

Open Practices in Higher Education: Trends and Possibilities for Africa

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# Acronyms

AHEAD Association of Higher Education and Disability

AUCEA Australian Universities Community Engagement Alliance

BGI Brain Gain Initiative

CC Creative Commons

CED Committee for Economic Development

CET Centre for Educational Technology

CHS College of Health Sciences

COL Commonwealth of Learning

COSTECH Commission for Science and Technology (Tanzanian)

COVAB College of Veterinary Medicine, Animal Resources, and Biosecurity

CPD Continuing Professional Development

DBE Department of Basic Education

DCD Department of Communication Design

DFAQ Dynamic Frequently Asked Questions

DHET Department of Higher Education and Training

EFA Education for All

GDP Gross Domestic Product

IADP Association for Digital Publications

ICT Information and Communications Technology

ILO International Labour Organization

KNUST Kwame Nkrumah University of Science and Technology

LMS Learning Management System

MDGs Millennium Development Goals

MIB Modern Information Business

MIT Massachusetts Institute of Technology

MOOC Massive Open Online Course

MRSI Mobile Research Supervision Initiative

OA Open Access

OCW Open Course Ware

ODL Open and Distance Learning

OECD Organisation of Economic Cooperation and Development

OER Open Educational Resources

OGP Open Government Partnership

OSI Open Source Initiative

OSU Ohio State University

P2PU Peer to Peer University

QA Quality Assurance

RUFORUM Regional Universities Forum for Capacity Building in Agriculture

SET Science, Engineering and Technology

SME Small and Medium Enterprise

SMS Short Message Service

SPOCs Self-Paced Online Courses

STI Science, Technology and Innovation

TESSA Teacher Education in Sub-Saharan Africa

UCT University of Cape Town

UFH University of Fort Hare

UNICEF United Nations Children’s Fund

UNISA University of South Africa

UP University of Pretoria

WVU West Virginia University

# Abstract

This report, based on a desktop review, unpacks the possibilities of openness in African higher education, launching the discussion with a presentation and explanation of the concepts and icons associated with various tenets of open practice. The discussion then moves on to explore the factors leading to the rise of openness, including a social inclination toward openness, government involvement, and technological innovations that have encouraged and facilitated openness. Global and regional trends in openness in higher education are highlighted in the context of the core business of universities: teaching and learning, research, and community engagement. Concerns over quality in open practice are raised and discussed. Given its importance, especially in relation to African economic development, the important role of higher education in research, development, and innovation is given special attention, covering aspects of supply and demand, and university-industry partnerships – their nature, enablers to partnership, open innovation, and barriers to such partnerships. The report concludes with an outline of recommendations on how African universities can reinvent themselves through making certain changes that will enable them to be more relevant and responsive to 21st century skills demands and ultimately to serve their communities more effectively and efficiently.

# Section 1: Open Concepts in Education

## Introduction

This report, based on a desktop review, explores the possibilities of openness in African higher education, and considers how African universities can respond to the skills demands of the 21st century. This discussion is timeous, given the increasing recognition that higher education plays a pivotal role in the development and transformation of nations, and a general consensus among policy makers, scholars and international development partners that the neglect of African higher education cannot continue (Yizengaw, 2008). As rates of participation in higher education continue to grow in Sub-Saharan Africa, institutions need to consider how this demand for higher education can drive new approaches to teaching and learning, creating opportunities for entry to new markets and new global partnerships, stimulating new distribution approaches, and also creating new sources of competition (Ernst and Young, 2012).

## Understanding the concepts

The concept of openness, which is used to refer variously to content, data, teaching and learning, has over the years attracted a repertoire of terms denoting various facets of open practice. Some of this terminology is used in this report and is elaborated in this section.

### Open data

Open data is information that can be freely used, shared, and built on by anyone, anywhere, for any purpose (Open Knowledge Foundation Blog, 2013). According to the Open Definition (n.d.):

A piece of data or content is open if anyone is free to use, reuse, and redistribute it — subject only, at most, to the requirement to attribute and/or share-alike.

There are three important principles underpinning this definition of openness:

* Availability and Access: people can get the data – the data must be available as a whole, and at no more than a reasonable reproduction cost, preferably by downloading over the Internet. The data must also be available in a convenient and modifiable format.
* Re-use and Redistribution: people can reuse and share the data – the data must be provided under terms that permit reuse and redistribution, including intermixing with other datasets.
* Universal Participation: anyone can use the data – everyone must be able to use, reuse, and redistribute. There should be no discrimination against fields of endeavour or against persons or groups. For example, ‘non-commercial’ restrictions that would prevent ‘commercial’ use, or restrictions of use to certain purposes (for example, only to education), are not permitted (Open Knowledge Foundation Blog, 2013).

Additional important elements are:

* Legal openness: others must be allowed to get the data legally, to build on it, and to share it. Open data needs to be licenced to indicate that it is open data. Without a licence, the data cannot be reused. Legal openness is usually provided by applying an appropriate (open) licence that allows free access to, and reuse of the data, or by placing the data into the public domain.
* Technical openness: there should be no technical barriers to using the data. The Open Definition has various requirements for ‘technical openness,’ such as requiring that data be machine readable and available in bulk (Open Knowledge Foundation Blog, 2013).

Governments and organizations that harness open data and build open content help to establish a culture of openness and sharing. The philosophy underlying open data, one of increasing transparency with information published under open licences, has important implications for the development of open education environments. This level of openness, with the provision of open data, provides one of the building blocks that support the development of different types of open educational intervention.

### Open access

Journal price increases over the last decade mean that many universities, particularly those in developing countries, can no longer afford subscription costs, thus reducing access to up-to-date research (Sherpa, n.d.). Open access (OA) is regarded by many people as a solution to this challenge.

There are various definitions of OA, although the concept is still evolving. Generally, OA refers to research articles that are freely and openly available to the public for reading, reviewing, and making and distributing derivative works (Wiley and Green, 2012). OA literature is digital, online, free of charge, and free of most copyright and licensing restrictions. It is made possible by the Internet and by the consent of the author or copyright-holder (Suber, n.d.). Open access publishing is compatible with peer-review, and open access articles typically go through normal refereeing and editorial processes (Open Humanities Press, n.d.).

There are two strategies by which research articles become available for OA:

1. Self-archiving: When authors make their articles freely available in digital form on the Internet, they are said to be ‘self-archiving’ them. OA archives or repositories do not perform peer reviews, but simply make their contents freely available to the world. These archives may contain un-refereed pre-prints, refereed post-prints, or both. Self-archiving can be done on authors’ personal websites, in disciplinary archives, institutional-unit archives (departmental or faculty), or in institutional repositories (Bailey, 2006; Suber, n.d.).
2. Open access journals: An alternate way of providing OA is to publish in an OA Journal. Authors who publish an article in an open access journal retain copyright of their work, and the articles are available free of charge for all readers immediately upon publication. Additionally, the articles are archived in public repositories, which ensure authors worldwide visibility and impact. Many OA journals use an ‘author pays’ business model, whereby authors pay the publication costs upfront to make the article available to readers worldwide (Beilstein Journal of Organic Chemistry, n.d.; Bailey, 2006). There is a growing number of open access Journals, with at least one journal available in most disciplines. A list of those currently available is provided by the Directory of Open Access Journals[[1]](#footnote-1) (10,066 were listed as of 1 December, 2014).

There is some disagreement as to whether open access journals should use peer review as a quality control mechanism. There is also the question of whether the journal must use a Creative Commons (CC) or similar licence. This dispute reflects the deeper, fundamental question of whether ‘open access’ is just free access, or free access plus a set of specified use rights that go significantly beyond normal copyright rights (Bailey, 2006). Nevertheless, if scholarly publications are regarded as a core activity undertaken by academics, then open access publishing represents a fundamental shift towards providing access to that knowledge (Sharples et al., 2013).

### Open source software

‘Open source’ refers to something that can be modified because its design is publicly accessible. Open source software is computer software that is distributed together with its source code – the code used to create the software. This allows the public to use and/or to modify the original design free of charge. It usually has a licence by which the copyright holder provides the rights to study, change, and distribute the software to anyone and for any purpose. Open source software is very often developed in a public, collaborative manner, which means that it is intellectual property shared amongst all who have helped develop or modify it. In general, open source projects, products, or initiatives are those that embrace and celebrate open exchange, collaborative participation, rapid prototyping, transparency, meritocracy, and community development (Pickett, n.d.; OpenSource.com). The world of open source software provides users with completely free and legal alternatives to expensive software tools (Wiley and Hilton, 2009).

Developed collaboratively through peer review, one of the claimed advantages of open source software is the high quality that results when source code gets passed around, tested, and modified to correct any bugs developers may encounter (Pickett, n.d.). Some developers generate revenue by selling documentation and help manuals to support the software, whilst others are donor funded. Since open source software is free to use, typically there is no technical support included; instead, users depend on forums and discussions to report bugs or find answers to their questions. Fortunately, the most popular open source programmes have an abundance of helpful resources available on the Internet (techterms.com).

Some open source licences ensure that anyone who alters and then shares a programme with others must also share that programme’s altered source code without charging a licensing fee (OpenSource.com). The Open Source Initiative (OSI) issues certification standards that confirm that the source code of a particular computer program is made available free of charge to the general public. The OSI notes that open source is not just about access to the source code, and that the software must meet several criteria, including free redistribution, allowing the modification of derived works, no discrimination against persons or fields of endeavour, a licence that is not specific to a product, it must not restrict other software, and must be technology neutral (Open Source Initiative website). It should be noted, however, that there are usually strict rules governing who is entitled to modify the core code (as opposed to code which is being changed for a derivative of the core product). This is an example of the meritocracy mentioned above, where openness is restricted by mutual agreement in the interests of maintaining high standards.

There are various well-known open source projects, such as the Linux operating system, the Mozilla Firefox Web browser, and the OpenOffice.org productivity suite. Some of the most widely used open source Learning Management System tools are Moodle, Claroline, Dokeos, Sakai and .LRN (pronounced ‘dot learn’). Each of these projects has been developed by a community of developers, and has gained levels of popularity that rival those of their commercial counterparts.

The availability of such open source solutions, with their philosophy of shared intellectual capital, is important as it offers a low-cost technology option for education service providers (including many outside traditional higher education institutions). Having access to such tools allows anyone to set up platforms to offer education at little cost. Education providers are not confined to using proprietary software, allowing them to offer increasingly varied educational offerings with reduced associated technology costs.

### Open educational resources

Open educational resources (OER) are any 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 the requirement to pay royalties or licence fees (Butcher, 2011). OER can exist as small, stand-alone resources (reusable learning objects) that can be mixed and combined to form larger pieces of content or as larger course modules or full courses. OER can also include simulations, labs, collections, journals, and tools. These materials are considered open if they are released under an open license, such as a Creative Commons licence, or are in the public domain (Wiley and Green, 2012).

The 2012 Paris Declaration on Open Educational Resources adopted the following definition of OER:

teaching, learning and research materials in any medium, digital or otherwise, that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions (UNESCO, 2012).

Although definitions may vary, the fundamental principles underlying OER are the freedom to share knowledge, and that the knowledge should be legally, socially, and technologically open (Torres, 2013). This ensures greater access for more people than to a similar commercial product. It also increases flexibility of use, facilitating still greater access (Smith, 2013).

OER create multiple opportunities for innovation in the teaching and learning context. For example, the sharing of resources opens access to intellectual capital, which in turn can dramatically improve the affordability of education. It can also enable better personalization of instruction (Wiley and Green, 2012) by focusing less on the content (which is freely available) and more on facilitation of the learning interaction. This directly contributes to pedagogical change in higher education as it encourages educators to think beyond traditional ways of teaching.

OER has been adopted by institutions such as the Massachusetts Institute of Technology (MIT)[[2]](#footnote-2) and Rice University[[3]](#footnote-3) and the world’s huge open universities (such as the Indira Ghandi National Open University), populist and community sectors (such as WikiEducator, Peer to Peer University (P2PU)), and Washington’s Open Course Library.[[4]](#footnote-4) New collaborations such as OERu are recognized as opening the doors to new levels of educational democratization (Conrad, 2013).

### Open learning

Open learning is a long-established approach to education that seeks to remove unnecessary barriers to learning, while aiming to provide students with a reasonable chance of success through an education and training system that is centred on their specific needs and located in multiple fields of learning (Butcher, 2011).

The Commonwealth of Learning (COL, 2000), in describing the philosophy of open learning, emphasises that learners should be given the following choices:

* Medium or media (for example, print, on-line, television, or video);
* Place of study (at home, in the workplace, or on campus);
* Pace of study (closely paced or unstructured);
* Support mechanisms (for example, tutors on demand, audio conferences, or computer-assisted learning); and
* Entry and exit points.

Open learning is regarded as including distance education, resource-based learning, correspondence learning, flexi-study, and self-paced study (UNISA Open n.d.). Butcher (2011) notes that open learning incorporates several key principles:

* Learning opportunities should be *lifelong* and should encompass both education and training;
* The learning process should *centre on the learners,* build on their experience and encourage independent and critical thinking;
* Learning provision should be *flexible* so that learners can increasingly choose, where, when, what and how they learn, as well as the pace at which they will learn;
* *Prior learning, prior experience* and *demonstrated competencies* should be recognized so that learners are not unnecessarily barred from educational opportunities by lack of appropriate qualifications;
* Learners should be able to *accumulate credits* from different learning contexts;
* Providers should create the conditions for a *fair chance* of *learner success.*

### Massive open online courses

According to Barclay and Logan (2013), the ubiquitous nature of information and communication technologies (ICT) has provided important opportunities in education through online learning methods, and this has now been extended to the development of massive open online courses (MOOCs). Since the New York Times declared 2012 ‘the year of the MOOC’, the phenomenon has attracted worldwide publicity and MOOC providers and platforms have emerged rapidly (Sharples et al., 2013).

The term MOOCs was coined in 2008 by Stephen Downes and George Siemens to refer to a web- based course, with potentially thousands of participants, that can be taken from anywhere across the world. The foundation of the concept is an extensive and diverse set of contents, contributed to by a variety of experts, educators, and instructors in a specific field, and aggregated into a central repository, such as a website. The uniqueness of this content is that it can be ‘remixed’ – thus, the materials are not necessarily designed to go together but become associated with each other through the MOOC. A key element of the original vision is that all course materials, and the course itself, are open source and free, with the option of a fee should users wish to obtain a university credit (Johnson et al., 2013).

Educause (2013) provides the following simple explanation of a MOOC:

A MOOC is a model of educational delivery that is, to varying degrees, massive, with theoretically no limit to enrolment; open, allowing anyone to participate, usually at no cost; online, with learning activities typically taking place over the web; and a course, structured around a set of learning goals in a defined area of study.

