students' learning and for academic planning. Openly licensed educational materials are recognised for their potential to contribute to improving the quality, accessibility, and effectiveness of education, whilst serving to restore a core function of education: sharing knowledge (Butcher & Hoosen, in press). Creating collaborative and open learning environments, and open distribution, means teachers are encouraged to enhance the quality of materials and to use input from outside their institutions as part of this enhancement process (Helsdingen, Janssen, & Schuwer, 2010).

Particularly in dealing with large classes — a phenomenon facing many higher education institutions and schools as demand for access to education increases — it is maintained that teaching staff can harness OER to facilitate more effective teaching and learning in ways that save time and that enable students to take greater control of their own learning by engaging more with core resources in their own time and at their own pace. This freedom to modify also provides an unprecedented opportunity to adapt curriculum to a far greater diversity of learners who would otherwise face barriers to learning due to large class sizes, language, cultural conventions, or disabilities. Freed from being the primary deliverers of content, teaching staff are able to use their time more strategically to nurture meaningful engagement and debate, and to reflect upon their own curriculum and pedagogic assumptions and practice with a view to critical reflexive practice. Face-to-face time with students is then better used to support engagement and to nurture discussion, debate, and practical application, or to support student research activities, thereby providing students with tools to advance their own understandings (Butcher & Hoosen, in press).

Another notable value of openness, particularly with regard to open access publications, is that it enables access to the widest possible audience. For example, Kansa and Ashley (2005; cited in

Downes, 2007) point to statistics showing that only 27 per cent of research papers are published and only five per cent of research is shared. The value of research data, they argue, increases ten times with openness. Furthermore, the Open Citation Project claims that articles from open publications are cited more frequently. There are multiple benefits for stakeholders: for readers, open access makes available an entire body of literature; for publishers, it guarantees the widest dissemination of the articles they publish; funding agencies obtain the highest impact for their investment; and universities obtain increased visibility for their scholarship (Downes, 2007).

In developing curricula and learning resources, academics and teachers have always tended to engage with what is already available — often prescribing existing textbooks, building on previous iterations of a course taught by predecessors or colleagues, and creating reading lists of published articles. Even in distance education institutions, which have a long history of materials development, it is arguably a rare occurrence to develop completely new materials with no reference to what already exists. Because OER removes restrictions around copying and adapting resources, it is claimed that it can reduce the cost of accessing educational materials. These can then be used to supplement and enrich courses, which is particularly useful when there are large course cohorts. In many systems, royalty payments for textbooks and other educational materials constitute a significant proportion of the overall cost, whilst processes of procuring permission to use copyrighted material are also regarded as very time-consuming and expensive. Even where teaching staff produce new materials, their ability to draw inspiration and ideas from other people's openly accessible teaching materials often serves to increase quality without adding cost (Butcher & Hoosen, in press). Furthermore, since course development is so resource-intensive, OER can help developing countries save both course-authoring time and money (Kanwar et al., 2010).

Thus, in a context where education systems are facing several significant challenges globally, the OER movement has emerged as an educational phenomenon that — at least according to its adherents — has significant potential to contribute to tackling these challenges. As can be seen from the above, a key argument put forward by those who have written about the potential benefits of OER relates to its potential for saving cost or, at least, creating significant economic efficiencies. However, to date there has been limited presentation of concrete data to back up this assertion, which reduces the effectiveness of such arguments and opens the OER movement to justified academic criticism. As a first step towards resolving this problem, the remainder of this paper aims to review the literature in order to sift out what — substantively — has been learned over the past ten years about the actual economic benefits, if any, of applying open licences to educational materials. It focuses on two specific aspects of OER: (1) course materials design and development and (2) the educational textbook market. It presents a brief review of literature and then explores in more detail a few case studies that provide greater insight into the potential economics of OER. Whilst this paper, which is based exclusively on desk research, is not able to provide conclusive evidence about the economic potential or otherwise of OER, it does indicate some clear trends and points the way to further, more detailed research that is now needed.

2 The Economics of OER

2.1 Introduction

The cost-effectiveness of OER is often noted as an advantage of adopting an open licensing model, although it has been separately argued that there is little substantiated evidence to support this notion. Many existing OER services were established with "one-off" initial funding and based on an altruistic notion of opening resources worldwide. Issues of sustainability, particularly financial sustainability, have recently generated much discussion (Belshaw, 2012). Analysing this area more carefully is thus particularly important if the OER movement wishes to have a lasting and sustainable effect on educational practices.

Many of the most high-profile OER initiatives historically have been donor driven. Often, as donor support is withdrawn, the initiative shuts down or reduces its operations significantly. An illustration of this is the discontinuation of Utah State University (USU) OCW, which received multiple rounds of funding from The William and Flora Hewlett Foundation, as well as a one-off appropriation from the Utah state legislature as part of the Utah OCW Alliance. However, despite having published over 84 USU courses over four years, the project is no longer operating due to lack of funding. It has been argued that this was due to OCW at USU not being integrated with university structures (Members of the IPT 692R Class at BYU, 2009).

Although there has been significant diversification of funding sources for OER initiatives in the past two years, many OER projects remain predominantly donor funded (although there is some growth of institutional funding, particularly amongst early adopting institutions), with major funders including The William and Flora Hewlett Foundation, the Bill & Melinda Gates Foundation, The Andrew W. Mellon Foundation, and the Shuttleworth Foundation. Whilst foundation funding has been an essential component of establishing the OER field, it has been argued that such funding cannot be relied on for ongoing development, operations, and sustainability, with many OER initiatives struggling to establish and transition to a future independent of foundation funding (Stacey, 2010).

Despite this situation, several arguments support the economic viability of adopting OER. M. Hall (2010) notes that an important distinction for the knowledge economy is between private returns on investments that can be directed to designated beneficiaries (such as shareholders in publishing companies, or scientific societies that retain surpluses from publishing) and public, or open, returns that have wider and far more diffuse benefits. It has been argued that returns on investment in the production of knowledge are likely to have far more substantial "open" benefits than private advantages. This outcome arises from the characteristic of non-excludability — the difficulty of

keeping knowledge to yourself — and the diminishing value of your asset as you try to do so. This is also an essential aspect of the lifecycle of scholarly knowledge: once something is discovered or reinterpreted, the whole point is to get it published and to reap the benefit of peers attributing the insight to you by means of the conventions of citation. These benefits are supported by the fact that knowledge is not exhausted through use and cumulative effects (M. Hall, 2010).

Another compelling explanation for the economic benefit of OER lies in the context of spiralling education costs and the need to make education more accessible and affordable at all levels. It has been argued that if education is paid for by the public, then research and content produced with those public funds should be publicly available. This has resulted in calls for governments to institute a policy that "all publicly funded resources are openly licensed resources" (Wiley, Green, & Soares, 2012). This argument is also seen in debates around access to results of academic research, much of which is funded by taxpayers.

