Education Technology in the International Context: A Critical Analysis of Massive Open Online Course Innovation in Sub-Saharan Africa

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Abstract

This Thesis Project investigates the recent innovations in the design of Massive Open Online Courses applied to the Sub-Saharan African context. A literature review of the current trends and case study analyses of innovative implementation of MOOCs in the region serve as the primary vehicle of investigation. The study establishes a preliminary foundation of research on the potential for innovative learning technology, Massive Open Online Courses included, to address and impact social health issues in Sub-Saharan Africa, and the international context more broadly. In conclusion, the discourse suggests the importance of considering certain criticisms of and barriers to the use of education technology globally, tailoring innovation to suit learner and context specific needs, rather than those of the producer.

*Keywords: Massive Open Online Courses, Sub Saharan Africa, IT4D, Education Technology, Design Thinking, Community Empowerment, International Development, Ethnographic Research*
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“Everyone has the right to education. Education shall be free... Technical and professional education shall be made generally available and higher education shall be equally accessible to all on the basis of merit.” — UN Universal Declaration of Human Rights, Article 26

The digital divide, as defined by Everett M. Rogers, describes the gap existing between individuals advantaged by the Internet and communication technologies, and those who relatively are not (Rogers 2001). The emergence and proliferation of communication technologies as tools to better connect—and close this gap between—developed and developing countries has had a significant impact on our global society (Digital divides revisited 2011). Electronic communications and digital technology are perceived today as revolutionizing international development, reshaping facets of day-to-day life in unprecedented ways. Not excluded from this transformation are the technologically driven education tools used to enhance and evolve learning experiences both inside and outside of the classroom.

As a student of international development discourse and Communication theory, the intersection between education in developing countries and the rhetoric of emerging technologies proves a fascinating nexus for investigation. This Thesis evaluates one particular type of education technology, the Massive Open Online Course (MOOC), and its attempt to confront a lack of accessible education in developing country contexts, the Sub-Saharan African region more specifically. The MOOC is just one digital learning tool within the popular movement of education technology aimed towards straddling the digital divide. The ethical complications of its use and application in the international context create an arena within which we must be hypercritical of success and cognizant of limitations.

As a vehicle for research, this Thesis will observe a variety of case studies, most saliently the Stanford ChangeLabs and Resilient Africa Network (RAN) project¹. The ChangeLabs and RAN case study is a review of the recent USAID funded work in Kampala, Uganda. This work

¹ As a portion of this Master’s Thesis Project, I supported Stanford ChangeLab’s research and implementation of the Design Thinking process to encourage production of learning content (MOOCs included) to address community challenges in the regions of East Africa, West Africa, South Africa, and the Horn of Africa.
informs the broader impact of innovation to facilitate the creation of context appropriate MOOCs across different Sub-Saharan African regions.

The discourse will begin with a brief review of the history of education technologies, specifically MOOCs, and a statement on the current MOOC environment today (Pt. 1). Subsequent, we will focus more specifically on MOOCs in developing countries, and provide a literature review of relevant research projects in the Sub-Saharan African context to better understand the ways in which the topic is currently being studied (Pt. 2). Although influential, the rapid growth of these technologies has not been without criticism — the following chapter will analyze the barriers to introducing MOOCs into developing countries, and discuss the importance of maintaining a critical perspective on the movement (Pt. 3). The next chapters will discuss recent innovative applications of MOOCs in the Sub-Saharan African context, analyzing their attempt to circumvent the aforementioned difficulties. The evidence to support this discussion will begin with 3 brief case studies (Pt. 4), and conclude with an in depth principle case study analysis of the USAID funded Stanford ChangeLabs and Resilient African Network project in Kampala, Uganda (Pt. 5). Looking forward, we will discuss the parallel trends emerging alongside and as a result of the application of MOOCs in developing countries (Pt. 6), and the feasibility of scaling MOOCs to reach classrooms earlier in the education pipeline (Pt. 7). In conclusion, the final chapter will summarize and briefly discuss the future trajectory of MOOCs in developing countries (Pt. 8).

2 The Resilient Africa Network (RAN) is a project funded by USAID and works in consortium with 20 African universities in 16 countries. Led by Makerere University with Stanford University, Tulane University, and the Center for Strategic and International Studies (CSIS), the RAN project is one of seven development labs under the Higher Education Solutions Network (HESN) in the office of Science and Technology (OST).
Pt. 1: A Brief History and Review of Massive Open Online Courses

History

“Distance learning — and, more recently, online learning— has a long history of increasing access to education, dating back to 1833. Correspondence schools and radio instruction contributed to reducing education barriers in the 1800s, and by the late 1960s, the launch of the Open University UK resulted in the development of open access universities around the world.”

— George Siemens, Massive Open Online Courses: Innovation in Education?

The foundation of MOOCs long predates the shiny gadgets and tech companies of Silicon Valley as we perceive it. Online open participatory learning ecosystems gained popularity as far back as the first decade of the 21st century, to form what is today deemed the Open Educational Resource (OER) Movement (Brown 2008, Yuan & Powell 2013). The OER Movement is composed of a variety of resources whose main purpose is to extend and eliminate barriers of entry into education. One of the most visible manifestations of these resources is the MOOC, or Massive Open Online Course.

The first MOOC, titled Connectivism and Connective Knowledge was created in 2008 by a Canadian team of academics (Downes 2012, Littlejohn 2013). Years later in 2011, the course Artificial Intelligence was launched by Sebastian Thrun and Stanford University. The AI course, which attracted over 160,000 learners from over 190 countries, is considered the landmark MOOC which triggered a period of rapid growth within the low-cost online education industry (Downes 2012, Booker 2013).

By early 2012, approximately 300,000 people were taking 38 courses taught by Stanford professors and few elite universities via the MOOC platform Coursera (Friedman 2013). Not long after, a Stanford professor founded Udacity, a platform offering free courses in partnership with colleges and professors. By April of that year, Stanford, Princeton, University of Pennsylvania, and University of Michigan joined forces with Coursera to also offer free classes, and in May, Harvard teamed with M.I.T. to create a similar venture, EdX (Perez-Pena 2012). Officially declared so by the New York Times, 2012 was the Year of the MOOC (Pappano 2012). Since this initial explosion, the technology only continues to captivate the masses.
**Major Players in the Field**

This explosion has caused an arms race of sorts, a metaphorical gold rush to seize full potential of the MOOC market as quickly as possible. Today, EdX, Udacity, and Coursera are the 3 most popular and pervasive platform providers. Edx, founded by MIT and Harvard University in May 2012, is a free non-profit online university level course provider. The platform today has 1.2 million users and offers a “flipped” classroom structure, also called a hybrid or blended learning model, to include an online interactive component. Conversely, both Coursera and Udacity are for-profit providers. Coursera was founded by Andrew Ng and Daphne Koller from Stanford University in 2012. Today, the platform has 2.4 million students, taking 214 courses from 33 universities, including 8 which are internationally based (Friedman 2013, Empson 2013). Udacity, founded by Sebastian Thrun and Peter Norvig in early 2012, had students in already 203 countries by the first summer after its inception. Their business model, based on the belief that “higher education is a basic human right” (*Udacity: About Us* 2014), aims to empower students across the globe.

*The three major providers in the Massive Open Online Course environment (Blake 2014).*

**Types of MOOCs**

These three providers represent only the most popular type of MOOC, the xMOOC. One other categorization, the cMOOC, also populates the online learning ecosystem. From these two, a number of secondary offshoots have been established: the quasi-MOOC, the Open Boundary MOOC, the tMOOC, to name a few. It is important to note that these defining categories remain fluid as the industry evolves. Research on MOOCs and MOOC types has been deemed by many academics as a fools game; the evolution of the industry is moving faster than many can document and publish (Siemens 2013).

The xMOOC, to begin, focuses mostly on instruction based approaches to teaching. The instructor, often along with a support team, records video lectures which are then viewed
remotely by learners. Comprehension of the lectures is then assessed through graded testing. George Siemens (2013) explains:

Traditional universities, including many elite American institutions, are the driving force behind this xMOOC model. The pedagogical model that underpins these courses is one of “teacher as expert” and “learner as knowledge consumer.” Learning is primarily a process of the learner duplicating the knowledge structure set by the course designer and the instructor teaching the course (Siemens, 7).

xMOOCs often leave learners feeling particularly disconnected, as the instructor interacts entirely remotely with course participants. This tension only begins to touch on the controversial discourse regarding the disadvantages of MOOCs, a theme that will be discussed thoroughly in the following chapters.

The cMOOC, also known as “connectivist MOOC”, is characterized by a structural emphasis on building and fostering community, often making use of blogging and social media in place of a classroom-like learning environment (Kernohan 2013). Student autonomy is emphasized as a primary importance; users choose their learning community as well as their material sources. As such, cMOOC instructors serve as course facilitators, rather than explicit lecturers. They create an infrastructure for content and administrative details, schedule synchronous sessions, and provide a medium for class organization (Siemens 2013). Unlike the detached nature of xMOOCs, cMOOCs encourage active exploration and the development of a co-learning community.

The Quasi-MOOC, a third type of corollary, provides Web-based tutorials, though is not technically considered ‘a course’. Its structure is intended to support learning-specific tasks such as measuring acute angles in geometry. Theorist George Siemens explains, “[Quasi MOOCs] are asynchronous learning resources that do not offer the social interaction of cMOOCs or the automated grading and tutorial-driven format of xMOOCs” (Siemens, 8). MOOC resources are loosely linked and are not packaged as a course; a popular example of this in today’s ecosystem is Khan Academy.

The 3 types of MOOCs reviewed above embody only one interpretation of the various categories and classifications that scholars, teachers, and learners have created to identify the technology. As platforms have grow and platform “types” develop, diversity of content expands parallel and at equal velocity. Although MOOC courses were traditionally offered in applied
sciences such as math, engineering, and computer science, the proliferation of partnerships with research universities has encouraged the inclusion of humanities based content as well. Moreover, a migration into other languages has made MOOCs accessible to previously excluded segments of the global community (Rivard 2013, Adams 2012). Online learning in a global society presents a very different set of considerations, those which deserve evaluation in the hopes that the technology can be universal, consistent, and culturally sensitive on an international scale (Eberle 2007).
Pt. 2: The International Growth of MOOCs

“A teacher-dependent education system is also time-dependent, location-dependent, and situation-dependent. With the multiplication of new information and communication technologies (ICTs)...knowledge and values are becoming more diversified and accessible beyond the confines of formal education systems.” — UNESCO, Education and Skills for Inclusive and Sustainable Development Beyond 2015

Subsequent to their rapid growth in the U.S. and Europe, Massive Open Online Courses have quickly become a global phenomenon, expanding into the broader reaching international arena. In February 2013, Coursera and EdX both announced plans for proliferation into the global sphere. The intention, according to Coursera co-founder, Andrew Ng, was to expand its global reach and increase universal access to education (Rivard 2013). Today, a whopping sixteen of the company's twenty-nine new partners are international institutions. Comparatively, EdX’s expansion in 2013 included five new international universities, with a similar aim to “dramatically increase access to education worldwide, in the long term”, according to President Anant Agarwal (Rivard, para 7). For both providers, adding courses instructed in French was a method pointed towards expansion of user bases on the African continent, specifically.