While all MOOCs have their large scale and free access in common (Rodriguez, 2013), the concept does appears to have evolved. Most definitions of MOOCs emphasize openness in relation to learners’ ability to access content through web-based platforms, openness in terms of cost, openness in terms of open courseware, or openness with respect to learner collaboration (Mundy and Geskell, n.d.). However, a dichotomy has emerged between two very distinct types of MOOC courses in terms of their underpinning theory, format and structure. Stephen Downes introduced the terminology of cMOOCs and xMOOCs to differentiate between them: cMOOCs, are connectivist MOOCs and match the original vision, while the newer xMOOCs are based on a very different pedagogical framework, the ‘x’ being adapted from MITx and edX. Whilst the two types of courses have common features, they differ with regard to the way in which social interactions happen during the courses (Rodriguez, 2013).

In essence, cMOOCs are based on a philosophy of connectivism and networking, where students learn from educators or from each other in online course environments. These courses are community constructed and driven (Mundy and Geskell, n.d.). Rodriguez (2013) explains that:

c-MOOCs establish a many-to-many relation to develop massive interconnectedness. Multiple spaces, tools, technologies and a distributed interaction govern c-MOOCs. The role of the facilitator is to govern knowledge coherence and then the learners form/transform it via exploration and deepening the exposed ideas…. In cMOOCs a vital concept relates to what learners do for themselves with tools from a digital world and networking. They promote a self-regulated, highly motivated and autonomous learner. The knowing part of learning (epistemological development) and becoming a certain type of person (ontological development) go hand in hand.

xMOOCs, on the other hand, tend to follow traditional behaviourist approaches to learning and the structure of existing educational practices. They typically have traditional course structures, content and methods, with videotaped lectures, online quizzes, and weekly assignments. Their primary innovation is scaling (Rodriguez, 2013). These may be existing institutional courses which have simply been translated into a web based environment and made available to all, or courses delivered by a consortia of institutions as open courseware (Mundy and Geskell, n.d.). xMOOCs are typically provided by higher education institutions, sometimes in partnership with an ‘organizer’ (Educause, 2012). Big name xMOOC providers include Stanford-originated Coursera, the Harvard–MIT collaboration edX, and Udacity, which together have hundreds of thousands of enrolled students, illustrating their popularity (Johnson et al, 2013).

The concept of openness thus has different meanings in cMOOCs and xMOOCs, with learner autonomy, peer-to-peer learning and social networking being emphasized in cMOOCs, whilst xMOOCs are based on a tutor-centred model that establishes a one-to-many relationship in order to reach massive numbers (Rodriguez, 2013). In xMOOCs, ‘open’ does not necessarily refer to open content or even open access, but may only equate to ‘no charge’ (Johnson et al, 2013), with the option of a fee for certification. With regards to xMOOC providers, edX appears to be the only major player to have made its code open source, and it explicitly states that it hopes to do more in terms of open content. Coursera is regarded as the least open, with no openly licensed content available. Udacity uses YouTube to host its videos and allows reuse under Creative Commons (Clark, 2013).

Despite their differences, the technological advances, including the quality of the online delivery platforms, the ability to personalize material and the capacity to analyse huge numbers of student experiences, have allowed MOOCs to open higher education to millions of people (Rodriguez, 2013). The freedom for anyone across the world to view these materials gives them an extraordinary spread of access. They have the potential to reach and serve hundreds of thousands of learners who would otherwise not have access to education (Stacey, 2013). An additional appeal of MOOCs is that they offer the possibility for continued, advanced learning at minimal cost, allowing students, life-long learners, and professionals to acquire new skills and improve their knowledge and employability (Johnson et al, 2013).

A variation on the MOOC is the micro open online course or mOOC. This refers to small, targeted courses that are usually a sub-component of a full course. For example, a mOOC may cover a third of the learning outcomes for a ‘full’ university course, so that if a full course takes from 10 to 15 weeks, a mOOC would usually be completed over a two- to three-week period (Lee, 2012). mOOC can also refer to a course that is focused on developing a targeted skill (Bartoletti, 2012). mOOCs allow users increased flexibility to manage their learning around their personal commitments and learning interests (Lee, 2012).

### Self-paced online courses

Self-paced online courses (SPOCs) are open enrolment courses that allow students to enrol at any time of the year and complete the course at a flexible pace. These courses are geared towards independent learners as there is no opportunity for interaction with fellow students. Students in these courses can work and submit coursework at their own pace (University of Central Oklahoma, 2013; Waubonsee Community College, n.d.)

Interestingly, SPOC is also an acronym used for Small Private Online Courses, which are essentially MOOCs, but with fixed enrolment numbers. There appear to be two types: private and selective, with the private type appearing to be traditional online courses and the selective type being more innovative in the sense that anyone can apply, but acceptance is selective to limit enrolment. These developments are being led by Harvard and University of California, Berkeley, and are considered the next generation after MOOCs ([Shimabukuro](http://etcjournal.wordpress.com/2008/10/01/jim-shimabukuro/), 2013).

## Licensing

Central to the issue of openness is licensing. Legal frameworks such as Creative Commons[[5]](#footnote-5) (CC) help to govern how open a resource is. They provide mechanisms to ensure that authors of materials can retain acknowledgement for their work while allowing it to be shared, can restrict commercial activity and can aim to prevent people from adapting it if they so wish.

There have been some pragmatic solutions to define openness for legal purposes. For example, a widely used description of openness is the ‘4Rs’ suggested by Wiley (2009) to express core dimensions of Open Content:

1. Reuse – the right to reuse the content in its unaltered / verbatim form
2. Revise – the right to adapt, adjust, modify, or alter the content itself
3. Remix – the right to combine the original or revised content with other content to create something new
4. Redistribute – the right to make and share copies of the original content, your revisions, or your remixes with others

Content is open to the degree that a licence provides users with no-cost (free) permission to exercise these rights with regard to that content. So, whether these rights are granted unconditionally, or permitted only if the user meets certain conditions (e.g., requiring attribution, requiring distribution of derivatives under a specified license, or prohibiting commercial redistribution), this content is still called open. However, the more conditions placed on the user, the less open the content. The fewer restrictions a licence places on a user’s right to exercise the 4Rs, the more open the content (Wiley, 2009). Seven years after introducing the 4Rs framework, Wiley (2014) has expanded it to include a 5th dimension of openness - Retain, which pertains to the right to make, own, and control copies of the content.

## Icons denoting openness

Symbols have been established to signify various aspects of openness and to enable identification of particular aspects of openness. These are presented in the box below; most of them relate to CC licensing.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Box 1: Open Icons

|  |  |
| --- | --- |
| Icon | Description |
| Open Access logo PLoS white.svg | Open Access logo developed by the Public Library of Science (PLoS) |
|  |  |
| Open Access PLoS.svg | Open Access logo with text |
|  |  |
| Od 80x15 blue.png | Open Data |
|  |  |
| Oc 80x15 blue.png | Open Content |
|  |   |
| cc | Creative Commons |
|  |  |
| http://i.creativecommons.org/l/by/3.0/88x31.png | Attribution: A license that allows for distribution, remixing, reworking, and building upon others’ work as long as credit is given to the originator. |
|  |  |
| http://i.creativecommons.org/l/by-sa/3.0/88x31.png | Attribution – Share Alike: This licence makes provision for the remixing, reworking, and building upon the original work, even for commercial purposes, provided the new work is licensed under identical terms |
|  |  |
| http://i.creativecommons.org/l/by-nd/3.0/88x31.png | Attribution - No Derivatives: Work can be used for commercial and non-commercial purposes as long as it is unchanged and credit is given to the originator. |
|  |  |
| http://i.creativecommons.org/l/by-nc/3.0/88x31.png | Attribution – Non Commercial: Original work can be remixed, reworked, and built upon for non-commercial purposes. The new work does not have to be licensed under the same license as the original work, and the originator must be credited for their work. |
|  |  |
| http://i.creativecommons.org/l/by-nc-sa/3.0/88x31.png | Attribution – Non Commercial – Share Alike: Original work can be remixed, reworked, and built upon for non-commercial purposes, with attribution made to the originator, and the new work licensed under the same licensing conditions as the original work. |
|  |  |
| http://i.creativecommons.org/l/by-nc-nd/3.0/88x31.png | Attribution – Non Commercial – No Derivatives: The most restrictive of the Creative Commons Licenses, this license allows users to download original work and share it with others as long as credit is given to the original author. No changes can be made to the original work. |

 |

(Information drawn from Wikimedia Commons and Creative Commons)

## Conclusion

Openness is making it increasingly easy to access research and publications by reputable scholars. This means that academics from financially constrained contexts can now access current research without having to wait long periods to access it. It is also now easier to gain access to teaching resources developed by top academics. This level of openness has broadened the choices for academics, enabling them to stay current in their teaching, learning and research activities, while they can also contribute to the core functions of universities through sharing their own research, content and resources.

# Section 2: Understanding Openness in Higher Education

## Introduction

Two important ideas are central to the concept of ‘open’: egalitarianism and sharing. Egalitarianism suggests an equal right to participate (to access, use and collaborate). Sharing involves enhanced access to things that were usually restricted, for example teaching resources. Enhanced access is often motivated by a desire to contribute to the common good or to participate in a coordinated or collaborative activity (Open ICT for Development, 2008).

‘Openness’ in education is currently mostly debated in the context of the technological developments that have allowed it to emerge in its current forms (Peter and Deimann, 2013). However, ‘Open content’ includes an attempt to adapt the logic of ‘open source’ software to the non-software world of cultural and scientific artefacts like music, literature, and images (Wiley, 2009).

There is no definitive view of what openness is as it relates to education. This speaks to the evolving nature of the term, and also the broad acceptance of openness as an approach, be it in developing software, conducting research, teaching and learning or community engagement. Openness can also be applied to administration systems, recruitment and financial management.

## The rise of openness in higher education

Higher education institutions have generally been quite slow in their adaptation to the rapid technological changes of the last decade, despite the fact that many of their students were ‘born digital’ and assume that the internet will play an important role in their education (Committee for Economic Development, 2009). A range of factors, some of which are discussed below, have led to a global response by higher education, and particularly in the developed nations, to new and open ways of teaching and learning, of doing research and of community engagement.

### The broader social move towards openness

The increased openness in higher education towards technology is partly motivated by the belief that knowledge should be ‘a common good’ and be accessed as openly as possible (Peter and Deimann, 2013). Thus, there appears to be broader societal move towards openness. As Wiley and Hilton (2009) express it:

Openness is a fundamental value underlying significant changes in society and is a prerequisite to changes institutions of higher education need to make in order to remain relevant to the society in which they exist.

Investment in open initiatives is largely being led by governments and donor agencies in the form of open government initiatives and government funded OER projects.

#### Open government initiatives

Several governments around the world are taking steps to open their data, and to adopt policies for maximum transparency and citizen engagement. An indication of this is the rapid growth of the Open Government Partnership (OGP), an international platform for ‘reformers committed to making their governments more open, accountable, and responsive to citizens’. OGP was launched in 2011 with eight countries, and has since grown to 65 participating countries, seven of them African countries (Ghana, Kenya, Malawi, Sierra Leone, South Africa, Tunisia and Tanzania). Countries who are part of OGP endorse a declaration acknowledging their recognition that civic participation is enabled by the provision of information. In the interest of openness and accountability, participating countries undertake to improve access to government data and information, and to increase access to technologies (Open Government Partnerships, 2011).

#### Government led OER initiatives

Governments and inter-governmental organizations are also leading the development of OER with many donor-funded projects (most often led by universities) enabling experimentation with different models of openness and their educational potential. Two studies from 2012 indicate this growing interest: first, a survey on OER policies conducted by the Commonwealth of Learning collected examples of government policies on OER and open licensing (Hoosen, 2012). These include:

* the Dutch Ministry of Education’s Wikiwijs initiative, which is a tool to promote the development and use of OER;
* the People’s Republic of China OER action plans involving Chinese universities, such as the Video Open Courseware and the Open Digital Learning Resources for Continuing Education Project; and
* the Bahamas’ ICT in Education Strategy which provides for the inclusion of OER.

Second, research was commissioned by COL to establish a business case for OER. This provided clear evidence that OER activities are extending beyond the realm of funded projects, for example with governments showing interest in the economic potential of using open textbooks to reduce the cost of procuring materials for schooling. For example, Brazil has recognized the high cost of textbooks, and is mobilising government support with concrete figures on the rising cost of textbooks. In the United States, the Washington State Board of Community and Technical Colleges launched the Open Course Library, which is a collection of high-quality, low-cost educational materials for the state’s 81 college courses with the highest enrolment (Butcher and Hoosen, 2012). In South Africa, the Department of Basic Education (DBE) has begun to distribute textbooks produced as OER. Additionally, the Department of Higher Education and Training (DHET) has included in a new White Paper a recommendation for the widespread use of OER (DHET, 2014). These developments are significant and positive, considering that openness is often regarded as being at odds with traditional education models (Oblinger, 2010), which regard institutions as holding the key to knowledge.

There has also been increased participation of government-supported and non-profit organizations in this area in recent years. This includes initiatives like the UNESCO World OER Congress in 2012, and UNESCO/COL’s development of policy guidelines covering the implementation and standardization of OER in higher education (Knox, 2013).

Importantly, as many governments move towards open policies, hundreds of billions of dollars of educational and research resources will become freely and legally available to the public. These developments have been partly in recognition of the fact that the public has the right of free access to educational materials that are funded by national taxes. In the context of spiralling education costs and the need to make education more accessible and affordable, it has been argued that, if education is paid for by the public, then the research and content produced with those public funds should be made publicly available (Wiley, Green and Soares, 2012). This argument is also seen in debates about access to the results of academic research, much of which is funded by taxpayers. For example, Brazil introduced legislation that requires government-funded educational resources to be made available to the public under an open licence. The legislation highlights that resources produced by public servants in an official capacity should be openly licensed or otherwise released under an open access framework (Vollmer, 2011). These arguments have powerful connotations in relation to the key challenge of providing access to satisfy the demand of populations eager for opportunities to study.

#### Textbook costs

The cost of higher education also adds to the increased need for openness. The high price of textbooks is a significant factor, pushing higher education beyond the reach of more individuals each year. Teachers usually ’work around’ the limitations of textbooks. When they cannot find a single textbook that meets their need, it is not uncommon to assign two or more textbooks, intending only to use parts of each. Teachers and students are constantly ‘making do’ with sub-optimal materials—and spending more than necessary as they do so. Furthermore, most African universities have limited financial resources, resulting in serious shortages of published books and journals. It is recognized that OER can be at least part of the solution to this problem. OER provide instructors with free and legal permission to engage in continuous quality-improvement processes, such as incremental adaptation and revision, empowering instructors to take ownership and control over their courses and textbooks in a manner not previously possible (Wiley and Green, 2012). Faculties, governments, and foundations are building or commissioning and sharing high-quality, openly licensed textbooks with the world. Many open textbook projects allow the textbooks to be used freely online, while providing a method for purchasing a printed copy for those who prefer printed books. Examples of such initiatives are highlighted below.