Yet another convincing argument, with some substantiated evidence, is OER's indirect income generation potential. OER has the potential to generate indirect revenue by marketing institutions' reputations and the quality of their materials, which may convince students to enrol in fee-paying courses. Studies at MIT indicate that 35 per cent of freshmen aware of OCW before deciding to attend MIT were influenced by it and by its availability (Carson, 2006, 2009; cited in Bacsich et al., 2011). In another example, the OpenLearn Initiative at the Open University in the United Kingdom (OUUK) has approximately 200,000 course enrolments and 130,000 students each year, of whom in a two-year period 7,800 came from people who used the "enrol now" button in the OUUK's course samples to convert to a fully paid enrolment. Thus, approximately 1.95 per cent of their enrolments in a two-year period came through conversions from free OCW users into paid course enrolments. Approximately 33 per cent of those conversions were new to the OUUK system, meaning that around 1,280 new paying students converted through free course samples each year. Similarly, the Open University of the Netherlands (OUNL) reported that 18 per cent of OCW users were "inspired to purchase an academic course" based on their interactions with OUNL OCW (Eshuis, 2009; cited in Johansen & Wiley, 2010).

Another approach to generate revenue is to integrate revenue-generating activities in open materials, as is the case with MIT, where all reading materials have a link to a retail website that sponsors MIT OCW for each sale it thus makes. Similarly, Flat World Knowledge presents its fee-based products next to free content. In the Netherlands, Wikiwijs has a different strategy in that it offers access to open and closed content, thereby generating interest from vendors/distributors of closed educational materials. This interest results in collaborations with commercial parties and may thus generate revenue. The University of California-Irvine presents information on whether the free course can also be taken for a credit and thus directs learners who are interested in accreditation to their fee-based programme. They also aim their marketing of fee-based courses at specific communities that have emerged around an open collection (Helsdingen et al., 2010). Thus, in these cases, OER brings direct commercial benefits, because the sharing of materials online raises an institution's "visibility" on the Internet, whilst also providing students with more opportunities to investigate the quality of the educational experience they will receive. As students in both developed and developing countries are relying increasingly heavily on using the Internet to research their educational options, sharing of OER may well become an increasingly important marketing tool for institutions, and there is some initial evidence that this translates directly into new business for them (Butcher, 2011).

Many proponents of OER advocate that a key benefit of open content is that it is "free" (i.e., it does not cost anything to download — leaving aside bandwidth costs). This is literally true: by

definition, open content can be shared with others without asking permission and without paying licensing fees. However, simplistic assertions that OER is free — and by extension that use of OER will cut costs of educational delivery — mask some important cost considerations (Butcher, 2011). A resource may be free for the consumer, but it does not follow that the resource is totally free, as it costs something in funding and/or services to create and distribute that resource. In converting material to OER, costs include factors such as converting courses to an OCW format, scrubbing content to remove copyrighted material, using or buying necessary hardware and software, and providing other supplies. If offering OCW courses attracts new paid enrolments, it is argued that the profit from those additional enrolments could offset the expense of offering OCW courses, making the programme self-sustainable (Johansen & Wiley, 2010).

Nevertheless, it has also been argued that OER can reduce costs through more cooperation, collaboration, and partnerships. For organisations that rely partly on contributions from individuals, such as Wikieducator, the fixed costs are very low. Usually, a staff of two can manage day-to-day business. Variable costs are typically lower for OER because most organisations do not provide any services to their customers other than the content. Thus, the only requirements are updating materials and maintaining the website. In community-based initiatives like Wikieducator and Wikiwijs, the costs for updating, maintaining, reviewing, and adapting materials, as well as providing feedback, coaching, and support, are distributed among all individual contributors. The only variable costs left for the distributor are for data storage, website support, and maintenance (Helsdingen et al., 2010).

Scrimgeour (2009) argues that it is vital to compare, on the same basis, the respective costs of producing OER and proprietary content. In particular, educators who produce OER may not be "in it for the money", but they are usually paid, as are the editors, formatters, promoters, and reviewers. The difference is that the cost arises at source and is only incurred once, whereas proprietary content is paid for through the mechanism of sales. Furthermore, the true cost difference lies in the relative cost structures and profit/loss of the publishers and distributors, which may or may not represent value for money in terms of efficiency, quality, and awareness. The real concern of publishers is breach of security, since it denies them the income from sales whilst continuing to expose them to production costs (Scrimgeour, 2009).

A key way to address funding issues is by acknowledging the benefits of integrating OER practices with any content/material development process (as has been done at the OUUK). Sourcing existing OER as part of the process of investing in high-quality learning resources that meet curriculum needs can potentially save costs. Given this potential, it is worth exploring the issue of course design in more detail to see what the actual economic value might be.

2.2 OER and Course Design

The value of investing in course design

ODL models have long asserted the economic value of investing in design and development of effective courses and course materials. This assertion is premised on an assumption that it is possible to shift patterns of expenditure to achieve economies of scale by amortising identified costs (particularly investments in course design and development, but also in effective administrative systems) over time and large student numbers. Several distance education providers have already

demonstrated clearly that when done well, this can achieve significant economic gains in the cost of delivering education to large numbers of students.

Added to this, though, in the context of teaching large classes as demand for education grows, several authors provide suggestions for teachers to reduce the negative features of large classes. Most commonly, there is a call for multiple teaching strategies to accommodate students' different learning styles. Thus, in a lecture setting, teaching staff increasingly are required to do more than just write lecture notes and walk into class. They should first be aware of the limitations of large classes, then plan their teaching and learning activities to compensate for those limitations (Arbour, Karras, & Lee, 2010). This approach is particularly important in developing world contexts, where the lack of equipment and teaching materials, rising student enrolments, a dearth of academics, and poor infrastructure may result in an over-reliance on the lecture method. Improved instructional technology, and particularly the development of the Internet and the Web, has provided opportunities for academics to improve teaching and learning. The proliferation of available resources makes it possible to shift content communication to a wider range of methods, offering students multiple modes of learning rather than just lectures. Given the proliferation of OER and ICT infrastructures, particularly on university campuses, use of these methods is increasingly affordable to implement and accessible to students, and provides many alternatives for use in designing creative teaching and learning environments that can offset the problems associated with growing student enrolments.

Furthermore, a core function of a university is effective teaching and learning, which requires appropriate investment in curriculum and course design and in materials development, as well as ongoing evaluation and regular renewal. At the same time, teaching staff often need to deal with ever-increasing class sizes and a growing diversity of learners. Therefore, institutions need to make better use of the resources they have. Given this reality, the primary role of teaching staff should not necessarily be delivery of content in the form of lectures: this can be managed more effectively by the development and provision of learning resources (Butcher & Hoosen, in press).

This makes the concept of resource-based learning of particular interest. Despite this, debates over OER have typically made little reference to the concept of resource-based learning until recently. This may be because the emphasis in most global OER discussion has been on the sharing and licensing of existing materials, a significant proportion of which has included simply sharing lecture notes and PowerPoint presentations used in face-to-face lectures.

Resource-based learning (RBL) refers to courses, or parts of courses, with a particular style of instruction in which students primarily learn from

> specially prepared teaching materials. That is, the teaching will have been largely pre-planned, pre-recorded and pre-packaged. It will be presented in instructional texts, audiotapes, videotapes, assignment exercises. (Rowntree, 1986, p. 11; cited in McKeachie, 1991)

Resource-based learning involves communication of curriculum between students and educators through *use of resources* (instructionally designed and otherwise) that harness different media (such as text, videos, simulations, and animations) as necessary. Resource-based learning strategies can be integrated into any educational programme, using any mix of contact and distance education strategies. The concept is based on the principle that educators should select, from the full range of educational provision, those resources and methods most appropriate to the context in which they are providing education.

