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MOOCs and Online Education: Exploring the Potential for International Educational Development

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Abstract

Massive open online courses (MOOCs) are a relatively recent innovation with potential to provide access to relevant education and workforce training at scale. RTI International previously studied MOOCs in the context of the US market and determined that more efforts are needed to examine the prospect of MOOC use in developing economies. This paper defines MOOCs and contrasts them with previously established forms of online learning and open educational resources. We conclude that although MOOCs have potential for expanding access to important educational content and resources, they favor more privileged and educated individuals. Further evolution of information and communication technologies' infrastructure, platforms, and pedagogical models is needed before common MOOC models can meet the needs of the majority of learners in developing economies.

Introduction

It is widely accepted that investing in education is the most effective way to reduce poverty worldwide (Global Partnership for Education, 2015). Higher education carries long-term economic advantages for individuals and is a critical enabler of building strong institutions and service sectors that can stabilize societies and strengthen economies. Today's increasingly global and connected "knowledge economy" is changing the way people around the world make a living, but success depends on skilled workers whose knowledge keeps pace with rapid changes in technologies and markets. However, large segments of populations cannot access quality higher education because of high costs or poor basic education preparation. At the same time, traditional higher education institutions face the challenge of adapting curricula to a global student base and new subject areas. As technology has changed the economy, it also has changed the way education is delivered. The growth in massive open online courses (MOOCs) is one example of how technology is transforming education and training delivery, and the MOOC model is gaining attention as a way to expand urgently needed access to higher education and workforce skills training in developing economies.

For example, in 2014, the US Agency for International Development (USAID) issued a request for concept papers to "catalyze new partners to co-invest with USAID and its resource partners" (p. 1) to address understanding of MOOCs and how to increase enrollment in courses that advance development objectives. Similarly, in 2014, the University of Pennsylvania held a "MOOCs for Development" conference with invited speakers from 25 countries and 150 participants to discuss the future of MOOCs in developing countries. Shortly thereafter, a diverse consortium hosted a forum on "MOOCs in the Developing World" at the United Nations headquarters in New York City. A number of MOOC initiatives are now emerging within developing economies. Trinidad and Tobago, for example, have created centers and supports for students to access MOOCs. Edraak, led by Jordan, is a course aggregator that targets the Arab world with original and repurposed content in Arabic, while XuetangX is a MOOC aggregator in China. Although not an exhaustive list of initiatives, these are illustrative of the expanding demand for open access and flexible education and training resources that can boost professional skills and improve individual employability in developing economies.

In this paper, we clearly distinguish MOOCs from other types of online, open, and flexible learning and then explore the opportunities and challenges of using MOOCs and online education to address

Key Findings

- Massive open online courses (MOOCs) have gained significant attention in recent years as both an opportunity for and a threat to higher education markets worldwide. "MOOCs for development" is also increasingly the focus of international conferences, journals, books, and donor-funded projects.
- The value of MOOCs and other kinds of online learning for development centers on providing access to sources of expertise not available locally or not up to date in dynamically changing conditions (i.e., job market training or health crisis management) and connecting with a diverse set of learners from around the world to share and create content. New business models are making it feasible to offer these courses at scale.
- The basic concept of MOOCs—structured academic/technical content that is accessible online free of enrollment fees and prerequisite requirements—is attractive for many reasons and suggests a ready-made solution to critical technical, vocational, and higher education training needs in developing economies.
- In practice, many different types of online learning are now considered under the umbrella of "MOOCs," resulting in ambiguity in efforts to take stock of MOOCs for development; furthermore, making any kind of MOOCs accessible and relevant to the populations who need them the most remains challenging because of indirect costs and technical, cultural, and language barriers.
- The focus on MOOCs for development should not drive attention and resources away from well-established virtual and open universities with decades of experience delivering flexible and low-cost education to specific populations in developing economies. Instead, development partners can capitalize on global experience with open education and open educational resources to support appropriate and scalable local adaptations of online open educational resources to meet the increasing demand for education and training.

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human resource needs in developing economies. By "developing economies" we generally mean low- and lower-middle income countries (LMICs), as classified by the World Bank, yet we also recognize that a wide range of socioeconomic conditions, student abilities, and access to resources exists within countries as well as across countries.

What Is a MOOC?

