

E-LEARNING BASED M&S CURRICULUM TO ACHIEVE A SUSTAINABLE DEVELOPMENT OF HIGH QUALITY UNIVERSITY EDUCATION AS PART OF THE UNIVERSITY REFORM PROGRAM IN ETHIOPIA

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Abstract. The paper presents an integrative concept for an information and communication technology (ICT) supported education, which embed e-Learning to achieve a sustainable development of high quality university education in Ethiopia. Based on available open courseware(OCW) material, the customization and reuse of OCW will be demonstrated. Moreover the integration of quality assurance is shown. Simulation is embedded for supporting education and training when it comes to dynamic system behavior.

1 Introduction

In seeking to overcome poverty by 2015 – which is the so called MDG 1 (Millennium Development Goal), the “Ethiopian Industrial Development Strategy” (August 2003) stresses the need for industrial development [1]. Capacity building has been identified as key factor in achieving this goal. Consequently a strategy for a comprehensive “Engineering Capacity Building Program” (ECBP) in Ethiopia has been developed by the Ethiopian government, represented by the Ministry of Capacity Building (MoCB). ECBP formulates a mission and corresponding objectives, and identifies four strategic areas of intervention, so called components, and lists key issues for each of these components [1]. One of the four strategic areas of this ECBP, that has been developed and approved by the respective stakeholders, focus on the University Reform Component. Background for this component is a fundamental rethinking on all levels of higher education with the result that radical redesign of studies are necessary to achieve significant improvements in professional performance of university graduates. As a result of several discussions of this ECBP University Reform Component on how to improve the nationwide education situation in a short time scale, it was decided to adopt the e-Learning concept. Henceforth, a project was initiated introducing e-Learning at the FOT’s of Ethiopian Universities with the target of awareness creation and trainings, to encourage instructors to deliver e-Learning courses and starting with the first steps towards institutionalization. As a result of a feasibility study this approach will not allow running e-Learning at a big scale within short time. It will be a process in slow motion. Henceforth, an additional strategic component was perceived being necessary to achieve the primarily target which take into account the possible use of already existing materials for e-Learning content and courses available on the web which fulfils the pre-accredited curricula at AAU FOT in order to identify international available e-learning courseware that can possibly be used. This emanates from a general agreement on leveraging the use of information and communication technology (ICT) in the learning and teaching process.

2 E-Learning: Quo Vadis?

Following the development of the Internet, learning and instruction have gone online in various forms. One of these forms, the standardized online learning, the so called pure e-Learning, incorporates content, communication, and technology. The fact that online education allows intensive interaction among students, as well as with the instructor, is probably the single biggest benefit of e-Learning from an instructional perspective. E-Learning allows students to access resources and information anywhere in the world. Under normal circumstances, it's difficult to achieve from e-Learning the same result that can be obtained through traditional face-to-face (F2F) teaching, thus many efforts are done towards this ideal. With the advance of the online learning technology, students enjoy a rich range of interaction while still benefiting from e-Learning's flexible schedules and user-directed paces. With the advance in technology, e-Learning will continue to offer alternatives for meeting national requirements for skilled professionals in periods shorter than conventional teaching. Therefore, the strategy advocated nowadays is to partially step outside the pure e-learning concept, and introducing the hybrid also called blended learning concept that leads to better achievement and higher satisfaction than pure e-Learning. The philosophy behind blended learning is, to combine e-Learning with some form of human intervention. In engineering education, blended learning comes in the form of a

combination of different modes and models of delivery and styles of learning, which can also make use of laboratory work as part of an embedded collaborative virtual lab [2], [3] and modeling and simulation [4], [5]. But several questions rises:

- What, however, does blended actually mean?
- What is blended with what?.

The answer can only be given tessellated :

- BL is agreed as net-based learning arrangement accompanied – or enriched – by F2F learning arrangements
- BL using online technology versus using pure F2F learning
- BL using different didactic approaches for presenting learning content online
- BL using different approaches to support the collaboration of learners
- BL using different approaches to support communication between tutors and learners and among learners
- BL has many possibilities to achieve blend of learning arrangements
- BL content delivery system → blend of different technologies

which finally result in three main stream topics:

Topic 1:

When assessing to which degree a course should consist of traditional learning (F2F) and e-Learning modules one should look carefully at the didactic strategies and at the technologies that are used for the e-Learning and F2F learning modules.

Topic 2:

Blend of learning arrangements comprises more than just combining online and F2F facilities.

Topic 3:

One important decision designing BL arrangements concerns the collaboration of learners. Various beneficial effects can be ascribed to collaboration of groups.

3 E-Learning: Project Workflow

It is internationally accepted that e-learning projects should pass through at least five phases to accomplish good results. These phases are:

1. Analysis
2. Design
3. Development
4. Implementation
5. Evaluation

The **analysis** part deal with the determination of what is needed for the project. Here there is a need to identify and prioritize the teaching needs and requirements. By analyzing and understanding the needs of universities and students, it is possible to decide in this phase how e-Learning can be integrated in the study programs of the education system. The result of this phase should be the production of a meaningful and effective project plan with an associated timetable showing the milestone for course development and implementation.

During **design**, opinions which assist how the job can be carried out further will be gathered, and layouts will be produced. There is a need to determine the type of learning management system (LMS) and e-Learning standards. The work in this phase include setting course goals, select and arrange course content, understand, estimate and integrate student's backgrounds, select effective instructional modes, build links with stakeholders, suggest recommendations on the pattern of learning sequences, write the syllabus, getting additional advices from experts

The **development** part focuses on creating courses and associated media, which is the core part that require much time. Here what has been planned in the design phase will be put into action which involves the production of any audio/video materials, writing any simulation programs, tailoring any software to meet the needs and requirements, authoring the course content and evaluating the various external resources that will be part of the of study program. If possible, it is important that parts or all, of the e-Learning course is made available for piloting first and testing with mainstream students. This will result in an early feedback and will allow modification to be made before implementation.

