A Flat Network for the Unflat World: Open Educational Resources in Developing Countries, Steven Muegge, Monica Mora, Kamal Hassin, Andrew Pullin

"I have engaged in literary license in titling this book The World is Flat to draw attention to this flattening and its quickening pace because I think it is the single most important trend in the world today [but]... there are hundreds of millions of people on this planet who have been left behind."
Thomas Friedman

Open educational resources (OER) apply the principles of openness--particularly the freedoms of use, modification and redistribution--to digital materials for teaching, learning, and research. In many regards, OER resemble open source software (OSS), open data, and open access scientific journals. OER can take several different forms, including learning content (such as courses, content modules, and learning objects), tools (for development, distribution, and delivery), and implementation resources (such as communities of practice and open licenses for intellectual property). Some prominent OER initiatives include MIT OpenCourseWare, the Carnegie Mellon Open Learning Initiative, and Rice University Connexions. As part of its codified knowledge and knowledge transfer initiative, the Talent First Network, publisher of the OSBR, is working to develop and distribute OER about open source technology and competing in open environments.

OER can potentially touch all areas of education - from elementary schools to higher education to professional development all over the world - but we are particularly excited about the potential to expand access to education in developing countries. That is the focus of our research and the topic of this article. The OSBR has previously covered OER in September 2007 and November 2007. Both articles describe many examples of OER and their successful application in various settings. This article is an update and extension of that work.

The World is Flat--or Is It?

In The World is Flat, first published in 2005 and currently at Release 3.0, New York Times Foreign Affairs columnist Thomas Friedman argues that a convergence of flattening forces has leveled the competitive playing field. According to Friedman, "Flattening forces are empowering more and more individuals today to reach farther, faster, deeper, and cheaper than ever before, and that is equalizing power--and equalizing opportunity, by giving so many more people the tools and ability to connect, compete, and collaborate." Entrepreneurs, companies, and individual knowledge workers in the urban centres of India and China can compete successfully with their counterparts in North America and Europe.

In a chapter titled "The Unflat World", Friedman admits that his analysis applies to about half the world today, but large parts, particularly Africa, rural India, rural China, and parts of Latin America, remain detached from the level playing field and largely untouched by flattening forces. For developing countries to create the right environment for companies and entrepreneurs to thrive and participate in the level playing field of the flat world, Friedman recommends getting four basic things right: i) infrastructure to connect people; ii) education to enable innovation and collaboration; iii) governance; and iv) preserving the environment. OER directly involves the first two points of infrastructure and education.

What About the Unflat World?

Low-cost computer infrastructure - including laptop computers, mobile phones and handheld devices, open source operating systems and software, and Internet connectivity - are widely available in industrialized countries but remain scarce in much of the developing world. Various philanthropic programs and commercial offerings have recently emerged to address the availability of computers. The rugged XO-1 laptop computer of the One Laptop per Child (OLPC) association focuses on durability, low power consumption, and network connectivity, with an initial target price of US $100. Its announcement was soon followed by commercial competition from Intel's Classmate PC. Other low-cost computing programs and companies include InkMedia, the VIA pc-1 Initiative, Sinomanic in mainland China, as well as Elonex ONE and the National Laptop Initiative in the UK.

As C.K. Prahalad explains in The Fortune at the Bottom of the Pyramid, addressing emerging markets is good business. For-profit businesses are increasingly looking towards bottom-of-the-pyramid markets in developing countries with enormous upside potential for future consumption of products and services.

Much of Sub-Saharan Africa and other parts of the developing world lack the wireline access networks common in industrialized countries. Satellite access service to remote areas is expensive, so Internet access points are scarce and often shared. Network connectivity is being addressed, in part, by rapidly expanding deployment of mobile telephony services in countries such as Nigeria. Novel networking technologies, such as mobile ad-hoc networks (MANET) that establish peer-to-peer connections with nearby computers in a mesh network can share and expand the reach of scarce Internet access points. Off-line collections such as the eGranary Digital Library can provide local access to a critical subset of Internet resources where Internet access is unreliable or over-subscribed.

OER complement enabling infrastructure technologies to create new opportunities for innovation. The combination of OER and information communication technology (ICT) can potentially provide children everywhere with opportunities for primary learning that approach those of Western nations, and provide adults with knowledge and skills that would otherwise be unavailable. Equally important, OER open up a previously closed commercial value chain system in ways that empower learners and teachers. The bottlenecks and cost structure of conventional publishing and distribution channels are removed, and previously passive consumers become authors, active collaborators, and content creators. This convergence of technology enables what Clay Shirky calls mass amateurization, where capabilities once exclusive to professionals become widely available to many.

Peering Through the Lens of Management Theory

Theories of management, strategy, and technological innovation can help us understand and make sense of the challenges and opportunities surrounding OER in developing countries. Education serves many different social functions, but it is also a business, and it is useful to analyze it as a commercial system.