While U.S. providers are expanding globally, international universities and organizations have checked into the MOOC rat race as well. In April 2013, the Hong Kong University of Science and Technology (HKUST) launched what was dubbed “Asia’s first MOOC” on Coursera. The course, titled Science, Technology and Society in China, garnered 17,000 registrants. Similarly, the University of Tokyo launched two courses via Coursera in Fall of 2013: Evolution and the Universe and Peace and Conflict, both English language based. The endemic, not confined solely to East Asia, is growing in Southeast Asia, Central Asia, and Oceana as well. In India, the first MOOC dedicated exclusively to business education in Southeast Asia, Academic Financial Trading Platform (AFTP), was recently launched in concert with Carnegie Mellon. Meanwhile, the Australian National University has partnered with EdX to offer online courses on the continent, and a Russian tech center has also announced a collaboration pilot with Coursera to bring more courses to Russian-speaking students, via translated subtitles and in-person consultations (Part 2: MOOC Development 2013).
Developing World

Obvious is the velocity with which the MOOC model has caught speed in international contexts. It continues to do so in both infrastructurally sound and unsound environments. While initially created by and for consumers in the English-speaking West, MOOCs are evolving to become an aperture through which to reach members of the international community who are educationally underserved (*Part 1: MOOC Development* 2013).

Although popular paradigms of the developing world insist that technological penetration, online learning included, cannot exist alongside poverty and poor infrastructure, the expansion of MOOCs suggests that this is perhaps not the case. The proliferation of high-speed Internet connections worldwide affords the possibility of sustainably introducing the technology in many developing world contexts. Statistics illustrate this point clearly. Since 2005, global Internet use has grown from 16 to 40 percent, approximately 2.8 million users worth (*Internet users per 100 inhabitants* 2013), and of this population, developing world users make up 31% of total use (*Key ICT indicators* 2013). In this light, MOOCs are commended for creating accessible learning in environments which cannot adequately support a sustainable education system. In countries where schools are physically substandard or not easily accessed by a percentage of the population, the technology creates an opportunity to “leapfrog” over the hurdles of underdevelopment. The free nature of most MOOCs cancels out financial pressures that the globally poor might otherwise confront in the battle to pursue an education. Certification and ‘access’ to a number of high caliber Western institutions (otherwise inaccessible to those in developing countries) massively democratizes a “world-class education” that was once available only to a small, wealthy elite. These claims, and the corresponding confidence associated with them, will be observed critically in forthcoming discussion.

**Honing in: The African Context**

Specifically, the Sub-Saharan African region proves a fascinating illustration of this phenomenon. In quality and quantity, tertiary education in Africa has structural challenges which make it difficult to offer a high standard of education to a majority of the population. Despite secondary-school enrollment on the continent increasing by 48% from 2000 to 2008, access to university education remains limited. Only three universities on the African continent are in the
global top 400 (Ekekwe 2013). Ndubuisi Ekekwe, President of the First Atlantic University in Nigeria, explains:

> Every year about ten million individuals take tertiary education entrance exams in Africa. Unfortunately, due to limited space, less than 1.5 million applicants are accepted. The continent currently has fewer than five million students in its tertiary four-year institutions, despite having three times the population of the U.S., which has 21 million students. Africa’s working-age population interested in furthering their education – estimated at 50 million people – cannot do so (Ekekwe, para 4).

In the face of high youth unemployment, McKinsey's Global Institute (2012) estimates that by 2020 there will be a shortfall of 85-million high and middle-income jobs in Africa (Koller & Ng, para 3). With this understanding, it seems reasonable that MOOCs are explored as a hopeful solution to the issue of education accessibility in the African context.

Although Africa accounts for only 16% of worldwide Internet penetration, this statistic has grown 8 times its size since 2005 (Key ICT indicators 2013). Even so, statistics of Internet penetration do not tell the full story of Africa’s technological connectivity. The recently released 2013 Africa Telecom Market Report indicates that mobile phone penetration on the African continent is growing faster than anywhere else in the world. By the first quarter of 2013, it reached an 80% penetration rate, and continues to grow at 4.2 percent annually (Elnadi 2013). The innovative use of mobile technology is one avenue for MOOC diffusion on a global scale which will be discussed later in this analysis.

Whether for reasons of need (to bypass infrastructural deficiencies) or opportunity (how can mobile access fuel the success of education technologies?), Sub-Saharan Africa is gradually becoming a hotspot for MOOC application in the developing world.

**Brief Literature Review: Research On MOOCs in Sub-Saharan Africa**

In order to identify the current landscape of research on MOOCs in Sub-Saharan Africa, and to better understand the existing methodologies used to investigate the topic, it serves to briefly review a variety of samples that represent the existing literature. The following review of MOOC adoption and utilization in African institutions of higher learning facilitates an understanding of the challenges and opportunities related to this technology.

Stephen Asunka’s fieldwork, titled *Online Learning in Higher Education in Sub-Saharan Africa: Ghanaian University Students' Experiences and Perceptions* (2008), provides an
overview of his investigation of MOOCs in the African university setting. Asunka adopted a qualitative case-study approach to examine the attitudes, experiences, and perceptions of undergraduate students who were enrolled in an online collaborative learning course at Regent University, a Ghanaian private institution. Data sources include surveys, student and instructor journal entries, email records, individual interviews, and Web-server logs. The study observes, “students do not respond favorably to online constructivist teaching approaches such as asynchronous discussions and ill-structured project-based learning activities” (Asunka, 1).

Students also perceived collaborative online learning within their context as a complex experience, which was more demanding and time-consuming than the non-MOOC alternative.

The research of Omwenga et al. at the University of Nairobi School of Computing and Informatics (2004) examines the deployment of e-learning systems in the Kenyan context. Their investigation is a review of early experiences in implementing a pilot e-learning system at the University of Nairobi. The authors explain a need for investigative research on MOOCs in Africa:

In the African context, there are enormous and varied challenges in accessing higher education, thus there is a need for relevant and customized content specific to the geographic and cultural needs and challenges. Most of the models that exist to address these challenges have their limitations in terms of flexibility, time and space constraints (Omwenga et al., 1).

Their research proposes an e-learning implementation model that can be used by educational institutions to introduce relevant technologies to staff and students. The model is a modification of Rogers’ model of diffusion of innovation in organizations, which they developed from experiences and experiments conducted over a period of three years at the University of Nairobi. In their e-learning pilot studies, different combinations of varying types of information and communication technologies were tested to resolve the given limitations. Models were contextualized to suit various parametric values dependent on cost, level of infrastructural support, and staff commitment (Omwenga et al. 2004).

In summary, teachers in the e-pilot programs struggled to receive adequate technology training, and were concerned with ownership and copyright issues of the content developed. Results also indicated that electronic learning models should be especially sensitive to the level of availability of infrastructure, technical support, and clear policy on implementation, evaluation and curriculum re-orientation in developing African countries. Although supportive of education
technology in conclusion, the authors note that it will bring about challenges of its own—associated costs and change of attitude and training on the part of the e-content developers, to name a few (Omwenga et al. 2004).

A third body of relevant research is that of Kasse and Waswa, from Makerere University in Uganda. The study utilized cross sectional qualitative research methodology to select a number of Ugandan universities for investigation, after which researchers used survey questionnaires as the primary medium for data collection. Their justification for research is as follows:

Existing and emerging e-learning technologies are having intense, immediate, and disruptive transformations on education systems (Archer, Garrison & Anderson, 2008). The rise of e-learning technologies in all sectors of education is responsible for the accelerated global competition (Daniel, 2000), increase in the quality of learning experiences (Garrison, 2002), removal of situational barriers and cost effectiveness (Kasse et al., 1).

Survey results indicated challenges in technical competence, infrastructural setbacks, and conceptual perception of e-learning. They also illustrated that only a small percentage of the sample population was engaging in all methods of e-learning (video conferencing and mobile, for example), while most focused simply on computer and web based instruction (Kasse et al., Table 1, 8). To close, the authors suggest proposing new variables, such as financial budgeting, training, and performance evaluation, to bolster the full scale utilization and optimization of e-learning and MOOCs (Kasse et al. 2013).

MOOC use is still in its adolescence within developing countries. As such, the body of applied research which addresses their use and effectiveness is limited. As observed, research methodology spans from survey studies to longitudinal fieldwork to ethnographic case observations. In general, these samples indicate that MOOCs face a variety of challenges in the Sub-Saharan African context—infrastructure and cultural challenges most saliently—and that there is still considerable space for improvement and innovation.
Pt. 3: Barriers and Criticisms

As observed, enthusiastic discussion regarding the advantages of MOOC technology in developing countries is rapidly increasing. Although established, the dialogue is not yet comprehensive; it fails to thoroughly consider the number of challenges this type of implementation confronts in the developing world context.

Theoretical Analysis: Disruptive Technologies and Leapfrogging

The Theory of Disruptive Technology, coined in by Harvard Business School professor Clayton Christensen, describes an innovation which creates a new market and value network, eventually displacing existent markets or technologies (Christensen 1997). Christensen’s theory highlights new market disruption, as that which occurs when a disruptive technology “targets customers who have needs that were previously unserved by existing incumbents” (Christensen 2003, 23-45). In other words, disruptive technologies find initial success in markets where the alternative is nothing and innovation is competing against nonconsumption (Regalado 2012).


MOOCs, which began in developed country markets and are now beginning to shift into the ‘new markets’ of developing countries, could in fact be considered a new market disruptive
innovation. Within the developing country context, they have the potential to positively impact students in environments where access to quality education has been restricted or is non-existent. This impact, however, is in some ways problematic—it exists only due to the lack of an available competitive alternative. That MOOC success in the developing world may be born solely from the absence of an effective alternative option forces us to consider whether this technology is really as effective and beneficial as popularly illustrated.

**Leapfrogging**, often referred to in the context of economic growth theories, is based on Joseph Schumpeter's notion of the process of creative destruction (Dalkmann 2006). Schumpeter explains the process as one which “incessantly revolutionizes the economic structure from within, destroying the old [one], creating a new one (Schumpeter, 83). The theory explicates that radical innovations eventually become the new technological paradigm, allowing the latest innovations to leapfrog ahead of traditional practice. In the context of developing African countries, it is not an uncommon phenomenon for governments to accelerate development by skipping over deficient and inferior industries or technologies.

MOOCs, with their ability to ‘skip over’ infrastructural issues in pre-existing education systems, are an example of leapfrogging in a developing country framework. Absorbing educational content through the virtual infrastructure of a MOOC model is a radical innovation which affords an avoidance of what is often the real issue: inefficient or inaccessible education systems. The problematic aspects of Leapfrogging to bypass an infrastructural deficiency are numerous; they are also reason enough to question the effectiveness and applicability of MOOCs as a solution to existing problems in the developing world.

Christensen’s Theory of Disruptive Technology and the Theory of Leapfrogging influenced by Schumpeter’s work are only two points in the theoretical literature which encourage analysis of the potential barriers to MOOC technology in the developing world context. In order to understand how these difficulties manifest empirically, we will move forward to discuss the barriers to and criticisms of using Massive Open Online Courses in the Sub-Saharan African region.
**Hard and Soft Barriers in the Real World**

The debate over MOOCs in the non-theoretical world is alive and well, forcing both producers and consumers of the technology to consider the advantages and disadvantages of its use. Education Technology Debate (ETD.org), an organization promoting discussion and analysis of low-cost ICT education initiatives in developing countries, offers a poignant critical perspective on MOOCs:

“Ultimately, MOOCs will come and mostly go, like television-for-education came and mostly went. MOOCs are here to stay, but in a few years, there will be some other fad to excite today’s MOOC fans. Meanwhile, the world of the future might have a few more people learning online, but very quickly a new equilibrium will be reached, and things won’t be all that different from today: students from underprivileged backgrounds will continue to lose the educational race; parents with means will ensure the best (non-MOOC) education for their kids; and most students won’t learn that much more or less than they learn today (Toyama, para 18).”

