

A Regional Integrated Virtual Learning Environment: The AOU's Experience

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ABSTRACT

In this paper we propose to construct a Regional Integrated Virtual Learning Environment (RIVLE) for the Arab Open University (AOU). AOU is a new nonprofit learning institution with branches in six Arab countries and more branches scheduled to open in the near future. The university adopts an open learning methodology. We describe the major elements of the RIVLE and their interaction. We present a generic interface between the RIVLE and the Student Information System (SIS). We focus on the characteristics of the pedagogical model in the Arab Open University context and explain why RIVLE would be a perfect fit for this model. We argue that the potential benefits of a RIVLE are realized in such a setting. We also study the possibility of extending the RIVLE to existing learning institutions in the region.

Keywords: VLE, e-Learning, Web-Courses, CMC, Open Learning.

1 Introduction

With the increased demand for higher education and the limited resources available for traditional learning environment, the need for nontraditional and more innovative learning methods is very obvious. Such methods should minimize the use of physical resources while maximizing the ability of accommodating potential students. With this in mind, AOU has been established, with branches across many Arab countries, to provide higher education opportunities to many potential students, who otherwise may not have the chance to attend higher education due to many reasons. AOU is a non-profit organization that adopts an open learning methodology to be able to accommodate larger number of students and allow a great deal of flexibility while maintaining respectable academic standards. AOU has partnerships with the United Kingdom Open University (UKOU) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) to help ensure a good quality of learning.

As part of achieving the above goals we present this system whose aim is to provide a Regional Integrated Virtual Learning Environment (RIVLE) that is initially applicable to the AOU context but could be extended to various learning paradigms including traditional and distance learning techniques. The RIVLE when applied in a certain learning paradigm will augment the techniques used in the hosting institution with other content delivery methods in order to achieve an optimum learning experience where the student can benefit from many learning mediums. In addition, the student can interact with the course and with the tutor using methods other than face-to-face contact.

There has been a lot of effort in the research and development to use computer technology in learning [1, 2, 5, 6]. In this paper we present the components of a regional integrated virtual learning environment that utilizes new computer and communication technologies in order to provide an integrated learning environment. The RIVLE consists of inter-related modules that can be implemented in continuous stages where each stage can be one or more modules of the RIVLE. The main goal is to perform research on the RIVLE components, within the AOU context, in terms of identifying the basic elements and designing the interaction between these elements. The other goal is to study whether the proposed RIVLE can be modified to be a generic one, in the sense that it is a general purpose medium that can be plugged into

many learning institutions and hence, concepts discussed in this paper need not be restricted to any context. We believe that such an environment can be deployed to varying degrees in open learning and in traditional learning institutions. However we focus on the characteristics of the open learning methodology as applied in the AOU. We illustrate how these characteristics can be augmented by the RIVLE and show how potential benefits are realized when deploying the RIVLE to the AOU context. Thus partially answering one of research question posed in [3] where the issue was "*what could be the conditions where the potential benefits of a VLE are translated into real advantages*".

The proposed RIVLE will support a number of teaching/learning services such as *course websites, e-TMA, e-Testing, e-Tutoring* as well as an *integrated Computer Mediated Communication* which offers video, voice, and text-based communication. In implementing the various elements of the RIVLE, we study the relevant issues with regards to the three main dimensions outlined in [3]; these dimension are teaching and learning issues, institutional issue, and cross-cultural issues. These are all relevant in our study, especially that AOU is spread across many Arab countries which gives rise to many institutional and cross cultural issues that need to be considered when implementing the RIVLE.

The rest of the paper is organized as follows: In Section 2 we present some related work. Next we discuss the pedagogical model in the AOU and how the RIVLE will be instrumental in dealing with many issues. In Section 4 we give the technical specifications of the RIVLE along with justifications on how the different RIVLE components and functions interact. Conclusions are given in the last section.

2 Related Work

The recent years have witnessed lots of research on discovering alternative educational delivery methods in an attempt to reduce costs of the existing traditional methods while enhancing the quality of the teaching/learning processes. These research efforts are derived by the advent of low cost and high performance Information and Communication Technologies (ICTs).

To facilitate the use of ICT in learning, many educational institutions utilize Learning Management Systems (LMS) to produce their own VLEs. There are many commercially available LMSs such as WebCT, CoSE and Blackboard. For a more detailed study of LMSs and a comparison between them see [1, 4, 6]. It is worth noting that the term LMS and VLE are used interchangeably in many references. However, in our paper, we look at the LMS as what you would normally get from a software vendor and then the VLE is the result of the effort performed to add the courses, define the environment and so on. We adopt the definition in [3] of a VLE: "*any combination of distance and face-to-face interaction, where some kind of space virtuality is present*".

