Exploring the role of ICTs in addressing educational needs[1]

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Introduction

Persistent myths have lessened the impact of Information and Communications Technologies (ICTs) on education. Fortunately, they are balanced by miracles of theory and practice that are gradually gaining the upper hand.

This paper aims to dismiss the pernicious myth that innovation in the application of ICTs is the preserve of industrialised countries by listing innovations from Southern Africa that are global trendsetters. It also argues that developing countries have two advantages over industrialised countries in the exploiting of the fundamental miracle of educational technology, which is its ability to provide higher quality learning to increasing numbers at lower costs.

Big myths and little myths

It is a myth that innovation in ICTs, and the use of educational technology more generally, is the preserve of the rich, developed countries, as the following examples will demonstrate.

The University of South Africa (UNISA)

Most people agree that the most impressive application of educational technology in the 20th century was the creation of the large distance-teaching universities – often called open universities. In 1995, I coined the term 'mega-university' for distance-teaching universities with more than 100,000 students. UNISA is the world's oldest mega-university and has a century-old history of innovation in higher education, pioneering the innovation that we now call the 'Open University'. Through its operations, UNISA has exploded three other myths.

1. The myth that developing countries are poor at administration and logistics. UNISA proves this to be a lie. It has constructed truly impressive administrative systems. UNISA's commitment to provide an examination venue to every registered student within reasonable distance of their place of residence, wherever they are in the world, is just one example of that.

2. The myth that in distance education you can't lend library books to students because you won't get them back. UNISA has a huge lending operation and gets very nearly all its books back. It also hosts the African Digital Library, which serves the whole continent and is full of digital, full-text books that any Internet-user in Africa can access.

3. The myth that mobile phones aren't really helpful for distance education because you wouldn't want to read *War and Peace* off the screen on your mobile phone! But UNISA has done an experiment, with a little help from the Commonwealth of Learning (COL), which shows that mobiles can be very effective for sending mass reminders of assignment and exam dates. Students reminded of their assignment deadlines have a higher submission rate.

SchoolNet

SchoolNet Namibia, (an offshoot of SchoolNet Africa, which originated in South Africa) is an example of brilliant innovation. Since February 2000, some 450 schools in Namibia have received free hardware, free training on the OpenLab operating system and subsidised telephone service, to help get the nation's young people and teachers online.

The aim is to empower youth through Internet access. The young people who receive training on how to set up and support these systems gain work experience through SchoolNet Namibia and are so well prepared that they are all absorbed into the private sector workforce. That alone is a wonderful achievement. SchoolNet Namibia is a great example of quality when quality is defined as fitness for purpose *at minimum cost to society*.

Mindset Network

Mindset creates, sources and delivers quality educational materials on a mass scale through appropriate media to the primary and secondary school communities and the health community. It uses the latest technology to reach even the remotest communities through an offline, on-demand, satellite-based technology platform. Training in the use of the technology is also an integral part of the three elements of its mission.

1) Mindset Learn, which provides educational content for students and educators for grades 10–12. Receiving equipment has been installed in 1,000 schools and content also reaches a million homes through satellite broadcast.

2) Mindset Cabanga, which provides educational content for students and educators for primary grades R–7. Receiving equipment is now in 50 schools as a first phase.

3) Mindset Health, which updates healthcare workers on the latest content and provides health education to patients in waiting rooms at 130 public hospitals and clinics.

AVOIR – Free Open Source Software Code Programming

AVOIR is a collaborative project that began at the University of the Western Cape and now links universities across Africa to bring together a core of Free Open Source Software developers. Through their software development activities they create educational and business opportunities that contribute to Africa's development. This extraordinary network of African code programmers kills stone dead the idea that the rich world has a monopoly on technological innovation.

Mobile phones

The final example is a phenomenon rather than an institution. It is the mobile phone. This is the most visible techie miracle in Africa. Access to telephones in South Africa is well over 90%. The mobile phone revolution explodes another persistent myth about educational media, which is that a 'magic medium' will appear and solve all teaching and learning problems. Over the last 200 years, the blackboard, radio, film, TV, computers, programmed learning, laptop computers and the Internet have all been hailed as that 'magic medium'.