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| Box 2: Free use of textbooks online***Bookboon*** (<http://bookboon.com/en/textbooks-ebooks>)Bookboon publishes free online e-textbooks for students and finances this publishing through advertising. The model is based on generation of revenue from advertising by future employers of the students who will use these books.***Boundless*** ([https://www.boundless.com/open-textbooks/)](https://www.boundless.com/open-textbooks/%29) Boundless offers open introductory textbooks in a number of subjects, published under the Creative Commons Attribution-ShareAlike (CC BY-SA) licence. ***Connexions*** (<http://openstaxcollege.org/books>)Rice University offers some free electronic textbooks for college students. These books are developed by highly qualified professors and the content is peer reviewed. Digital copies are free of charge and printed copies cost the minimal price of producing the book. ***College Open Textbooks*** (<http://www.collegeopentextbooks.org/>)This is a project by a collection of colleges, government agencies, educational non-profit organizations, and other education-related organizations that are focused on driving awareness, adoption, and affordability of open textbooks. |

### Technological innovations in higher education

The key driver of the move towards openness has been the development of information and communication technology (ICT). While openness is not limited to technology, ICT has certainly been the primary driver of the creation, modification, and mass redistribution of digital information. ICT are enabling exponential increases in the transfer of data through increasingly globalized communication systems, and connecting growing numbers of people through those networks. The Internet is enabling copying and sharing of information with efficiency never before imagined (Wiley and Green, 2012).

Technology is rapidly advancing to a point where hardly a day goes by when users are not engaged in some sort of interaction with technology. On a daily basis, most higher education students, faculty members, and educational administrators use computers or a smart device, such as a smart phone or tablet, to check email, go online for course updates, or engage in online courses (Waller, 2013). What is certain is that more educational resources are available to more people than ever before (Lane, 2009). Additionally, online learning environments offer different experiences than face to face engagement at campuses, including greater opportunity for collaboration while equipping students with powerful digital skills (Johnson et al, 2013).

Digital technologies have transformed the media, retail, and entertainment industries, and it is expected that they will similarly transform aspects of higher education. In particular, it is predicted that digital technologies will transform the way in which education is delivered and accessed, and the way in which ‘value’ is created by higher education providers (Ernst and Young, 2012).

As a consequence of growing connectedness and the proliferation of Web 2.0 technologies[[6]](#footnote-6), there has been an explosion in the collective sharing and generation of knowledge. Collective intelligence and the mass participation of amateurs in previously specialized disciplinary areas are extending the boundaries of scholarship, while dynamic knowledge creation and social computing tools and processes are becoming more widespread and accepted. Digital systems are highly adaptable and flexible and can be personalized to a wide variety of learning needs. This opens the opportunity to create and share a greater diversity of learning resources, thereby accommodating a greater diversity of learner needs. The digitization of content has made the sharing of resources both simple and highly scalable, thus opening access to intellectual capital as never before. The range of learning resources becoming openly accessible online is vast (and growing very rapidly), so the Internet makes it possible for students and faculty to find and adapt quality learning materials on many subjects (Daniel, 2011).

Already, higher education constantly needs to keep up with the changing technologies used by students and academics. Entrepreneurs are looking at virtually every facet of higher education and finding ways to enhance or replace it with something new. There are many areas in education that people are attempting to replicate or improve through technology; this includes course-selection software, e-textbooks, assessment tools, and online mentoring services (New, 2013).

The following section highlights some of the ways in which new technologies are being used in higher education. These descriptions are by no means exhaustive, but are merely illustrative of some current happenings in higher education.

#### Mobile technology

Mobile technologies play an increasingly important role in students’ personal and academic lives. Factors that make mobile learning more attractive to students include convenience, flexibility, engagement, and interactivity. Devices such as smartphones, tablets, and e-book readers allow students to connect to the world instantly, improving access to information and enabling interactivity with others. Applications (apps) that run on these devices allow users not only to gather content, but also to invent and produce content. With an increasing number of apps not requiring an Internet connection, mobile users are even more likely to use their smartphones to take courses while on the go. Mobile technologies thus have the potential to transform how students learn, as well as influence their learning preferences, both within and outside the classroom (Chen and Denoyelles, 2013; Bali, n.d.).

As mobile devices become almost as powerful as computers, higher education institutions are beginning to see these devices as essential tools for students’ academic success. Internationally, universities are using mobile technologies, and are creating mobile-optimized versions of their websites, or are building stand-alone applications that can be downloaded from mobile application stores (Chen and Denoyelles, 2013). For example, at Purdue University's Studio Project, the project's Hotseat app takes status updates and creates a ‘collaborative classroom’ by allowing students to provide near real-time feedback during class. The idea is that lecturers can then adjust the course content and improve the overall learning experience (Kirchick, 2011).

Mobile technology is thriving in Africa, and local e-learning developers are increasingly focusing on apps as the most effective way to deliver learning content. In 2001, only about 25 million people in Africa had a mobile phone subscription, but by 2012 this number had rocketed to about 650 million – an increase of 2,600%. According to a 2012 report by GSMA, a trade association that represents 800 mobile operators across the world, there are 475 million mobile connections in Sub-Saharan Africa alone, compared with just 12.3 million fixed line connections (Parr, 2013). According to the United Nations Children’s Fund (UNICEF), South Africa houses the third-largest number of mobile subscribers on the continent, with around 20% of the population owning a smartphone. Smartphone growth in Africa has increased by 43% annually since 2000, and experts predicted that 69% of mobiles in Africa would have Internet access by 2014 (Chadwick, 2014). Mobile phone ownership in Africa is transforming everything from banking and healthcare (with text messages used to transfer money and send health advice) to agriculture and politics (farmers can receive guidance, weather forecasts and market reports). Mobile technology has also played a key role in recent uprisings.

Advances in mobile technology are making great strides in creating a more accessible and convenient higher education system for non-traditional and distance students. With mobile Internet, students can access digital learning resources such as eBooks and MOOCs. Cloud storage and Voice over Internet Protocol (VoIP) services have provided a new way of collaboration and information dissemination among students, faculties and institutions. For example, VoIP services, such as Skype and Google Hangouts, allow for video conferences with multiple participants using a smartphone. The implication for higher education is that entire classes can use VoIP products to attend a scheduled lecture. They can even remotely interact with one another and pursue group or team projects without having to meet on campus (Albert, n.d.).

Kirchick (2011) suggests five ways in which mobile technology can be used in higher education institutions:

* Announcing campus events, such as fundraisers or a special guest lecture.
* Providing real-time information for practical campus information, such as events, news alerts and social recommendations. Examples of these are at West Virginia University (WVU), where the school’s iWVU app shows everything from athletics to shuttle bus info. Ohio State University (OSU)has an OSU Mobile app that even gives students their grades and schedules in real-time.
* Creating a safer campus – universities such as Princeton University, send their student body SMS alerts for emergency situations. Apps such as the MyForce Campus interface provide crime data about the campus and surrounding areas.
* Using mobile commerce (paying with your phone) – Stanford University is experimenting with BlingTag stickers, which charge students’ PayPal accounts for purchases on campus. Embracing mobile payments on a wide scale will result in new levels of data and commerce, for example, giving universities a better idea about dense periods of commercial activity, and helping to identify the best (and worst) performing kiosks and services.
* Enhancing university brand reputation – Developing strategies that make mobile activities easy to share on existing social networks, particularly if the app connects with Facebook. This allows students to share what they are doing with their friends, mapping directly to the brand of the university.

While there is great potential for the use of mobile technology in African higher education, this appears to be, as yet, minimally exploited. Nevertheless, there are some examples of higher education institutions using mobile technology to support learning.

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| Box 3: Use of Mobile Technology in Higher Education in Africa***The Centre for Educational Technology (CET)[[7]](#footnote-7), University of Cape Town (UCT)*** CET is involved in a mobile learning project, which seeks to explore the use of mobile technologies to support teaching and learning in higher educationla. The project seeks to provide student support in a context where over 98% of students have mobile phones, and anecdotal evidence suggests that texting is one of the most common ways of communication among students. The project has several activities including the following:* Dynamic Frequently Asked Questions (DFAQ) allows students to anonymously ask and receive answers to questions they could otherwise not ask in face-to-face sessions. Designed with a seamless Web and Mobile interface, the anonymously created artefacts become a resource to the entire class and also serve as feedback to the academic on student learning.
* Virtual Noticeboard allows academics to post announcements and students use SMS to access notices on demand.
* Collaborative Glossaries allows students to collectively create short notes (e.g. acronyms, definitions etc.) and the resulting repository becomes accessible through SMS.
* An Event Notifier allows an academic to plan messages about notifications, reminders, deadlines etc. in advance (e.g. for the whole semester or year) and the tool sends notifications to students at scheduled times.
* SMS broadcast is commonly used by faculty staff to send text messages to dispersed students. Among most common messages include: scheduling of lectures, sending urgent notices and pointing students to useful online resources (Centre for Educational Technology, n.d.).

***The University of Pretoria (UP)***UP launched ‘UP Mobile’, a comprehensive mobile application that aims to help students stay connected to the university, whether they are on or off campus. The UP Mobile application is available on iOS®, Android™, BlackBerry®, and web-enabled smartphones. Students are able to download the application by searching for UP Mobile from their phone-specific application store, or at m.up.ac.za. One of the features of UP Mobile is that it has the ClickUP (Blackboard Learning Management System) application embedded in it, which enables the University to deliver teaching and learning information on mobile devices. Students have been using this application since the beginning of 2012. It allows students to access course content and view important class announcements, while some phones allow students to receive notifications about new information or activities within their modules. Students are also able to read and download assignments or upload content and interact with peers and lecturers by participating in discussions, blogs and journals. In 2012, usage data indicated that over 8,000 students had downloaded the ClickUP app and between 2,500 and 3,200 students accessed their modules on their mobile devices daily (Tsunke, 2012).UP has also in the past used SMS to support rural students in an in-service special needs education course. The SMS support included:* Instructions on what concepts to focus on for studies as these would be the focus of assessment,
* Invitation to participate in a quiz,
* Directions on work to be done and inviting questions,
* An invitation to students to phone the university on a provided number to find out more about concepts in the asset-based approach, and
* Instructions to complete an exercise (Viljoen, du Preez and Cook, 2005)

***Makerere University supervision support to students through SMS***Makerere University has used mobile technology for the Mobile Research Supervision Initiative (MRSI) in its Department of Distance Education. In this programme, SMS messages were sent to provide research students with academic support on data collection, pointers on literature searches, and to provide general motivation to students in the field. The mobile support provided to students whilst away from the university improved throughput, compared to other years when this support was not available (Muyinda et al., 2008).***Dunia Moja (One World) Initiative***The Dunia Moja initiative was an environmental education pilot project launched in 2009 as collaboration between Stanford University in the United States and universities from South Africa, Tanzania and Uganda. The project used mobile technologies to provide access to course materials; enable field research and assignments; and to facilitate communication, interaction and knowledge sharing between students and faculty in the different countries (Isaacs, 2012). |

#### e-Textbooks

Technology has also opened a huge market, full of new opportunities, for books, which are no longer confined to print. An eBook is an electronic version of a traditional print book or a digital publication containing text, images or both, readable on computers or digital devices (Nagy, 2010).

Traditionally, students are handed printed syllabi for their courses at the beginning of the semester and are required to purchase certain textbooks. New technologies have created the opportunity for these resources to be disseminated more conveniently and cheaply. The recent proliferation of eBooks has reduced the cost of classroom resources, and allows course modules and syllabi to be received more quickly. Schools can send a digitized copy of these papers to their students via email, school blogs or mobile-responsive web portals, allowing students access to critical class resources (Bali, n.d.).

It is not clear what the extent of e-textbook usage in Africa is. Nevertheless, whilst there are few higher education examples, there have been initiatives in Africa to introduce e-textbooks into schools. For example, in 2013 Sunward Park High School in Johannesburg, South Africa successfully made the transition from physical textbooks to tablets when the tablet project initiative was officially launched by the Basic Education Deputy Minister, in partnership with Modern Information Business (MIB). Learners at the school can now access their e-textbooks, a digital library and video tutorials via their tablets on the schools' open Wi-Fi Network (Chadwick, 2014). Recently, Van Schaik, a provider of academic resources in South Africa and Namibia, began making prescribed textbooks available as e-textbooks to South African higher education students (Van Schaik Bookstore, 2013).

#### Social media

Web 2.0 technologies have transformed the way knowledge is stored and shared. Many companies rely on social media such as Facebook, Twitter, and other consumer applications to connect people (Cross and Sessums, 2012). Students already spend much of their free time on the Internet, learning and exchanging information, often via social networks. Social media have the potential to offer an array of opportunities to learn and interact. If used correctly, they are regarded as having the potential to enhance the efficiency and standard of work that is produced by students (Chadwick, 2014).

In higher education, web-based tools are regarded as having an important impact on education, enabling communication that facilitates collaboration, discussion, exchange of opinions and critical thinking. The uses of social networks in universities include being able to organize study groups, share notes, and better prepare for exams and projects by using the networks to foster peer-to-peer collaboration. Staff members can also use social networks to support communication and information sharing among committees, teams, and research projects. Furthermore, social software can be used to improve communication with students. Development offices use social networks to stay in touch with alumni and support them with news, information, and networking opportunities (Cross and Sessums, 2012).

Universities face many of the same pressures as corporations do to embrace social networks. Social media simplify and streamline the transactional aspects of administration; they encourage open communication and shared decision-making, and provide a learning ecosystem that enables students to co-learn in order to supplement the formal aspects of their education (Cross and Sessums, 2012).

#### Cloud storage

Cloud computing - which in its most basic form is a virtual server available via the Internet – is growing rapidly as the next transformational stage of computing. Globally, there is an increase in browser-based software that is device independent. Cloud-based applications and services are changing the way in which software and file storage is configured and used, as well as how those functions are conceptualized. Increasingly, it does not matter where our work is stored; what matters is that our information is accessible no matter where we are or what device we choose to use. Importantly, cloud computing holds the promise of significant cost savings in storing information (Johnson et al, 2013).

In higher education, cloud storage solutions, such as Google Drive and Dropbox, allow students and academics to exchange information. For example, when lecturers assign coursework, they can simply create documents straight from Google Drive containing the instructions. Instead of attaching a file they can just send a link to that document to a student’s email or social page. Students can submit their assignments and other work using the same service. As information on the cloud is updated in real-time, lecturers can track their student’s progress and even add notes and suggestions without requiring actual consultations.

Additionally, the cloud can allow institutions to revolutionize examinations in such a way that they become more convenient for distance and other non-traditional students. Universities can facilitate examinations by designing mobile-responsive virtual examinations, using for example Google Forms, a feature included in Google’s cloud services (Bali, n.d.).

Researchers are looking to resource-rich cloud-based services that, when integrated with mobile apps, will expand the depth of information mobile phones can access and the range of their function (Grush, 2011). MOOCs also draw upon cloud-based services, such as WikiSpaces, YouTube, and Google Hangouts, to foster discussions and to create and share videos (Johnson et al, 2013).

Fritelli (2012) noted the transformational educational and social implications of cloud computing in the African education sector:

In countries where electricity is unreliable and educational resources are scarce, cloud computing, like the pay-as-you-go mobile phone, can be a powerful tool for socio-economic development, capable of liberating users from the memory and processor constraints of location-based computing.

Users can access the cloud directly from their own devices and modems, without being dependent on institutional electrical power and bandwidth.