MOOCs are a relatively recent evolution of online and distance-learning courses that are distinguished from more traditional online courses by having no limit on attendance, open enrollment (no prerequisite courses or degree requirements), and no course participation fees. The term *MOOC* was first coined in 2008 by David Cormier and Bryan Alexander of the University of Prince Edward Island in reference to a 2008 course, "Connectivism and Connective Knowledge," taught by George Siemens and Stephen Downes at the University of Manitoba. The course was made available online and offered free of charge to the public. The course comprised a college classroom of 25 tuition-paying students and more than 2,300 online students, who did not earn credits for completing the course (Parry, 2010). The large number of students who took the online course surprised many and signaled a potential approach to educating students who normally would not have access to higher education. Although there were many previous attempts at making course materials and lecture notes available online, Siemens and Downes are widely recognized as creating the first MOOC.

MOOCs can be defined in many different ways. For example, "massive" can be interpreted as a course delivered to a large number of learners who interact simultaneously in the same class or simply the ability to reach a large number of learners who take the class individually in a self-paced manner. "Open" typically means free of fees and entry requirements in this context, but it also leads to confusion about whether the content is openly licensed, as is the case for open educational resources (OERs). Even the term *course* can be construed as either delivery of a structured set of content within a defined start and end date by an instructor or as any self-paced set of content that can be accessed on demand without an instructor. As a result, MOOCs vary in delivery method and learner and instructor composition. Although accessing the content is free of charge, some MOOCs charge fees for certificates or college credit. Pedagogy also varies widely; on the one hand, cMOOCs refer to a type of MOOC that emphasizes student-centered, "connected" learning through social networking and knowledge co-creation. On the other hand, xMOOCs are instructor-centric courses that follow an instructivist learning model in which content is largely delivered through video lecture and reading materials, and feedback is given through computer-based quizzes and informal discussion groups. One also can find reference to related courses: BOOCs, or "big" as opposed to "massive" open online courses, for which enrollment may be limited to hundreds instead of thousands; DOCCs, or distributed open collaborative courses, a partnership of several universities; and SMOCs, or synchronous massive online courses, a university classroom-based course broadcast live over the Internet.

The fact that many of these MOOC models are not so different from their predecessors in online distance learning is often overlooked, resulting in the general application of the term *MOOC* to any online educational resources such as Khan Academy (http://www.khanacademy.org)[1] or self-paced, on-demand online courses such as those offered through ALISON (http://www.alison.com)[2] or Saylor (http://www.saylor.org).[3] In fact, as early as 2001—prior to the advent of MOOCs—the Massachusetts Institute of Technology (MIT) was providing all of its course content online on demand, free of charge, through its Open Course Ware initiative. These "courses" were designed for independent study without instructor facilitation or other student services (although courses are now linked to asynchronous study groups outside of the MIT structure where

[1] Note that Kahn Academy does not claim to be a MOOC, yet they use the URL https://mooc.khanacademy.org/.

[2] ALISON also does not call itself a MOOC, although the media does. It refers to its model as "certified online learning."

[3] Saylor only considers the scheduled, synchronous courses as MOOCs, such as the Systems Engineering course produced in partnership with NASA personnel and delivered to 9,000 students in 2014. Otherwise, it describes itself as an "open education ecosystem."

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learners post questions and discuss problems, further blurring the distinction between OERs and MOOCs). Carnegie Mellon began a similar initiative in 2001 as well, offering courses through its Online Learning Initiative.

As news of the success of "Connectivism and Connective Knowledge" spread to other universities, MOOCs began to take root in higher education. One of the most publicized courses was a 2011 offering on artificial intelligence (AI), taught by Sebastian Thrun and Peter Norvig at Stanford University. The AI course drew 160,000 registered students in 190 different countries around the world, of whom 20,000 completed the course (Rodriguez, 2012). MIT followed suit a year later offering a MOOC on electronic and circuit systems. Soon after, Harvard University paired with MITx to create what is now known as edX. This nonprofit organization initially offered a circuit class known as "6.002x," with an initial enrollment of 155,000, and 7,157 students who completed and passed the course. Although the completion rate for this course is very low relative to the university classroom, the number of completers is high. As Anant Argawal, president of edX, noted, "… in absolute terms, it's as many students as might take the course in 40 years at MIT" (Hardesty, 2012).