In the 1980s, Michael Porter of the Harvard Business School defined a value chain as a sequence of activities through which a product passes in order to create value and competitive advantage. Goods and services in a value chain flow from left to right, starting from raw materials, passing through value-adding intermediaries, and ending at end-customer consumers. The figure below provides one possible way to depict the established value chain of formal education in developing countries. Naturally, there will be important differences between different countries and regions of the world, but this provides a useful starting framework.

Figure 1: Value Chain in Developing Countries

In the traditional value chain prior to the availability of OER and its enabling technologies, educational materials were typically textbooks and other professionally published resources. Knowledge creation for these materials is a professional activity restricted to select authors with access to scarce resources: the capability and contacts to publish a book. Developing countries often adapt books developed elsewhere, many of which are written in English, to local language and culture.

This localization step is expensive but also important. Research shows that the learning effectiveness of localized material is much higher than that of unlocalized material.Publishing books is traditionally a high cost-structure business protected by high barriers to entry and limited by economic forces to a small number of large companies. In some areas, non-governmental organizations (NGOs) such as World Vision, Save the Children, Oxfam, Book Aid International, and the African Book Collective program play important roles in local distribution. However, high costs built into the first three stages on the value chain - knowledge creation, publishing, and local distribution - limit the selection, number of books distributed, and the timeliness of updates.

Schools, in various forms, and teachers disseminate knowledge locally. All too often, government

funding for schools and community centres does not cover all costs. NGOs can help this situation by providing funds, importing education resources, and employing foreign teachers. Teachers Without Borders is an example of an NGO which places teacher leaders from different cultures within specific countries. However, without the necessary learning resources, these efforts cannot reach their full potential.

Technological innovations and social change are reshaping this value chain to the benefit of students and teachers in the developing world.We first consider how the combination of OER and ICT can impact each stage of the traditional value chain, and then examine the impact on the relationships between stages and the reshaping of the overall structure of the value chain system.

What Lies Ahead?

The global digital divide refers to the gap between those with access to technology (hardware, software, and connectivity) and the abilities to use them, and those without. It is the antithesis of Friedman's flat world. OER are inherently digital materials, thus an ICT infrastructure of networked computing devices and software is a prerequisite to adoption. Some of the recent efforts to bridge the global digital divide with low-cost computing infrastructure were described in the previous sections.

The increasing availability, accessibility, and capability of software tools to create, manage and distribute OER enables new opportunities for knowledge creation. Some tools for OER creation and editing are co-opted from other tasks, such as document creation, photograph and image editing, video and audio editing, web development, and other forms of creative expression. Other tools are unique to OER. For example, the eGranary Digital Library is an ICT access tool for digital educational resources that garners permissions, copies web sites, and delivers assets to partner institutions in developing countries. Much OER knowledge creation has thus far been at the level of higher education in industrialized countries. For example, the Open University in the UK offers an open inventory of more than 200 undergraduate courses. However, the number of initiatives local to developing countries is also growing. The China Open Resources for Education (CORE) consortium shares 750 courses by 222 university members. Although most OER available today are in English and based on Western culture, the tools for new OER creation also enable adapting, remixing, and recombining OER to fit local regional conditions, culture, interests, and languages. Localization can happen by individual teachers and learners, or through organized projects such as Youth-Managed Resource Centers (YMRC) in Nepal and the Vietnam OpenCourseWare project.

Internet technologies such as YouTube, Flickr, and Blogger enable anyone with a computer and an Internet connection to be a publisher of video, photographs, and text. Equivalent user-networks for OER distribution are already emerging, pressuring publishers to find new ways of creating value.

Two examples from the Fourth Annual Open Education Conference suggest how the publishing business model might evolve to create value that the end-user is willing to pay for on top of free content. The National Repository of Online Courses (NROC) is a financially self-sustaining non-profit organization built around OER with multiple streams of revenue. Within their free online courses, they serve up advertisements from companies interested in targeting their audience of 15-21 year-old students, and they also collect license fees for use of content by commercial vendors and textbook publishers. Flatworld Knowledge is a new venture that publishes college textbooks under free and open licenses. Books are available in digital form through a web-based platform in which students and users can read, edit, comment and provide feedback on the content. Content is available for free on-line "as is" or available for purchase in other formats for a fee, and institutional customers pay for customized packages of content that are suited for their specific teaching needs. The full commercial launch is planned for January 2009.

Freed from supply dependence on traditional publishers and empowered by new technical capability, the role of NGOs shifts from passive distribution of books to localization of OER and creation of new learning resources. Today, many established NGOs lack expertise and experience in these areas, but new NGOs have emerged to help other NGOs master this new role. Tactical Technologies Collective (TTC) is a new NGO building a network for other NGOs to learn about and apply OSS. Aspiration rewrites software to better localize educational content created as OER.