Well-designed learning resources typically require much greater individual engagement by students with information, ideas, and content than is possible in a large-scale contact lecture. Teaching staff can harness OER to facilitate more effective teaching and learning in ways that save time and that enable students to take greater control of their own learning — engaging more with core resources in their own time and at their own pace. Open licences that encourage activity and creation by students through reuse and adaptation of content can make a significant contribution to creating more effective learning environments. As has been noted, this freedom to modify provides an opportunity to adapt curriculum to a far greater diversity of learners who would otherwise face barriers to learning due to large class sizes, language, cultural conventions, or disabilities (Butcher & Hoosen, in press).

Costing for course design and development

There have been several attempts to estimate the costs involved in course design and development. For example, Boettcher (2006) notes that, based on much anecdotal evidence plus her real experience over the last ten to 15 years of building computer-based material, it takes an average of about 18 hours (with a range of five to 23 hours) of faculty time to create an hour of instruction for publication on the Web. This refers to instruction that can be delivered independently of an expert faculty member.

Swift (1996; cited in Butcher & Roberts, 2004) estimated the design time for courses at first-year university level as follows:

Table 1 Time taken to design one notional hour of student learning time[1]

Media	Hours
Print	20–100
Audio	20–100
Video	50–200
Computer-based instruction	200–300
Experiments	200–300

Similarly, Bryan Chapman of Brandon-Hall listed these average design times to create one hour of training:

Table 2 Average design times for one hour of training[2]

Material type	Average hours
Instructor-led training (ILT), including design, lesson plans, handouts, PowerPoint slides, etc. (Chapman, 2007)	34
PowerPoint to eLearning conversion (Chapman, 2006a, p. 20)	33
Standard eLearning, which includes presentation, audio, some video, test questions, and 20 per cent interactivity (Chapman, 2006a, p. 20)	22
Third-party courseware. Time it takes for online learning publishers to design, create, test, and package third-party courseware (private study by Bryan Chapman)	345
Simulations from scratch; creating highly interactive content (Chapman, 2006b)	750

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[1] Butcher & Roberts, 2004.
[2] Clark, 2010.

Note that these are "averages". Thus, any one programme might take as little as one hour or up to 500 hours, depending on the person's design skills and knowledge of the subject, the amount of material to be converted, and the type of transformation needed (Clark, 2010).

The University of South Africa notes that the staff time required to produce a course of a given number of learning hours cannot be exactly specified. Mays (2011) calculates these values based on ratios of staff hours to learning hours for the development of a module.

Table 3 Staff hours to develop a module[3]

Activity	Hours
Course design preparation	8
Curriculum design	250
Compiling of study material	1,300
Editing (if done by academic department)	50
Translation (if done by academic department)	300

In this instance, many modules use a prescribed textbook and "wrap-around" study guide (a guide that contains little subject content but provides students with a learning structure that assists them in working through the prescribed book). For such modules, the number of staff hours allocated to compiling the study material could be halved — 650 hours instead of 1,300 hours (Mays, 2011).

Estimates for course design tend to vary across a number of variables, such as course structure (costs for online courses differ from print-based distance education or face-to-face teaching), tools to be used, learning methods, and the availability of existing content (Johansen & Wiley, 2010). In addition, staffing costs may be much lower and technology provision and access costs much higher in developing countries than in developed countries. In face-to-face learning environments, course materials may be in an outline form, as it is expected that the instructors will mediate the curriculum and fill in the blanks during contact hours. In distance education or eLearning environments, usually all the content is provided and suitable for self-study, so materials development may have more upfront costs.

As ICT has become an increasingly important element of the educational landscape, course development costs have typically increased over time, as video and computer-based multimedia materials — whilst adding potential educational value — are significantly more expensive to produce than equivalent printed materials. As interactive content use increases in materials development, more time is required to develop content, and often more specialists as well (Boettcher, 2006; Mays, 2011). However, as faculty become more experienced and comfortable with the available tools, the number of hours required may decrease. Efficiency in resource development can be enhanced by the availability of digital resources, particularly if these are open. Furthermore, through collaborating or partnering with a faculty or multiple faculties from different institutions working in the same content area, a larger, richer database of content can be developed more efficiently, have broader use, and, importantly, prevent duplication of efforts (Boettcher, 2006).

The cost of materials acquisition has also increased as a consequence of developments in pedagogical approaches, instructional design improvements, and the introduction of outcomes-

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[3] Mays, 2011.

based learning. This is because many modern printed materials tend to be workbooks rather than traditional textbooks; thus, once a single student has used the book, it cannot be used by other learners (Johansen & Wiley, 2010). However, practitioners have cautioned against comparative costing, particularly using analyses in one jurisdiction to draw inferences about costs in another (Mays, 2011).

In some examples of costs involved in creating online resources, the MIT OCW Evaluation Findings Report in 2006 stated that MIT OCW's cost to open a course ranged from USD 10,000 to 15,000 per non-video-based course, to USD 30,000 per video-based course. Utah State University (USU) reported that their cost to open one course was approximately USD 5,000 (Wiley, 2007). USU's expenses came primarily from the labour costs of the personnel working on USU's open publishing initiative. USU's open publishing team consisted of a full-time director, two half-time graduate students, and three half-time undergraduate students. USU also opened some courses with no direct cost by having students and graduate students publish courses as class projects (Johansen & Wiley, 2010).

It is worth noting that the costs of creating courses are just one aspect of enhancing education, and several other factors need to be considered to ensure their sustainability. These include the cost of training, supporting and mentoring staff to use a resource, of creating reliable assessment procedures, of effectively managing students, and of keeping content up to date and relevant. Furthermore, when harnessing OER, consideration must be given to dealing with copyright licensing and associated costs such as ICT infrastructure (for authoring and content-sharing purposes), bandwidth, running content development workshops and meetings, and so on. As institutions make strategic decisions to increase their levels of investment in design and development of better educational programmes, the most cost-effective way to do this is to embrace open licensing environments and harness existing OER (Butcher, 2011). Nevertheless, it is important to note that the costs of design are incurred regardless of the number of students who study the course. Low unit costs then follow only if very large numbers of students study the materials successfully, and if the person power devoted to "presenting" the course is substantially lower than in face-to-face settings. This provides a very strong argument in favour of harnessing OER to manage the cost of course design and development, as is highlighted in the case study below.

A case study from Guyana

COL, the Commonwealth Secretariat (ComSec), and Microsoft recently supported the creation of an ICT Professional Development Strategy for Teachers in Guyana, building on the UNESCO ICT Competence Framework for Teachers (CFT).[4] Part of the process involved creating a set of training modules for teachers to help them move through basic technology literacy to more advanced usage of technology. This was done in recognition that if ICT are to become part of the way in which teachers teach, learners learn, and school managers operate, the teacher education curriculum (of both pre- and in-service teachers) should reflect the important roles that ICT might play in a typical school. Thus, at a series of meetings with the National Centre for Educational Resource Development (NCERD) and key players from the Guyanese education system, such as staff of Cyril Potter College of Education (CPCE) and the University of Guyana (UG), overall requirements for these modules were defined. These can be summarised as follows:

1. A pre-assessment tool was required to assess whether participants had the basic ICT skills to participate in the first module. If not, students would be given a remedial training module to learn basic ICT skills (use of mouse, keyboard, etc).