The barriers to MOOC use, and criticisms of these problems, can be characterized as two types: Hard and Soft. Hard barriers are tangible obstacles, such as infrastructural issues, which disrupt the effectiveness of MOOCs in developing countries. Conversely, soft barriers are non-tangible issues, such as cultural contention or linguistic exclusion, introduced by this technology.

**Hard Barriers**

**Infrastructural Access**

The first commonly discussed barrier to MOOC use in the developing world is access to necessary technological infrastructure. While MOOCs have found success in developed ecosystems with ubiquitous access to Internet and broadband technologies, this type of infrastructure is less common in the developing world. Infrastructural barriers, such as an inability to consistently access high speed Internet from multiple locations, difficulty in navigating poor ICT national policy, or complications scaling up MOOCs via reliable online networks, lead to a disruption of the equal and fair dissemination of MOOC knowledge. Students in rural and outlying areas are often left with unreliable access to courses or educational content, a significant obstacle in the learning experience. Researchers Boga and McGreal clarify:

Access to technology is most likely a prohibitive factor in developing countries. While there are often pockets with good infrastructure, such as the capital city and a few other major urban areas, many of the towns and almost all of the rural areas
will have only unreliable or part-time electricity, and no internet connectivity (Boga & McGreal, 5).

Even if accessible, the infrastructure of fixed Internet in Sub-Saharan Africa is not realistically affordable. Only an estimated 16.3% of individuals use the fixed broadband Internet in Africa, a reasonable statistic with the knowledge that African fixed broadband prices are, on average, 64% of GNI per capita (Measuring the Information Society 2013).

Output Costs

Output costs are another significant hurdle within the dialogue of MOOC application in the Sub-Saharan African context. Training teachers and professors to use the necessary technology, providing computers or devices on site, and forming contracts with different players (e-learning sponsors, policy makers, broadband providers) are all financial obstacles which burden the process of successfully circulating a MOOC. These fiscal barriers are often unsustainable in the given context, and provide just one more reason to doubt the feasibility that MOOCs could viably thrive in these ecosystems.

Scalability

Another danger of overreliance on MOOCs in developing countries is that they don’t build local capacity for training, research, or knowledge creation in the education sector. A portion of the concern regarding MOOCs applied internationally centers on the fear of replacing homegrown local professors with beamed-in lecturers from abroad, what Anya Kamenetz (Exporting Education 2013) calls the “educational equivalent of reruns of Baywatch”. There is a serious danger in assuming MOOCs inserted by an external actor can sustainably solve problems which derive from a system internally. Scaling a system built via “top-down” education may inhibit the emergence of a local academic culture or course content tailored specially for local and community audiences (Altbach 2013).

Attrition Rates

Attrition rates are perhaps the most contentious tangible criticism of Massive Open Online Courses. The average dropout rate for a MOOC is between 91% and 93% (MOOCs on the Move 2012). Even MOOCs which have found success in affluent developed contexts are
lambasted for the discrepancy between extremely high enrollment rates and pitifully low completion rates. To present a framework: Stanford University’s *Artificial Intelligence MOOC*, cited as *the* Massive Open Online Course to have sparked the “MOOC Revolution” (Friedman 2013), had an approximately 86% attrition rate. The commonly shared statistic of the *AI* MOOC is that 160,000 students from around the world enrolled—what many do not know is that only 23,000 actually finished the course (Waldrop 2013). Another example is Duke University’s Fall 2012 Bioelectricity MOOC. The course started with 12,175 registered students, though there were only 7,761 who ever watched a video, 3,658 to take at least one quiz, 345 whom attempted the final exam, and finally only 313 who passed with a certificate (Caltropa 2013). According to cofounder Daphne Koller, Coursera averages a retention rate of just four percent across all courses (Koller 2013).

Academic Doug Clow describes this phenomena—the steep drop-off in activity and pattern of unequal participation characteristic of MOOCs—as the *funnel of participation* (Clow 2013). Clow uses Figure 1 (below) to rationalize:

There is typically significant attrition in numbers through the stages [of the funnel]. A vast number of people need to become aware that the product exists; a fraction of those will be interested in that class of product; a fraction of those will form a desire for the specific product; and, finally, a proportion of those will make a purchase. In formal education, despite concerns about dropout rates, the total attrition from enrolment/registration to graduation is typically much lower. In a MOOC, the attrition rate is significantly higher (Clow, 2).

![Figure 1: The funnel of participation](image)

*Figure 1 from MOOCs and the funnel of participation. Clow, Doug (2013). Pg 2.*
The free nature of MOOCs means that learners can enroll at no opportunity cost and with no commitment mechanism to complete the class. Moreover, remote participation lacks face-to-face interaction with peers or a professor, an aspect of traditional education that pressures students to complete coursework and ultimately succeed in the class. Lastly, although enrollment in a MOOC requires momentary access to Internet and technological infrastructure, sustained participation and success in said MOOC requires continuous access to these privileges. As discussed above, this is often not a reality for students in developing countries. Yang et al. consider the issue may be due in large part to the absence of a social environment conducive to sustained engagement and learning. “Rather than evolving gradually as better understood forms of online communities, MOOCs spring up overnight and then expand in waves as new cohorts of students arrive from week to week to begin the course. As massive communities of strangers that lack shared practices that would enable them to form supportive bonds of interaction, these communities grow in an unruly manner” (Yang et al., 1).

That dropout and non-completion rates are substantially higher in MOOCs than in more traditional education learning environments is a powerful barrier to their success in both developed and developing countries. Clow explains, “MOOCs alone cannot replace degrees or most other formal qualifications. The significant efforts that institutions put into supporting their learners to reach a commonality of learning outcome are necessary, and have a real effect” (Clow, 3). In developing Sub-Saharan African countries, MOOC coursework is rarely supplemented with this type of institutional support. Furthermore, what constitutes as “completion” of a MOOC is a complex issue, especially in developing countries where students are continents and cultures apart from certificate providers (Ashby 2004). This brings us to the final “Hard” barrier in discussion: legitimacy and price of certification.

**Legitimacy and Price of Certification**

In order to legitimize the value of a MOOC, providers are moving towards introducing certification for those who complete a course from enrollment to finish. Coursera recently introduced ‘specialization certificates’, which students are awarded once they complete a capstone project or master a sequence of courses on a given topic (Specializations 2014). Udacity and Ed-X also offer their own systems of certification, which operate similarly. What many do not realize is that this legitimacy comes with a price tag. In the case of Coursera,
although one can take any offered MOOC for free, students must pay $49 - $100 through the “Signature Track Program” to receive a verified certificate. Via Udacity as well, students must pay a subscription to receive a verified certificate, in-class projects, and feedback from instructors (Larson 2014).

Legitimacy costs money, and it seems only those that are able to afford it will profit from the value of a MOOC. Essentially, what this system illustrates is a socio-economic bias towards certification; although the technology creates an aperture for equal access to education, legitimizing that education is not so equitable. Since paying for certification is not often feasible for learners in developing countries, a hierarchy of whom can obtain the most value from MOOC education is formed.

Even if certification is gained via a MOOC, industry players and business communities must also have faith in the technology for certification to truly prove useful. It seems only certification from MOOCs that focus on business or IT related topics, such as those offered by the Africa Management Initiative³, are respected as viable credential amongst the continent’s post-education workforce.

**Soft Barriers**

The implementation of MOOCs in developing countries introduces a number of intangible complexities as well.

*Cultural Exclusion Within the MOOC Ecosystem*

If MOOCs are to be universal and consistently successful, the argument stands that they must also be culturally sensitive. Like most innovations and technologies transferred top-down from the developed to developing world, MOOCs are often criticized for a failure to be culturally inclusive. “The issues [with MOOCs] go beyond catering to diverse learning requirements and should also expand to creating online spaces that cater for culturally diverse learners” (Marrone et al., 1). In other words, attention to cultural differences and nuances is extremely important when introducing the technology into new contexts.

If not culturally inclusive, MOOCs disseminated in the developing country context risk creating a neocolonizing effect. ICEF Monitor comments on this phenomenon, explaining that,

³ http://www.africanmanagers.org
“Concerns have been expressed about MOOCs’ domination by US developers, the one-way transfer of educational content from rich nations to poorer nations, and the cultural damage that could occur in the wake of “a wave of intellectual neocolonialism” (Part 2: MOOC Development 2013). At the 2009 UNESCO World Conference on Higher Education, the President of South Africa also deemed MOOCs as a form of intellectual neocolonialism (Daniel 2012), and academic Tony Bates argues that “elite universities continue to treat MOOCs as a philanthropic form of continuing education, and until these institutions are willing to award credit and degrees for this type of program, we have to believe that they think that this is a second class form of education suitable only for the unwashed masses” (Bates, para 6).

Examples of cultural exclusion vary based on the type of MOOC, content provider, and the environment of those enrolled. Often, MOOC content is based on American or European academic experience and pedagogical thought. Approaches to the curriculum and overall philosophy of MOOC education often fall in line with Western tradition and practice. Thus, learners who come from a non-Western culture may have difficulty understanding course content and MOOC etiquette that fails to relate to their own context. Philip Altbach of Boston College’s Center for International Higher Education rationalizes:

While globalisation has increased the sway of the academic centres in economically powerful countries, MOOCs promise to enhance this higher education hegemony by harnessing technology to the existing knowledge network. Others, in diverse and less-developed regions of the world, are joining the MOOC bandwagon, but it is likely that they will be using technology, pedagogical ideas and much of the content developed elsewhere. In this way, the online courses threaten to exacerbate the worldwide influence of Western academe, bolstering its higher education hegemony (Altbach, para. 7,8).

Although MOOCs are easy to access and inexpensive for the user to engage in (unless they desire certification), they risk creating a culturally insensitive and exclusive experience for learners in developing world contexts.

Linguistic Exclusion

The majority of MOOCs today are taught in English, a reality which excludes many students in developing countries from participating in full. Students from these contexts, whose native language is not English, may not have the language mastery to successfully engage in a MOOC course. Colloquialisms used in discussion forums or the learning culture typical of North
American and European students, for example, begin to exclude the non-English language speaker. Translation, although seemingly a solution to the problem, does little to mitigate idiomatic confusions or linguistic mistranslations of content.

**For Profit Control Over Education Market**

For-profit MOOC providers, such as EdX or Coursera, are inherently revenue focused. As such, their provision of educational content to the developing world proves potentially troublesome. For example, concentration on revenue introduces the risk of providers compelled to consider the formation of corporate partnerships despite the best interests of the learners. Boga and McGreal explain another issue: “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” (Boga & McGreal, 8). For instance, Coursera makes their MOOCs available only under strict copyright terms, lessening flexibility of instruction and limiting the use of supplementary content. Manipulation of the MOOC ecosystem by providers focused on fiscal revenue or market control detracts from both the learner and instructor’s control over their own educational experiences.

**Effectiveness Across Subjects**

Lastly, MOOCs are criticized for an inability to educate effectively across all academic subjects, rather than just Maths and Sciences. Experience indicates that remote learning caters well to less-abstract, numbers based instruction, similar to that you’d find in an engineering or mathematics class. Humanities based content, however, seems to thrives most via face-to-face instruction and small group discussion. For this reason, many believe that MOOC instruction cannot satisfactorily deliver content that is not strictly analytic.