Although MOOCs are typically associated with the higher education institutions and platforms that popularized their use (e.g., MIT, edX, Coursera), anyone can design and deliver a MOOC. Many international organizations, including UNESCO and the World Bank, are now offering courses on topics of interest to the development community. Although no institutions offer MOOCs as a replacement for a complete higher education degree, individual course offerings are targeting an important gap. Moreover, Coursera, edX, and Saylor have begun to offer clusters of courses with certification that align with technology-based careers (computer programming, data science, and others). Udacity offers "nanodegrees" in a range of information technology subjects such as front- and back-end web development, mobile application design, and data analysis. However, at the time of publication, the cost to the learner was $200 per month for access to the content, or about $2,000 to complete the degree—an important departure from the free-access MOOC model.

MOOCs vs. Other Online Learning Models

MOOCs as a form of educational content delivery are really an extension of well-established mechanisms of online distance learning. In removing course fees, prerequisites, and admissions processes, the courses can reach exponentially more people in a single-course cohort. As a result of the large enrollment, important changes in instructional design and pedagogy are needed. Most MOOCs replace direct instructor feedback with self-assessment and computer- or peer-generated feedback and are increasingly integrating other social media interaction, live webinars, and other real-world activities as part of the learning experience.

Although on-demand, self-paced online learning may be considered a "course," for the purposes of this paper, this type of opportunity is referred to as "online learning" or an "OER," depending on the breadth of the resource. Many of these resources are free to access, but the fact that MOOCs additionally engage thousands of learners at once in live or synchronous activities really defines the unique nature of MOOCs. OERs are further distinguished as a form of digital media that goes beyond just open permission to access, allowing content to be freely distributed and modified (e,g., Curriki, OER Commons), which is not always the case for MOOC content. Therefore, our working definition of a MOOC is as follows: "Structured courses offered online by established subject matter experts with no enrollment restrictions or fees." Through the online environment, the instructor provides a substantial amount of deliberately sequenced lessons to a cohort of students simultaneously, along with assignments designed to develop specific competencies as the final goal.

For our purposes, "online learning" is defined as sequenced learning content, delivered online by a subject matter expert who provides personalized feedback and learning assessment to a small cohort of

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students. Both MOOCs and online learning share the fundamental rationale for their existence:

- The location and temporal independence of learning, often referred to as "anytime, anywhere." The flexibility to start, stop, and review content at the time and place of choice has benefits for all learners but is often a necessity for employed adult learners.
- The ability to reach a diverse population of learners, often those who are underserved or who would otherwise be unlikely to be found together in the same traditional classroom. Deliberately seeking to include a diversity of learners in knowledge transfer can be a valuable pedagogical strategy in addition to building communities and favoring follow-on action.

When barriers such as academic prerequisites and fees, timing, distance, and structure associated with formal university programs are removed, MOOCs and online learning have the potential to provide access to new sources of learning. These new sources encompass acquiring new workforce skills and facilitating professional development in the workplace through continual learning on the most up-to-date topics, such as new technologies and advances in health care.

Given the overlap between the different types of learning models, acknowledging the differences between MOOCs, as defined above, and more traditional forms of online learning is important when exploring the benefits of online education in developing economies (see Table 1). To do otherwise is a disservice to the efforts that have been made to bring open, flexible, and online learning to individuals with greatest need, even if not "massive" by MOOC standards. Both MOOCs and traditional forms of learning have unique opportunities and constraints for these learners, but the real distinction lies in the difference between open and flexible learning and traditional "brick and mortar" education.

Table 1. Comparison of typical MOOCs and online learning

Characteristic	MOOCs		Online Learning	
	cMOOC	xMOOC	Courses	OERs
Audience size	No limit	No limit	Limited	No limit
Enrollment fees	None	None	Variable	Not applicable
Academic prerequisites	None	None	Variable	Not applicable
Cost of supplemental materials (i.e., readings)	Free	Free	Variable	Free
Instructor/facilitator	Yes	Yes	Yes	No
Timing	Synchronous	Synchronous	Synchronous	Asynchronous[a]
Certificate of completion	Variable	Some, often for a fee	Yes	Variable
Primary pedagogical model	Student centered, content creation	Instructor centered, content study	Interaction with instructor/subject matter expert	Self-directed learning
Individual instructor feedback	Infrequent	Infrequent	Yes	No
Evaluation	Computer/peers	Computer/peers	Instructor	Computer
Content free to modify or redistribute	Variable	Variable	No	Yes

[a] Also called "self-paced" or "on demand."