Additionally, cloud computing can also help foster collaboration and sharing of research across institutions. For example, the Consortium for Advanced Research Training in Africa, which focuses on improving public-health research and doctoral training, worked with Google to develop a cloud-based virtual research platform enabling nine African university partners, four research institutes, and eight partners in North America, Europe, and Australia to collaborate on research, and manage application processes, online assignments, Webinars, and discussion forums.

The Centre for Higher Education Transformation in South Africa is allowing African universities to access and manipulate performance data stored on Google’s public data platform - a service that would otherwise be limited by their own IT infrastructure (Fritelli, 2012).

#### Gaming and gamification

In recent years, gamification, the process of using game thinking and game dynamics to engage audiences and solve problems, has taken the world by storm. According to analyst company Gartner, more than 50% of businesses that manage innovation processes will gamify those processes by 2015 and more than 70% of the world's largest companies are expected to have at least one gamified app by the end of 2014 (Chadwick, 2014).

Gaming is considered an important way of engaging students in learning. Those in favour of the idea most often cite student motivation and the ability of games to simulate real world circumstances so that learners can safely explore these environments without endangering themselves or others (Walsh, 2013). Jane McGonigal (Buck, 2013), at a presentation at Educause shared several revealing statistics:

* There are 1 billion gamers worldwide who spend at least an hour a day playing a game.
* Gallup engagement research in 2012 revealed that 71 percent of workers are not engaged in their work (meaning they are emotionally disconnected from their workplaces and are less likely to be productive), which costs approximately $300 billion annually in the US in lost productivity.
* The longer children stay in school, the less engaged they become: 76 percent of elementary students are engaged, which drops to 61 percent in middle school and down to 44 percent in high school.

McGonigal asserts that the cure for the apparent lack of engagement lies in gaming, partly because of the positive emotional effects that gamers experience. These include creativity, contentment, awe and wonder, excitement, curiosity, pride, surprise, love, relief and joy. Games also encourage a sense of resilience, and also teach gamers that failure is permitted (Buck, 2013):

Gamers fail, but you have this positive emotional resilience. Think about how different that is from our current educational system.

Other reported benefits of game based learning are that they:

* Engage, motivate and challenge. They also appeal to different learning styles.
* Encourage collaboration and team work.
* Facilitate the development of generic skills, such as communication, problem solving, negotiation and decision making.
* Enable students to construct their understanding and allow skills and knowledge to be contextualised in the real world.
* Support formative assessment.
* Provide accelerated learning of cause and effect and complex subjects (Games Ed3, n.d.).

Walsh (2013) highlights four reasons why gaming is particularly suitable for higher education:

* Urgent Optimism: Incorporation of games specifically designed to align students with real problems centered in the discipline being studied, provides learners with a sense of urgency to solve the problems they encounter, and gives them a sense of optimism, both in terms of solving the immediate problem and any other problems they may encounter.
* Social Engagement: Games provide the content, structure, and medium for focused social interactions aimed at solving problems. In the gaming environment, in the classroom, and all across campus, the injection of game-based problems provides students with a reason for learning, interacting, and working together in ways only rarely seen on the traditional campus by extending learning beyond the classroom and beyond the campus.
* Blissful Productivity: People are happiest when they are working hard toward attainable goals. Gamification helps students to become blissfully focused on virtual problems by asking insightful questions and developing solutions to real issues.
* Epic Meaning: Theory without application has little place in a world that is all about hands-on experiences, interacting with the world, and creative thinking. Students learn best by doing and college should be about helping students to change the world. The gamification of higher education bridges those two areas by providing students with the skills and knowledge needed to effect the changes they want to see in the world.

The following are examples of games that have been used in higher education (Buck, 2013).

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| Box 4: Gamification in Higher Education***Foldit***The University of Washington’s Foldit game allows students to contribute to scientific research through virtual protein folding. The game developers theorize that human gamers’ propensity to not give up on a gaming task – resiliency – makes them much more adept at solving complex protein structure prediction and design than supercomputers. Foldit game participants have been named in several published scientific journal articles, including one that describes how a protein structure could be solved and used in the treatment of HIV.***Urgent Evoke*** This game was developed for The World Bank as a way of teaching youth in Sub-Saharan Africa to solve social problems in ways that could also provide sustainable living. The platform is free and available online and can be used by schools to teach social entrepreneurship. Participants complete projects in real life to solve real problems, such as securing a community’s food supply or establishing a sustainable power source, then progress through levels of the game. Those who successfully complete their 10-week missions earn certification from the World Bank Institute. In 2010, 50 student participants saw their entrepreneurship models funded by the World Bank, including Libraries Across Africa (now Librii), a franchise operating in Ghana.***Find the Future: The Game*** The Game combines real-world missions with virtual clues and online collaboration, resulting in young people working together overnight in the New York Public Library to write and publish a book of personal essays about what they had learned. |

However, even though there is high saturation of mobile devices across Africa, uptake of these for educational purposes is still low. For example, in Nigeria, while it is estimated that at least 64% of the population has access to a mobile phone, the devices are underused in education. It has been hypothesized that reasons for this are low levels of awareness of the technology, and lack of expertise in the newer technologies. Osang, Ngole and Tsuma (2013) conclude that:

The adoption of mobile learning is not the same in all countries due to the level of awareness of the technology, availability of infrastructure, the expertise in the new technology and the willingness of the users to implement and use the technology.

### MOOCs in higher education

MOOCs have mushroomed, often with the support of some of the world’s leading universities. There is a wave of enthusiasm for MOOCs worldwide, with literally millions of people registering for a growing number of courses (Boga and McGreal, 2014). MOOCs are widely seen as providing a possible solution to the challenge of access to higher education, by affording people opportunities to learn through their massive enrolments, particularly for those in developing countries and those who cannot afford the high costs of higher education (Gallagher and Garrett, 2013). MOOCs have the potential to positively impact students in many regions of the world where access to high quality education has been minimal or non-existent (Boga and McGreal, 2014). They help to establish education as a fundamental human right, and afford the opportunity for education to any person with motivation (Sharples et al, 2013). The courses are collaborative and usually encourage learners to participate in learning communities. This allows learners across the world to collaborate with peers in other workplaces, thereby crossing cultural barriers (Towards Maturity, 2014).

MOOCs offer new ways to make learning a lifelong endeavour, and allow those who already have an education but require additional professional development to advance their knowledge or their career (Sharples et al, 2013). In the context of lifelong learning, they provide an important resource, as they provide opportunities for personal career development. Individuals can study for their own interest or to advance their careers. In general, this addresses the increasing demand for affordable higher level study (Towards Maturity, 2014).

Additionally, people can learn something new whenever they wish to, without being required to go through formal structures (Jonas, n.d.). The freedom for anyone around the world to view these materials gives them an extraordinary spread of access. As Smith (2013) illustrates:

Some of the MOOCs have drawn over 100,000 students with perhaps 15 to 25 percent completing the course. If the average class size in the university were 100 students and all completed the course, it would take between 150 and 250 years for the instructor of a conventional course to reach the completion number she reached in one year teaching a MOOC. The geographic and demographic spread of access for the MOOC is equally compelling.

Thus, at the very least, MOOCs provide an initial level of openness and usefulness – access to material that is free to observe, read, listen to, enjoy, and possibly to learn from (Smith, 2013).

Another notable potential value that MOOCs add to higher education is that they can prompt or compel higher education providers to reconsider their pedagogical models. In a manner similar to open content, they force universities to focus on their core competency of teaching, as well as to re-think traditional teaching methods that rely on lecture-based formats. One way in which this unfolds is by universities ‘flipping the classroom’, allowing students to study lecture material in their own time, and then using in-class time to debate issues and solve problems with peers (Gallagher and Garrett, 2013). The flipped classroom is described by Educause (2012) as a:

…pedagogical model in which the typical lecture and homework elements of a course are reversed. Short video lectures are viewed by students at home before the class session, while in-class time is devoted to exercises, projects, or discussions. The video lecture is often seen as the key ingredient in the flipped approach, such lectures being either created by the instructor and posted online or selected from an online repository. While a pre-recorded lecture could certainly be a podcast or other audio format, the ease with which video can be accessed and viewed today has made it so ubiquitous that the flipped model has come to be identified with it. The value of a flipped class is in the repurposing of class time into a workshop where students can inquire about lecture content, test their skills in applying knowledge, and interact with one another in hands-on activities. During class sessions, instructors function as coaches or advisors, encouraging students in individual inquiry and collaborative effort.

This particular model is one which Coursera promotes. Coursera’s pedagogy involves video lectures, mastery learning, and peer assessment. It provides its university partners with a flipped classroom opportunity whereby the lecture, course reading, and to some extent assessment, and peer-to-peer interaction for campus-based tuition paying students, are handled in the MOOC, with on-campus activities focused more on active learning (Stacey, 2013). Thus, MOOCs have the potential to be more student-centred and to provide more interactive education or more active learning. Many can be seen as complementary to mainstream courses rather than competing with them.

However, Stacey (2013) points out that, for Coursera MOOC participants who are not tuition-paying, campus-based students, there is no active learning component. This is because the pedagogy is based on the assumption that social learning is not possible with very large student numbers. They have replaced the social component of learning with an ‘artificial intelligence interaction’ with a platform:

Designing MOOC pedagogies based on what some are calling robot marking jeopardizes quality, learning outcomes, and ignores best practices in online learning (Stacey, 2013).

Additionally, the vast majority of MOOCs seem to emulate the logic and structure of traditional university courses. Sadly, many MOOCs also appear not to be open at all, despite their marketing claims to the contrary. These new models are all too often just old educational ideas, repackaged using new technologies, and simply magnifying the educational weaknesses of their predecessors.

Nevertheless, according to Educause (2013), MOOCs have galvanized much of the senior leadership in higher education into evaluating the strategic role of online education. Another way in which MOOCs add value to higher education is that they raise discussions about hybrid learning/blended learning models, and determining the optimal mix of online and on-campus teaching and learning, both within individual institutions and across whole systems of higher education (Gallagher and Garrett, 2013). MOOCs lend themselves naturally to the world of big data and field experiments about pedagogy. The massive scale of MOOCs allows for real time experiments in new forms of pedagogy and assessment, and thus has the potential to help improve education at a rapid pace (Gallagher and Garrett, 2013). The large amount of data (data analytics) allows educators to understand how students learn and how to improve their teaching methods. It may thus inspire more academics to be better and more creative teachers.

Additionally, many higher education institutions face financial challenges, compelling them to examine their business models. Universities are struggling with large enrolment numbers, and with a rising global demand for access to higher education. MOOCs are regarded as a possible solution to make education widely accessible at a lower cost (Kendrick and Gashurov, 2013). MOOCs are also regarded as a useful marketing tool to increase the visibility of institutions, or to drive student recruitment. This approach allows students to use MOOCs to sample the courses that an institution is offering (New, 2014). This is considered important as universities position themselves in a competitive market to attract new students.

MOOCs also add value to higher education in that their growth and adoption can encourage institutions to seek partnerships and collaborations, thereby facilitating a network of relationships between students and multiple colleges and universities (Educause, 2013).

## Openness, quality, and assessment

With the rapid growth of digital learning in higher education, the issue of quality has been recognized as critical, both within institutions and at national and regional levels. Traditionally, academics have protected their intellectual capital, but the move towards openness exposes their teaching to the pressures of peer review (Wiley, 2006). The transparency provided by OER (where resources produced by staff are shared openly) places social pressure on institutions and teaching staff to improve the quality and effectiveness of education, and encourages them to coordinate curricula better.

The release of OER at an institutional level provides an opportunity for existing quality measures to be evaluated, and this can open up useful dialogue in institutions. The JISC/HE Academy UKOER Programme (2009-2012) found that, despite initial fears of staff about engaging with OER, the notions of open peer and student review of OER featured strongly in both institutional and community released OER and was often incorporated into the OER themselves. This was seen as an important way to ensure quality (McGill, 2013), although some have questioned the absence of visible quality checking processes for OER (Junmani, Noreen, and Nayyar, 2013).

In situations where academics produce new materials, their ability to draw inspiration and ideas from other people’s openly accessible teaching materials can also serve to improve quality. OER materials can be adapted to suit local contexts, making the content more relevant and useful. The act of localizing depends on the ability to access content, create derivative works, and then reuse the derivative work. Having modified and reused content, its value is further enhanced by sharing the derivative work with the larger OER community, allowing for additional cycles of use, modification, reuse, and sharing. The establishment of such a cycle, supported by appropriate processes, practices and infrastructure, helps to further improve quality, as quality improves through iteration. The idea that hundreds or thousands of individual scholars, teachers, practitioners, and students can create, review, and modify OER helps ensure that factual inaccuracies, incomplete information, and cultural biases are questioned, while newly discovered information and knowledge is included in OER in a continuous cycle of improvement.

Increasingly, while teaching staff are expected to have the knowledge and skills to teach in a broad spectrum of subjects, they often lack the time to re-visit and modify curriculum and educational materials on a regular and systematic basis. OER can also be leveraged to improve quality through capacity building, by providing institutions and teaching staff with the means to create and adapt high quality teaching and learning materials at a relatively low cost. This can be harnessed to develop competence in producing such materials and carrying out the necessary instructional design to integrate these materials into high quality programmes of learning.

The issue of quality with regards to MOOCs has been widely noted as an area of concern. MOOCs usually lack structure (compared to other online courses), are largely self-directed learning, and rarely include the central role of the educator. MOOCs also demand a certain level of digital literacy from participants, which has raised concerns on inclusivity and equality of access (Yuan and Powell, 2013). Weller (2013) notes that most of the quality measures that have been developed for formal education do not apply to MOOCs, as formal education is based on a specific relationship between the education provider and the student. This relationship is fundamentally altered in a MOOC, and therefore existing measures are not applicable. Conole (2013) contends that this is a key gap that needs to be plugged if MOOCs are going to be valuable and viable learning experiences.

There have also been criticisms levelled against open access journals’ poor quality controls in accepting articles (Shaw, 2013). However, the open scholars do provide blogs on which open access journals are questioned, and it is always useful to search for a review of specific journals before considering working with their articles or submitting an article to them.

On its current trajectory, the growth of openness is unlikely to demand major changes to quality assurance (QA) practices in universities. The principles of good quality higher education have not changed as a consequence of growing openness, and thus the same quality principles apply to higher education delivery whether it is open or closed. There are essentially two purposes for quality assurance: accountability (summative assessment) and improvement (formative assessment). For accountability purposes quality procedures are based on criteria set down by external authorities and institutions. They aim at strengthening external oversight and control, with the possibility of undertaking external corrective action, if necessary. Quality procedures for improvement purposes aim at promoting future performance rather than making judgements on past performance. The focus is not on control but on improving quality (Kis, 2005).

However, it is important not to make institutional quality assurance structures and processes an exercise in compliance for accountability. The emphasis rather needs to shift to the process of learning and self-improvement, which really improves quality. In an environment of openness, where on-going improvements and refinements to course environments are more likely, this shift in emphasis is likely to become increasingly important.