Schools and other educational institutions can access knowledge repositories directly at no cost and adapt content to their needs. Perhaps more importantly, new ways of interconnecting people extend the geographical reach of schools outside their physical buildings and enable alternatives to traditional formal academic institutions and classroom teaching. OER can complement other open learning technologies, such as learning management systems for course management and video conferencing services for distance education. Interconnectivity through modular interfaces and open standards creates more value and capability. Teachers can obtain free and high-quality educational resources and gain the capability to localize and redistribute those resources according to the needs of the communities they attend. They can improve OER based on their own experiences in the classroom and create new OER for previously unaddressed areas. Confident that students have access to educational resources, teachers have greater flexibility to develop challenging assignments and independent projects. Teachers can also become students by accessing self-study OER for professional teacher training. Teacher Education in Sub-Saharan Africa (TESSA) is an international consortium that creates open content multimedia resources and course design guidance for teachers and teacher educators.

Ultimately, it is students who are most empowered in the evolved value chain system. No longer limited to the education resources provided by their teachers and institutions, students can utilize ICT to access OER on their own--both to complement formal studies and for independent learning--and also modify and redistribute what they find on-line and create new unique content.

Enabling Entrepreneurship

Muhammad Yunus received the 2006 Nobel Peace Prize for "efforts to create economic and social development from below" by providing tiny microcredit loans to aspiring entrepreneurs in Bangladesh who were too poor to qualify for conventional bank loans. Yunus believed that if given the opportunity, poor borrowers would use the money wisely and would repay loans, even without collateral at risk. Between 1976 and June 2008, the Grameen Bank that Yunus founded issued US $7.12B in loans to 7.53 million borrowers, with a loan recovery rate of 98.11 per cent. In his 2008 book, Creating a World Without Poverty, Yunus argues that enabling entrepreneurship--particularly social businesses--provides the poor with the means to raise themselves out of poverty. OER can play at least two roles in Yunus' vision of enabling local entrepreneurship. First, OER can provide learners with knowledge and skills to do things that they could not do before. Second, just as innovative entrepreneurs have discovered novel ways to profit from other open innovations, OER may enable innovative social entrepreneurs to earn a sustainable living in the new and increasingly open education value chain.

From a Chain to a Network

A final insight concerns the evolving structure of the commercial system for education. The traditional value chain for books and printed material was linear with well-defined roles. Particular organizations and individuals typically identified with one stage or with a small number of adjacent stages in the value chain. Thus, the structure of interactions between organizations and individuals was linear and sequential, moving left to right in an orderly progression from production of resources to consumption by students. In the evolved commercial system enabled by ICT and OER, organizations and individuals empowered by technology and mass amateurization can easily and simultaneously occupy many roles. Formerly passive consumers can move up the value chain to actively shape OER at early stages by creating new resources, modifying existing resources, remixing resources, and sharing the results with others. Students can become active learners. Teachers and schools have greater choice and flexibility. Entrepreneurs can unlock tremendous value by creating products and tools for better collaboration and interaction. The structure of interactions between organizations and individuals is no longer a sequential chain, but rather an interactive network. Each user, on approximately equal footing, is only one step removed from the Internet, ICT infrastructure, and OER tools for collaboration at the centre of the hub. In other words, the network is flat.

Conclusions

OER, in combination with enabling infrastructure technologies such as low-cost computing and Internet connectivity, have the potential to reshape the education systems in developing countries. This combination allows development of high quality open content that is localized and compatible with existing infrastructure. It is the end-users--learners and teachers in developing countries--who will directly benefit most from these changes. The systematic application of theories of management, strategy, and technological innovation has been useful for better understanding the impact of these changes.

The old education value chain in developing countries was anchored around textbooks and other published material. It was sequential with clear distinctions between stages. Technological, social, and market forces are now motivating some participants to change their roles, allowing others to shorten

distances and bypass barriers, and enabling new participants. Novel business models enabled by OER and ICT provide a sustainable means for local entrepreneurs and foreign social entrepreneurs to affect positive social change.New opportunities are available for profit-seeking companies to create and capture value by servicing previously inaccessible markets. The emerging networked system of individuals and organizations will be less sequential than the linear chain it replaces, and the distinctions between roles will be less sharp. Individuals and organizations can simultaneously be knowledge creators, publishers, teachers, and students of OER, with the Internet and enabling infrastructure technologies providing distribution and access.

Returning to Thomas Friedman's flat world analogy, the powerful combination of OER and emerging ICT capability is a flattening force for the unflat world--the developing countries on the other side of the global digital divide who today remain detached from the level playing field of the flat world platform. It is an enabler of opportunities for entrepreneurship, sustainability, and empowerment in parts of the world where fewer opportunities exist today.

This article summarizes key findings from research presented by the authors at the 2007 Open Education Conference and the 2008 IEEE International Symposium of Technology and Society.

Recommended Resources

A Review of the Open Educational Resources (OER) Movement: Achievements, Challenges, and New Opportunities

Here Comes Everybody: The Power of Organizing without Organizations

Seeing What's Next: Using Theory to Predict Industry Change

Disrupting Class: How Disruptive Innovation Will Change the Way the World Learns

The Fortune at the Bottom of the Pyramid: Eradicating Poverty Through Profits