In his essay titled *What’s Right and What’s Wrong about Coursera-style MOOCs*, author Tony Bates argues that it is “extremely difficult if not impossible to teach higher order skills of critical thinking, creative thinking, and original thinking using the pedagogy [of MOOCs]” (Bates, para 7). Academics are not the only pundits concerned. Coursera co-founder Andrew Ng also admits, "One thing that Coursera doesn't do well is teach non-cognitive skills...There are studies that suggest that 80 percent of your income are due to non-cognitive skills: teamwork, ethics, the ability to regulate anxiety. It's an open question whether Coursera can develop
technology to teach non-cognitive skills. By contrast, universities do a much better job” (Green, para 4). The question of whether or not MOOCs can successfully teach different types of content across the board is an important point for scrutiny.

**Conclusion**

As MOOCs grow in popularity and variety, particularly within developing countries, it is important to consider the ways in which providers can be more cognizant of the barriers to MOOC success within the developing country context. Theoretically, MOOCs could very well be a technology steeped in a Hype Cycle (see figure 2), whereupon a peak of inflated expectations fails to perform to the standards that were initially set at the technology’s trigger point.

![Hype Cycle Diagram](image)

*Figure 2: from Hype Cycle Diagram, adapted from Gartner, Inc. by Olga Tarkovskiy.*

These cycles often end satisfactorily in what is termed a point of “plateaued productivity”, but not without experiencing failure and understanding the pain points of the product first (see “slope of enlightenment”). In this light, while consideration of these obstacles is essential, it does not necessarily mean that MOOCs are not or will never be a successful technology in the developing world context. To be an effective model for education, however, the technology will require critical analysis and ethical consideration by creators and users alike.
Pt. 4: Innovative Application of MOOCs in the Sub-Saharan African Context—Three Brief Case Studies

Across Africa and the rest of the developing world, governments, public bodies, and private investors have all looked towards MOOCs as a solution to the problem of low quality, unaffordable education systems. Our discussion thus far regarding barriers and criticisms illustrates that for a variety of reasons, it makes sense to strongly doubt the endeavor. Jamie Hodari, co-founder and CEO of Kepler, a MOOC education company in Rwanda, explains this skepticism well: “sometimes [the] hope is unreasonable: No matter how much we all might want to believe it, a student in Uganda cannot now get a Stanford-quality education with little more than a laptop and 3G Internet” (Hodari, para 5).

However, all hope should not be lost. MOOCs still hold potential in the developing world; perhaps not because they are explicitly solving staid issues of substandard infrastructure and policy still present within some education systems, but because they are encouraging local industries and organizations to experiment, explore, and potentially reinvent the current framework of education (Hodari 2013).

This encouragement towards innovation is an important aspect of the current discussion. As such, our effort to analyze the introduction of MOOCs into the developing world context, specifically Sub-Saharan Africa, requires an observation of the current field of applied innovation. How are MOOCs being remixed and remapped in real time within the African context? Has this application been successful? How, and more importantly, why?

Through the analysis of three different case studies, we will observe and gain perspective on the current ecosystem of innovation surrounding MOOCs in Sub-Saharan Africa. Although not a comprehensive analysis, the intention is for this review to facilitate an understanding of the ways in which these exploratory endeavors are succeeding, or perhaps failing, to make a positive impact on African learners and communities.
Overview:

In 2013, The World Bank’s New Economy Skills for Africa Program (NESAP-ICT) and the Tanzanian Commission for Science and Technology (COSTECH) partnered with Coursera to pilot the Youth Employment Accelerator Program Initiative (YEAPI). The initiative was introduced to bolster IT skill sets in tertiary education institutions, of high demand in Tanzania and on the continent at large. The Coursera pilot program aims to address a shortage in IT skills, a problem which causes an outsourcing of jobs in the banking, oil, gas and telecom sectors, and perpetuates a cycle of poverty in the Tanzanian economy (Koller & Ng 2013).

The program, still in the planning stages, is working to create a MOOC IT curriculum aligned with the needs of Tanzanian private sector employment tracks, a demand that was not currently being met by existing course offerings from Tanzanian institutions. The design and creation of curriculum will be informed by academics in the IT and business sectors of Dar Es Saalam. The program intends to “support students in various ways as they participate in MOOCs as part of their studies, in advance of the traditional recruiting season” (Trucano, para 7).

Kavita Watsa, a Senior Communications Officer for the Africa Region of the World Bank explains, “Tanzania wants to try out the MOOC approach as a small pilot and what COSTECH is beginning now is a very small-scale exercise with approximately 100 final-year science students, to help them enhance their skills” (Sperber, para 17). Tanzanian youth, however, seem to feel
less open to the program’s introduction. Isaack Lee, a 19 year old studying geology at the Earth Science Institute of Shinyanga, condemns the MOOCs for “involve[ing] a speaker pontificating from a Western perspective, without engaging the audience in any hands-on learning” (Sperber, para 1).

**Analysis:**

This case study introduces important questions regarding MOOC implementation in the Sub-Saharan African context. First, analysis shows MOOCs have the potential to become a useful delivery model for IT skillset growth in the Tanzanian population. If successful, the IT oriented curriculum could serve to solve an important local issue— introducing “globally-benchmarked, industry-rated skills assessment, training and certification [and creating] new partnerships with the best- in-class learning institutions, industry associations, global certification providers, and global technology companies” (*The World Bank* 2012). Coursera, however, is an internationally based platform with little experience disseminating MOOCs in developing African countries. In this sense, a number of critics question whether a foreign player should have control over the creation and dissemination of content to Tanzanian, largely Swahili speaking, learners. Boga and McGreal explain this tension well:

> If developing countries allow themselves to be locked in to a certain MOOC platform, they may have to adhere to the foreign values put forth by the platform owners. As a result, developing nations may lose some of their autonomy and exclude potential local partners who may not be a part of the same platform (Siemens, 2013). 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 (Boga & McGreal, 8).

Moreover, it is important to question how the program will be disseminated to learners, and whether or not official ‘credit’ will be given for successful completion. If accreditation is provided, it is important to consider if and how local industries will adhere to a system of valuing certification appropriately.

Looking forward, it is critical to consider whether the program will be translatable or scalable beyond this case study. Will the YEAPI initiative help the higher education system to align itself with ecosystem needs, or will it remain the sole solution to a problem which broadly permeates the Tanzanian context? If the program is both scalable and translatable, local
institutions will need sufficient capacity, infrastructure, and desire to support similar MOOC coursework.

2. Generation Rwanda and Kepler Schools; Rwanda

Image from: http://kepler.org

Overview:

In September 2013, the nonprofit organization Generation Rwanda established Kepler, a free education program, which “threads together open-source, online content from Western universities, on-site classroom instruction, and an associate degree from College for America” (O’Neil, para 4). The program was considered an innovative response to Rwanda’s low tertiary education rates during the post 1994 genocide recovery period (Bartholet 2013). According to the World Bank, only 7% of college age Rwandans were enrolled in tertiary institutions in 2012 (School enrollment, tertiary 2012). The program’s website explains the context of its creation well:

This technology has the potential to revolutionize learning, but completion rates of exclusively online courses remain dismally low at under 10% and often worse. Kepler is an experiment to use these innovations — but paired with proven in-person classroom facilitation — to meet the challenge of educating the millions of brilliant students that lack access to traditional universities (Mind Over Minerals, para 3).

Entrance into the Kepler program via Generation Rwanda is scholarship based, and aims to offer a low-cost, “blended” learning model, pushing past current boundaries of MOOC and online learning initiatives in developing countries (O’Neil 2013). Co-founder Alex Hague
explains, "The dream is [to] basically provide a higher education experience that’s internationally competitive, for a cost that’s radically less than the regional competition” (Kamenetz, para 3).

In Spring 2013, Generation Rwanda launched a pilot program using a critical-thinking-skills class from the University of Edinburgh, offered through Coursera. Although students viewed MOOCs online and by themselves, this activity was supplemented by small group discussion and teacher instruction once a week to make the content more digestible (Leber 2013). This additive content seems to have bolstered attrition rates—12 of the 15 students who started the class successfully completed it. Compare this 20% attrition rate to 90%, the average for most MOOCs.

The program continues to grow today. In Fall 2013, the first pilot program in partnership with College for America, a competency-based U.S. program accredited in 2012 by the New England Association of Schools and Colleges' Commission on Institutions of Higher Education, was launched (O’Neil 2013). 50 students were chosen from 2,696 applicants, all of which lived together in houses with electricity and Internet access provided. Supplementary material was taught in person by 8 different teachers: two Americans with backgrounds teaching in charter schools, one Jamaican, one Nigerian, and four Rwandans (Kamenetz 2013).

**Analysis:**

The Kepler pilot program can be observed as an innovative response to preexisting MOOC limitations. The disaggregated approach mitigates certain barriers such as the lack of a social learning community during MOOC duration or absence of face-to-face interaction with an instructor or peers. This type of instruction, often deemed ‘blended learning’, has been shown to generally have better outcomes than online or face-to-face programs alone, since it provides a social infrastructure for content consumption (group discussion, class community, local lectures, etc.). The Kepler case study illustrates that alternatives to traditional MOOCs are being explored to offer a more effective system of online education in Sub-Saharan Africa.

However, deeper analysis of the case shows that even a blended MOOC model carries its own disadvantages. Entrance into the program is competitive, and even the top students chosen have varying levels of English language competence. Although they are each given a personal laptop and training, many still only have minimal experience with digital technology and lack
ICT skills as well (O’Neil 2013). Culturally, students in the program grew up learning within a teacher-centric education system; although a number of the Kepler teachers are African, the program structure is nonetheless based on a Western academic framework, risking a sentiment of cultural exclusion or detachment in the learning process.

Though innovative, pushing to create a U.S. affiliated education program in a developing African country has its hazards. In general, it seems that Kepler provides support for students with the knowledge that participating in a Westernized education system is not a seamless endeavor. Still, however, their contract with American based MOOC providers and institutions will introduce a present, if not disruptive, cultural divide, creating just one more challenge for students attempting to successfully complete the program. Kepler’s focus on STEM and business oriented degrees also speaks to the difficulty in and stigma against using MOOCs, even those supplemented by a ‘blended’ learning structure, to teach social science and humanity based content.

3. Numeric and Khan Academy Partnership; South Africa

![Image](http://numeric.org/)

*Image from: http://numeric.org/

*Overview:*

Numeric, a South African based education non-profit born from the University of Cape Town, aims to create high impact learning environments in low income areas through MOOC instruction. The organization began it’s programming in 2011, and currently runs 27 classrooms of Khan Academy with over 500 kids and 17 coaches across 12 different sites in the Eastern and Western Cape of South Africa (Numeric 2014). Still recovering from an education system debased by the Apartheid Era, the price tag on substantial schooling in South Africa is often higher than many students can afford. As a solution to this problem, Numeric partners with online MOOC provider Khan Academy to offer a cost effective blended online learning curriculum.
Khan Academy provides educational content for a variety of subjects, the primary focus being mathematics. The learner proceeds through a series of exercise modules, and once they reach a module covering difficult or unachievable material, they are able to view a MOOC that teaches them how to do it (Numeric 2014). Effectively, the Khan Academy MOOC framework allows the students to opt into only learning the material they cannot understand on their own. The Numeric learning model uses existing computer labs in low income areas to run Khan Academy programs, offering 3 hours of MOOC programming each week and supplementing MOOC content via facilitated coaching sessions, games, and other enriching material (Creating High Impact Learning 2013).