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[4] See www.unesco.org/new/en/unesco/themes/icts/teacher-education/unesco-ict-competency-framework-for-teachers

2. The Information Literacy module was expected to last approximately 60 to 90 hours, comprising a blend of face-to-face interaction and self-study. It drew on the module designs already prepared by NCERD and CPCE, but took into account the new course descriptions prepared for a revised teacher education programme in Guyana. Development of this module was based on the requirements of the UNESCO ICT CFT, and to the greatest extent possible incorporated existing materials to keep the course design cost-effective and globally relevant.

3. The advanced Knowledge Deepening module, also based on the requirements of the UNESCO ICT CFT, would last approximately 90 hours and comprise a blend of face-to-face interaction and self-study.

Given the capacity limits within the relevant Guyanese structure, draft modules were developed by a consultant contracted by COL and ComSec. The innovative curriculum and materials development process used in Guyana involved the following:

1. Reviewing the existing curriculum, which involved examining the ICT in Education curriculum at CPCE and UG. It was recognised that the curriculum and associated materials should be designed to work within the national context and mirror the conditions that teachers would find on the ground.

2. A curriculum programme was mapped ahead of any development phases. This was based on the UNESCO ICT CFT and included high-level objectives as well as specific unit outcomes, proposed content, and teaching methodology. This process allowed writers to weight the different focus areas and to determine the number of hours a student should spend working on the materials.

3. Guided by the curriculum map, a four-person, part-time development team conducted an Internet search for potential resources relevant to the subject matter. In addition to identifying OER and free resources that were closely aligned to the course direction identified by the curriculum map, the developers also determined the quality and suitability of each resource found, as well as the amount of repurposing needed. Resources that required little repurposing were selected as much as possible.

4. The development team constructed a set of simple user guides to set out the suggested learning pathway through the selected resources. In addition to identifying the sequence of learning events, the team also offered a set of suggested student activities so that the learning process was not merely didactic in nature but called on students to engage critically with the sourced OER. In addition, teaching guidelines and a list of further readings and references for the lecturers were assembled.

5. The content was piloted with stakeholders in Guyana to test the assumptions of the development team. Various units of the course were deployed at CPCE, where staff reported a mostly positive experience. Initial feedback from CPCE staff as well as comments and suggestions from UG staff were collected and collated to inform revisions to the course materials. During 2012, the Knowledge Deepening course will be integrated into the UG Degree Programme.

6. A revision phase followed so that the collected user feedback informed changes to the course. This included less emphasis on the teacher facilitation notes so that they were aimed directly at the students rather than at the lecturing staff, and hence became teaching materials rather than guides. In addition, the OER and free resources were downloaded onto a CD-ROM. An electronic version of the course was developed so that staff and students could choose between using the paper-based versions or the electronic CD-ROM. The latter was deemed important to eliminate the need for connectivity.

The overall cost of the development team is reflected in Table 4.

Table 4   Time and costs of developing OER (the case of the ICT Professional Development Strategy for Teachers in Guyana)

Development team	Time (days)	Costs (USD)
Educational consultant/Instructional designer/Graphic and Web designer/Editor	32	16,624
Instructional designer 2	17	6,684
Instructional designer 3	19	7,290
Graphic and Web designer	7	1,453
TOTAL	76	32,051

According to the educational consultant, who was also the main instructional designer, the Information Literacy module lasts approximately 70 hours, whilst the Knowledge Deepening module lasts approximately 90 hours. If one compares the cost of this development with the notional figures provided in the previous section, there is a clear indication that building a course using existing content is significantly more cost-effective. In Guyana, it took 76 days (or 608 hours) to produce 160 hours of learning (of which 80 are effectively print-based and 80 are computer-based instruction). Table 5 compares Swift's estimates of time to design one notional student hour of learning with the actual time taken to develop the Guyana materials.

Table 5   Comparing Guyana design with Swift's notional estimates

Media	Swift's notional estimate of time required to produce material equivalent to one notional learning hour	Actual hours taken to develop one notional learning hour of material
Print	20–100 hours	3.8 hours
Computer-based instruction	200–300 hours	3.8 hours

However, as these estimates are for distance education course development whereas the Guyana courses are a blended learning design, it is possibly more useful to compare the costs with the notional estimates from Bryan Chapman. The result is no less startling (Table 6).

Table 6   Comparing Guyana design with Chapman's notional estimates

Media	Chapman's notional estimate of time required to produce material equivalent to one notional learning hour	Actual hours taken to develop one notional learning hour of material
Instructor-led training (ILT), including design, lesson plans, handouts, PowerPoint slides, etc.	34 hours	3.8 hours
Standard eLearning, including presentations, audio, some video, test questions, and 20% interactivity	22 hours	3.8 hours

These figures do not reveal an even greater cost saving, as the time reflected also includes the development of content based on international examples (i.e., not Guyana specific and containing more generic content). Thus, the outcomes of the project were eight versions of content:

- Guyana Pre-service Information Literacy module (print version and CD version)
- Guyana In-service Information Literacy module (print version and CD version)
- Guyana Pre-service Knowledge Deepening module (print version and CD version)
- Guyana In-service Knowledge Deepening module (print version and CD version)
- International Pre-service Information Literacy module (print version and CD version)
- International In-service Information Literacy module (print version and CD version)
- International Pre-service Knowledge Deepening module (print version and CD version)
- International In-service Knowledge Deepening module (print version and CD version)

As all of this content is being shared under an open licence, the potential for achieving economies of scale grows further as and where it is used by other institutions. Already, the material is being adapted for use in countries as diverse as St. Vincent and the Grenadines and Indonesia, where it is being redeployed with marginal redevelopment time required to contextualise the materials effectively.

It is important to note that, in this case, a key contributor to cost reduction was that the leader of the team was multiskilled and thus able to serve several functions. The educational consultant in this instance served multiple roles: as an instructional designer, graphic and Web designer, workshop facilitator, and general editor. Traditionally, such functions have tended to be spread across multiple people, raising costs. This kind of multitasking has been facilitated by the growing access to content development tools provided by ICT, but also suggests that effective economic use of OER for course design and development requires highly skilled designers.

Thus, whilst curriculum revision and content creation is often considered a time-consuming and expensive process, the creation of an ICT-friendly component for the teacher education curriculum in Guyana was achieved at a relatively low cost by using an existing curriculum framework (the UNESCO ICT CFT) and repurposing OER.

2.3 OER and Textbook Publishing

The increasing demand for access to quality education combined with rising education enrolments also calls for more educational resources, particularly textbooks. However, textbook prices are soaring along with the rising cost of education. For example, in the U.S., the average undergraduate student spends over $1,168 on books and materials each year (College Board Advocacy and Policy Center, 2011). In addition, the average retail cost of a market-leading new textbook (based on a sample of ten high-enrolment college courses) is $176, and many cost more than $200. The increase in textbook costs is more than four times the rate of inflation for the past two decades (Student Public Interest Research Groups, 2010). This has caused the overall price of higher education to increase significantly, and poses serious financial difficulties for students and parents. Notably, affected students are mainly from lower socio-economic backgrounds (Koch, 2006). The problem is especially severe at community colleges, where textbook costs often rival the cost of tuition. A survey conducted by the Student Public Interest Research Groups (PIRGs) in 2011 found that seven

in ten respondents had not purchased one or more required texts due to cost, even though 78 per cent believed their academic performance could suffer. Furthermore, a 2009 report by Public Agenda found that 60 per cent of college dropouts said that textbook costs had affected them financially (Allen, 2011).