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Relevance of MOOCs in Developing Economies

The concept of the MOOC is appealing in international development as a way to address critical human resource needs for millions of individuals in LMICs who would not otherwise have access to higher education. The discussion of MOOCs for development highlights the potential for individuals from around the world to access coursework from elite universities and globally recognized subject matter experts without fees. However, as described above, MOOCs also differ from more traditional online education because of the pedagogical model enabled by the massive learning cohorts. Some researchers note that MOOCs function more like an event such as a conference and less like an interactive online course (Venkataraman, 2013). In this way, MOOCs also provide opportunities for learners to network with other professionals in their field around the world; such networking can be as important for professional development as the actual knowledge and skills acquired through the course.

This benefit is particularly true for cMOOCs, which intentionally build a community across learners with different levels of experience. cMOOCs also focus on knowledge creation and tangible outputs, which is particularly useful in contexts where a specific product or service is lacking. For example, in places that lack local language reading materials or early-learning lesson plans, teachers participating in a cMOOC can co-create content within the context of the course that they can use in their classes, while a subject matter expert guides the learners through the development of these resources and peers provide feedback on the final product. This model responds to an immediate need with a measure of quality control over developed content. Being able to communicate, share, and compare experiences across regional or national boundaries can strengthen the learning process and create opportunities for independent follow-up. This type of collaboration may happen in smaller, synchronous online courses as well as larger university settings, but the combination of free access to recognized experts and a large community of peers is what sets MOOCs apart. A community of peers is what makes MOOCs particularly interesting in developing economies where such opportunities are limited.

Although coursework may be free, MOOC participation has some implicit costs. MOOC participants need Internet access with adequate bandwidth, which comes with associated costs of hardware, software, electricity, and connectivity fees. Most MOOCs incorporate some video lectures, which can be a challenge to access in low-bandwidth environments and, in some countries, can even be blocked by broad censorship (e.g., countries where YouTube is blocked). Although mobile phone access is pervasive in developing countries, personal computers are still primarily accessed through public, shared sites, creating the barrier of distance and cost of access.

In addition to these technological barriers, digital literacy, language, and culture also pose barriers to participation in MOOCs. Most MOOCs and MOOC platforms are delivered in English and require different levels of language and literacy skills. The learner needs to know the academic vocabulary of the subject area and the technical vocabulary of the course delivery system. In the highly interactive cMOOC model, the coursework may integrate content across several different websites and social media platforms. Therefore, the learner needs to know how to navigate these systems and to communicate in the unique register that online social media discussions usually involve. Researchers studying the implementation of a MOOC on mobile learning characterized the MOOC model as "chaotic," because it required self-organization, connectedness, openness, and the ability to deal with a certain level of complexity (deWaard et al., 2011). Although these researchers promoted such chaos as a transformative educational paradigm, they also noted that dialogue was central to knowledge creation. It is likely that learners not fluent in the language of that dialogue would have a much more limited learning experience.

Similarly, researchers studying a MOOC designed for teacher professional development in Sweden found that although some participants considered the openness of the MOOC an advantage, others saw

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it as an obstacle: "The openness means a flexibility of when and to what extent to participate, but it also creates an uncertainty of what is expected and how to participate" (Karlsson, Godhe, Bradely, & Lindström, 2014). In their meta study of MOOCs (as of 2012), the authors used terms such as "time consuming," "challenging," and "overwhelming" to describe learner reactions to the amount of different content types and ongoing discussions and suggested that learners need "to learn how to learn in a MOOC" (Liyanagunawardena, Adams, & Williams, 2013). Most reviews of MOOCs cite the need for a high degree of learner autonomy and capacity for self-organization and demonstration of skills development through content creation.

Therefore, despite MOOCs' promise, their complexity may explain why learners who enroll from low- and high-income economies "are disproportionately elite, young, and male" (University of Pennsylvania, 2014), or otherwise individuals who are already the most educated. In a study of MOOC participants in Mexico, Thailand, and Senegal, Franco Yáñez (2014) found that 86 percent of MOOC participants had an undergraduate degree or higher, while only 13 percent had a secondary education or lower. Moreover, 42 percent of participants were already associated with a higher education institution as students, researchers, or professors. Liyanagunawardena, Adams, and Williams (2013) also found that participants are largely from North America and Europe, followed by Southeast Asia, but relatively few are from Asia and Africa. Specific challenges associated with lower representation from Africa include "the gap in national and institutional policies to accredit learners, resistance to a change from the standard 'brick and mortar' institutions, and the scarcity of human resources to support new initiatives," according to a representative of the African Virtual University speaking at the MOOCs for Development conference (University of Pennsylvania, 2014, p. 5).