Analysis:

One of Numeric’s most unique and exploratory characteristics is that it maps the Khan Academy content to better fit the South African education context. Detailed attention to learner environments is not common amongst most Westernized MOOCs applied to the developing world context. Numeric, however, has tailored the Khan Academy videos and exercises to the South African CAPS curriculum, part of the National Curriculum Statement Grades R-12, which represents a national policy for learning and teaching in South African schools (Curriculum Policy Statements 2014). Rather than accessed via the general Khan Academy interface, Numeric MOOC content is organized by Grade, Term, and Week, and offers an online graphical user interface which allows South African learners to more easily find applicable content. Founder Andrew Einhorn explains, “We’re big fans of Khan Academy, but realise that the amount of material on the Khan Academy website can be overwhelming, and it can be difficult to find the material relevant to [the learner]” (Einhorn, para 2). This attention to contextual relevance is one aspect of the Numeric case study which sets it apart from many other attempts to innovatively apply MOOCs to the developing Sub-Saharan African context.

Moreover, Numeric does well to address the issue of bandwidth and Internet access constraints, a barrier faced by most MOOC providers attempting to establish a foothold in developing countries. To skirt the problem, the organization has introduced KA Lite, an unofficial volunteer drive initiative which builds Khan Academy videos into an offline browser then made available to students who wish to browse videos in contexts within which they do not have bandwidth connection (Offline Programs: KA Lite 2014). Numeric explains that this hybrid
system of offline videos and online exercises reduces bandwidth requirements by 90-95% (Einhorn 2012).

While an attention to ICT and infrastructural constraints has bolstered the success of the program in South Africa, their “hybrid model” still struggles to find success in rural areas with substandard infrastructure and accessibility. Moreover, because Khan Academy content focuses mostly on math instruction, Numeric’s MOOC content fails to achieve a well roundedness in academic material offered. Observe that within all three case studies the difficulty of using MOOCs to address the social sciences is ubiquitous, and results in failure to fully gain from innovative potential.

**Conclusion**

The three case studies above illustrate that MOOC providers as well as local NGOs are exploring the range of opportunities for MOOC innovation in the developing Sub-Saharan African context. Whether the solution lies in offering a ‘blended learning’ MOOC environment, adjusting content to appropriately serve the African context, or any other innovation, the above research indicates a growing shift towards re-inventing the Westernized MOOC to better suit African learners. Though not conclusive, this review suggests that a shift towards conscientious innovation of the pre-existing MOOC format may help mitigate current barriers to the successful evolution of MOOCs and affiliated education technologies in Sub-Saharan Africa.
Pt. 5: Principle Case Study — Design Thinking and MOOCs, An Innovative Approach to Empowering Regional Resilience in Africa

Introduction

As discussed above, experimentation and modification of the stereotypical MOOC may be the necessary stimulus for the successful application of this technology in the developing world. Much of the experimentation in the field thus far has failed to address the limitations of MOOC content when applied in non-stereotypical ecosystems.

In this portion of the discussion, we will observe the Stanford ChangeLabs pilot project in Kampala, Uganda, as a case study which represents the innovative application of MOOCs and other diverse learning content to address relevant, realistic, problems at the grassroots level. This principle analysis will serve as a lens through which to examine the strengths and weaknesses of using innovative methodology to create learning content (MOOCs included) to transmit actionable knowledge in developing country contexts.

Overview

As previously examined, subsequent to their rapid growth in the U.S. and Europe, Massive Open Online Courses have quickly expanded into the broader reaching international arena. For a variety of reasons, the growing MOOC trend confronts barriers in the developing world context that it has otherwise avoided thus far. Infrastructural access, output costs, legitimacy and price of certification, attrition rates, cultural and linguistic exclusion within the MOOC ecosystem, and for-profit Westernized control over a developing education market are only a number of the criticisms that Massive Open Online Courses garner when applied in the developing world.

Change Labs from Stanford University, in consortium with the Resilient African Network (RAN) and Makerere University, proposes the use of the Design Thinking framework to teach local actors to conceptualize and create contextually relevant MOOCs themselves. Like most innovations and technologies transferred top-down from the developed to developing world, MOOCs risk creating a neocolonizing effect. As such, this introduction of a bottom-up approach
to MOOCs in developing countries is an innovation that carries extreme potential to address the current barriers.

**Those Involved in the Case:**

**Resilient Africa Network (RAN)**

Image from: http://www.ranlab.org/

The Resilient Africa Network (RAN), funded by the United States Agency for International Development from 2012-2017, is a partnership of 20 African universities in 16 countries, led by Makerere University jointly with Stanford University, Tulane University, and the Center for Strategic and International Studies (CSIS). RAN is one of seven development labs under the Higher Education Solutions Network (HESN) in the office of Science and Technology (OST), USAID (Resilient Africa Network 2013). The project’s mission, as described in its charter, is to “strengthen resilience in Africa through university-led local innovative solutions using evidenced-based approaches” (About Us: Resilient Africa Network 2013).

Although efforts to address development and humanitarian aid on a project-by-project basis have evidenced certain success, they have not increased the capacity of affected populations to withstand future difficulties themselves. With this understanding, RAN attempts to “adopt a resilience based approach to programming that provides a framework for analyzing resilience and enables people to discover how to be more resilient to shocks and stresses...by engag[ing] a wide network of students and faculty members in improving well-being though generating local innovative solutions to specific development challenges in African communities” (The Resilient Africa Network 2013).

**Geographic Resilience Hubs**

The Resilient Africa Network Innovations are facilitated throughout four “hubs”, also known as Resilience Innovation (RI) Labs. The four RILabs are located at the following Universities:
- University of Health and Allied Sciences, Ghana (West Africa RILab)
- Jimma University, Ethiopia (Horn of Africa RILab)
- University of Pretoria, South Africa (Southern Africa RILab)
- Makerere University, Uganda (Eastern Africa RILab)

Pictured: Resilience Innovation Hubs and Universities. Credit: USAID Research Proposal, Stanford University ChangeLabs and Peace Innovation Labs. [Note: since the production of this visual, there is no longer an RILab hub in DRC]

Each RILab aims to focus on different, contextually relevant resilience challenges. While the Eastern Africa RILab examines community resilience in the face of chronic conflict and displacement, the West Africa RILab focuses on population growth and urbanization (from fast-growing cities and low-income settlements to refugee camps). The Horn of Africa RILab examines the impact of drought and chronic displacement on local communities and regional dynamics, whilst the Southern Africa RILab concentrates on the impact of chronic disease, especially HIV/AIDS (Resilience: Resilient Africa Network 2013).
Stanford ChangeLabs

Stanford ChangeLabs is a new initiative housed within Stanford's Hasso Plattner Institute of Design, aimed at initiating rapid, large-scale transformation of the complex issues facing mankind—water, energy, climate change and social inequity (Vision: What We Do 2012).

ChangeLabs explains:

The “wicked problems” facing civilization today are marked by complexity, immense scale, extreme urgency, global pervasiveness, and resistance to change. They represent interlaced eco-systems and deep dependencies and demand highly innovative, integrative interventions to achieve systemic change. They are also marked by the need to at once, connect global phenomena with actionable interventions at the local level. While there are many sciences directed towards characterizing large-scale phenomena, relatively few focus on factors that would create large-scale transformation in our current technological, societal, and policy landscape, and diffuse it at a pace pertinent to the timeframe related to the challenges… [There is] a need for rapid transformations that cut across boundaries, disciplines, and government silos as well as innovative strategies that lead to higher impact (The Need ChangeLabs is Addressing, para 1,3).

Stanford Change Labs has introduced the observed pilot project as one innovative solution which cuts across boundaries and aims to introduce a higher impact to a local community.

Case Study: ChangeLabs Pilot Workshops in Kampala, Uganda

In the context of the given case study, the Stanford ChangeLabs approach is predicated on the belief that MOOCs (and digital learning content more generally) have not yet tackled the problems of scope and scale that the Resilient Africa Innovation Labs are attempting to address.
The team attempts to question what it means to fundamentally rethink education that scales; in other words, how can one generate education that matters and knowledge that can be put into action?

ChangeLabs strives to acknowledge the distinction between creating learning content which teaches classroom literacies and that which enables a framework for solution finding in real world contexts. Though the latter is achieved less easily, in theory it facilitates a more sustainable solution. As aforementioned, the endeavor also prioritizes a bottom up approach, to ensure contextually appropriate content generation fueled at the grassroots level. By using MOOCs to teach design thinking and innovation, the project hopes to enable community actors to create their own relevant learning content to address the problems they themselves find most important.

Stanford University Change Labs and the RAN team have to date held two workshops at Makerere University in Kampala, Uganda. The focus of these workshops was The Design Thinking Process (Workshop 1, Feb 26-28) and MOOC Visioning, or How To Apply the Design Thinking Process to the Creation of Relevant MOOCs (Workshop 2, March 20-21). Summary and content analysis of workshop proceedings and participant feedback (survey responses, interviews, MOOC prototypes) will allow for a pragmatic observation and analysis of this innovative venture.
Structure: ChangeLabs Framework to Create a Digitally Enhanced Learning Experience

In the context of the Resilient Africa Network pilot workshops in Kampala, Uganda, ChangeLabs introduced the framework model (pictured right) as a scheme to address the given innovation challenges. The framework began with an overview of the Design Thinking Process, translated via a quasi-MOOC format, during the first 3-day workshop. An exploration of this framework via 6 MOOC like modules, was used to encourage and foster a culture of innovation amongst community members.

This culture of innovation then facilitated the creation of transformative, disruptive solutions—in this case, MOOC prototypes—during the second innovation workshop in March. ChangeLabs describes the mission as one to “Enhance resilience-related knowledge and share it globally, engaging students, faculty, staff, and development experts from around the world to collaborate on solving resilience related problems” (RI Lab Innovation Visioning Workshop 2014). These pilot workshops serve as a microcosm to represent implementation of a “new mode of thinking”, in this case, one which teaches the Design Thinking Process to empower innovation and communication of sustainable, actionable knowledge.

Intention: MOOCs as a Springboard for Innovation

“The issue isn’t MOOCs, the issue is how to give people the tools they need to change their lives, via education.” — Margarita Quihuis, Stanford ChangeLabs RAN Team

The exodus from traditional MOOC, and from traditional power hierarchies in MOOC creation, is an innovation worth exploration. By giving community members the necessary tools and framework to create their own disruptive, innovative learning content (MOOCs included), the product is more likely to address contextually relevant knowledge gaps, appropriately account for cultural nuances, and focus on the needs of the learner, rather than the producer.

Throughout the pilot projects, the intention of the innovation shifted from a pointed focus on MOOCs exclusively, to a broader focus on innovating the communication of effective,
applicable knowledge. Although the endeavor initially intentioned to empower MOOC creation as a learning tool to address real world problems in the RILab regional areas, moving forward, it will use this initial innovation as a springboard to reimagine scalable education in the developing world context, via various types of learning content, rather than solely MOOCs.

Analysis: What’s Unique?

“The most profound impact of the Internet is its ability to support and expand the various aspects of social learning... Attention has moved from access to information towards access to other people.... Web2.0 blurs the boundaries between the producers and consumers of content”— John Brown and Richard Adler, Open Education, The Long Tail, and Learning 2.0.

Observation reveals that in a variety of ways, the ChangeLabs project and pilot workshops differ from what has already been attempted in the international ecosystem of MOOCs and digital learning content.

• **Bottom up Approach:** A concentrated focus on empowering learners to create digital learning content themselves, rather than implementing knowledge via a top down model as many mainstream xMOOCs are known to do, is a unique aspect of the ChangeLabs project. The pilot workshops equipped community actors with the tools necessary to control their learning experiences and knowledge consumption.