Publishers have been criticised for producing books that are too long (faculty use only a small portion of the text), for bundling (forcing students to buy not just the book but other resources that inflate prices and may make the book harder to resell), and for publishing revisions more frequently than needed (GAO, 2005). Faculty have been criticised for assigning expensive textbooks when other alternatives are available. In many instances, professors assigning the textbooks are not even aware of the books' prices (Hilton & Wiley, 2010).

Concerns about high textbook costs are not limited to the United States. For example, in South Africa, the publishing industry receives approximately ZAR (South Africa Rands) 1.5 billion each year from the Department of Basic Education's textbook orders. The ruling party is considering establishing a state-owned publishing enterprise, in recognition that the acquisition of textbooks from private publishers is "neither cost-effective nor efficient" (John, 2012).

The following detailed analysis from Brazil further illustrates the growing economic cost of textbooks that have all-rights-reserved copyright licences.

The cost of textbooks in Brazil[5]

Brazil has recognised the high cost of textbooks, and the OER movement in that country is seeking to tackle this issue. Brazil has made remarkable steps in the OER field, including signing an international declaration on open government; senate-approved legislation on access to governmental information; local legislation that gives preference to free software for governmental use in states like Rio de Janeiro; and discussions about implementing policy related to OER at different governmental levels. One of the primary tenets that moves OER forward in Brazil, including providing an open model for textbooks, is that publicly funded educational materials, both teaching materials and research output, should be considered public goods and made available under international definitions of OER.

A key driver of these developments is that the current model of textbook costs places them out of the reach of most Brazilians. In 2008, the Brazilian Institute for Consumer Protection (IDEC) calculated the costs of acquiring material for disciplines such as law, economics, and business, focusing on the first college year at some public and private teaching institutions. The Institute found that the average cost was BRL (Brazil Reals) 2,578 in public institutions and BRL 3,908 in private ones. Strikingly, almost a third of the required books were out of print, so these were not included in the average cost. The IDEC discovered that in institutional libraries, the average collection numbered no more than six books per 100 students at public institutions and no more than eight per 100 at private ones.

Similar results emerged from a study conducted by the Research Group for Public Policies for Access to Information (GPOPAI) at the University of São Paulo (USP), which evaluated the cost of all professional books required in ten top courses at USP, comparing this with the average monthly income of the students' families. For 75 per cent of students, the cost of acquiring books was higher than the family's monthly income (the Brazilian monthly minimum wage was BRL 465 in 2010). Again, for this study, one third of titles were out of print and thus were not included in the costs.

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[5] This section is adapted from Rossini (2012).

In response to a set of connected problems — high costs, unclear limitations on the rights of copyright holders, and increasing pressure from students, under the flag "Copying Books is a Right" — some universities issued internal resolutions adopting ten per cent of a work as the definition of "short extracts" acceptable for photocopying without payment. However, this stance resulted in a threat from the International Intellectual Property Alliance, which then led to revocation of such university resolutions (Rossini, 2012).

Business associations in Brazil have echoed these international threats. The Brazilian Association of Reprographic Rights (ABDR) refused to accept the universities' resolutions, began revoking licences and suing copy shops, and started a media campaign called "Copying Books is a Crime". ABDR's actions did not differentiate among cases where books were out of print or rare, openly licensed through Creative Commons, or even in the public domain. At the policy and legal level, ABDR have pushed for restrictive bills to enshrine their position in law, though so far without success.

When investigating who pays for the greater part of the production of professional and scientific textbooks adopted by Brazilian universities, USP researchers discovered that:

- The market for professional and scientific textbooks accounts for 25 per cent of titles and seven per cent of sale-units. This amount accounts for 20 per cent of sales in the publishing market — equivalent to BRL 418,550,460 in 2006.

- Since 1960, the publishing industry (i.e., books in all forms, newspapers, and magazines) has been tax-exempt. In 2004, the publishing industry was granted additional benefits and freed from an obligation to make contributions such as Social Integration Programme fees and the Contribution for the Financing of Social Security. These tax and contributions exemptions, which affect both the final product and the production process (including, for instance, the paper used) are intended to reduce the final price of the product.

- Between 2001 and 2006, these subsidies (by virtue of the tax and contribution exemptions) represented a windfall of around 30 per cent of the total sales income, and were roughly double the total budget of the Brazilian Ministry of Culture over the same period.

- Taxpayer monies constitute the largest single investment source for higher education scientific and professional books in Brazil. Federal and state public universities in Brazil are free, the salaries for employees and professors come from the universities' budgets (and thus from the government), and many scholarships, including at master's and doctoral levels, are provided. Additionally, the majority of public institutions maintain their own academic publishing units, also supported by their university budgets.

- Most textbooks are written by professors. For instance, 86 per cent of the books in the GPOPAI sample (1,910 books adopted for 25 different courses in more than 14 institutions) were authored by full-time professors from public institutions.

- Furthermore, according to GPOPAI (2008), the total invested by universities and public financial agencies (such as the São Paulo Research Foundation) through scholarships and publication grants is BRL 78,410 over three years per master's thesis per student, and BRL 155,344 over three years per doctoral thesis per student. By comparing these values with what is invested by publishers of books derived from theses, the GPOPAI (2008) study concluded that 17.9 per cent of the total cost of a book based on a master's thesis comes from private investment, whilst 82.1 per cent comes from public investment. For doctoral theses, 9.9 per cent is from private sources, whilst the remaining 90.1 per cent comes from public investment.

- University presses also play an important role, and the estimated average value of public support (through either direct or indirect means) was 66 per cent of the total cost of the university press.

At the school level, through the Ministry of Education, the Brazilian federal government operates three programmes geared toward K–12 textbooks: the PNLD (National Textbook Programme), which meets the demands of students registered in elementary education; the PNLEM (National Textbook Programme for Secondary Education), which meets the needs of secondary school students; and the PNLA (National Textbook Programme for Youth and Adult Literacy), which meets the needs of youths and adults who have already finished the regular school phases but wish to continue their education to receive formal diplomas.

The textbooks for courses in a given school year are distributed free of charge to all students registered in elementary school, high school, or the Brazil Literacy Programme. For those states that opted for decentralisation, such as São Paulo, the National Fund for Education Development (FNDE) transfers financial resources for the acquisition and distribution of textbooks, and the Secretary of Education of that state has total autonomy with regard to the choice of titles. All of the resources used for the textbook programmes are financed by the general budget of the federal government, obtained through a tax called "salary-education". In 2008, the total gross amount collected was BRL 8,863,800,740 (Rossini, 2010). This data calls attention to the amount of investment that moves from the government directly into the hands of private publishers through a long and complex process that has not changed in many years.