For example, evaluating a course, though required, is not sufficient. Quality enhancement will only take place when the lessons from evaluation are reflected in the next offering of the course (Butcher and Wilson-Strydom, 2013).

Higher education institutions must always take full responsibility for the quality of their offerings, and thus institutions are also the guardians of quality for MOOCs (Butcher and Wilson-Strydom, 2013). The implications are that, within institutional contexts, open content release should be subject to on-going QA processes.

Another suggested approach to addressing the issue of QA is for open courses and content to be evaluated by both learners and educators, leading to league tables that rank the courses by the quality of their offering. In this way, it is possible that courses from institutions and individuals that rate poorly will either disappear due to lack of demand or survive by improving course quality in response to their poor ratings. Openness thus creates opportunities for courses to be assessed on the quality of information/content and the quality of the educational experience. Arguably, for MOOCs, the most significant form of quality assurance and enhancement comes from the reflections and informal evaluations of participants who post comments using social media (Yuan and Powell, 2013).

This calls for institutions to relinquish their guarding role of assessing quality and consider other integrated approaches to assuring quality. OER can improve quality via the traditional peer review process that is now built into the workflow of OER repository platforms. Connexions, for example, has ‘lenses’ where a community or association can provide a post-publication review by rating and commenting on a particular resource in the Connexions repository. The MedEdPortal is another such example of a peer review process applied to OER.

Schmidt et al. (2009) make a case for a peer-based method of assessment and recognition as a feasible option for accreditation purposes. They note that the learning theories behind peer-to-peer learning are not new, but that the social web has created new opportunities to learn collaboratively and to track such learning. The peer-based method could leverage online communities and tools, for example digital portfolios, digital trails, and aggregations of individual opinions and ratings into a reliable assessment of quality (Schmidt et al., 2009).

In the 21st century knowledge society, it becomes increasingly important to include employers in curriculum design and delivery for some kinds of courses, for example in ensuring that work based placements lead to clear learning outcomes. QA can support institutions by involving employers in designing work-based learning around relevant learning outcomes and assessment methods. Such an approach can also help in the development of more flexible learning pathways. To help to ensure that graduates have the right skills for the labour market and to reduce skills mismatches, there is a need to ensure that study programmes meet labour market needs (European Commission, 2014). A few examples of university- industry partnership based on open principles are presented in Box 5.

Box 5: University-industry Open Innovation

***Technology Transfer Interface (TTI), Free University Brussels, Belgium***

The Technology Transfer Interface (TTI) (<http://vubtechtransfer.be/>) is an intermediary between industry and the university, which identifies research results that can be promoted to commercialisation and turns them into licensing deals or spin-offs. When TTI identifies such research, it alerts researchers about the value of their research and assists them through stages of collaboration with industry. A key aspect of the TTI’s research valorisation efforts is CROSSTALKS (<http://vubtechtransfer.be/partners/crosstalks/>), an innovative open-exchange platform for contemporary thematic discussions, which is organised around congresses, workshops, publications and Pecha-Kucha Nights (informal, fun gatherings).

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| ***DEMOLA Platform, Finland***Started as collaboration between Hermia Ltd, Tampere University of Technology, University of Tampere and Tampere University of Applied Sciences, DEMOLA is a Finnish open innovation platform for the creators of next generation products and services. DEMOLA provides students and companies with a collaborative and multidisciplinary innovation environment to create demonstrations of novel service and product concepts from companies ranging from local small and medium-sized enterprise (SMEs) to international large-scale enterprises as well as public organisations. As of 2014, there were nine DEMOLA centres around the world with 140 partner companies participating in collaboration with 37 universities, on 350 projects. One thousand six hundred students were working on these projects (<http://www.demola.net/>).***Strategic Health Innovation Partnerships (SHIP)[[8]](#footnote-8), Medical Research Council (MRC), South Africa***Recently launched in 2013, SHIP aims to coordinate the development of strategic, multi-disciplinary and multi-institutional partnerships to address South Africa’s major health problems. SHIP is housed within the MRC and is responsible for the following activities:* Seeking, managing and funding multi-disciplinary, multi-institutional product research, development and innovation projects from discovery to proof-of-concept
* Enhancing the capacity of South African science in the research and development of novel or improved drugs, vaccines and other biologicals, diagnostics and medical devices in the identified priority diseases
* Facilitating, through partnerships with local universities, science councils and the private sector, the transfer of research outputs into improved health outcomes and/or social benefit
* Along with its Technology Transfer unit, developing pathways to facilitate the seamless movement of new products and services from the laboratory to the marketplace (Medical Research Council).

***Uganda Gatsby Trust SME Support Project***In 1994, the Gatsby Foundation partnered with Makerere University to bring research into the SME sector, through provision of consultancy services to SMEs and linking final year students from the Faculty of Technology with SMEs. The Foundation also set up a small business finance programme for larger manufacturing SMEs, which was spun-off as Gatsby Microfinance Limited in 2005. Another initiative that was commercialised successfully is the Uganda Tree Resources Ltd which was registered in 2012 to service a growing demand for hybrid eucalyptus varieties among tree growers in Uganda (The Gatsby Foundation).***International Institute for Water and Environmental Engineering (2ie), Burkina Faso***With 24 partner universities and research partners in 11 countries, 2ie offers qualifications in geotechnics, energy, water, and environmental management in mines and quarries. The Institute’s mission is to train entrepreneurial engineers to meet the continent’s needs by being a leader in academic, scientific and technological innovation. The Institute is built around a strong public/private partnership, with over 50 industry partners and funders. Some of the Institute’s students have received accolades in international competitions for projects on construction of low cost housing in Chad, and the development of soap for the prevention of malaria. Another innovative project of the Institute is the Taxi Brousse Low Cost®, a flexible and adaptable online vocational training programme aimed at working professionals. Students can enrol at any time of the year, stop the programme if their circumstances do not allow them to continue, and resume the courses within 24 months to graduate. The programme addresses the change in employment patterns where employees are required to have changing skills in the course of their employment. The courses they offer enable employees to stay relevant in the workplace (2ie Foundation, 2013). ***IBM’s Research Lab, Kenya***Located in Nairobi, Kenya, the IBM Research-Africa physical lab was opened at the Catholic University of Eastern Africa on 7 November 2013. The lab is IBM’s 12th global laboratory and the first commercial technology research facility on the continent conducting both applied and far reaching exploratory research. IBM Research’s presence in Kenya is intended to encourage and strengthen an innovative culture and engage local entrepreneurs and innovators to develop solutions to the challenges faced by Kenyan people, the region, and other fast growing markets around the world. A focus issue for the new lab includes solving traffic congestion in Nairobi: ( <http://www.research.ibm.com/labs/africa/>). |

## Openness in university administration

The day to day activities of a university, including teaching scheduling, allocation of accommodation, student finances, admission and enrolment, assessment, and graduation can all be supported by an administration and management system. The advent of technology ushered in automation of many of the administrative processes that were performed manually by administrators, resulting in the streamlining of administrative systems. This required the reskilling and upskilling of administrators. Although there is a range of proprietary software available to enable effective and efficient management of many university functions, there is also comparable open source management information software, some of it focusing on specific functions, and others more comprehensive and focusing on multiple data management tasks. Some examples of this open source software are presented in Box 6:

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| Box 6: Open Source Software for University Management and Administration**Single Functionality Software*** ***OpenCourse Timetabler*** (<http://open-course-timetabler.software.informer.com/>) is intended for university and school course timetabling.
* ***UniTime (***<http://www.unitime.org/>) was developed collaboratively by staff and students at Universities in Europe and North America. The software supports the development of course and exam timetables. It can be used independently or interfaced with already existing student information systems.

**Comprehensive Software*** ***openSIS*** (<http://www.opensis.com/trade_schools.php>) - openSIS is an information management system for managing student data throughout their stay at the university. The software captures data from prospect (when a student inquires about the institution) to application, enrolment, graduation, alumni, and students as donors. Data is captured once and is available and updated on the system for the duration of the student’s study period and beyond. All departments in which the student is studying get access to student data so that there are no duplicated entries.
* ***A1 Academia*** (<http://www.academia.a1.io/>) - This is a comprehensive software solution for university management and administration with features such as calendar management; inputting and analysing data on institutional structure; course structure for tracking each student’s academic progress; management of admissions; and registration. The solution also has capabilities for timetabling, curriculum management, and automation of academic staff workloads. Further, allocation of student accommodation can be facilitated, and financial aid from various sources can be managed by the system, as can student financial records (<http://www.academia.a1.io/product-features.html>).
* ***Kuali*** (<http://www.kuali.org/>) - Kuali has a comprehensive range of information management components for student, staff, library management, curriculum design, and financial management. A particularly interesting component of this system is Kuali Coeus, a research management tool for managing research processes from proposal preparation and submission, proposal tracking and negotiation, award, sub-awards, report tracking and close out. While Kuali is mostly utilised by HEIs in the US, the North West University in South Africa is also using Kuali.
* ***Open University Systems*** - ***OPUS*** (<http://www.opuscollege.net/OPUS.php?page=homeENG>) - OPUS College is an information management system for registration and management of student, staff and course data within a university or any HEI. African countries using OPUS include Zambia (two universities there use it) and Mozambique, where five universities are using it.
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While there may be other open source software packages available for use, it is important for institutions to conduct an evaluation of a few recommended ones before making the choice to adopt any one for use.

## Conclusion

Diverse factors have driven the move towards openness in higher education, bringing with them multiple options and choices. Importantly, some of the choices, for example mobile technology, provide an opportunity for higher education institutions to improve education at reduced costs, as the prevalent student ownership of smart devices and other mobile technologies can enable institutions to focus on the development of the teaching and learning resources that can be used on students’ own devices. Of huge potential value is the significant quantity of open resources and data, and open source apps and software that can be adapted, reducing substantially the cost of redesigning curricula and content. The current low uptake of educational technology in African universities signals huge potential for the development of higher education on the continent, with a lot of lessons that can be learned from the pioneers in developing better and more effective solutions for improving the quality and experience of learning and of university administration.

# Section 3: Trends Towards Openness in Higher Education in Africa

## Introduction

Universities once held a monopoly on access to expertise, and faculties selected appropriate content for a course of learning and structured a path through that content for learners (Wiley and Hilton, 2009). Traditionally, lecturers’ work in the teaching of students has happened behind closed doors, usually characterised by an authoritative relationship between the lecturer and students. However, openness is challenging the notion that formally credentialed ‘experts’ are the only producers of knowledge, or the sole sources of innovation (Schmidt et al., 2009). Increasingly, lecturers are opening up their classrooms through various means, including action research that is disseminated through relevant platforms, including publications and conferences. The increasing availability of MOOCs allows the views of the ‘experts’ to be accessed more readily, thus providing opportunities to learn from the world’s best teachers. This is particularly significant in the African context, which faces a shortage of teaching staff and experiences other significant teaching and learning challenges.

Open practice has enabled lecturers to engage across institutional, national and regional boundaries in their attempts to solve teaching and learning challenges.

## Teaching and learning challenges in Africa

African higher education institutions are faced with multiple challenges including limited public funding, low uptake of science, engineering and technology (SET) programmes, low research output, staff shortages, under-qualified staff, and varied quality of offerings. Limited public funding affects access and infrastructure development. Student enrolment at most African public universities far exceeds what they were structurally designed to accommodate, and even so universities cannot meet student demand for higher education. Increasing student enrolment numbers have not been matched by increased public funding, and additional enrolment without an equivalent increase in infrastructure and other resources is detrimental to the desired educational outcomes (Mohamedbhai, 2011). Yizengaw (2008) highlights that many African higher education institutions have had little or no infrastructure improvement in recent decades. This is primarily due to budgetary constraints and reliance on public financing. Access to infrastructure, such as the Internet, library, textbooks, equipment, laboratories, and classroom space is often limited, impacting negatively on the quality of education and learning.

There is concern about low enrolment rates in SET and health fields, with fewer than 39% of students in Sub-Saharan Africa enrolling in these fields, which are regarded as critical for innovation, knowledge generation and adaptation, and overall national competitiveness (Yizengaw, 2008). A related challenge is the low research output from African universities, caused by lack of staff with research experience, heavy teaching loads and lack of resources, such as library facilities, ICT infrastructure, and well-equipped laboratories.

In some parts of Africa, academics are so poorly paid that they often seek additional employment (Altbach, 2013), which impacts their capability to do research as they battle to find the time between their multiple teaching jobs. For those who do get involved in research, the relevance of the research has been questioned, as many faculty members are undertaking research for personal gain, for promotion purposes, with topics not appropriate to national development. Additionally, many research publications remain within institutions and are therefore not accessible to or understood by policymakers or communities (Mohamedbhai, 2011). Investment in research and development is still limited to less than 1% of gross domestic product (GPD) in most countries in the African Union (NEPAD, 2014). This means resources available for development and innovation in key areas are very limited; these areas would include agriculture and natural resources, applied sciences, health sciences, engineering and technology, as well as the expansion of postgraduate education. As a result:

These circumstances seriously constrain building up the elements of national innovation systems that are so essential for increasing national productivity ‐ research capacity, university trained researchers and professionals, graduates with advanced technical and managerial skills, and dynamic university‐industry linkages. (Yizengaw, 2008: 8)

Considering staff shortages, several factors contribute to this problem. In several African countries, new universities that are very similar to existing ones are being established, resulting in the depletion of the staff of existing institutions as they are transferred to the new ones (Mohamedbhai, 2011). Staff shortages are compounded by ‘brain drain’, with academics and professionals leaving the continent to seek greener pastures (Regenesys Business School, 2013). Across disciplines in African higher education institutions, on average, only 70% of faculty positions are filled, and in some departments only 30‐40% (Yizengaw, 2008). Staff shortages not only affect higher education institutions, but also the other levels of education services, the health care systems, and overall economic activities. A related challenge is that there are insufficient staff members with the appropriate qualifications in higher education institutions. In South Africa, for example, only 40% of university staff have qualifications at a doctoral level (Regenesys Business School, 2013). Further, university faculty staff are regarded as aging, and, with no proper investment in growing faculties for the future, staff shortages are likely to be perpetuated into the future. This is of concern, especially as universities are meant to be ‘breeding grounds’ for the skilled individuals that the continent requires.

Related to quality, there is a lack of effective regional, national, and institutional quality assurance, and a failure to enhance systems and agencies in most African countries and universities, which further exacerbates the problems of quality and relevance. Structured quality assurance processes in higher education at a national level are a very recent phenomenon in most African countries, with technical capacity being the most pressing constraint in national quality assurance agencies and institutional systems (Yizengaw, 2008).

Faced with these challenges, higher education institutions across Africa, even in relatively resource-scarce contexts, are increasingly viewing investment in ICT for management and administration, marketing, research, and teaching and learning purposes, as necessary to establish their competitive advantage. The rapid development in ICT and the accompanying explosion of ICT-related activity has resulted in a global phenomenon where higher education institutions are determined to best harness ICT to the benefit of academics, and students. This rapid ICT development offers both opportunities and challenges for learners who face barriers in traditionally delivered education. Digital systems are highly adaptable and flexible and can be personalized to meet a wide variety of learning needs.