There is no 'magic medium' and never will be. Each new medium adds extra value to the existing media mix. That is what mobile phones are doing in Africa, showing that they can contribute far more to the development of Africa than the laptop, which was the most recent candidate to be hailed as the 'magic medium'. Laptops are great, but they are part of an increasingly rich media environment, not a magic solution.

Big miracles and little miracles

So much for myths! The innovative institutions described above have, in turn, dispelled several little myths that the big myth carries in its baggage.

Let us now turn to the miracles. Previously, we defined quality as fitness for purpose at minimum cost to society. The last part of that definition is important if we are serious about sustainable development. If you spend more than necessary to make a product or process fit for purpose you are wasting resources. As we explore the role of ICTs in addressing educational needs, we stress two aspects of that definition. First, we are not engaged in a futile search for the perfect method of learning. We are applying 'scientific and other organised knowledge'. That can mean tacit knowledge, crafts, and organisational experience, not to mention a good dose of common sense. And second, we are living in a world of people and machines. Good use of technology always involves people and their social systems. What are people's educational needs?

There are three most important aspects of education – wide accessibility, good quality and low cost; these are universal, and can be viewed as three sides of a triangle. By seeing education in this way, you realise the limitations of conventional methods of teaching and learning – and why education for all is so difficult to achieve. Suppose that you want to increase access, as some counties in Africa have done recently by making primary education really free. Much larger numbers of children come to school but the recruitment and training of teachers cannot keep pace. Class sizes increase and people think that the quality of learning has gone down.

Suppose that you want to increase quality by providing more books and learning materials. The cost of schooling will go up, which may mean that it can be offered to fewer people, so access goes down. The point is that if you try to improve one side of this triangle, your action usually changes the other two sides in undesirable ways. For this reason, we refer to it as the 'iron triangle'.

The revolutionary feature of educational technology in general – and of open and distance learning and ICTs in particular – is that it can break open the iron triangle. You can increase access, improve quality and cut costs – all at the same time. This is because of the economies of scale and consistency of quality that come with using media. That is the big miracle.

The little miracles are that these advantages seem to grow with every new generation of media. CD-ROMS and DVDs cost less to print than books. Distributing material on the Internet costs almost nothing once networks and computers are in place. Social software and the collaborative development of open educational resources are particularly promising developments for Africa.

## Independent and interactive learning

You can explain the impact of technology on the iron triangle by noting that learning takes place in two ways:

1. **Independent learning:** learning that you do by listening, watching, reading, surfing the Internet and so on. Most of our learning is of this type – and more so as we get older. People sometimes say that learning in a classroom or lecture hall is interactive because there is a teacher present, but in reality most of the time in the classroom is spent in a one-way flow of information, and learning is done independently.

2. **Interactive learning:** where a person – a fellow student, teacher or tutor – reacts directly to a comment or a question that another human being makes. Moments of interaction can be very important. Asking a question can enable the teacher to clarify a misunderstanding. Even more valuable is when the teacher comments on or corrects something that the learner has done in order to demonstrate their understanding of a topic.

In the early years of distance education, its great strength was to concentrate on the independent component of learning by producing quality self-instructional materials, almost always in print form. What did this do for the iron triangle?

First, printing has economies of scale, and second, once you have printed a thousand copies, the marginal cost of printing a few more is small, so that acts on the first two sides of the triangle. By getting the cost down you make it possible to increase access, because you can provide learning materials to more people. The potential effect on the third side of the triangle, namely quality, flows from these two. If you are producing in volume you can make the initial investment necessary to ensure that the materials are of high quality in both content and pedagogy.