Therefore, promoting MOOCs for development cannot ignore that this type of complex environment is not equally accessible to learners with different language and technological skills, as well as very different prior learning experiences and understanding of the learner–teacher relationship. In fact, it may be that learners with the greatest need are those with the least experience in the self-directed and proactive nature of online learning. Important questions remain as to the usefulness and efficacy of MOOCs in developing economies. Can simpler forms of MOOCs, or the more instructivist xMOOC model, provide a more credible source of learning in terms of depth, breadth, and quality of the content for less experienced learners? Do we need MOOCs designed specifically to teach technology, literacy, and study skills needed to participate in MOOCs? Or should we focus efforts on tailored content and smaller, more localized versions of traditional online learning to serve the same purposes but without the constraints of the MOOC model?

International Regulations and MOOCs

The US Department of State regulates the international dissemination of American educational products. Within this jurisdiction, the State Department has worked to both limit access to MOOCs in countries with sanctions and expand access in other countries. In January 2014, the State Department clarified that export control regulations that prohibit US businesses from doing business in sanctioned countries (such as Cuba, Iran, North Korea, and Sudan) apply to MOOCs. This ruling disproportionately affected Coursera; edX had already begun working with the State Department for country-specific operating licenses regarding sanctioned countries.

The State Department's blocking of MOOC content was scrutinized for limiting access to Internet content that could be improving the view of America internationally and improving international Internet access (Blake, 2014). Less than 6 months later, in June 2014, the State Department allowed MOOC providers to enroll Iranian students by issuing a "general license" for Iran, thus partially reversing the decision made in January. Thus, the State Department is using MOOCs both to foster positive relations with foreign countries and as a way to regulate access to American educational products for sanctioned countries. At the time of publication of this paper, edX reported on its Frequently Asked Questions page that learners from Crimea (Ukraine) were still prohibited from registering.

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Relevance of Online Learning in Developing Economies

As noted elsewhere, MOOCs are rooted in traditions of open education around the world, open universities (of which there are at least 60 around the world), OERs, and online distance learning that evolved as technology allowed. Research has shown that both online and distance education, when well designed, are as effective as face-to-face learning, but a key component of being "well designed" includes continuous monitoring of student progress and individual feedback as needed (Seimens, Gašević, & Dawson, 2015). This meta-analysis of studies concluded that in situations where the students experienced blended instruction (either an online course with some additional face-to-face time or a face-to-face course with some online time), student academic achievement was higher than that of students who experienced one or the other mode uniquely. The authors suggest that blended learning environments are effective because they capitalize on the perceived benefits of both approaches: "… the enhanced social presence and relationship building through face-to-face modes (Rovai & Jordan, 2004; Shea & Bidjerano, 2013), and the learner control and the flexibility of access through online modes (Graham, 2013)" (p. 83). The same meta-analysis reported that the largest significant and positive effects of distance learning are for adult workplace learning, suggesting that situated learning that makes the content immediately applicable to the workplace is the most effective.

In contrast, MOOCs are designed for massive numbers and broad content areas and are, for that reason, not suited to meet the specific individualized needs of a heterogeneous learner base. Although an xMOOC might be appropriate for highly literate adults who need some new skills such as basic accounting or electronics and mastery of the subject area can be objectively or auto-verified (the total sums or the light bulb turns on), the needs do not end there. If the objective is to reach those least served and most in need of critical new skills, then tailored pedagogy, language, and instructional pace are essential.

An important driver of online education is rapid access to up-to-date content in fast-changing content areas such as health care, education, and technology. Skills in these areas are required by important first-line service professionals (such as teachers and health care workers), but they also require that a subject matter expert directly observe and measure the quality and completeness of the learning process. For example, online course providers were able to respond rapidly to the Ebola crisis by providing content online. BBC reported that 10,000 people accessed a free course through ALISON called "Understanding the Ebola Virus and How You Can Avoid It" (Coughlan, 2014). This course was available via mobile phone in French and English. (Note, by our definition, this course is not a MOOC and is therefore considered an OER because there is no interaction with an instructor or other learners. The estimated 1 to 2 hours of content are delivered in a self-paced manner, mostly through video, with self-assessments. However, the media and researchers often apply the term *MOOC* to these courses.)