In many African countries, however, a paucity of technology, out-dated technologies, and maintenance problems remain challenges, as does access to personal computers for both teaching staff and students.

### Responding to teaching and learning challenges

Despite the funding challenges that affect investment in technology infrastructure, a few institutions in Africa have made efforts to be responsive to global developments in technology and openness in the development of teaching and learning. These efforts range from the use of technology in the examples given in Section 2, implemented as small scale individual lecturer case studies, to more institutionalised programmes whose reach goes beyond the individual university, like OER interventions.

#### Using open content to tackle the challenge of large classes

As already elucidated, higher education faces immense challenges to meet rising enrolment demand. One of the main benefits of the move towards openness is the provision of open content. Traditionally in universities lecturers have provided content, usually through teaching practices such as lectures. In most face-to-face universities the lecture method remains the most widely used form of presenting information to students. This usually positions the academic as the expert with a body of knowledge to impart to students. Students are typically silent participants, with their activity largely limited to note taking. The prevalence of lectures often has less to do with learning outcomes and more to do with a long tradition in which it is viewed as the principal form of teaching.

However, this way of providing information is regarded by many as less effective than active learning methods, particularly when it is employed as the dominant mode of information transmission (see, for example, a review by Siriopoulos and Pomonis, 2006). Learning appears to be more effective when students are actively engaged (as opposed to being passive recipients of information); have opportunities for interaction with others; are presented with challenging situations or questions that require critical thinking skills; and are surrounded by a nurturing learning environment (Ray, 2004). Furthermore, lectures predominantly emphasize learning by listening, which puts students who have different learning preferences at a disadvantage. Lecturing may also not be well suited to teaching higher order thinking such as application, analysis, synthesis, or evaluation, or for influencing attitudes or values - all of which are typically regarded as key attributes of effective higher education graduates.

This is not to say that there is no role for lectures, or that the lecture is not a good teaching technique. For some content, particularly if a primary objective is to disseminate information, to introduce material not readily available elsewhere, or to provide inspiration, the lecture method is appropriate and potentially effective. An effective lecturer may also stimulate discussion or prompt additional study. Lectures can be good for stimulating thinking and initiating debate. Lectures can also provide a useful way of supplementing material from other sources, or providing information that is difficult to obtain in other ways, particularly if students do not have the time required for research, or if they do not have access to reference material. In subject areas where information is available in widely scattered places (textbooks, journals, tapes), the lecture allows the instructor to summarise and emphasise pertinent material (Learningspark, 2012).

Nevertheless, with the increasing availability of open content, universities are required to reconsider traditional teaching and learning methods, as lectures are relatively more expensive and less efficient for the pure delivery of content. Lectures are simply one method of instruction, useful for particular types of engagement. In particular, the proliferation of OER makes it possible to spread the communication of content across a wider range of methodologies, offering students multiple modes of learning, rather than being limited to one. OER helps create a diversity of learning resources, accommodating a greater diversity of learner needs. In addition, it facilitates better use of resources by providing students with the opportunity to engage with material out of class, and instructors to use contact time to facilitate knowledge acquisition and understanding. These methods are not only increasingly affordable to implement and accessible to students; they also provide many alternatives for designing creative teaching and learning environments that can offset the problems associated with growing student enrolments.

This indicates a need for teaching practices to evolve to help learners navigate available content (including MOOCs), and the role of the academic needs to move towards one of facilitating learning. The primary role of academics in the future would be to teach students how to engage with information, rather than simply providing that information. True teaching encompasses much more than the mere transmission of information. For most good teachers, OER are no more of a threat than the university library. The increased access to education would only constitute a threat to teachers who only convey information that can be found in books, and do not provide an interactive learning experience (Wiley, 2006).

The notion of the flipped classroom is supported by the students having access to learning materials before the lecture: - in a traditional lecture, students try to capture what is being said during the lecture, and they frequently miss significant elements because they are trying to transcribe the instructor’s words. However, being able to consider the content or view a video or other multimedia ahead of the lecture gives learners greater control, as they are able to view the content more than once. By focussing the class time on the application of concepts, academics have a better opportunity to detect errors in students’ thinking. Collaborative projects can encourage social interaction among students, making it easier for them to learn from one another, and for those with greater skills to support their peers (Educause, 2012).

Adopting approaches such as the flipped classroom changes the role of academics, who no longer lecture, but instead introduce a more cooperative and collaborative approach into the teaching process. It requires academics to be motivators rather than presenters. They need to encourage innovative ideas through greater participation and interaction. However, it should be noted that this requires careful preparation in integrating out of class and in-class elements, which may mean that academics need to develop new skills. Such an approach also changes the role of students from passive participants to taking greater responsibility for their own learning, while providing greater impetus to experiment (Educause, 2012).

The changes described in the preceding paragraphs, while they would be a welcome shift towards active learning, would not in themselves reduce pressure on class sizes. If anything, they would increase lecturer workload since there would be a need to meet in smaller classes to enable effective discussions and interactions to occur. By moving to the next step, adopting Web 2.0 models, and creating collaborative online projects where students would interact with one another online, more ‘work’ would be done by the students and the need for class attendance would be reduced. In that scenario the lecturer could see how each student responded to the challenges faced by the team, so could in fact have a more detailed understanding of each student’s progress. The less frequent class discussions would be considerably richer because the students would have experienced the application of the content in real life situations.

#### The rise and use of OER in higher education in Africa

The past few years have seen a significant increase in the creation and use of OER in Africa. An illustrative selection of OER use in higher education is provided in Box 7.

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| Box 7: OER in Higher Education in Africa***The Teacher Education in Sub-Saharan Africa (TESSA) initiative*** (<http://www.tessafrica.net>)TESSA is a research and development initiative creating OER and providing course design guidance for teachers and teacher educators working in Sub-Saharan African countries. The TESSA initiative aims to achieve the Millennium Development Goals (MDGs) and Education for All (EFA) goals and to ensure that by the year 2015, every African child should have access to primary education. In order to achieve these goals, Sub-Saharan African countries need four million trained teachers, which cannot be achieved with the present conventional ways of teacher training. The TESSA initiative therefore stands on three pillars:* Affordability and accessibility of ICT;
* OER philosophy, which allows materials to be placed on the Internet and be accessible to all for free;
* Research studies in cognitive science to give current information on how learning takes place.

Since its inception in 2005, the TESSA consortium of 18 institutions has worked collaboratively to design and build a multi-lingual OER bank to support school-based teacher education and training. These materials are modular in format and focus on classroom practice in the key areas of literacy, numeracy, science, social studies, the arts and life skills. Each of the 75 study units are designed to directly improve teacher classroom practice and contain a series of activities for teachers to carry out with their pupils. Each study unit has been adapted and versioned to the nine country contexts of participating TESSA institutions, including translations in Arabic, English, French, and Kiswahili. The design of the TESSA web environment is organized to enable each country/institution to have its own web presence, and because of the current challenges in connectivity and access, the study units are provided in a range of formats. Additionally, members of the TESSA community are encouraged to explore, share, adapt and add their own resources for teacher education. The website also includes a forum platform for discussion (Thakrar, Zinn, and Wolfendon, 2009).One of the institutions belonging to the consortium, the University of Fort Hare (UFH) in South Africa, has described the positive benefits of participation in the TESSA consortium:Participation in the TESSA consortium, including involvement in the development and integration of TESSA OERs, has afforded UFH academics and students (both pre-service and in-service) and relevant external stakeholders, such as the DoE, access to communities of practice within the institution, across institutions, and across countries, and generated a new discourse of finding, adapting, and sharing educational resources (Thakrar, Zinn, and Wolfendon, 2009). The work of TESSA offers a considerable contribution towards overcoming the problem of scarce resources in teacher education.***University of Cape Town’s OpenContent*** ([http://opencontent.uct.ac.za](http://opencontent.uct.ac.za/))The UCT OpenContent directory is the web portal for accessing open teaching and learning content from the University of Cape Town (UCT), South Africa. Produced by the Open Educational Resources project in the Centre for Educational Technology (CET) at UCT, with the support of the Shuttleworth Foundation, the directory aims to showcase the teaching efforts of UCT academics and encourage the publication of open resources. Such a resource is important in providing access to content that allows re-use and adaptation, thereby contributing to creating more effective learning environments. Open content makes the role of students in deciding what is useful and what is not increasingly important. Course designers can harness this information to improve students’ interaction with content. Such an approach has potential to change the role of the students in the course to become active participants rather than passive consumers of information.***Lilongwe University* of Agriculture and Natural Resources *OER Project***The Lilongwe University of Agriculture and Natural Resources, Bunda campus (previously known as the Bunda College of Agriculture) embarked on an OER project to develop a textbook on Communication Skills. Through this project staff of the Language and Communication for Development Department intended to use OER to address specific problems:* While the Communication Skills course was a core one for all first year students, they did not have access to all the textbooks used by the staff. This was due to there being no set textbook for the course, while lecturers tended to draw their teaching materials from a number of sources.
* Students could not always access the ‘recommended reading’ textbooks that did accompany the syllabus outline, as the library either did not have them, or else had an insufficient number of these texts.

University staff therefore decided to create a paper textbook from freely available OER that would cover at least 75% of the first semester course content, and would be easily replicable for up to 200 students and staff per annum. A series of writing workshops facilitated by OER Africa/International Association for Digital Publications (IADP) assisted university staff to source, analyse, and adapt a variety of existing OER to help craft the textbook. The workshops were also intended to act as a model for expansion into other departments in the college facing similar needs. The team members wrote new materials, but also used and adapted material from all around the English speaking world to suit the specific needs of this course (Moore and Preston, 2010). The project resulted in the compilation of a first year communication skills textbook. Like most African higher education institutions, the university faces on-going challenges as the demand for tertiary education continues to grow but physical and human resources remain fixed. This initiative provides a good example of how OER helped to tackle the shortage of textbooks by producing material that is much needed and contextually relevant.***Kwame Nkrumah University of Science and Technology (KNUST) OER*** At KNUST, located in Kumasi, Ghana, the College of Health Sciences (CHS) launched an OER initiative, supporting the production and use of OER. Its OER project (<http://web.knust.edu.gh/oer>) funded by the Hewlett Foundation began in 2008 as collaboration between KNUST, University of Ghana, University of Michigan, University of Cape Town, University of Western Cape, and OER Africa. KNUST’s CHS identified three strategic priorities for health education, which form the basis of their OER activities:* To develop contextually relevant textbooks, as many medical textbooks and publications originate in Western countries and therefore use photographs and examples that are not always suitable for the Ghanaian context.
* To increase student engagement with the local curriculum, as growing class sizes limit the in-person interaction between lecturers and their students. In order to supplement the limited time they have with students for classroom and clinical training, several CHS faculty members were interested in creating interactive, self-guided learning materials that students could work through on their own and in their own time.
* To strengthen the core curriculum, as the limited contact time and faculty availability makes it difficult to cover all the necessary topics within the confines of the classroom and with locally developed resources. OER were viewed as an alternative method for delivering difficult topics to students.

The KNUST OER team has trained the faculty and other staff in OER policy and production, content development, and open licensing, and fostered the creation of a dozen comprehensive, interactive OER modules. KNUST distributes OER electronically, either online or via CD-ROM, which enables the students to access the materials on a computer at their convenience.[[9]](#footnote-9) In this case it appears that the introduction of OER provided an opportunity to re-examine the curriculum, re-examine teaching methods and learn new teaching strategies.  |

The development of OER in the initiatives described above has had several significant ramifications. One of the outcomes of KNUST’s involvement in OER has been the recognition it has had at a national level in Ghana. In particular, out of the engagement with the Ministry of Education around open access, the KNUST institutional repository has been designated the national Open Access Repository (Electronic Information for Libraries, 2011). This is an important development in facilitating access to content for anyone with Internet access to use and build upon.

A few African institutions that have embarked on OER initiatives have taken several steps to develop OER amenable policies. For example, UCT has updated its Intellectual Property (IP) policy so that it now specifically covers issues relating to the creation and licensing of OER. The policy provides support for publication of materials under CC licences, and notes the adoption of open licences as the default for research and teaching related to software development at the university (University of Cape Town, 2011).

Other institutions engaged in the development of OER have realised the importance of policy and strategy to their OER initiatives. In March 2014, UNISA approved an OER strategy focusing on managing intellectual property (study materials), harnessing OER for teaching and learning, and the subsequent release of openly-licensed materials. The strategy also focuses on contributing towards global knowledge and the review of institutional policies to incorporate OER values (UNISA, 2014). Additionally, UNISA has approved several other policies and plans to embrace OER. These include the Institutional Operational Plan, a Curriculum Policy and an ICT-enhanced teaching and learning strategy. These policies make provision for the use of open licensing, creation of a portal to showcase UNISA’s openly licensed teaching materials, as well as engagement with MOOCs and other forms of open education. UNISA-Open is a portal aimed at assisting students, staff and other users to source high-quality OER. It also provides a showcase for the OER work being conducted at UNISA (UNISA Open website).

At the University of Ghana, the College of Health Sciences (CHS) initiated a process to update its academic recognition policies to support OER. The committee responsible for policy development, comprising academics and librarians reviewed existing university policies and drafted a new OER policy - ‘*Draft Policy for the Development and Use of Open Educational Resources for University of Ghana*’ (University of Michigan and OER Africa, 2009). Importantly, the policy establishes the Creative Commons Attribution (CC BY) licence as the default licence for all OER, and gives authoring faculty members the right to select their preferred Creative Commons licence (Ludewig-Omollo, 2011b). However, it is not clear whether the policy has been passed (University of Michigan and OER Africa, 2011).

Similarly, KNUST also developed an OER policy which formalized the role of the OER coordinator, as well as the technical support role of the Department of Communication Design (DCD). The university maintains copyright ownership for OER and other instructional materials developed. Faculty members may, however, select the Creative Commons licence they prefer. Most notably, the policy established a reward structure for OER production: it proposed that faculty members receive the same credit for OER modules as for peer-reviewed publications, and that the university allocate time for faculty members to devote to creating OER (Ludewig-Omollo, 2011a). These policy moves are significant in demonstrating institutional commitments to OER. They are also regarded as important in ensuring sustainability of OER at institutions.

One of the major values of OER is that they may enhance an institution’s reputation and brand image. Whilst many institutions may initially be hesitant about sharing their educational materials online, evidence is now starting to emerge that institutions that share their materials online are attracting increased interest from students in enrolling in their programmes. This in turn brings potential commercial benefits, because the sharing of materials online raises an institution’s ‘visibility’ on the Internet, while also providing students more opportunities to investigate the quality of the educational experience they will receive there. For example, at KNUST, OER was seen as a way to enhance institutional reputation by sharing its curriculum. In late 2009, KNUST added a Creative Commons Attribution licence to the university’s website footer as part of a broader strategy to use Wikipedia and Google to help increase the institution’s web traffic. The KNUST webmaster believes that the licence is responsible, in part, for increasing the university’s ranking in the *Webometrics Ranking of World Universities* (Ludewig-Omollo, 2011a)*.*

UNESCO and COL (2011) support the notion that when an institution makes its courses/materials publicly available online (assuming their quality and relevance), this can attract new students, facilitate accountability, advance institutional reputation, and support the public service role of institutions. It may also further the dissemination of research results and thereby attract research funding.