There are currently many projects who aim to construct VLEs in lots of universities. The work in [2] discusses the implementations of VLEs in five different UK universities. The paper reports that all of these universities independently chose Blackboard as the LMS for their VLEs. There has been efforts to build a uniform conceptualisation and understanding of VLEs based on how they are implemented across

different contexts, e.g. IVETTE [3]. Some of the issue raised in [3] which are relevant to our discussion is the observation that the implementation of VLEs is no longer a luxury, but rather a necessary response by the educational systems to the new, urgent, and very fundamental changes in our societies.

3 Pedagogical model in AOU

In what follows we describe the major properties of the pedagogical model applied in the AOU that are relevant to our discussion of the RIVLE. We discuss the meaning of *open learning* in our context and the flexibility provided by the AOU model. We also discuss the unique institutional structure of the AOU. We highlight some key roles or functions present in the learning process in the AOU.

3.1 Institutional structure of the AOU

AOU is a pan-Arab university with branches across many Arab countries (six already operating with more in the near future). Each branch has one or more teaching centers that could be spread throughout the country of that particular branch. The headquarters of the AOU is located in Kuwait where the various colleges are located. Faculty members can be located in the headquarters or in the various branches. This structure gives rise to many issues and the RIVLE can be instrumental in dealing with them; these issues include:

- *Standardization*- Having a university spread throughout many countries requires more emphasis on applying specific standards than in the case where a university has one location or is only located in one country. Having a RIVLE across all branches would at least guarantee a uniform interface that students and staff members across all branches and centers can use as a comprehensive learning/teaching tool.
- *Communication*- The need for an efficient and inexpensive method of interaction and communication is obvious. As will be seen in the next section, RIVLE will provide an easy way of communicating through the use of conferencing, the way conferences are divided among various members of the university (staff and/or students) is mainly based on a certain need. Thus, faculty members can hold meetings and discussions through conferencing or Visio-conferencing. Students in many countries can have shared conferences through which they could exchange ideas and communicate effectively. This could facilitate a form of *cross-cultural* interaction amongst many cultures.

3.2 Open methodology

The philosophy of the AOU is to provide quality higher education opportunities to as many potential students as possible. Certain sectors, who might have been otherwise deprived, can now utilize such an opportunity and continue their studies. These sectors mostly include women (who are now housewives or live in remote areas), older students who are now employed and don't have the time or other resources to attend traditional universities, or students whose situation did not qualify them to enter any university after high school. So, in one sense, the AOU is open to all of these sectors and allows them a great deal of *flexibility* to attend classes (we will discuss the flexibility provided in the next point). In another sense, the AOU is a non-profit institution, so university fees are inexpensive compared to other higher education institutions which makes it affordable to many candidates. Finally, the AOU is open in the sense it's mostly free from the many restrictions or constraints imposed by regular higher education institutions which include time, space and content delivery methods. The RIVLE fits perfectly within this philosophy because it further alleviates such constraints by giving the students a great deal of freedom in organizing and conducting the learning process.

3.3 Flexibility

The AOU is different than many other open learning institutions because it has a mandatory face-to-face component of each course. In other words, students registering for any course have to attend regular classes or tutorials. This seems to be a bit contradictory to the title of this point; however, the number of such tutorials is significantly less than traditional institutions. For example, a 3-credit course would require students to attend 48 hours in a regular university for its completion while a similar course in the AOU would require them to attend 12 hours only. Furthermore, the tutorials' schedule is reasonably redundant so a student doesn't need to stick to a regular time in attending tutorials. A tutorial for a certain course is repeated throughout the week days and times so when a student misses a tutorial he/she can make up later on. To illustrate the point, we have been able to accommodate airline personnel and students with similar jobs who have a busy and constantly changing schedule as part of our student body. So although the face-to-face tutorial restriction exists, the student still has a lot of flexibility in terms of being able to attend these tutorials. Also, since the structure of the AOU can expand to many locations, a potential student has a lot of flexibility in deciding which center to attend. The RIVLE can enhance such flexibility and support face-to-face tutorials by publishing the various tutorials schedules (can also publish the basic concepts discussed in the tutorial) and even sending students who miss tutorials some reminders and ways of making up the tutorial.