Once courses are developed, the next step is the **implementation** phase where courses are given and evaluated. It is important that courses are promoted in a positive way for achieving good results. It is better collecting statistical and management information that may help with any course improvement and functionality. If a course is developed for large number of students, then it is also good to appoint skilled and appropriately trained tutors.

Finally, there is a need to collect student feedback via a course survey so that it is possible to review (**evaluate**) the performance of the e-Learning course against its learning objectives, in terms of take-up, efficiency, effectiveness and return on investment. It is important to assess the experiences of the students to determine where online learning has been a success because there might be parts of the course where a different technique would be more successful.

In the face of numerous pressures from shortage of time, commitment and resources, e-Learning projects at present become more successful if they adopt a form of **hybrid or blended learning**. The term blended learning is used to describe a solution that combines several different delivery methods such as F2F classrooms, live e-Learning, software sharing, and self-paced learning.

4 Identifying Open Courseware

This section highlights the methods and the process of open courseware (OCW) identification and review. Besides, the vital standards and specification of some elements of the criteria and the technical requirements, the methodology used to identify, review and evaluate (finalize) was introduced as a process workflow, shown in Fig. 1.

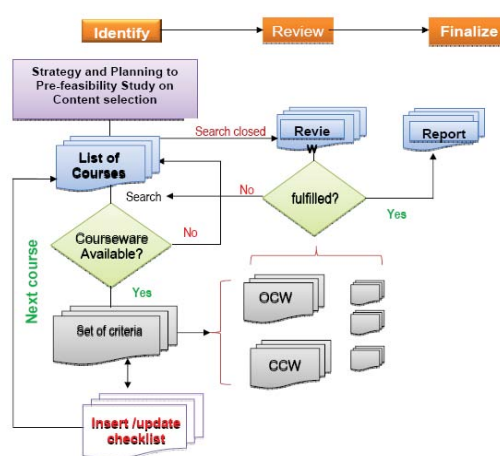


Figure 1. Open Courseware Identification and Review Process Workflow

5 Customizing Open Courseware

From Taylorism to Tailorism? Companies have adopt strategies which embrace both a closer reaction to the customers needs and efficiency by means of customization. Customization can be deemed to make use of flexible computer-aided manufacturing systems to produce custom output, combining low unit costs of production with the flexibility of individual customization. Implementations of customization are operational today in industry like software-based product configurations' which make it possible to add and/or change functionalities of a core product or to build fully custom enclosures from scratch. The degree of customization has only seen limited adoption, e.g. individual products doesn't often mean a product is produced individually, but rather that similar variants of the same produced item are available. Customization applied to open courseware is seen as combing low or zero cost for open courseware material with the flexibility of packaging this material into a specific learning object that fulfill customers – instructors and learners at the university level– needs. Open courseware customization make it possible to merge content from different sources, add exercises, lab project work or building fully custom enclosures from scratch.

6 Quality Assurance

The prime objective is to design an e-Learning customization process model, to qualify e-Learning material developers and editors as well as deploying a sustainable E-Learning in Ethiopia's higher education. Vividly, the central focus of the this model project lies on development and test activities of various integrated processes:

- qualification of teaching personnel as top-down model to gain experiences with minimum cost outlay, so that they can efficiently develop and implement e-Learning materials within short period of time,
- instruments to simplify the process of qualification, production and implementation e-Learning giving more weight to pedagogy (i.e. didactics-led, innovation-dynamic), appropriate technology, low cost and sustainability,
- production of high-quality e-Learning materials which opens venue for better and effective learning chances by the qualified teaching personnel in a network system, effective deployment of the e-Learning materials and other

instruments of e-Learners, and replication of the system and the e-Learning materials to different learners in various learning scenarios.

7 Integrating Simulation into Blended Learning

Important didactical elements for the composition of content within an authoring and learning environment are simulation models. The pivotal demands a simulation coupling within a learning environment must satisfy are:

- quality assurance of the models
- platform independency of the clients and a web-based access to the model
- customization of the user interface and the level of detail depending on the learners background by the author
- multi-user access to models and a user specific administration of simulation runs and results

The advantages and disadvantages of typical solutions to integrate simulation models into e-Learning environments (reprogramming in a new programming language, using a terminal client, etc.) need a specific system architecture. Embedding simulation in a client/server architecture has proven to be the best solution and achieves the demands mentioned before for coupling simulation with a learning environment, shows Fig. 2.

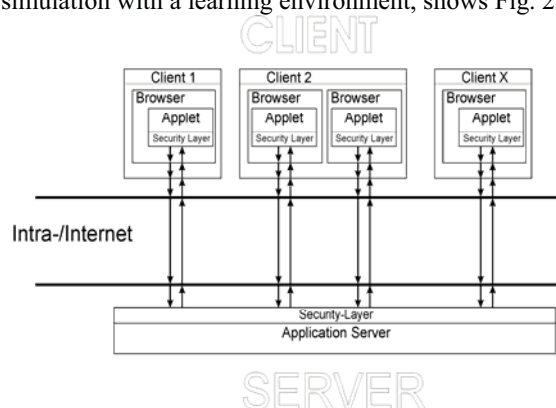


Fig. 2: Embedding Simulation in a Client-Server Architecture

8 Conclusion

Identifying open courseware content and its customization and reuse is an approach that allow running e-Learning at a big scale within short time. Integrating e-Learning with modeling and simulation is an ideal problem-oriented learning strategy.

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