On the face of it, the trends in OER hold great potential in African countries, where finances are generally scarce and openly licensed resources offer the possibility of providing cheaper access to high quality educational and research materials for use in universities. Further, such adoption of OER enables access to resources beyond the institution developing those materials.[[10]](#footnote-10) The 2012 impact evaluation of the Health OER Project revealed that the materials and videos were being viewed extensively by people from all over the world (University of Michigan and OER Africa, 2012) – one of their videos on YouTube has had over 34 000 views.

#### MOOCs in Africa

Although theoretically MOOCs have the potential to reach distant or disadvantaged learners and to provide continuing and informal education from highly trained educators from all over the world (Towards Maturity, 2014), available evidence suggests that students from Sub-Saharan Africa are not actively participating in MOOCs. Most MOOC participants appear to be from North America, Europe, and Asia. A study by the University of London tracked four new MOOC courses launched with Coursera, and the results indicate that more male than female students (ratio of 64:36) participated, with the majority of students (22%) coming from the United States. India accounted for the second biggest proportion of students, with 6% of participants, with the UK coming third with 5% of candidates (Fearn, 2014). Data provided by Coursera indicates that every country in Africa has enrolments in their courses, although only a small proportion in relation to word wide registrations. Coursera shows that 64,000 people have registered for their courses from Sub-Saharan Africa, about 2% of the worldwide total. The top six Sub-Saharan African countries have enrolled 34,000 people, over 50% of the total (in order of enrolments: South Africa, Nigeria, Ghana, Kenya, Ethiopia, and Uganda). The completion rate for students enrolling in these countries is 14% (Association for Public and Land-grant Universities, 2014).

Importantly for Africa, MOOCs may also provide a way to fill a gap in local expertise by providing large-scale access to high quality courses on required skills (Boga and McGreal, 2014). For example, Coursera recently partnered with the World Bank and the Tanzanian government to provide MOOCs to African students in an ICT education initiative. The World Bank, in collaboration with the Tanzanian Commission for Science and Technology (COSTECH), is running a small pilot to meet the specific needs of students and the Information Technology sector in Tanzania. The focus is on incorporating existing Coursera offerings as part of a broader initiative to help equip students with market-relevant IT skills, in recognition of the growing demand for technically skilled workers in Tanzania (Trucano, 2013).

In another example, edX has partnered with Facebook to give Rwandan students free access to collaborative, online courses. Facebook will be collaborating with edX to develop a mobile app that will deliver an educational experience through social media. The partnership, known as SocialEDU, was announced in March 2014, and aims to serve as a blueprint for future projects (Rothberg, 2014).

However, there is much concern about how to use MOOCs on a broader scale in the African context. Access to technology is probably the most prohibitive factor in developing countries using MOOCs. According to the Association for Public and Land-grant Universities (2014):

MOOCs are strongly dependent on high and reliable bandwidth for delivery of rich multimedia materials and videos. Except in some urban areas in Africa, it is likely to be some time before bandwidth is adequate and affordable for the great mass of African citizens, especially those in rural areas.

Access to electricity is regarded as one of the most overlooked but critical problems facing the continent and creating a setback to potential gains in the ICT sector in Africa. Electricity problems threaten access to online resources even in ICT-savvy countries like Kenya, Uganda and Rwanda. Moreover, power surges and an unreliable and unpredictable power supply are a daily occurrence in West Africa (Association for Public and Land-grant Universities, 2014). While some urban areas may have good infrastructure, many towns and almost all rural areas have unreliable or part-time electricity, and very limited Internet connectivity hindering accessibility to MOOCs (Boga and McGreal, 2014).

It has also been pointed out that language and culture also influence MOOC usage in Africa. The majority of the MOOCs are in English, which can prevent students from developing countries who are not fluent in English from fully participating in the courses. These students may not be sufficiently proficient in English to take an online course, or may not understand the colloquialisms used in discussion forums. Notably, some MOOC providers provide translations of their video subtitles. However, it has also been argued that these courses were generally originally created for a North American audience, so the content does not accurately reflect the reality of students in other countries. It is possible that these difficulties can be mitigated by ensuring that local instructors have the ability to create their own content and conduct classes in the local language (Boga and McGreal, 2014). However, this can only occur if MOOCs are more open.

Importantly, all major MOOC providers have highly proprietary terms and conditions that claim ownership of course content and prohibit sharing or remixing of material. For example, Boga and McGreal (2014) point out that Coursera’s MOOCs are made available under strict copyright terms. Furthermore, by participating in a course the user agrees to grant providers a sweeping license to do what they want with the user’s content. These restrictions assume critical importance with regard to adaptation of content to suit African contexts. MOOCs need to be aligned to the African context in order to realise their full potential (Association for Public and Land-grant Universities, 2014). If higher education institutions choose to be tied to a specific platform, they may have to adhere to the foreign values put forth by the platform owners. As a result, African higher education institutions may lose some of their autonomy and exclude potential local partners who may not be a part of the same platform. According to Boga and MacGreal (2014):

This exclusivity will make developing countries vulnerable to the effects of cultural imperialism, and prevent true collaboration with other developing countries that may be facing similar issues.

Furthermore, data collected from African MOOC participants are usually only available to MOOC platform providers who therefore can restrict the analysis by higher education institutions providing the courses, or by independent researchers interested in the performance of MOOCs and e-learning (Association for Public and Land-grant Universities, 2014).

A danger of for-profit companies like Coursera delivering MOOCs to the developing world is that they are revenue-focused. This compels them to be open to the possibility of accepting corporate partnerships that may not have the best interests of the learners in mind. Another issue is that commercial MOOC platforms copyright-protect their materials, which means that developing countries will lose the ability to adapt, localize or translate content to their own context. Coursera’s less flexible approach may also limit MOOC instructors in their ability to use publicly-available, high-quality OERs in their MOOCs. This will negatively impact instructors’ and learners’ long-term ability to take control of their own learning. (Association for Public and Land-grant Universities, ibid)

Open-source platform solutions (such as that offered by edX) are regarded as increasing MOOCs’ chances of long-term success in African countries by allowing local educators control over the applications, content and curriculum. Like Coursera, edX offers courses from leading universities for free, but with the difference that many of its supporting textbooks and other materials are published as OER that can be used, reused and modified by anyone (Boga and McGreal, 2014).

It is clear that the idea of MOOCs is only beginning to be explored in the African higher education context, and currently, there are no African MOOC providers. The potential value of MOOCs for African higher education remains unclear. However, the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) wishes to explore whether there is a role for a well-designed MOOC in Africa, which can enhance teaching and learning and provide economies of scale. In recognising the context where e-learning and the online teaching and learning environment are still emerging, RUFORUM is exploring how to use a MOOC platform and to use online tools to create a ‘blended course’. The uniqueness of this course is that it will be completely open, using OER and Open Access resources in order to extend the reach of course created. Additionally, it will be in the field of agriculture where there are few MOOCs. Given that there is no single model for MOOCs, and that approaches to MOOCs are growing and changing at a rapid pace, it will be interesting to see how this evolves in the African context.

## Openness and research in Africa

Openness is valuable for research activities of both students and academics. To produce the next generation of researchers, academics need to focus on teaching research skills, and developing students as researchers. If academics no longer need to focus on lecturing (for example, in a flipped classroom), then students can spend more time doing research, much of which might be advancing a broader research agenda being coordinated by an academic. Such an approach could help to tackle the critical shortage of research output from African universities. Additionally, the wide availability of open data described above and open access publications, together with technologies like cloud storage, helps address the challenge of poorly resourced libraries, and provides wider access to information to support research functions. Openness therefore has the potential to support the development of research capacity and reverse the paucity of African-generated research across the continent.

Technology opens up possibilities for research that can mitigate some of the challenges in African higher education, for example, the brain drain and the lack of funding. A large number of highly qualified African academics have left the continent to work abroad, never to return. Technology can traverse the space between these professionals and their countries of origin, and facilitate the opportunity to tap into their extended knowledge base. For example, using grid and cloud computing, the UNESCO-HP brain gain initiative (BGI) reverses brain drain in African and Arab countries by funding collaborative ventures between lecturers in home countries and those in the diaspora to engage in teaching and research. The BGI has been running since 2003, and in 2013 there were 19 participating African universities (UNESCO, 2013).

Grid and cloud computing enable students and academics in participating institutions to collaborate with scientists all over the world. The projects of this initiative are responsive to local challenges, for example, in Cameroon, where professors at the University of Yaoundé are collaborating with a Cameroonian engineering professor at the University of Arkansas in the US, the project focuses on fighting pollution through the use of remote electronic sensors to measure urban air pollution in Yaoundé. This project can be replicated in other countries (Kigotho, 2013). Other BGI projects addressing local challenges include:

* E-waste management programme in Kenya, where the Masinde Muliro University of Science and Technology developed and introduced a diploma in computer technology and e-waste management to address the threat of poor waste management associated with aging electronic devices, mostly donated from overseas for educational purposes.
* The Makerere College of Computing and Information Science in Uganda has four projects focused respectively on the use of mobile phones to follow up on HIV/AIDS patients on antiretroviral treatment; localising the VLC open source software in the Rukiga language; adapting open source terminal/server software for use on the Ubuntu operating system; and developing an SMS based system to identify emergency services within a close proximity.

Research dissemination is an important aspect of sharing ‘best practice’ in higher education pedagogy, and this sharing occurs at conferences and through publications. However, both these methods have proved to be expensive for academics working in African universities. The cost of attending regional and international conferences is prohibitive for most African academics. Fortunately, the advent of virtual conferences now enables these academics to participate in global knowledge sharing events at limited cost, provided they have access to the internet. Some of the virtual conferences for higher education are:

* Educause Annual conference[[11]](#footnote-11), aimed at higher education IT professionals, which can be attended in person or virtually.
* Association of Higher Education and Disability (AHEAD) hosts annual conferences every July[[12]](#footnote-12) aimed at sharing practice on inclusion in the post-secondary sector. Participants can attend the conference virtually at discounted rates.
* Online Learning Consortium[[13]](#footnote-13) organises annual conferences for professionals using technology in education. Since 2011, virtual participation has grown significantly, from 600 in 2011, to 1,100 in 2012, and 1,615 in 2013.
* On 7th November 2014, Sakai held a completely virtual conference[[14]](#footnote-14) covering pedagogic aspects of using Sakai as well as some technical aspects.

Research dissemination through peer reviewed commercial publications dominated the academic publishing space for a long time, with commercial publishers obtaining substantial revenue from selling academic research for high profit. Academic research articles were published in subscription journals, at a cost prohibitive to most African academics. Even today, the cost of purchasing a single paper in most commercially produced journals is unaffordable for most. The rise of open access journals has changed this situation, and by 2011, 11% of scientific research articles were being published in Open Access journals (van Noorden, 2013). Although authors still have to pay to publish in Open Access journals and other publications, they are free to choose from a range of publications, and open access allows them to evaluate the service they are getting in relation to the fee they are paying, as there is a wide range in cost of OA journals.

The lower cost of OA journals provides an alternative to academics from resource constrained African universities who want to publish. Information is available online on how to evaluate the best OA journals to publish with. Apart from the lower cost, publishing in an OA journal also has the advantage of higher exposure. Because readers can access OA journals without subscription, more readers have access to the published work, and this means more people can engage with the work, critique it, as well as cite it in their own work.

## Openness and community engagement

It is difficult to succinctly define community engagement, variously referred to as ‘outreach’, ‘public service’, ‘community development’, ‘civic participation’, ‘community responsiveness’ and ‘community engagement’ (Hodgkinson-Williams et al., 2009). According to the Australian Universities Community Engagement Alliance (AUCEA), a university’s communities include businesses, industries, professional associations, schools, governments, alumni, local communities as well as the whole nation’s citizens (AUCEA, 2006) and the whole world beyond the geographic location of the university. Community engagement is embedded in all of a university’s core functions. When universities produce human capital for the labour market, do research in schools, support teachers in school, engage government and civic society on policy matters, and engage with industry on research, development and innovation, this all constitutes community engagement.

Community engagement is particularly important for universities in developing countries, where communities can benefit from practical solutions targeted at improving everyday social and economic challenges. The following examples highlight socially responsive community engagement projects by universities in Africa.

|  |
| --- |
| Box 8: Community Engagement Initiatives in African Universities***Makerere University AgShare project***Makerere University in Uganda was a participant in the AgShare project, aimed at developing healthier and wealthier livestock-based communities in Africa by disseminating knowledge, skills, and community service through an innovative information loop system for OER-based research, education, and knowledge. For this project, the College of Veterinary Medicine, Animal Resources, and Biosecurity (COVAB) and the College of Agricultural and Environmental Sciences developed a programme to improve the production and economic performance of small- to medium-sized dairy farms, after the dairy industry was identified by the Ugandan government as a priority sector for development. The programme was designed to improve the performance of the dairy value chain from farm to market, and involved graduate students collecting baseline data around which interventions could be designed, and then serving as conduits of information between the University and farmers as they aided in the implementation and monitoring of the success of these interventions. The results of the project and knowledge gained from this engagement were captured in the form of OER, so that they can be re-used by future students and other universities undertaking similar initiatives, making the replication of this initiative feasible and cost-effective (Kaneene et al., 2013).***Open University’s Health Education and Training in Ethiopia (HEAT)***In 2011, the Open University (based in the UK) teamed up with the Ministry of Health in Ethiopia, and other stakeholders to provide contextually relevant training to health care workers, using up-to-date content developed as OER. The training focuses on frontline health workers to enable them to deliver effective healthcare services to their communities. Community healthcare workers enrolled on the course at their workplaces and from their homes. Some of the materials used for training are in Kiswahili. The HEAT project aims to train 250,000 community health care workers in Sub-Saharan Africa by 2016 (Long, n.d.). |

## Conclusion

There is a growing consensus that higher education institutions, including universities, community colleges and polytechnics, are important for Africa’s development (Yizengaw, 2008) and critical for national economic competitiveness (Brand, 2014). In Africa (as around the world), education is acknowledged as being the ‘common thread’ needed to transform economic, social, political, and cultural factors on the continent. Higher education is regarded as the foundation from which to tackle economic, social and political matters; for example, the economic benefits are that it facilitates employment, increases salaries, and fosters greater productivity and national development. Social improvements attributed to higher education include improved quality of life, better decision making, increased status and opportunity for individuals, and social mobility. Higher education is also regarded as enhancing a country’s political environment by contributing to civil society, enlightened citizenship, self‐reliance, and equal opportunity (Yizengaw, 2008). Openness in education, coupled with good use of the wide array of technological tools available, is increasingly seen as a key to these much needed advances.

# Section 4: Moving Forward

## Introduction

Technology, together with the new innovations it is bringing, is placing pressure on universities to consider what it means to teach and learn in the 21st century. The issue is no longer whether to integrate technology into teaching and learning, but how technology is going to be used to reshape them (Shepard, 2012).