The course website at the time of writing showed 20,455 enrollments. ALISON claims to have 1 million users in Africa, of which 250,000 are in West Africa. By contrast, the Open University–sponsored platform FutureLearn also provided two MOOCs on Ebola from United Kingdom universities at the height of the outbreak, one of which was "Ebola in Context: Understanding Transmission, Response and Control," developed by the London School of Hygiene & Tropical Medicine featuring Peter Piot, an eminent researcher in HIV and Ebola. Although enrollment figures could not be verified, this is closer to the definition of a MOOC because it was free to access and involved discussion and real-time analysis of the outbreak, while encouraging students to get involved and share their experiences in the field.

Although the ALISON course targeted individuals at risk of contracting the disease, the FutureLearn courses targeted medical professionals and researchers, preparing them to respond to the crisis. This illustrates the very different objectives and instructional needs that are best met by either self-paced online instruction or live, collaborative MOOCs. Both types of delivery have the potential to

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reach massive numbers of learners, but the models are very different. Furthermore, one should not ignore the possibility of achieving the same collaboration and live discussion as afforded by MOOCs but tailored to the language, culture, and needs of a smaller audience.

Conclusions and Recommendations

This brief discussion of MOOCs and other forms of smaller or self-directed online education highlights the fact that both provide much-needed access to important information and skills that can benefit learners in developing economies, especially when provided free of cost and in a flexible manner. Important development-focused knowledge and information can also be disseminated widely and more rapidly than traditional academic schedules and enrollment limits allow, therefore indirectly benefiting international development goals even when the target audience is not necessarily the learner in a developing economy. Based on this review, we offer the following key recommendations:

- Promote blended learning opportunities that capitalize on the benefits of both massive and smaller models of online learning.
- Target dissemination of MOOCs as workforce training, or skills upgrading, with a focus on content that is relevant and easily transferable to other contexts, independent of credentials.
- Seek to develop innovative business models and partnerships for effective information and communication technologies–enabled workforce training.

First, combining MOOC methods and smaller online models might benefit developing economies in ways that each model separately cannot. For example, the free, noncopyrighted content of MOOCs can be adapted by local institutions or delivered by a facilitator who modifies and translates it to meet the needs of the local audience. This type of "learning hub" is being encouraged by edX and other MOOCs even when the content is not freely licensed for adaptation. For example, the US Department of State's Bureau of Educational and Cultural Affairs "MOOC Camp" program helps students in developing nations experience US higher education by facilitating discussion of MOOC course content. Coursera's "Learning Hubs" are partnerships in which students can access the Internet and participate in MOOCs in a physical space with peers and additional facilitation. The Kepler project in Rwanda (http://kepler.org) and the University of Northern Paraná (Brazil, http://www.unopar.br) are both implementing blended schemes that offer learners access to higher education through a combination of online coursework, classroom-based work, and follow-up through an industry expert; both involve private-sector partnerships and have started small but intend to scale up in the future. The coursework is not free but remains low cost for the learners as a result of the partnerships.

Second, in the past, higher education credentials have been important primarily as evidence of a broad set of academic knowledge and intellect that is valued and required by employers. Increasingly, credential-free learning is considered valuable in domains where demonstration of a skill is more important than evidence of a diploma. MOOCs and other online learning models are a beneficial resource to learn new skills or update current competencies. The value of these nonaccredited online learning opportunities for employers in international contexts is an understudied aspect of the subject. ALISON (n.d.) claims that over 14 percent of graduates "stated that learning with ALISON helped them get a new job, a promotion, or college placement." In the United States, a small study of North Carolina employers found that they valued MOOCs more as a signal for potential employees' motivation than a verification of the knowledge employees acquired (Radford et al., 2014). Some courses are moving toward using "badges" based on how much of the course the learner interacted with or completed. Other course providers offer a certificate for a fee. Effective certification and recognition of the learning effort remain a challenge for MOOCs, and employer acceptance of skills acquired through MOOCs in both developed and developing economies has yet to be determined and requires further study.

Quality control is an important element of all online learning, but in regard to MOOCs, some subjects

can be more effectively taught through behaviorist "xMOOC" style pedagogy than others. Efforts to scale MOOCs for development should focus on core skills that are immediately relevant to the learners and the local labor market. Developers of online courses should make a distinction between the types of courses that necessitate collaboration, social interaction, and instructor feedback and those that can be delivered in a more self-directed, self-monitored style of teaching and learning.