Taking account of the expense of procuring all-rights-reserved textbooks, and then attempting to move this system towards the use of OER, OER activists in Brazil have identified the need for policy-building and advocacy at federal, state and local levels. There are currently four main policy efforts underway in Brazil. These efforts have demanded significant work behind the scenes to get policy makers to "buy in" to the idea of OER and understand the role of the government in setting such policies. The work involved presentations and meetings to convey and discuss the main results of the research conducted by IDEC and GPOPAI, and thereby to explain the economics of textbook and educational resource publishing, and how and when the government pays for educational resources. Given the numbers presented above, it seems likely that significant economic gains can be achieved from applying open licences to the textbook market in that country, particularly given the significant economies of scale. A parallel textbook model analysis completed in South Africa illustrates this potential quite clearly.

Educational textbooks in South African secondary education[6]

As has been indicated, the high cost of textbooks is also being questioned in South Africa. The expense of materials acquisition in this context has also increased as a consequence of developments in pedagogical approaches, instructional design improvements, and the introduction of outcomes-based learning. This is because, as has been noted, many modern printed materials typically tend to be workbooks rather than traditional textbooks designed for use by single students. If one examines traditional government models of learning and teaching support materials (LTSMs) acquisition in large-scale education systems such as the schooling system, it is clear that these models are not as economically efficient as they could be.

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[6] Costs in this scenario are taken from 2006.

The following scenarios, based on the South African context, compare traditional textbook acquisition with an alternate model based on using open licences.

Traditional models of textbook acquisition

If a government education department in South Africa wishes to procure copies of life sciences textbooks for Grade 10 learners, the traditional approach is to rely on publishers to produce these textbooks and then attempt to sell these to the Department of Education. This model has certain advantages:

• It creates choices.

• It leaves the development of LTSMs in the hands of private companies, thus allowing competition to improve the product.

• It prevents governments from having to make their own preliminary investments in developing LTSMs.

A brief review of this model, however, reveals several conceptual flaws worth interrogating. Let us assume that the Department wishes to procure 50,000 copies of these textbooks (colour, approximately 300 pages each) at an average price of ZAR 60 each. The cost of procuring these materials will be ZAR 3 million. Further, let us assume that a requirement of the tender is that these materials have been produced to meet the specific requirements of the National School Curriculum, and that the Department has been presented with ten competing products from which to select. If the average total cost of development of each textbook was ZAR 500,000, then the initial venture capital investment was ZAR 5 million. Looked at in isolation, this may seem to confirm an argument in favour of such a model.

However, if we are to assume that all of the publishers making these textbooks available are commercially viable organisations (that is, their venture capital investments ultimately yield profits of significant enough value to justify the initial investment), then it stands to reason that those publishers which have not been successful in selling enough copies of a single book must have an alternative strategy for recovering their initial investments on this book and then turning a profit. The reality is that this model of competition spreads the venture capital cost of textbook development across multiple products, in the expectation that several books will not sell well enough to recover their venture capital cost. So, publishers logically expect several of their products not to sell, and thus — if unsuccessful in one subject — hope to be successful in other subjects and/or grades.

This is one of the key reasons that such textbooks remain so expensive, even though advances in printing have reduced the (profitable) printing and school distribution costs of a 50,000-book print run to around ZAR 18–20 (a conservative estimate). The balance of the money spent goes to cover the overall venture capital cost of developing the publisher's entire textbook product base, after which it is recovered as profit. This model has at least five key implications:

1. Systemically, it loads the cost of textbook acquisition with a series of failed venture capital investments.

2. It discourages publisher investment in niche courses and materials with limited distribution potential.

3. It discourages ongoing revision, updating, and improvement of materials over academic years, as from a business perspective it makes sense to sell the same textbook for as many years as possible before revising.

4. It tends to discourage the best materials developers from collaborating to produce materials, as each is competing for a fixed market.

5. It means that despite large investments by government, the education system is structurally incapable of building a public-domain intellectual property base, upon which new knowledge can be constructed.

An alternative scenario

An alternative approach to this strategy would be simply to shift the point of competition, so that rather than publishers competing at the point of sale of completed products, competition would occur at two separate stages: (1) at the point of development of the materials and (2) at the point of printing and distribution.

In this scenario, the same government department could deploy its ZAR 3 million investment for a set of 50,000 books very differently. It could set aside, say, ZAR 2 million for development of the materials and ZAR 1 million for printing and distribution (at an average cost of ZAR 20 per book). The investment in development of the textbook is four times higher than in the traditional scenario, thus allowing sufficient budget to buy out the copyright of the produced materials and to ensure a collaborative, team approach to materials development (demonstrated in many environments to produce better quality learning materials, all other factors being equal).

This model has several benefits:

1. It leaves LTSM development and printing in the private sector, thus retaining the benefits of competition.

2. It allows companies to specialise in only one of the two functions if they desire, thus opening the way to greater participation in the process by more organisations that might not be inclined to compete in both areas.

3. It gives the tendering agency (the government department) the ability to require tenderers to cooperate during the development phase, where such collaboration might lead to better materials.

4. It leaves intellectual property in the hands of government. If this is deployed sensibly — for example, through release under an Attribution–ShareAlike Creative Commons licence — it creates a globally accessible pool of OER on which other materials developers can build for future development processes.

5. If managed wisely, it can lead to choice over time (through selective investments in multiple versions of textbooks).

Table 7   Traditional textbook acquisition scenario (all figures are in ZAR)

	Initial investment	Content development investment	Printing and distribution investment	Content adaptation/ versioning investment	Total cost	Budget balance (for further investment)	Cumulative budget balance (for investment in other LTSMs)
Year 1	3,000,000.00	0	3,000,000.00	0	3,000,000.00	0	0
Year 2	3,180,000.00	0	3,180,000.00	0	3,180,000.00	0	0
Year 3	3,370,800.00	0	3,370,800.00	0	3,370,800.00	0	0
Year 4	3,573,048.00	0	3,573,048.00	0	3,573,048.00	0	0
Year 5	3,787,430.88	0	3,787,430.88	0	3,787,430.88	0	0

Table 8   Alternative textbook acquisition scenario (all figures are in ZAR)

NOTE: This scenario assumes that in year one, it is necessary to procure books according to the traditional model to facilitate the transfer from one approach to another.