• **Human Centered:** Although the macroscopic aim of the RAN Innovation Labs is to address regional resilience challenges, the digital learning content produced via the ChangeLabs facilitated workshops focused heavily on people, rather than solely on solutions. This human centered design pivots on the learner as a vehicle to sustainably implement change, rather than solution discovery as the final depot of the learning trajectory. As such, ChangeLabs emphasizes the importance of learner feedback and learner needs, rather than concern for deliverables or performance. MOOC content disseminated in the first workshop was analyzed holistically via participant surveys, interviews, and verbal conversation, rather than tested by traditional quantitative assessment methods, often used in stereotypical MOOCs.
Innovation as a Problem Solving Framework: Most MOOCs introduce textbook frameworks (the quadratic formula, for example) to solve textbook problems (an algebra equation, to provide the equivalent). Instead, the ChangeLabs project relies on the Design Thinking (DT) Process, and more broadly innovation, as a problem-solving framework. Requesting learners to adopt an entirely unsystematic, non-traditional solution seeking framework is disruptive, to say the least. As such, integration of the DT framework introduced difficulties; teaching a novel problem framework can quickly become the most challenging aspect of introducing an innovative solution. Fostering innovation also requires the building up of a strong culture of trust and risk-taking; creativity itself is an intimate act which commands vulnerability. As such, the pilot workshops strove to facilitate this ecosystem, to encourage fluid adoption of the DT process.

Change at the Societal Level: The ChangeLabs endeavor attempts to effect change at a macroscopic, societal level, rather than singularly and to address only one problem or setback. The concern is not with creating a successful product, but with creating a product that will prove successful in the context of a broader ecology. As such, it is important to establish a depth in understanding of what contextual noise may be produced by the introduction of an innovation, as well as the pre-existing contextual noise which might affect the innovation’s introduction. In the context of the RAN Resilience Innovation Labs, the ChangeLabs project pushes to understand how the introduction of digital learning content, MOOCs included, will affect not only those participating, but also members in central and peripheral communities as well. How can we capitalize on or magnify the ripples created to generate collective and widespread good?

Localization of Solutions: Although the project prioritizes change in the context of a widespread, pervasive ecology, the localization of solutions is also highly valued. The nature of the RAN ecosystem is such that dissimilar regions (South Africa, West Africa, East Africa, the Horn of Africa), operating in different environments and stressed by different challenges, collaborate to innovate sustainable frameworks to address the given challenges. These dissimilar systems are not just human, they are environmental, infrastructural, and social, too. Rather than relying on generalized application of westernized conceptualizations of knowledge, the ChangeLabs project capitalizes on
indigenous knowledge and recognizes the significance of tailoring content to regional needs. Innovation will take a particular path based on the regional challenges of the given Resilience Innovation Lab hub, taking into account the grassroots knowledge needed to ignite innovation in the given ecosystem.

• **Aims to Ignite a Social Movement:** In the long run, the ChangeLabs project aims to ignite a sustainable and pervasive culture of innovation. Success will not come in the form of new gadgets or apps (or even MOOCs) created, but instead in the growth of a culture which facilitates the practice of innovation as a behavior. Although MOOCs will initially be used to frame and explain the substantiating principles of Design Thinking and innovation, the hope is that community members will then have the tools to innovate their own, relevant digital learning content. Whether that be a MOOC, or an alternate vehicle all together, is and should be up to them.

**Content Analysis of Pilot Workshops:**

**Workshop 1, Feb 26-28: Design Thinking Process**

The first ChangeLabs workshop was held February 26-28, 2014 in Kampala, Uganda, in coordination with the Resilient Africa Network and Makerere University. The workshops were attended by 28 individuals from 9 different countries throughout the Resilience Innovation Lab regions in South Africa, West Africa, East Africa and the Horn of Africa. These individuals represented a spectrum of professions, from students, faculty, community members, and professionals working in a variety of industries.

The workshop focused on teaching the 6 components of the Design Thinking Process (Understand, Frame and Strategize, Conceptualize, Prototype, Test, Iterate), in order to equip participants with the necessary framework to create their own learning content. The foremost goal was to establish a common vocabulary around design thinking amongst a broad and diverse spectrum of participants. Secondly, the workshop aimed to flatten hierarchical boundaries while exposing participants to a culture of innovation.

The content was communicated in a format similar to a cMOOC; modules and activities structured around digital learning content communicated by a lead. The workshop spanned 3 days, encouraging participants to learn the components of the Design Thinking process and its implementation within the context of innovation. The MOOC design framework presented was
used as a tool to guide subsequent prototype MOOC development, pilot, and delivery activities. Other important content delivered during Workshop 1 included MOOC design team formation, stakeholder analysis, and technology platform selection.

**What Was Discovered?**

Throughout the workshop, two surveys were given (See Appendix A, B) to gage participant reaction to components of the design thinking process, and to better understand the ways in which they might apply these components in their own contextually relevant ecosystems. The first survey (See Appendix A) asked two questions for each Design Thinking Component module: “Why is this module important?” and “Reflect on how you would use this module in your own context”. Content analysis of survey one feedback indicated a rich overlap in vocabulary used to answer the given questions. In response to the *Prototyping* module, the terms “innovation”, “problems”, and “prototypes” appeared most commonly across written survey feedback. In response to the *Understand* module, the terms “problem”, “community”, and “need” all experienced heavy overlap in participant lexicon. Though analysis of this nature is fairly nebulous, it serves to illustrate that there was in fact a common vocabulary created amongst workshop participants, many whom, from dissimilar environments and backgrounds, would not have otherwise had the chance to share in absorbing this new vocabulary.

![Infographic](image)

*Figure 3: Infographic of word frequency from survey one participant responses to the Prototyping module (left) and the Understand module (right). Source: Content Analysis of Workshop 1 Survey Feedback, created via Tagu.com*

Survey two (See Appendix B) was given at the end of the workshop, and gaged participant feedback on workshop structure and content. The survey gaged participant description of the workshop, whether they felt it was a worthwhile experience, which tools they liked most or least, and an overall rating of the workshop. Of this content, particularly interesting was that 56% of
participants (14/25) criticized the brief time frame of the workshop or requested access to more supplementary information post-workshop proceedings. Statements like “So much learned in so little time”, “Time allocated was not adequate”, “Please make available the slides afterwards”, and “More time to digest new methodology, to allow for better understanding and application” (RI Lab Innovation Visioning Workshop 2014) were the norm in response throughout content analysis of survey two feedback. This observation illustrates a sustaining interest amongst participants, and a desire to allocate more time and energy to comprehensively understanding the innovation. From this we can also suggest that the Design Thinking framework did in fact introduce participants to a new technique for innovation and problem solving.

**Workshop 2, March 20-21: MOOC Visioning**

Similar to the first February workshop, the second iteration, from March 20-21, was also held in Kampala, Uganda in coordination with the Resilient Africa Network and Makerere University. The workshops were attended by 28 individuals from different countries throughout the Resilience Innovation Lab regions. Again, participants spanned a diverse demographic spectrum, and came together from a variety of occupational perspectives.

The second workshop focused on “MOOC Visioning”, or the use of MOOCs as a vehicle to experiment with and practice application of the Design Thinking process. In an introductory round of “Why am I Here” and “What do I want to learn” questions, a majority of participants responded with answers such as: “To learn how to adapt tools to [my community]”, “How to apply the learning”, “empower Africa through the lab”, and “use MOOC learning platforms for RAN” (March 20 MOOC Day One Recap, n.p.). Very clear from the beginning of the workshop was an emphasis on applying MOOC content to empower and affect participant communities.

Subsequent to a brief review of the Design Thinking process and MOOC formatting, participants were charged with the task of ideating and creating MOOC prototypes to address issues which they felt were relevant and important in their communities (see Appendix C). Observation of these MOOC prototypes serves as fodder to analyze the potential for MOOCs (and digital learning content more generally) to accurately represent and address contextual challenges, as well as be sustained by the design thinking process.
What was discovered?

Figure 4 below illustrates the given innovation challenges and corresponding MOOC prototypes created throughout the second workshop. Presentations were created using various media types including video, audio, PowerPoint slides, articles, and graphics (March 20 MOOC Day One Recap 2014). Each RILab region teamed to create a prototype, which they composed via the 6 steps of the Design Thinking process.

Evidently, the content of MOOC prototypes reflected different demographic needs; note that each prototype varies greatly in the challenge it attempts to address, from Malaria to PhD Thesis Dissertation Writing. Observation of the comparison between Workshop 2 prototype topics and RAN dictated regional resilience challenges illuminates the importance of bottom up innovation. The Workshop 2 prototype MOOC topics addressed vastly different problems than the RAN indicated resilience issues for each regional area. If the direction and origin of innovation mattered little, then we would likely observe no difference in types of problems addressed via the bottom up (Workshop Prototype MOOC Topic) or top down (RAN Resilience Challenge) approaches. Instead, we perceive that when given the opportunity to create their own MOOC (or learning content) solution, individuals on the ground and near communities chose to address different problems from those that outside actors might assume. Except for a slight similarity between West Africa’s peripheral focus on urbanization, the MOOC prototypes created during Workshop 2 did not reflect the given RAN Resilience Challenges.

<table>
<thead>
<tr>
<th>Regional Area</th>
<th>Prototype MOOC Topic</th>
<th>RAN Resilience Challenge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horn of Africa (HoA)</td>
<td>Malaria</td>
<td>Drought and chronic displacement on local communities and regional dynamics</td>
</tr>
<tr>
<td>East Africa</td>
<td>Dissertation Writing</td>
<td>Chronic conflict and displacement, climate change and variability</td>
</tr>
<tr>
<td>South Africa</td>
<td>Participatory Action</td>
<td>Impact of chronic disease, especially HIV/AIDS, on access to livelihood assets</td>
</tr>
<tr>
<td>West Africa</td>
<td>Android Mobile Development/Rapid Urbanization</td>
<td>Population growth and urbanization</td>
</tr>
</tbody>
</table>

Figure 4: Graph of Prototype MOOC topics and dictated RAN Resilience Challenges for each RILab hub region. Source: Content Analysis of Workshop 2 Pilot MOOCs.
Feedback from workshop facilitators also indicated that participants suffered from “action paralysis”, or were initially hesitant to take the plunge into innovating new prototype concepts (*March 20 MOOC Day One Recap* 2014). The exploratory nature of creating content from scratch and sharing it with a community at large requires high levels of trust and interdependence. Thus, participants were encouraged to try and test new innovations, in the hopes that they might become comfortable enough with the Design Thinking process to innovate towards solutions in the future.

**Lessons Moving Forward**

Too often, education and the teaching of resilience skillsets (how to solve problems at the community level, how to avoid disaster (both natural and manmade), how to effectively distribute resources, etc.) tend to be institutionalized in hierarchical frameworks of learning. This narrative is already shifting in formal education—there is a sharp desire for user centric, rather than producer centric learning content inside of the classroom. Undeniably, this evolution must be ushered into the MOOC ecosystem as well. In piloting the marriage of Design Thinking and MOOCs, ChangeLabs and RAN attempt to question how digital education might be turned into a tool to increase resilience within communities. Unlike formal education, MOOCs and similar digital learning content have the potential to offer a velocity, continuous dialogue, and sense of co-creation to learning. How can learners capitalize on this phenomenon to address and create knowledge around relevant, important challenges?

In conclusion, although it perhaps began as such, the ChangeLabs RAN project is not solely about MOOCs. Instead, it evolved to become about Design Thinking as a framework for bottom up content creation. MOOCs, in this context, were a vehicle through which to teach a problem solving framework.

*Figure 5: Schedule of Project Objectives from RAN Objective 3 Delivery, ChangeLabs March 20, 2014.*
We can conclude that MOOCs are not the end-all be-all, though they do serve as a useful vehicle to introduce new frameworks of thought. Their value is not in their content or structure but in the innovation and community based empowerment that they can inspire. Theoretically, anyone with an iPhone or access to a few digital media tools and the Internet can create a MOOC; though with enough support, they can also exchange and disseminate this information to their community at large. The hope is that through the design thinking process, they have the capability to innovate the way ideas are gathered, prototyped, and implemented.