3.4 Key Functions in the AOU

Open learning differs from traditional learning in the sense that there are many more functions or roles involved in the learning process. In a traditional university there are two main functions in the teaching/learning process, these are tutor/student functions and administrative functions. In open learning, the pedagogical model relies on many other functions, besides the above two, in ensuring a good learning experience. Some of these functions are:

- *Staff Tutor Functions* – A staff tutor is typically responsible for a group of tutors in a certain course. The staff tutor roles include quality assurance processes that support the tutors in terms of monitoring and enhancing their tasks.
- *Course Designer or Course Team Functions* – Each course will have its own design team that will write the course material and decide on the main issues relating to the course such as references, what types of media to utilize in that course, activities and so on.
- *Course Coordinator Functions* – Each course will also have an overall coordinator who oversees the presentation of the course in all branches and centers. The coordinator works closely with the course team and the staff tutors to ensure an overall successful presentation.

In addition there are other functions to facilitate the quality assurance processes such as *external examiners*. Similarly, as mentioned in [3] a VLE requires a fundamental change in the roles of academic and technical staff. This seems like a perfect fit because open learning in general (and the AOU in particular) already requires a host of different functions and roles, so adding new ones will not be that hard to adapt to. Furthermore, the RIVLE will conveniently facilitate the functions above and will make the quality assurance process a manageable task.

In the next section we will elaborate on the components of the RIVLE which will clarify the arguments we presented here about the use of the RIVLE in the pedagogical model of the AOU.

4 Technical Specification for the Proposed RIVLE

The RIVLE environment integrates the curriculum with computer-mediated communication, electronic assignment handling, electronic testing, and electronic tutoring systems designed to deliver audio, video, and animated tutoring materials. These essential constituents which are interfaced with the student information system, access to world-wide digital libraries, and off-line learning resources make up the proposed RIVLE. Access to the different components of the RIVLE resources that are related to a certain course is initially granted from within the student information system once the student registers for that course. However, the RIVLE administrators should be able to monitor, customize and control the RIVLE resources from a standard web browser. Administration facilities will include:

Figure 1 shows a block diagram of the proposed RIVLE. In the sequel, we will discuss the function and services in each of the proposed system components in more detail.

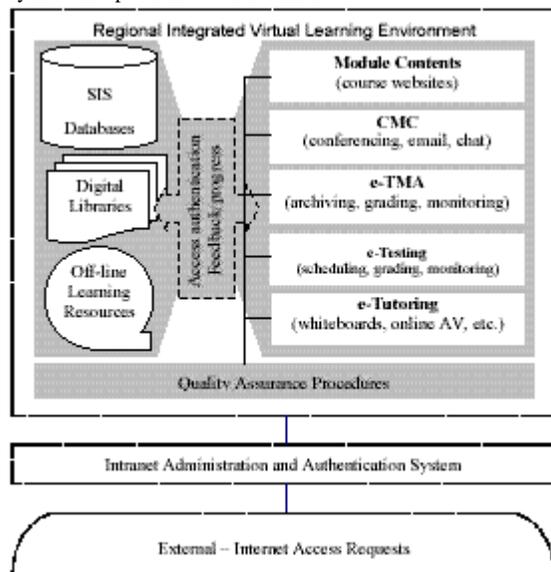


Figure 1: The proposed Regional Integrated Virtual Learning Environment.

4.1 Module Contents

The first part of the RIVLE is the module contents, where each course should have its own website. The student should be able to easily get to a given course site from the main institution's website. In other words the navigation of the links in the website should be clear. There could be many ways to get to the course site, for example courses can be organized by deanship; alternatively courses can be obtained using search (course finder) engines. The view of the course website depends on who is accessing the site. The course website should provide the following views:

1. *General public view*: This view is intended for anyone visiting the institution's website for information about a particular course.
 - o General course description, objectives, and itemized module contents.
 - o Credit hours and credit equivalence.
 - o Time and places for future presentations.
 - o Number of TMAs, quizzes, exams, etc.
2. *Registered students view*: This view is intended for students who are currently registered in a particular course. The information provided in this view depends on the course itself. Course material could range from a totally web-based course to a course with minimal information on the web. In addition to the information provided in the general public view, we feel that as a *minimum* the following information should be available:

- o Course calendar and study guides.
 - o TMAs description, progress plans, and deadlines.
 - o Grade distribution.
 - o Actual module contents.
 - o Sample quizzes and final exams.
 - o Smart agents to perform timely tasks such as TMA deadline reminders and routine broadcasts to initiate group activities.
3. *Tutors view*: In addition to the information provided in the previous views, other information can be available here that is appropriate for tutors. Examples of the information provided here is the *tutor guide* and a *tracking system* that allows the tutor to monitor student progress through website readings and exercises.
 4. *Designer or course author view*: A privileged area which allows the designers to update the course website.