These principles apply even more strongly to later forms of media, particularly the mass media. Once you are broadcasting a TV or radio programme it costs you nothing when extra people tune in. Provided they have a TV or radio, it costs them very little too, just a little electricity. These mass media are another miracle and their economies

*Students at Kenyatta University
African Virtual University, Kenya*
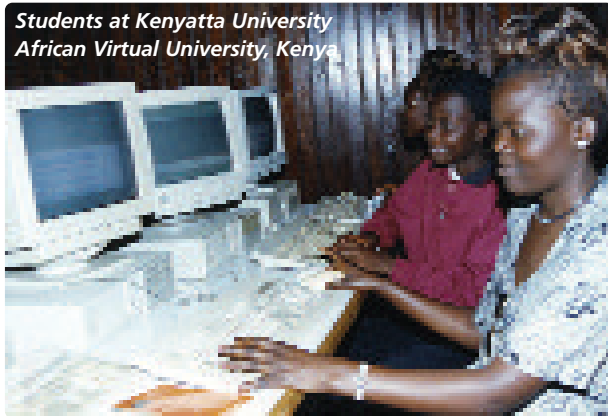
of scale are the foundation of the success of the Mindset Network and the many open universities that have done so much to put open and distance learning on the policy agenda of governments.

But the more successful distance learning institutions, by understanding the fact that the possibility of interaction with teachers and the institution is vital if most learners are to achieve their goals, set up systems for interactive learning, usually by making part-time tutors available to mark and comment on students' work, to answer questions, and to hold face-to-face meetings. Such arrangements are inherently more expensive per student than the independent learning media, but if the institution organises itself well, there can be economies of scale here too.

Evidence shows that the combination of high-quality materials for independent study and effective arrangements for interactive tutoring is the basis for successful open and distance learning whatever media are used.

The UK Open University was able to dramatically increase access to higher education as well as cut its cost. But the greatest surprise to most observers was on the quality front. By 2003, it had risen to fifth place in national rankings of the quality of teaching in English universities. Note also that when students were asked which aspects of the university's distance-teaching system were most helpful to them, it was the printed materials and the tutors that consistently gained the highest ratings.

The problem with all this is that the big miracle of busting open the iron triangle depended on the economies of scale of print and the mass media. To bust open the triangle you had to be big. UNISA and the UKOU each have over 200,000 students, while India's Indira Gandhi National Open University has over a million. Which raises the question: is it still possible to get wide access, high quality and low cost by conducting distance learning on a smaller scale? The good news is that social software and open educational resources do make this possible.

The latest miracles: Social software and open educational resources

Social Software

For most students, successful distance learning requires interaction. Traditionally, this has been provided by tutors and however efficiently they are organised, they do not have the economies of scale of independent study with the mass media.

One attempt to get around this has been to try to make computer systems genuinely interactive so that they respond to the student. Research on this continues, but it has not yet produced any systems that work at scale. Another, more successful, approach is social software, which uses ICTs to enable people to work together easily as individuals or in groups. This multiplies the impact of the teachers and tutors but also, perhaps even more importantly, makes it easier for students to learn from and coach each other. Irrespective of your status, background or position, you can participate in this collaborative social movement – it represents democracy in action. Social software helps create the learning communities that are the basis of good education and good distance education.

Open Educational Resources

The final miracle is Open Educational Resources (OERs). One reason that successful distance learning organisations are big is that developing good learning materials is an expensive, labour-intensive process. You can only afford the investment if you have economies of scale in their use.

The miracle of open educational resources is that sharing and adaptation are now easy because everything is held electronically. It also helps that the World Wide Web and miraculous tools like Google have made it psychologically OK to share materials.

To simplify, we can distinguish three phases – or generations – in the development of OERs. In 2001, the Massachusetts Institute of Technology (MIT) caused a stir by making the course notes of its faculty available on the Web. This launched the OER movement, with all the prestige of MIT, although the material on display is information on course curricula rather than self-learning materials. In 2006, the UK Open University announced the next generation of OERs by launching its Open Content Initiative. The aim was to make educational resources freely available on the Internet, with state-of-the-art learning support and collaboration tools to connect students and educators. These collaboration tools are the social software referred to above.