As the project enters the Assessment and Pilot stages (see Figure 5 above), ChangeLabs is less concerned with scale, and instead focused on the creation of a meaningful learning experience which produces knowledge that can be operationalized and appropriated into the real world. The question is not ‘How might we get a million students in Africa to take this MOOC?’ but instead, ‘How might we create knowledge that matters (whether via MOOCs or some other type of learning content) and how do we ensure this knowledge has a bias towards action?’
### Appendix

A. (Sample of Survey 1 worksheet, Pt. 1)

<table>
<thead>
<tr>
<th>MODULE DESCRIPTIONS</th>
<th>WHY IS THIS MODULE IMPORTANT?</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNDERSTAND</td>
<td>It opens my mind to various ways through which we can actually thoroughly analyze and human need and to build on that to design innovative solutions.</td>
</tr>
<tr>
<td>FRAME &amp; STRATEGIZE</td>
<td>It helps define the problem and define solutions.</td>
</tr>
<tr>
<td>CONCEPTUALIZE</td>
<td>It helps in understanding the usefulness of different strategies in eventually getting a good solution.</td>
</tr>
</tbody>
</table>

Incorporate this in the new community outreach programs targeting primary school teaching postgraduates.

Apply this in Department of School decision making.
B. (Sample of Survey 2 worksheet)

RILAB INNOVATION VISIONING WORKSHOP – EVALUATION

NAME (optional):  

1. What are three words you would use to describe this workshop?
   - Fast-paced
   - Engaging
   - Exciting

2. Was this a good use of three days? (1-5 scale)
   1 not at all    2 a little useful    3 moderately useful    4 good use    5 excellent use
   Please elaborate:
   ~ Lack of tools/methodologies introduced
   ~ Effective/efficient time keeping - no time wasting
   ~ Ample support throughout
   ~ Very clear/simple presentations

3. Which activities did you find most useful and why?
   - Prototyping - brought to life seemingly "dead" creations

4. Which tool(s) did you find most useful?  Least useful?
   - Individual Project Plan (2-4)
   - System Storm (2-5)
   - Vision & Mission

5. Was there anything you wanted to see more of during the workshop?
   ~ Reflection time at the start / end

6. On a scale of 1-5, how would you rate the workshop overall?
   1 poor    2 bearable    3 average (same as any other)    4 good    5 excellent
   Comments and additional reflections:
C. (Sample of material used to facilitate MOOC Prototyping)
Pt. 6: The Evolution of Parallel Trends

The ChangeLabs and Resilient African Network Case Study is a poignant example of the exploratory revolution occurring within the field of education technology in the developing world. MOOCs make up a large portion of this revolution, though as we conclude, it serves to also explore the analogous trends developing parallel to the innovation of Massive Open Online Courses.

Mobile

Mobile technology is often used as a substitute for connectivity in environments where broadband is not reliable or widely accessible. In the developing world, cell phone use has risen to approximately 5 billion mobile subscriptions, and three-quarters of the world now has access to mobile networks (Eulich 2012). According to the New York Times article Where a Cell Phone is Still Cutting Edge (2010), more people in the developing world today have access to a cell phone than to a clean toilet. As briefly noted in the introduction of this Thesis, mobile phone penetration on the African continent is growing faster than anywhere else in the world (Africa Telecom Market Report, 2013). By the first quarter of 2013, it reached an 80% penetration rate, and continues to grow at 4.2 percent annually (Elnadi 2013). The World Bank notes that, “the surge in cell phones in Africa—some 94 percent of urban Africans are near a GSM signal—is transforming the continent” (Devarajan, para 1).

Academics and policy makers are talking Mobile Ed., too. In 2011, the US Agency for International Development and Stanford University held m4Ed4Dev (Mobile for Education for Development), a round-table discussion designed to explore the use of mobile devices for education in developing countries. Last year, UNESCO published Turning on Mobile Learning: In Africa and the Middle East; this February, they hosted the second annual Mobile Learning Week, a five-day conference designed to explore the contribution that mobile learning might make towards its Education for All goals.

Thus, although poor infrastructure makes ubiquitous access to Internet difficult, the innovative use of mobile technology has been one method used to skirt around the problem in the education sector. Mohammad Ally, author of Mobile Learning: Transforming the Delivery of Education and Training explains the significance of mobile technology, primarily that it allows citizens around the world to access learning materials and educational information from
anywhere at anytime, revolutionary in the field of global education technology (Ally 2009). The UNESCO think piece titled *Education and skills for inclusive and sustainable development beyond 2015*, predicts a shift away from teaching in a classroom-centered paradigm of education to an increased focus on learning which happens informally throughout the day (*Education and Skills* 2012). Mobile learning, of all ICT endeavors, supports this notion of ubiquitous accessibility.

Moreover, learning via mobile technology may promise users the opportunity personalize the learning experience more effectively than via other mediums. Personalized and always at hand, mobile phones support informal and contextual learning (Vosloo 2012), a characteristic especially important in developing country contexts. Mobile phones also motivate learners to opt into a mobile community of students, allowing flexibility in information chosen, and encouraging users to make the information relevant to their own contexts. Marguerite Koole of Athabasca University explains, “Visionaries believe mobile learning offers learners greater access to [culturally] relevant information, reduced cognitive load, and increased access to other people and systems [relevant to the user]. It may be argued that wireless, networked mobile devices can help shape culturally sensitive learning experiences” (Koole, 25). As observed, mobile technology bypasses a number of barriers associated with distance learning. In this light, its growing popularity in developing countries as a tool to diffuse educational content (MOOCs included) serves as a logical parallel trend.

To cites a few examples, **Worldreader**, a global non-profit based in San Francisco, offers access to learning content available to 80% of the developing world via mobile phone applications (both smart and not). “In 2013 an average of 334,851 monthly active users completed 657,475 books on Worldreader Mobile. By the end of 2014, the organization hopes to have 2 million people reading educational material each month (*Mobile Phones as E-Readers*, para 3).

**Dr. Math**, a mobile tutoring service which begun in South Africa in 2007, now has over 32,000 students using the service (*Mixing it With Dr. Math* 2012). According to the application’s creators, the success of Dr. Math is “in part due to its accessibility on the free application MXit, another South African innovation. Figures from 2009 indicate that MXit had over 8.6 million registered users and processed around 250 000 messages per day” (*Mixing it With Dr. Math* para.
4). The application offers a universally accessible social network and help hotline for educational purposes.

**Nokia Mobile Mathematics**, a project which also aims to support learning and teaching of mathematics with mobile devices, was launched in 2009 in partnership with UNESCO and piloted amongst secondary school teachers and pupils in urban and rural areas of South Africa (Vanio & Walsh 2013). The mobile application gave teachers a novel way to supervise and plan learning and increased viability for teacher-pupil communication outside of the classroom. Studies showed that “pupils’ attitudes towards learning mathematics changed during the use from negative to positive and the learning outcomes improved” (Vanio & Walsh, para 3).

Nokia was also responsible for piloting **M4Girls** with the NGO Mindset Network and the South African Government’s Department of Education. The program, based around the Nokia 6300 handsets was designed to help improve the mathematics performance of Grade 10 girl learners (*Nokia Gets Educational* 2008). “This project demonstrates the potential of mobile phones to enable social development and improve education especially in underprivileged areas”, explained Micheline Ntiru, Head of Nokia’s Community Involvement Programs in the Middle East and Africa, “Young people are increasingly using their phones to gain knowledge via the Internet, social networking and interaction with their peers, so it makes sense to introduce learning through these devices” (*Nokia Gets Educational*, para 3).

While the trend in mobile technology for education is inspiring, it too has its pitfalls. Firstly, similar to a significant criticism of MOOCs in developing countries, most content in the mobile learning revolution also focuses on STEM and non-humanities based material. M4Girls, Dr. Math, and Nokia Mobile Mathematics are just three examples of this trend. Moreover, a 2012 report by the World Bank and the African Development Bank points to “an absence of comprehensive national strategies to promote the use of mobile technology for education, and a lack of finance and prioritisation of investment in ICT” (Parr, para 23), as barriers in the mobile learning sphere. Although mobile technology would allow schools to more broadly deliver content and communicate with or support students at a distance, it seems many institutions have yet to fully buy into the revolution (Parr 2013).
**BYOT/D (Bring your own Tablet/Device)**

Another trend in education technology evolving parallel to the MOOC revolution is that of BYOT/BYOD, also known as Bring Your Own Tablet or Bring Your Own Device. The phenomenon refers to the growing popularity of permitting and encouraging students to bring their own device or tablet into the education setting, as a supplement to content taught in the classroom. Popular BYOD programs disseminated in the developing world context include iSchool Africa\(^4\), the One Laptop Per Child Initiative\(^5\), and the Intel Classmate Education Tablets\(^6\).

Tablet adoption as a means of increasing accessibility to education content in both urban and rural areas is gaining traction within the African ecosystem. Evaluation of the current environment indicates that tablets are the major distribution channel for educational content suppliers competing in Africa at the primary, secondary, and tertiary levels. As evidence:

- In October 2012, Microsoft partnered with the Kenyan government and Indigo Telecom to supply 2,000 tablets preloaded with educational content to rural Kenyan schools.
- In June 2013, the Kenyan government committed to a four-year, $622 million project, aimed to provide computing devices, mostly tablets, to every primary and secondary student in the country (just under 10 million).
- At the tertiary level, Ghana Technology University College (GTUC) launched a new educational tablet in 2012, preloaded with Mobile Learning content from several educational publishers and sold to student at a heavily discounted price.
- In 2013, the University of South Africa launched a program to provide students with subsidized tablet and 3G connectivity, also at discounted prices.

Source: (Adkins 2013)

Combining the BYOD/BYOT revolution with mobile phones is a trending idea as well. Professor Johannes Cronje, Dean Informatics and Design at the Cape Peninsula University of Technology, explains:

> Tablets are getting cheaper and cheaper, and more and more versatile...The combination of tablets and phones, "Phablets", [is] set to revolutionise. We are progressively finding that our technology has to be portable. We are moving to a

\(^4\) [http://www.ischoolafrica.com/ipad-learning](http://www.ischoolafrica.com/ipad-learning)

\(^5\) [http://one.laptop.org](http://one.laptop.org)

multi-screen universe, with the screens being very intelligent, and even knowing where they are and who is using them. This ability of machines to learn our behaviour and our needs will mean that we have to explore new ways of learning and thinking about technology (E-Learning and Technology 2013).

Although these initiatives are purposefully aimed towards affordability and accessibility, there still exist students who cannot afford to pay for their own tablet or device, introducing yet another discriminatory disadvantage into the classroom. Moreover, simply because a student has their own device does not necessarily mean their technological literacy is of a high enough threshold to utilize it productively. Without a blended learning model, or support for device usage offered in the classroom or community, the BYOD/BYOT movement could negatively impact populations with low technological literacy and exposure.

Problems with the trend exist, but it is clear that the rise of the PLD or Personal Learning Device is an alternative with strong potential. It may have the capacity to develop prolifically alongside MOOCs in Sub Saharan Africa, bolstering education technology as an avenue for the low cost, high quality consumption of knowledge.

**Education Technology Geared Towards Non-Formal, Community Based Education**

The last parallel trend worth exploring is that of education technology geared towards non-formal education purposes, often community based. Within this scope, MOOCs and mobile applications are not excluded; Massive Open Online Courses are sometimes used to teach less formal literacies, such as sexual health, community engagement, entrepreneurship, or ICT literacy itself.