	Initial investment	Content development investment	Printing and distribution investment	Content adaptation/ versioning investment	Total cost	Budget balance (for further investment)	Cumulative budget balance (for investment in other LTSMs)
Year 1	3,000,000.00	2,000,000.00	3,000,000.00	0	5,000,000.00	–2,000,000.00	–2,000,000.00
Year 2	3,180,000.00	0	1,060,000.00	106,000.00	1,166,000.00	2,014,000.00	14,000.00
Year 3	3,370,800.00	0	1,123,600.00	112,360.00	1,235,960.00	2,134,840.00	2,148,840.00
Year 4	3,573,048.00	0	1,191,016.00	119,101.60	1,301,117.60	2,262,930.40	4,411,770.40
Year 5	3,787,430.88	0	1,262,476.96	126,247.70	1,388,724.66	2,398,706.22	6,810,476.62

This kind of economic logic has underpinned a recent initiative by the South African Department of Basic Education (DBE) to begin distribution of textbooks produced as OER. The DBE has

> printed open-licensed science and maths textbooks for every grade 10 learner in the country, and will follow up with grades 11 and 12 soon…[W]hen offered a good, open-licensed textbook written by volunteers and developed by Siyavula (a Shuttleworth Foundation project), the DBE decided that printing and distributing these to schools countrywide could be a key part of improving science and maths education in South Africa. (Attwell, 2012)

As the author of this report goes on to note:

> A precedent has been set: the DBE printing open-licensed materials from a non-traditional publisher on a massive scale. Today, the right team of pros can produce open-licensed textbooks in months and pitch them to the DBE. Tomorrow, these might be ebooks or software on tablet computers. Their development might not be funded by a social-impact foundation, but a corporate sponsor. They could be produced as part of broader business models that involve teachers, learners, schools, device makers, distributors or printers. And the teams that produce them could do so under far better circumstances than the badly paid, debilitating, high-pressure environment that schoolbook production teams have become used to, often to their personal detriment. (Attwell, 2012)

Other emerging trends in open textbooks

As textbook costs rise, there is a simultaneous move toward digital textbooks, due to the increasing availability of ICT. The rise in sales of e-books in general indicates the growing opportunity for electronic textbooks (Hilton & Wiley, 2010). This potential, combined with the potential of OER, is an option to mitigate the rising cost of textbooks. Several organisations are making electronic textbooks available for free. For instance, Rice University's Connexions (in the USA) offers some free electronic textbooks. Furthermore, higher education textbook publishers like Textbook Media and Flat World Knowledge (FWK) use the "freemium" pricing strategy, in which some goods are given away for free, whilst premium services are available for a price. Textbook Media offers free (advertisement-supported) online textbooks as well as print and electronic paid versions of the textbook that are not supported by advertisements. FWK also makes free online textbooks available and is trying to build a sustainable business based on open textbooks. The basic approach of FWK is similar to the traditional publishing process up to the point of publication. The model begins with recognised, reputable authors who have established reputations writing textbooks and receiving editorial and design support from FWK. Supplemental materials (such as digital flash cards, study guides, PowerPoint presentations, teacher materials) are also created. Once the book and materials are complete, the book is published online for free public access under a Creative Commons Attribution-NonCommercial-ShareAlike (BY–NC–SA) licence. Alternate formats of the book (such as printed and audio versions) and supplemental materials are then made available for purchase. Notably, FWK makes their books available for customisation and remixing, and offers audio versions as well as study aids (Hilton & Wiley, 2010). FWK is thus able publish OER textbooks that students can use for free online or purchase in print for less than USD 40, compared to a typical USD 175 textbook (Wiley et al., 2012).

There have been several other approaches to reduce the cost of textbooks. In the state of Florida in the U.S., the Open Access Textbooks Grant Project aims to create a model for open textbook

implementation (www.openaccesstextbooks.org). The focus is on creating a sustainable model for Florida and other states to discover, produce, and disseminate open textbooks. The project builds on efforts in Florida and across the U.S. to create a sustainable open textbook model and a collaborative community for further implementation of open textbooks (Open Access Textbooks, n.d.). "Concepts in Calculus" textbooks are being developed by faculty members in the University of Florida Math Department. By providing access to just one text thus far (Concepts in Calculus I), Florida has helped 2,400 students over two semesters save up to USD 516,000 — at a single institution (Donaldson, 2011).

Another notable initiative demonstrating the tremendous potential to reduce the cost of textbooks is the Washington State Board of Community and Technical Colleges' launch of the Open Course Library. This is a collection of high-quality, low-cost educational materials for the state's 81 highest enrolled college courses. The project is funded in part by the Washington state government as an investment in reducing the cost of textbooks for the state's college students. The first 42 courses were released in October 2011, and the remaining 39 are slated for development in 2012 and release in 2013. The materials will be distributed digitally and can be used in place of traditional, more expensive textbooks. Some courses include commercially published materials, but the total cost cannot exceed $30 per student per term. Materials created through the programme are released under a Creative Commons Attribution licence. Courses are designed and peer reviewed by faculty members of the Washington community and technical college system. The authors are selected through a competitive process and are compensated through grants. All authors agree to adopt the materials they produce, and although use is optional, many faculty and departments have already moved to adopt them (Allen, 2011).

The Student Public Interest Research Groups conducted an informal study to evaluate the Open Course Library's impact on textbook costs. Based on a survey of 22 of the 42 faculty who designed the courses, it is believed that these faculty and their departments will alone have saved students USD 1.26 million by using these materials in place of traditional textbooks during the 2011–2012 school year. This is greater than the USD 1.18 million cost of producing the courses. For students, the materials cost 90 per cent less on average than the traditional materials previously used by faculty. Each term, this translates to USD 102 in savings per student and USD 5,499 per course of students. Once the full 81 courses are released, the overall savings could climb to USD 41.6 million annually if the materials are adopted for all 410,000 annual enrollments at Washington's community and technical colleges. The savings are likely to be even greater, since the materials are freely available for use at any college in the country. Whilst 100 per cent adoption is unlikely, usage at other colleges and universities across Washington and the rest of the country is likely to produce even greater savings. The results of this study show that the Open Course Library not only will save students millions on textbooks, but also is a good investment, generating a considerable return on the state's investment. Even in the unlikely case that the faculty who created the courses are the only ones who use them, the programme will essentially pay for itself in textbook savings within the first year, but it is likely that the savings will be far greater (Allen, 2011).

There is already evidence that the impact of these courses is more widespread. For example, the Saylor Foundation, a non-profit organisation dedicated to free education, plans to create professionally edited, modular versions of the courses. Project Kaleidoscope also intends to adapt the materials to suit California's community college students. Furthermore, the department of education in São Paulo, Brazil, plans to translate the material into Portuguese. Whilst this analysis is based on a very small sample that is not necessarily representative of the larger faculty population, the findings do at least make a convincing case for the programme's cost-saving potential (Allen, 2011).

2.4 Open Access Publishing

Another discernible area of debate on the economics of OER is in the field of open access publishing. The Wellcome Trust, in an examination of scientific publication, argues that savings of up to 30 per cent could be achieved through open access publishing (Downes, 2007). Harvard University has encouraged its faculty members to make their research freely available through open access journals and to resign from paid publications. This is in response to rising subscription fees from academic journal publishers, which cost the university's library approximately USD 3.5 million a year (Sample, 2012). There is a possibility that their decision to take on the publishers may prompt other universities to follow suit.

McGreal and Chen (2011) compared Canada's first open access press — Athabasca University Press (AUPress) — with three other traditional Canadian university presses whose editions are available only for purchase, mostly in print format. Using Amazon.com and Amazon.ca rankings, they found that releasing academic books on open access does not lessen printed book sales online. However, AUPress was able to demonstrate a significantly larger readership for its books, as evidenced by the number of downloads of the open electronic versions.