This same distinction may also apply to courses that can more easily be "translated" rather than localized. For example, courses in computer sciences or programming languages may be more easily scalable than social science courses, which are more grounded in local cultures and points of view (Franco Yáñez, 2014). However, even Sebastien Thrun, a renowned expert in AI and automation and the cofounder of Udacity, emphasizes the importance of the "human touch" and instructor feedback in MOOCs: "The most effective learning environment is often one where the student gets to practice something under the guidance of someone more experienced and then gets personalized feedback on how they are performing," he is quoted as saying in an interview with the *MIT Technology Review* (Byrnes, 2015). MOOCs that may be more immediately relevant in developing economies include those with a research and collaboration focus or for which teaching and learning benefit from collaboration; involve multiple voices; or facilitate international, inter-institutional, or regional collaboration.

Third, in some instances, instead of focusing on a single online course targeting thousands of learners, a massive replication of the same online course to smaller numbers of students, making the necessary accommodations for language, skills, and individualized feedback, may be more effective. Massive replicating through translation and localization of content creates a cost challenge given the high costs of course development, but certain implementation models may be applicable to initial development as well as ongoing replication. Udacity has established a model where a paid network of reviewers grades assignments for students completing the Android degree. However, to accomplish this, Udacity had to depart from the traditional MOOC model by charging a fee and eliminating the synchronous peer structure of the course; instead, learners completed assignments independently. Interestingly, these reviewers can earn a substantial living; according to Thrun, the best-earning code reviewer in one of the Android programming courses earns "more than 17,000 bucks [assume dollars] a month" (Byrnes, 2015). Therefore, development and management of online distributed learning can be its own exercise in workforce development.

Business models such as this, or the rationale used by current institutional and university partners, can inform the expansion of MOOCs in developing economies. For example, many universities invest in MOOCs as a direct gateway to recruiting international students for larger (paid) degree programs or because it indirectly generates international recognition of faculty and programs. Alternatively, the institution offers the course for free but charges a fee for additional services or certification. In another example, the African Management Initiative is a social enterprise offering business-oriented MOOCs in cooperation with African business schools; the platform is deliberately designed for low-bandwidth environments and mobile use. This example illustrates how development partners can focus on supporting institutions in developing economies to create and deliver courses and raise awareness of the availability of MOOCs. Furthermore, MOOCs should not be stand-alone initiatives but can involve regional and international partnerships that build the capacity of these institutions.

Another model for MOOC design involves deliberate curating of MOOCs in a specific content area and creating a learning community—digital and local—around that topic, perhaps in partnership with the private sector. In this model, the private-sector incentive is to recruit talent by casting a wide net and hoping to find even a dozen highly qualified individuals. Microsoft Research uses this model. According to one report, approximately 2,000 students from 27 engineering schools have signed up for a "MOOC-like" program that will use video lectures and online quizzes. The top 10 students will

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be offered the opportunity to intern with Microsoft Research (Riddel, 2013). However, even without private-sector involvement, raising the profile of a specific subject area important to a community or a region (e.g., migration or the environment) through free online education could be an incentive for development partnerships. Creating local study groups and communities of learners can be the bridge between the complexity of online learning and the needs of local learners with low literacy, lack of access to technology, or less experience with online learning. These are the kinds of partnerships and initiatives that development nongovernmental organizations can focus on rather than only promoting increased enrollment in common existing MOOCs.

To conclude, regardless of the model of online learning, advances in infrastructure and learner support will be required before access in developing economies becomes truly "massive." Content-driven MOOCs may be a substantial resource for those who are aware of them and who have the capacity to access and use them—by all accounts the kind of people who would be more likely to succeed than their peers anyway. Whether MOOCs present a positive alternative to learners in developing economies very much depends on what current higher education opportunities exist locally. However, we should not count on MOOCs designed largely in and for Anglophone, developed countries to solve the human resources challenge that developing economies face for the majority of the unskilled workforce. One clear positive effect that MOOCs have already had is in drawing attention to and increasing the visibility of existing models of online learning and open universities. Efforts should be made to ensure that these highly local and immediately relevant opportunities are expanded to audiences that, if not massive, are at least as large as the context allows.

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