One example, Ummeli\(^7\), is a mobile jobs and community portal hosted via Vodafone, one of Africa’s largest cell phone providers. The application is accessible through Young Africa Live, a livechat mobile application, and “creates a gateway for young people to enter the mainstream economy through a network of connections to community jobs” (Ummeli, para 1). For this reason, it is often referenced as the LinkedIn for the BoP (Bottom of the Pyramid).

The Youth for Technology Foundation, a Nigerian based international non-profit that partners with low-income communities in the U.S. and with rural communities in developing nations, is another illustration of non-formal education through technology. The Foundation

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7 http://www.ummeli.com/learn-more.html
teaches youth and women how to apply appropriate technology to solve critical problems in their home communities and “builds human capital through the development of innovative programs that use technology as a medium to educate, fight poverty, stimulate entrepreneurship and create a new generation of change leaders” (Youth for Technology Foundation: About Us, para 3). In this light, we observe that ICT need not only be used to generate traditional literacies or academic knowledge.

The Resilience Innovation Hubs affiliated with the Resilient Africa Network and Stanford ChangeLabs Project are themselves examples of community serving programs which aim to use education technology for non-formal learning. Addressing community specific needs, such as conflict resolution or water sanitation, through MOOCs or other digital learning content proves an innovative method to teach sustainable and context specific problem solving frameworks.

As education technology in developing contexts continues to grow rapidly, it is important to consider just how vast the scope of information effectively taught may be. While MOOCs, mobile learning, and BYOT/D initiatives are often focused on translating formal literacies, they have a great potential to educate on less formal topics as well.
Pt. 7: Potential Earlier in the Education Pipeline

“Higher education is playing a crucial role in the modern world due to the changing economy, as knowledge continues to supplant physical capital as the source of present and future wealth. As a source of ideas and innovation, higher education is the main bastion of the continued economic viability of any continent.” — Ndubuisi Ekekwe, founder of the non-profit African Institution of Technology

Exploration of the trends evolving parallel to Massive Open Online Courses in developing countries affords a breadth of understanding in regards to the future of international education technology. To gain a depth of comprehension in the same arena, it serves to observe future high impact potential developments within the evolution of MOOCs. Of these, the feasibility of scaling MOOCs to reach classrooms earlier in the education pipeline (primary and secondary schooling) is a focus point of significance.

In the sphere of education technology for development, the emphasis placed on higher education is vastly disproportionate to that placed on schooling earlier in the education pipeline. The reasons for heavy investment in tertiary education systems are valid. By the time students reach the tertiary level, they are often less restricted by issues of literacy, mastery of dominant language, or fiscal stability (Montanini 2013), all barriers that hinder academic success within primary and secondary schooling. Moreover, particularly in underdeveloped countries, social and economic progress depends heavily on the scope and effectiveness of investments in higher education. It could be argued that tertiary education is a direct pipeline into the workforce or into alternative support for national development. As such, university educated citizens are valuable resources in which developing country governments are more willing to invest money and capital.

The reasoning above is especially true within the context of the Sub-Saharan Africa. The World Bank commissioned study by Bloom et al. titled Higher Education and Economic Development in Africa (2006) explains:

In the knowledge economy, tertiary education can help economies keep up or catch up with more technologically advanced societies. Higher education graduates are likely to be more aware of and better able to use new technologies. They are also more likely to develop new tools and skills themselves. Their knowledge can also improve the skills and understanding of non-graduate co-workers, while the greater confidence and know-how inculcated by advanced schooling may generate entrepreneurship, with positive effects on job creation (Bloom, 15).
In general, the Sub-Saharan African region suffers from the worst education (primary, secondary, and tertiary) rates in the world (Bloom 2006). These numbers, however, fail to illustrate the recent boom in tertiary education. Enrollment in tertiary institutions has grown faster in sub-Saharan Africa than in any other region over the last four decades. While there were fewer than 200,000 tertiary students enrolled in the region in 1970, this number grew to over 4.5 million by 2008 – a more than 20-fold increase (Trends in Tertiary Education 2010). World Bank world development indicators report that in 2011, approximately 7.6% of Sub-Saharan Africa was enrolled in tertiary education (School Enrollment, Tertiary 2011).

Though, as resource and capital investment flow into higher education infrastructure, logic follows that innovation of and progress within primary and secondary schooling has stalled. UNESCO illustrates how large a percentage of Africans never even reach secondary education schooling: in sub-Saharan Africa, 11.07 million children are leaving school before completing primary education, which is the equivalent of the aggregate primary school-age populations of Burundi, Benin, Somalia, Guinea, Rwanda, Chad, Guinea-Bissau, Botswana, Lesotho, Namibia, and Congo (Global Trends: Regional Dropout Rate 2012).

The recent boom in tertiary education investment means that resources are reaching only a small subset of the population. Ironically, the benefits of innovative education technology with which many developing African countries are experimenting, is aiding only a small minority—those who have made it past the barriers and obstacles that exist earlier in the education pipeline. If the demographic from which it derives (primary and secondary school age students) continues to receive little attention, this minority will never grow to become a majority.

MOOCs are no exception to the phenomena; they too are an innovation focused primarily at the tertiary level. This could be for a variety of reasons: university level students are more likely to be technologically literate, tertiary institutions are often located in urban settings with stronger access to broadband and technology, and the independent infrastructure of MOOCs best suits high achieving, top level students (often those that have made it past the more common hurdles and into a tertiary institution).

Observe that tertiary level students are perhaps more able to engage in the MOOC framework, and their success is an exponentially more valuable piece of capital for State purposes. For these reasons, it seems reasonable that African governments sink a majority of resources into corresponding innovations. Imagine, however, that innovation in education
technology, MOOCs included, was applied just as aggressively to problems and setbacks earlier in the education pipeline? True, initially the endeavor might be met with hurdles not otherwise faced in the tertiary context. Though the potential for delayed gratification — that being a higher performing primary and secondary system which in turn might lead way to a more successful tertiary system, economy, and society— seems tremendous.

**The Problem of Rural Accessibility**

One common explanation for the lack of focus on early pipeline education is that universities are on average much closer to urban centers, and internet or broadband access, than locally based primary or secondary schools. Within the infrastructure of most developing African countries, a majority of early education establishments are located in outlying semi-rural or rural areas, as most families and young children live outside of urban centers. And although, due to Education for All\(^8\), enrollment in primary schooling in Africa has boomed over the past two decades (between just 1999 and 2007, primary school enrollments in Sub-Saharan Africa increased by 51% (*Thematic Paper on Millennium Development Goals* 2, 1)), the quality of early education, particularly in rural areas, still falls short.

Innovations that work to solve this dilemma are slowly growing in popularity, perhaps an impetus for governments to invest in introducing learning technologies to early education contexts. At present, solutions such as solar powered classrooms and wind powered broadband access are an emergent focus for both broadband providers as well as non-governmental organizations.

**Players Innovating in the Rural Access Arena**

Certain mobile broadband providers have pledged financial aid in order to work towards resolving the problem of rural accessibility. Inmarsat, the leading provider of global mobile satellite in Africa, recently announced its intention to plunge resources into the development of broadband connectivity to promote education in rural areas. Nada El Marji, Lead, Sector Development at Inmarsat explains:

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\(^8\) The Education for All (EFA) movement is a global commitment to provide quality basic education for everyone: children, youth and adults. At the World Education Forum held in Dakar in 2000, 164 governments, including 44 African governments, identified six education related goals which they pledged to achieve by 2015. (Source: UNESCO)
Satellite communications can unlock a wide range of education opportunities for people living in remote areas. Giving students in more isolated regions the same opportunities as their counterparts in urban areas is crucial to both personal and community development. As Inmarsat expands its operations into the education sector, 'eLearning Africa' provides an excellent platform for raising awareness of how effective and reliable broadband connectivity can be in delivering eLearning resources (Inmarsat, para 5).

In attempts less oriented around funding, other providers have created tangible solutions to the problem. In 2011, Samsung Africa manufactured and launched a solar powered mobile classroom, aimed to increase access to education and connectivity within rural African communities. Each ‘school’ is easily transportable, built in a 40 ft. shipping container with mobility to remote areas.

Solar panels provide energy for up to 9 hours each day and the classroom, equipped with Samsung notebooks, Galaxy pads, and an electronic E-board, can house up to 21 students and one teacher (Samsung Africa 2011). The solar panel classrooms were aimed to serve as education centers not just for students, but the community at large, facilitating an ecosystem of education in rural areas that might otherwise be excluded.

Broadband providers are not the only players addressing the difficulty of connectivity in non-urban areas. In March 2010, Computer Aid International, an IT focused non-profit, introduced a solar powered Internet café titled the “ZubaBox” (ZubaBox 2009). The “café” is constructed similarly to Samsung’s model, a shipping container covered with solar panel roofing.
The ZubaBox, also easy transportable and able to be shipped and dropped off in remote locations, contains 11 working PCs per shipping container. Although the solar powered cafés are meant to provide general Internet access to communities, they are especially conducive to educational use. Beyond this, they can also be used for disaster relief purposes as well as for timely healthcare information needs (Kyana 2010).

**Moving Forward**

As we consider questions for future research, the feasibility of introducing education technology, MOOCs included, earlier in the education pipeline is a significant, and perhaps under-observed, nexus for investigation. It will be important to look out for developing innovations, solar powered rural classrooms being one example, which might aid in further addressing the issue at hand.
Pt. 8: Conclusion

“The Google Doctrine is an enthusiastic belief in the liberating power of technology accompanied by the irresistible urge to enlist Silicon Valley start-ups in the global fight for freedom” —Evgeny Morozov, Net Delusion: The Dark Side of Internet Freedom

As Morozov asserts, in today’s global society, there exists a fervent and undisputed confidence in technology to solve many of the world’s most serious problems. Cellphone apps that revolutionize finance in the ‘third world’, media platforms that revamp constituent access to the democratic process, SMS messaging to remedy prenatal health in rural areas, the list goes on. Prescriptive forms of education technology, Massive Open Online Courses being one example, are not excluded from this catalogue either. It is important to understand that technology, although affording revolutionary advances in development, is no silver bullet and should not be considered as such.

As observed in our discussion of the Barriers and Criticisms facing the application of MOOCs in developing countries, there are a variety of significant frustrations with the technology, as it exists. Experimenting with innovation of and deviation from the stereotypical MOOC format and function is a necessary phase in the technology’s utility. Rather than attempt to make African education Western, better question how technology invented in Western contexts can be altered to best fit and support education systems as they exist in developing Sub-Saharan African communities. This may take the form of MOOC content tailored to context specific users, a bottom-up model to design the learning process, or a focus on learning content applicable to environment specific challenges. It is important to note that not only are these examples not exhaustive, the exhaustive list of discovered and piloted innovations is only still a subset of the possibilities for progress. We perceive a movement towards this rhetoric in the brief innovation case studies, as well as via our principle observation of the Resilient African Network and ChangeLabs project and pilots workshops in Kampala, Uganda. In this light, The Google Doctrine mindset need not be scoffed at as foolish or naïve, but instead paired with a critical viewpoint and willingness to adjust.

In all, it is essential to recognize the problem that MOOCs are attempting to solve—access to education—rather than remain distracted by the technology itself. As the
ChangeLabs team stressed, innovators should focus on revolutionizing the learning experience, and tailoring education technology to that goal, rather than vice versa. The opportunity exists, though its success will require an unprecedented critical awareness and eagerness to innovate on the part of both users and producers.
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