In the UK, Houghton and Oppenheim (2010) considered the costs and potential benefits of alternative models for scientific and scholarly publishing, and whether there are new opportunities and new models that might better serve researchers and more effectively communicate and disseminate research findings. Their paper summarised the findings of a study undertaken for the Joint Information Systems Committee (JISC) in the UK (Houghton & Oppenheim, 2010). They considered three scholarly publishing models: (1) the subscription publishing model, in which the publisher charges a fee for a subscription to a journal or for the purchase of a book; (2) the open access publishing model, in which access to the journal or book is free of charge, with publication costs being paid by the author or the author's institution or funding body; and (3) the open access, self-archiving model, under which the author deposits a manuscript in a freely accessible online repository. They acknowledge that the last is not in itself a formal publishing model, but they seek to turn it into a formal model by either running self-archiving in parallel with subscription publishing, or overlaying on it some form of post-archiving peer review, quality control, and branding (S. Hall, 2010).

The authors estimated that open access publishing for journal articles using the "author pays" model might bring system savings of around GBP 500 million per annum nationally in the UK in a worldwide open access system (at 2007 prices and levels of publishing activity), of which around GBP 430 million would accrue in higher education. Open access self-archiving without subscription cancellations (Green OA) might save around GBP 108 million per annum nationally in a worldwide Green OA system, of which around GBP 75 million would accrue in higher education. The open access, self-archiving with overlay services model explored is necessarily speculative, but would likely produce similar savings to open access publishing using the "author pays" model. They do acknowledge that in reality there are variations and hybrids (e.g., delayed open access, and open choice/author choice), and the models co-exist in various mixes in different research fields (Houghton & Oppenheim, 2010).

Houghton and Oppenheim (2010) conclude that different publishing models can make a material difference to the costs incurred and benefits realised from research communication, and it seems likely that more open access to findings from publicly funded research would have substantial net benefits.

The paper is regarded as a major contribution in considering the case for open access and for open institutional repositories as standard resources in publicly funded universities (M. Hall, 2010). However, it also generated much debate and has been criticised for its methodology, in particular that the model does not take account of certain costs and that some of the figures are incorrect (Houghton & Oppenheim, 2010). Another criticism asserts that it is difficult to compare the models, as the subscription model is mature and costs can be known, whilst the open access model is immature and not yet proven to work in any sustainable or scalable way. Further criticisms are that the research is outdated, that there was no engagement with the subscription publishing industry during the report's development, and that it is not feasible to ask the publishing industry to provide figures, as these constitute commercially sensitive information in a highly competitive industry. Thus, some have argued that the research uses data selectively, with a bias towards open access (S. Hall, 2010).

Another criticism is that this will not make a substantial difference to UK scholars, as they have immediate access to the vast majority of the scientific articles that they need for their research (S. Hall, 2010). However, there are substantial benefits for scholars from the developing world, particularly in the context of limited resources. Furthermore, M. Hall argues that even if the differential were zero, there are still benefits to open access, particularly if the research is publicly funded:

> A true comparison between the system of open access publishing and repositories and the for-profit, subscription model of publishing would require that the investment in public funding was either factored out, or corrected by means of a return on the investment through profits from sales. This would require that subscription publishing was at least £5 billion cheaper than open access across the UK's scholarly output system as a whole. (M. Hall, 2010, p. 64)

Regardless, the debate has opened up options for new ways of locating public investment.

2.5 OER and Accreditation

An additional noteworthy economic trend in OER pertains to efforts to shift the pricing of accreditation models that use OER by making course materials available for free and then charging only for assessment and accreditation when students have worked through those materials. Various models of this kind are now being piloted by universities. Possibly the most ambitious of these is the OER University (OERu; Attwood, 2011). The plan is to draw together existing free online learning materials from around the world and develop new OER to create whole degree programmes that can be studied via the Internet for free.

The OERu aims to provide free learning to all students worldwide, using OER learning materials with pathways to gain credible qualifications from recognised education institutions. It is rooted in the community service and outreach mission to develop a parallel learning universe to augment and add value to traditional delivery systems in post-secondary education. Through the community service mission of participating institutions, the project plans to open pathways for OER learners to earn formal academic credit and pay reduced fees for assessment and credit (Wikieducator, n.d.).

Thus, the project will focus on how to offer students using OER the opportunity to earn academic credit and to have their work assessed at a significantly reduced cost. It is hoped that these degrees could cost up to 90 per cent less than a traditional qualification gained through on-campus study. It is believed that this initiative would widen access to higher education in the developing world,

and would help students in the developed world who are faced with rising tuition fees. Universities would work together to develop learning materials under open-content licences. The universities would use existing materials in addition to producing new OER themselves to fill the gaps and create coherent courses. It is estimated that an OER university degree could be ten to 15 per cent of the cost of a traditional degree. This system could run alongside traditional modes of delivery (Attwood, 2011).

The move towards such a collaborative approach, spanning several institutions, is inspiring, although it will require research and monitoring to determine whether it fulfils its economic potential.

3 Conclusion

Good education cannot be created or sustained without proper funding, regardless of which methodologies or technologies are used. Investing in education can only ever be meaningfully justified in terms of the long-term social and economic benefits that it will bring societies, not in terms of how those investments will help to enrol more students at progressively declining unit costs. The OER movement considers these long-term benefits in its argument for the cost-effectiveness of OER, particularly in the context of global challenges from increased student enrolments and higher costs for education. However, there is limited concrete corroborating evidence to support this assertion.

Although the available information is limited, this paper has found that there are at least four areas in which emerging data demonstrates actual or potential economic gains to be had from harnessing OER. These are:

1. Harnessing OER in the creation of new, contextually relevant courses. The case study from Guyana demonstrates powerfully, if only anecdotally, the significant cost reductions that this approach can yield.

2. Applying open licences in the textbook market. The economics of the textbook market, especially in places where economies of scale are readily applied, indicate clearly that significant efficiency gains can be attained by shifting to open licences. This approach is accompanied by clear evidence from around the world that governments are increasingly understanding its potential and starting to shift decisively towards such models.

3. Releasing research under open licences. Although not OER per se, research is a critical resource requirement for effective education, particularly at the higher education level. Although there is still some debate about the merits of open access approaches, data is emerging that demonstrates the economic value to be gained from supporting open access models.

4. Harnessing OER to create alternative accreditation pricing models. This work is still in its infancy, and thus there is no concrete data to demonstrate actual economic gains, but it will be interesting to monitor progress in this area over the next few years.

Encouragingly, there is a drive within the OER movement towards making a case for public funding of OER. Brazil provides a good example of efforts to mobilise government support with concrete figures on the rising cost of textbooks. At the same time, it is important to provide actual costs of moving to an open model, to illustrate its potential for sustainability. Such cost information is also particularly important because many people are trying to develop sustainable OER models independent of donor funding.

Whilst this paper has provided an overview of the economic benefits of OER, it is clear that further research is needed to explore the economic gains from harnessing OER, and to analyse any unintended consequences. With this in mind, it is recommended that future research focus on the following:

- Conducting an analysis of indirect income revenue generated through OER activities, particularly in instances where universities with OCW have begun to collect this information. It will also be particularly important to track the progress made by the OER University.

- Including a focus in OER research on actual costs of creating OER, to build a rich databank of resources that will help government and institutions make informed cost–benefit analyses before adopting an OER model. Focus should be placed on creating content from scratch, as well as actual costs of adapting/converting content to OER.

- Conducting a longitudinal analysis of organisations that have adopted OER business models, to determine their sustainability over the long term.

- Encouraging new OER "projects" to include a financial assessment element, to address the cost-efficiency of the model. These results should be made publicly available to help others make decisions around adopting OER.

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