If the MIT initiative shared information and the UK Open University project shared learning, the next phase will be to share course development. This is what COL and its 25 country partners are aiming to do through the Virtual University for Small States of the Commonwealth. The OER movement has come a long way in five years and holds enormous promise for Africa, with the proviso that open content is genuinely open.

What kind of Creative Commons Licence?

Conventional copyrighting is clearly inappropriate for OERs, but so is leaving the field for copying completely open. The solution, invented by Larry Lessig, is the Creative Commons Licence, designed to promote and protect the freedoms of creative works within the educational commons. This licence does not negate the property rights of the creator; it simply regulates the use of the creator's efforts.

However, a range of 'protections' must be applied to the licence. One is attribution (BY), which simply means acknowledging the source of the OER. Another is 'share-alike' (SA), which means that if you adapt my OER, you must share your adaptation with me in a reciprocal manner.

Undertaking vocational skills training

The difficulty arises with the non-commercial (NC) restriction, which is intended to restrict use to non-commercial activities. Intuitively, this non-commercial restriction seems like a sensible condition to put on the use of OERs developed in the public sector. There is an understandable fear within universities that naked capitalism could monopolise and consume the well-intended efforts of open content creators.

Unfortunately, however, the NC restriction can have the effect of closing open educational resources to just the type of use that the originators would like to see, especially in developing countries. It does this in two main ways.

1) First, preventing the distribution of free content to people who need it most. The NC restriction would not, for example, legally permit a local community institution to package a print version of an online OER for resale on a cost recovery basis for printing, packaging and overheads.

2) Second, the NC licence is incompatible with other free content projects. You cannot mix material with a free content licence with material that has a Creative Commons Licence with the NC restriction. This prevents you getting economies of scale by taking advantage of the explosive growth of free content from other open projects, such as Wikipedia.

The downside of dropping the NC restriction is that it is highly unlikely that an entrepreneur will be able to make a substantial profit from an OER, simply because the original version of the OER will remain open. The commercial sector used to have the advantage of better distribution networks, but today large-scale distribution can be done by anyone with an Internet connection or a DVD burner.

Even the low risk of commercial exploitation is better addressed by the SA protection, which means that any published revisions and derivative works must always be released with an SA protection, thus ensuring the future freedom of the resource by encouraging community participation.

If people regularly place non-commercial restrictions on OERs, the latest miracle of educational technology will not be able to work its wonders in creating a global intellectual commons. Our strong advice is that OER creators should avoid the non-commercial restriction and use a licence that meets the requirements of the free content definition (http://freedomdefined.org/Definition).

Conclusion

We strongly advocate another vision of globalisation, one where open and distance learning, ICTs, social software and open educational resources are used to create a global intellectual commons. The miracle of a global intellectual commons is that it cannot suffer the tragedy of the commons. That is because when you give your knowledge to someone, you still have it to use yourself.

Endnote

1 This paper was adapted from a speech delivered at the NADEOSA 10th Anniversary Conference, Pretoria, South Africa, 23 August 2006.

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In his work at COL, he has encouraged the use of open source software where it is appropriate to expand access to learning content, and IT systems to support teaching and learning. Paul is responsible for leading the 'Virtual University for the Small States of the Commonwealth' (VUSSC) initiative.

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Wayne has extensive experience in the theory and practice of open and distance learning (ODL). Prior to moving to New Zealand, he spent 11 years working at the University of South Africa (UNISA), a distance learning institution and one of the world's mega-universities.

He has participated in a range of international consultancies and projects, including work for COL, the International Monetary Fund, UNESCO and the World Bank. Wayne also serves as a member of the Editorial Board of Open Learning and publishes regularly in the field of flexible and distance learning.

A committed advocate of free/libre and open source software for education, Wayne was the project leader for the e-Learning Xhtml editor (eXe) project, funded by a grant from the Tertiary Education Commission of New Zealand.