It is clear that universities need to change to keep pace. Resilient institutions will be open and adaptable in the face of changing circumstances. In this fast moving context, inaction is the greatest risk, as has been demonstrated in other economic sectors, such as publishing, journalism, and media, where those organizations that resisted change have either experienced significant economic stress or have already closed their doors. The main challenge is for universities to find truly innovative things they can do so that they do not lag behind in a context of continuous flux. To play an indispensable function in the new competitive environment, the average university must change more quickly and more fundamentally than it has been doing.

There is no single response to these challenges that can successfully tackle every institution’s situation. One thing that is clear is that it is essential for institutions to engage with openness as a potential core organizational value if they wish to remain relevant to students, lead change, and contribute to positive advancement in the field of higher education (Wiley and Hilton, 2009).

Universities are required to juggle between working with what they know and experimenting with different models of possible change in order to ‘future proof’ their core business (Gallagher and Garrett, 2013). This means that institutions will most likely develop and thrive by embracing and grappling with the challenges and by working on constructing their future, rather than waiting for it to happen and then responding. It is predicted that universities that do not respond to the changes occurring are unlikely to be able to adapt at a later date and will thus cease to exist or be forced to merge with others (Norwegian Government Administration Services). It is also anticipated that institutions that do not have some form of commitment to openness may be relegated to observer positions in which they cannot participate in creating significant innovations, as they would not have a meaningful open service to offer (Wiley and Hilton, 2009). The access to open content and open courses, combined with increasingly available access to the Internet, offers an opportunity to rethink the basis on which universities organize the educational experiences of their students.

If OER and MOOCs simply replicate the models and curricula of the past, a significant opportunity to usher in critically needed systemic changes will have been lost. Thus, although we cannot be sure what these new models and curricula may look like, it will represent a significant opportunity lost if African universities do not engage proactively and rapidly in working towards them, rather than just using new technology to recreate the models that academics grew up with and that are most familiar in our societies.

Universities therefore need to consider the following issues when considering how to make their offerings more applicable to the needs of a changing society:

#### Investing in collaboration and materials development

Adopting OER in an African context can have positive impacts on the teaching and learning environment as it requires institutions to invest in programmes, course and materials development, and thereby begin to incorporate notions of quality (Adam et al., 2011). OER can also assist in alleviating funding constraints by integrating OER material into other content/material development processes. Sourcing existing OER can be seen as part of the process of investing in high quality learning resources that meet curriculum needs while saving costs. Faculty members can work with OER to preview how topics are taught at other institutions. Additionally, open licensing allows faculty members to contextualise and translate OER to suit local needs.

Incentive structures at higher education institutions often reward individual rather than collaborative activity in encouraging the production of ‘new’ materials. While there are sometimes good reasons for a faculty member to develop materials from scratch, such processes may often duplicate work taking place in global knowledge networks that are engaged in facilitating increasingly creative forms of collaboration and sharing of information. Consequently, it is opportune for universities to think strategically about the extent to which their policies, practices, and institutional cultures reward individual endeavour over collaboration and create inefficiencies by prizing, in principle, the creation of ‘new’ materials over the adaptation and use of existing materials and content. As the amount of content freely accessible online proliferates, the old approach to creating materials is unnecessarily wasteful. Thus, there may be merit in ensuring that incentive structures and quality assurance processes include the selection and use of existing content, as well as the development of new content.

Regular reviews of curricula are important in order for universities to stay relevant, to contribute to social progress and economic transformation in the continent, and to prepare students for the working world.

#### Aligning policies with requirements for openness

Related to the above, universities may wish to consider the extent to which their policies motivate educators to invest in on-going curriculum design, the creation of effective teaching and learning environments, and the development of high quality teaching and learning materials. Some institutions already have policies that encourage such investments, either through the inclusion of these elements in job descriptions, the inclusion of these activities in rewards, incentives, and promotions policies, and/or the appointment of people and units dedicated to these tasks. While different institutions may wish to incentivize these activities in different ways, according to their specific mission and vision, all would benefit from ensuring that their policies provide structural support to investment of time by educators in these activities, as part of a planned process to improve the quality of teaching and learning. A policy commitment to the use, adaptation, and creation of appropriate OER, in support of on-going curriculum and materials review cycles, would help to ensure that teaching and learning are seen as parts of a continuing process of renewal.

Institutions may wish to focus on reviewing and revising policies, rather than creating new policies to address the changes occurring, as developing a specific policy is likely to narrow their strategic focus around a single choice at a time when the range of choices is still not clear. Existing institutional policies tend to be too detailed, and tend to place too many constraints on behaviour. The more rules and regulation there are in place, the more difficult it is for academics to innovate and experiment. Thus, policies may require revisions to remove unnecessary bureaucratic constraints on innovation. Most universities tend to discourage innovation except in the narrow area of research. Additionally, whilst universities may have innovations, these are usually restricted to a small scale. This calls for the development of a policy environment that rewards innovation, as well as the mechanisms to integrate these innovations into university systems.

This means that it is difficult to develop policies based on certainty, especially as the terrain is evolving at a rapid pace. With this in mind, universities will likely need to review and adjust their existing policies and staff incentive schemes regularly to ensure that they encourage teaching staff to embrace open practices, rather than penalizing them. It should be noted that higher education per se, with its core functions of teaching and learning, research and community engagement are not under threat as a consequence of these developments, but institutions that do not adapt to the changing context will be at greatest risk of either closure or ever-tightening financial constraints.

An important consideration is that institutional technology plans warrant regular review. Due to rapid technological changes and the reliance on a good ICT infrastructure to access open material, it is important for institutions to conduct regular reviews of technological implementation plans and to revise them as necessary. To be successful, strong leadership is required to ensure that these plans are communicated convincingly to all constituents, and to ensure the involvement of all stakeholders.

#### Adapting business models

Good education cannot be created or sustained without proper funding, regardless of the methodologies or technologies adopted. One key consequence of openness is that higher education content is rapidly being commoditized and thus its economic value is declining. This will impact negatively on universities that base their business model primarily on providing content, either through lectures or distance education materials. If universities are going to adjust their models towards increasing openness, they are likely to be making investments in areas such as creating robust technology platforms, content management and delivery platforms, and course design. To succeed, universities will need to forge new business models that are dynamic.

Ernst and Young (2012) predict that university business models will become more diverse along three broad lines of evolution:

1. ‘Streamlined Status Quo’ — Some established universities will continue to operate as broad-based teaching and research institutions, but will progressively transform the way they deliver their services and administer their organisations — with major implications for the way they engage with students, government, industry stakeholders, technical and further education institutions ( TAFEs), secondary schools, and the community.

2. ‘Niche Dominators’ — Some established universities and new entrants will fundamentally reshape and refine the range of services and markets they operate in, targeting particular ‘customer’ segments with tailored education, research and related services — with a concurrent shift in the business model, organisation and operations.

3. ‘Transformers’ — Private providers and new entrants will carve out new positions in the ‘traditional’ sector and also create new market spaces that merge parts of the higher education sector with other sectors, such as media, technology, innovation, venture capital and the like. This will create new markets, new segments and new sources of economic value. Incumbent universities that partner with the right new entrants will create new lines of business that deliver much needed incremental revenue to invest in the core business — internationally competitive teaching and research.

According to Ernst and Young (2012), this dynamic industry landscape requires universities to critically assess the viability of their institution’s current business model, to develop a vision of what a future model might look like, and develop a broad transition plan.

It may be useful to consider Clayton’s argument that the key to successful innovation is not to imitate what other universities have done. Rather, the success in an increasingly competitive higher education environment requires each institution to identify and pursue those things it can do uniquely well. He uses the example of Harvard to illustrate that a strong sense of uniqueness has long been a driving force behind Harvard's success, and even when Harvard borrowed traits from other institutions it did so with innovative twists that endorsed its unique strengths and needs.

Harvard succeeded in becoming Harvard in large part because it never tried to become anything else (Christensen and Eyring, 2011).

Open education proponents, such as Wiley (2009, cited in Schmidt et al., 2009) also speak of the ‘disaggregation of education’, and speculate how core services of the university might evolve as independent elements in an open education ecosystem. Wiley argues that universities will need to decide what role they are going to play in higher education and innovation and it is likely that they will need to become open service providers should they wish to maintain their influential positions. This would require them to create and market a convincing message about the value of learning at an institution that is, organizationally, entirely inward-looking (Wiley and Hilton, 2009). What is essential is that the educational focus of institutions is forced to tighten so that universities make more efficient use of the resources they have.

#### Deciding on which technologies to adopt

The strength of MOOCs lie in their power to bring quality educational content to people who might not otherwise have access. Universities in Africa need to engage with the issue of how to leverage this potential to the benefit of the continent. A robust, flexible and scalable platform is an essential component of a MOOC. It doesn’t matter how good the content is, the whole MOOC will fail if the platform is not suitable. Major purveyors of MOOCs tend to have highly proprietary terms and conditions that claim ownership of course content and prohibit sharing or remixing of material. Nevertheless, African higher education institutions have the benefit of a growing range of online learning vendors and internet-based platforms to choose from. There are extensive open-source modules for online course management, content delivery, and student interaction.

It is thus worthwhile for universities to consider using an open-source platform in combination with OER. This would allow the local faculty the flexibility to adapt curricula to meet the unique needs of their learners. Additionally, universities should consider using existing technologies available in the African context, including mobile phones. Mobile phones are ubiquitous in Africa and most people already know how to use them. MOOCs with mobile phones could be a very powerful way to provide an accessible learning experience. According to Boga and McGreal, (2014)

Instruction designed for mobile phones has a similar pedagogical underpinning to the instructional design of MOOCs, meaning that students can receive high-quality instruction on devices they are familiar with, while taking part in learning activities that are similar to those offered in North American MOOCs.

#### Capacity building and professional development

The requirement to develop different kinds of skills and competencies has implications not only for students but for educators as well. Clearly, it can be anticipated that educators will be required to do different kinds of work in an open and technology-enhanced learning environment. These might include the following:

* They will become facilitators and managers of learning in situations where they are no longer the source of all knowledge;
* They will plan, negotiate, and manage the integration of technology based learning in formal institutions, in the workplace, and in communities;
* Many may spend a considerable proportion of their workloads contributing to the preparation of courseware;
* Many of them will interact with students at a distance through any one, or any combination, of media (of which real-time, face to face interaction is only one of many possibilities);
* It will be essential that educators design and administer complicated - often computer-based - record-keeping systems that keep track of learners’ progress through their individual learning pathways, pathways that reflect individual variations in learning content, learning sequence, learning strategies, learning resources, the media and technologies chosen to support them, and the pace of learning;
* Increasing proportions of their work will involve them as members of teams to which they will contribute only some of the required expertise, and of which they will not necessarily be the leaders, managers, or coordinators (Butcher and Associates, 2014).

This all involves a paradigm shift from the traditional relationship between lecturer and learner. Creating knowledge and sharing it with students is no longer adequate, and educators are required to become content guide and facilitator in helping students identify and decipher credible resources and aggregate content (Johnson et al, 2013). This can pose a difficult situation for educators, most of whom are themselves products of classroom-bound education, and whose professional identities are linked to the traditional image of the teacher at the front of the classroom, and in the centre of the process. Thus, relevant on-going professional development activities should be made available to academics to enable them to acquire the skills and competencies necessary to perform their jobs effectively and productively. Consequently, university policies may make provision for rewarding academics for facilitating students’ educational experience, as opposed to just lecturing students. Policies may reward activities where content is engaged with before face-to-face interaction, and can consider penalising educators for relying purely on lecturing to teach. Examples of recognised professional development activities to improve teaching, learning and assessment at higher education institutions (Lewin and Mawoyo, 2014) are:

* The Higher Diploma in Higher Education and Training, offered at a university in the Western Cape region in South Africa, aimed specifically at practitioners with no teaching qualification. Modules offered on the programme include skills on facilitating learning and assessment, development of web based learning, and facilitating research.
* The Scholarship of Teaching and Learning (SOTL) is an approach that encourages lecturers in higher education to organise events like seminars and conferences to share research on practice to improve student success.
* Some of the areas discussed at seminars organised by the Academic Development fraternity in South Africa include the use of technology to improve teaching and learning.

## Concluding comments and some key questions

Openness is now a dominant feature of the higher education landscape. Educational institutions therefore have to reformulate their strategies and policies if they are to remain relevant in the future. The challenges facing African educational institutions are compounded by intense pressure to increase student numbers, coupled with economic constraints. A few key questions that need to be addressed in this process include:

* Content: Who owns it, who evaluates it, who has access to it, and to what extent does it contribute to the unique brand of an Institution?
* Efficacy: If MOOCs are seen as having significant potential to get higher education to the masses, why is there such a low completion rate for existing courses? There is a need to investigate the teaching efficacy of this approach when used outside of an institution.
* Pedagogy: If content is freely available, what role does the institution play in providing a rounded educational experience? In today’s world, this includes providing employer-relevant skills to give meaning to the knowledge.
* Certification: How does the institution ensure that whoever graduates from their offerings has met the required standards? Are all students required to attend physical classes on the campus, or can students who have studied from remote parts of the country, or elsewhere in the world, be examined without having to be physically on campus? Will there be a charge for this stage in the process?
* Financial viability: How will the institution be able to leverage the new environment to ensure that the highest standards are maintained, to attract and retain quality staff and to fund quality research in a tight economic environment?
* Innovative technologies: Can the institution benefit by using their intellectual capital to create marketable electronic products?

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1. <http://www.doaj.org> [↑](#footnote-ref-1)
2. Open Courseware Initiative [↑](#footnote-ref-2)
3. Connexions project: http://cnx.org [↑](#footnote-ref-3)
4. <http://www.opencourselibrary.org> [↑](#footnote-ref-4)
5. [www.creativecommons.org](http://www.creativecommons.org) [↑](#footnote-ref-5)
6. Referring to the move away from static Web content to dynamic, user-generated content and social media, [↑](#footnote-ref-6)
7. A recent merger between the Centre for Educational Technology and the Adult Education Studies & Development Unit (HAESDU), has created a new unit called Centre for Innovation in Learning and Teaching (CILT) [↑](#footnote-ref-7)
8. http://ship.mrc.ac.za/ [↑](#footnote-ref-8)
9. These resources can be found on both the KNUST OER site (<http://web.knust.edu.gh/oer>) as well as on the African Health OER Network space on the OER Africa website ([www.oerafrica.org/healthoer](http://www.oerafrica.org/healthoer)). [↑](#footnote-ref-9)
10. KNUST OER videos are available at <https://www.youtube.com/user/knustoer> [↑](#footnote-ref-10)
11. <http://www.educause.edu/annual-conference/virtual-conference> [↑](#footnote-ref-11)
12. <https://www.ahead.org/meet> [↑](#footnote-ref-12)
13. <http://olc.onlinelearningconsortium.org/conference/2014/aln/about> [↑](#footnote-ref-13)
14. <http://virtconf.apereo.org/> [↑](#footnote-ref-14)