

# Chapter 19

## Enhancing the Quality of Computer Science Education with MOOCs in Sub-Saharan Africa

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### **ABSTRACT**

*The quality of computer science education in higher education in Sub-Saharan Africa is reported to be poor. This is due to acute shortage of well-trained faculty members, irrelevant and outdated curricula, and poor teaching methodology. Although several interventions exist to improve the quality of computer science education in the region, there have not yet been many attempts to systematically adapt and integrate Massive Open Online Courses (MOOCs) in computer science education. This chapter presents approaches that can be used by faculty members to adapt and integrate MOOCs in order to enhance the quality of computer science education. These approaches are the first steps towards helping faculty members and institutions in Sub-Saharan Africa to utilize the potential of MOOCs to improve the quality of computer science education and to equip students with employable skills for both local and international IT industry.*

### **INTRODUCTION**

The Information and Communication Technologies (ICT) have been described as an effective tool to assist in the poverty alleviation as well as to boost economic growth in Sub-Saharan Africa (UN, 2005). ICT can boost economic growth by

increasing efficiency, providing access to new markets or services, and creating new opportunities for income generation (Bezy, 2013). These ICT impacts cannot be achieved without equipping graduates with relevant computing skills to understand local needs and develop solutions that address challenges facing their communities. This

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can be done by strengthening computer science education in the region (Chetty, Buckhalter, Best, Grinter, & Guzdial, 2007).

Many graduates in sub-Saharan Africa have innovation skills but they lack computing skills due to the poor computer science education (Bezy, 2013). Computer science education is faced with many challenges. First, the majority of institutions do not have well-trained faculty to teach computer science courses more effectively (Chetty et al., 2007). Many senior faculty members who are currently teaching computer science were graduates of mathematics and other related fields at undergraduate level who were trained at masters or doctoral degree level in disciplines related to computer science (Rai, Rodrigues, Venter, Suleman, & Edumadze, 2013). As a result, they tend to lack aspects of computer science foundation.

Second, the majority of computer science curricula are irrelevant (Bezy, 2013). In fact, these curricula have been adapted from western institutions with minimum or no modifications (Chetty et al., 2007). The curricula from western institutions were developed to address the needs of their communities and not the African needs. This has resulted into producing graduates who do not have the necessary skills to develop solutions that address the African challenges (Rai et al., 2013).

Third, there is a massive shortage of doctoral-level faculty members to as low as 20% in many institutions in the region which impacts on their ability to provide quality instruction and research (Bezy, 2013). It is not uncommon to find a bachelor's degree faculty member teaching at university level (Tettey, 2010).

Fourth, many of the existing curricula are outdated (Escher, Noukakis, & Aebischer, 2014). For instance, Bezy (2013) found one major university in South Africa had not updated their curriculum for the last 20 years. The situation is similar in many institutions in sub-Saharan Africa. It is rarely to find courses such as mobile and wireless technology, mobile software development, and human computer interaction in many curricula in

the region (Bezy, 2013). These courses are critical for Africa given the widespread and penetration of mobile technology.

Finally, the majority of faculty members rely on behaviorism pedagogical teaching approach where students become recipient of instruction from their faculty members (Bezy, 2013). In this approach, students are evaluated based on their capacity to remember and repeat the content of the course taught by their faculty members. The approach is not suited to teach complicated materials like those of computer science which require students to think critically, solve problems and develop creative solutions (Bezy, 2013).

Given these challenges and many others, the mismatch between the degrees offered and the skills required by the labor market has been evident (Bezy, 2013). Many graduates suffer from unemployment while many jobs remain unfilled (Sawahel, 2011). This is because graduates do not have the skills that industries seek from candidates (Micahel Trucano, 2013).

This was also evident in a two-day summit funded by Google and held in Kampala, Uganda in August 2010. The summit was attended by faculty members from 15 institutions in sub-Saharan Africa, IT practitioners and researchers from within and outside Africa. In this summit, the industrialists claimed that many computer science graduates have limited problem-solving skills, poor communication skill and inability to handle practical problems (Rai et al., 2013).

## **Interventions**

Given the above challenges, institutions and international agencies have been making various efforts to improve the quality of computer science education. For example, the Royal Melbourne Institute of Technology (RMIT) in Melbourne, Australia delivered computer science diploma and degree programs in four African Universities: University of Dar es Salaam (UDSM) in Tanzania, Kigali Institute of Science and Technology (KIST)

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