

# Chapter 16

## Integrated Multi-Agent-Based eLearning System as a Strategy to Promote Access to Higher Education in Africa

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### ABSTRACT

*In this chapter, the authors present the integrated multi-agent-based eLearning system as a strategy to promote access to higher education in Africa. The integrated multi-agent eLearning system breaks through the traditional barriers of time, location, and the cost of delivering educational content. The power of the Internet in an educational context has always been that it simplifies access to content and contact with the experts. An agent-oriented methodology is used in this chapter to demonstrate how multi-agents can help to design an eLearning system. This integrated multi-agent-based eLearning system brings in merits of portability, convenience, collaboration, instant response, and multi-literacies, and provides solutions in cases where expertise is distributed all over Africa. Given the rising population in Africa and scarcity of qualified professors in higher education, the best strategy is to implement the designed eLearning system to help support the learning processes in higher education institutions.*

### INTRODUCTION

Higher education is essential for Africa's development. Development trends in East Asia and India have shown that higher education coupled with good governance and sound infrastructure have been critical to economic success. Potential

impact of higher education in the strengthening of institutions, governance, social development, scientific innovation and technological advancement is required for Africa's socio-economic development (Nafukho, 2013).

While the higher education sector is critical to Africa's development, there are challenges

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that impede the provision of the same. Teshome (2008) outlined the following six challenges facing institutions of higher learning in Africa: (a) faculty shortage and development, (b) governance, leadership, and management, (c) problems of quality and relevance, (d) weak research and innovation capacities, (e) poor physical facilities and infrastructure, and (f) inability to meet increasing demands for access and equity. These six challenges facing institutions of higher learning in Africa could partly be addressed through the use of eLearning designed systems (Nafukho, 2007). The current learning environment in higher education in Africa emphasizes problem-centered over subject centered learning in the planning and delivery of educational programs. In the problem-based learning system, studying is a comprehensive and lengthy process instead of divided short-term classes. There are different persons, mentors and experts to support the students. The teacher's role changes from information deliverer to organizer and facilitator of learning (Essi, 2009). eLearning is an emerging area in Africa with wide application in higher education and enterprise training. It is considered a brand new model and platform of learning which is based on computer multimedia and the Internet, and emphasizes the guiding function of the teacher and the subject, and the position of the student (Wung, 2009). In addition eLearning refers to the teaching and learning behavior in the information technology environment. Thus, the whole of eLearning computing technology may be viewed as distributed, complex, and dynamic because it has attributes such as network, popularization, personalization and lifelong (Danish, Slavi, & Rob, 2009).

The object-oriented design methodologies have been used as a solution to eLearning system design. The eLearning system design is also being approached from artificial intelligence point of view.

Many questions therefore have arisen about the notion of eLearning and its relevance in Africa.

One general question is how modern artificial intelligence models can be applied to in the design and successful implementation of eLearning systems in Africa. An open direction of inquiry into this is by the investigation of how multi-agents can be used in eLearning system design and implementation, hence the need for this chapter.

## **BACKGROUND**

In this chapter, the authors focus on the design of a multi-agent systems model, where the components involved in eLearning scenario are intelligent and can reactively and proactively participate in facilitating learning in higher education in Africa (Wooldridge, Jennings, & Kinny, 2000). An agent-oriented methodology –Prometheus- is used in the analysis and design of the integrated multi-agent based eLearning System (Wooldridge, Jennings, & Kinny, 2000). The overall solution to the integrated multi-agent based eLearning system is the settlement resulting from communications and negotiations of individual agents in the eLearning process. This is a multi-agent scenario. It is important to note that several researchers are still working on the design and utilization of eLearning system designs to make its performance better. Multi-agent systems are interesting in their own right. It is interesting to reflect on how they will change software development approaches in the near future. The use of multi-agent systems in an area such as eLearning presents good opportunity to gain insight into their architecture and also use them to solve educational and training problems facing the continent of Africa.

The following reasons explain why we are seeking to promote access to higher education in Africa using integrated multi-agents approach. According to Teshome (2008, p. 7) "African universities are plagued by critical shortage of teaching faculty and research scholars. The situation serious with respect to the shortage of senior

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