4.2 Computer Mediated Communication (CMC)

In the first part of the RIVLE (course websites) the student is mostly receiving information. The tutor/students interaction is limited to progress monitoring and other routine exercise checklist updates. The CMC module of the RIVLE is dedicated for utilizing the computer to enable additional student-tutor interaction. For the proposed RIVLE we suggest to use CMC in the following forms:

- o *Online Conferencing*.
- o *E-mail*.
- o *Chatting*.
- o *White-boards*.
- o *Video conferencing*.

4.3 Electronic Tutor Marked Assignment (e-TMA)

This module of the RIVLE is concerned with one of the major learning methods in open learning which is the Tutor Marked Assignment or TMA in short. Each course offered by the institution has a number of TMAs. Students are required to submit their TMAs and tutors should grade them and comment on the student assignment. This form of interaction is very crucial in modern learning methodologies because it provides the student with a form of constructive feedback from the tutor.

Some quality assurance regulations might require that TMA grading and feedback need to be monitored by senior academic members. Regulations might also require that TMAs need to be archived for future retrieval. Such a process naturally lends itself to the use of computer technology. We propose an electronic TMA system that will accommodate such potential requirements, regulate and automate the TMA handling process that will lead to many benefits as can be seen from the description below. The e-TMA process can be summarized in the following major points:

- *Submission*: Whenever possible, students are required to submit their TMAs through an electronic submission system (could be an online conference with proper access privileges). This of course will greatly enhance the TMA submission process because it relieves the tutor from the burden of worrying about who had submitted the TMA and who hadn't. The student also will have a way of verifying whether the TMA was indeed received by the system. University administration can regulate TMA deadlines by monitoring this submission system. Note that for TMAs in some courses, it might not be possible to hand them through an electronic submission system. However, we believe that course authors and designers should take into consideration the benefits of such a method of submission and try to use it whenever possible. We recommend that all university students be trained on the use of the e-TMA submission in some early course, that is actually a requirement for many universities in the current time.

- **Grading:** After submitting the TMA through the system, each tutor will have his/her TMAs in a predetermined place. The tutor can then grade the TMA and send his/her comments and feedback to the student through the e-TMA system. The e-TMA system should interact with the SIS system in a way that guarantees accurate and timely postings of students TMA grades.
- **Monitoring and Quality Assurance:** Through the e-TMA system monitoring and quality assurance processes are facilitated for staff tutors and others. The e-TMA can randomly choose a set of TMAs for a certain tutor to be monitored. The number of TMAs monitored for each tutor can depend on some rating where experienced tutors have a fewer number of TMAs monitored than newer tutors. The system can keep track of such a rating. Alternatively, the staff tutor can pick any particular TMA and monitor it which means that a staff tutor will have the necessary authorizations to access the TMAs. The e-TMA system should keep track of the monitored TMAs and channel them to the appropriate locations. As an example the tutor should get back the monitored TMA with feedback from the staff tutor. Also, copies of the monitored TMAs need to be sent to the corresponding deanship administration. In addition, external examiners can be given authority to inspect random TMAs.
- **Archiving:** The last major component of the e-TMA system is the archiving and retrieval part. TMAs should be archived in some long term storage device. A dedicated server should be provided which will facilitate for many operations on the stored TMAs; some of these operations include:
 - Retrieval of some TMAs based on some criteria such as a student name or a tutor name and a year.
 - Search the whole TMA database according to some keyword within the TMA itself.
 - Cross-referencing of the TMAs for a certain subject. This feature will allow comparing and inspecting TMAs to see if some potential plagiarism took place and then take the necessary action. This is a nice feature of the e-TMA system that will help in achieving the TMA objectives. As we mentioned earlier the TMA component in open learning is very crucial and having the students rely on themselves in doing their own TMA is very important.
- **Intelligent agents:** The use of intelligent agents are designed to help in a number of online facilitators' routine tasks such as reminding students on assignments cut-off dates, sending out exercises, and answering frequently-asked-questions. An empirical study evaluating the effectiveness of intelligent agents in online instruction showed remarkable improvement in the assignment completion rate [2].

4.4 Electronic Testing (e-Testing)

The proposed RIVLE supports an integrated seamless online assessment that extends beyond conventional essays and examinations. The enhanced interactive capability of the Internet provides means for more reliable assessments which can take the form of evaluation measures such as portfolios, summary statistics of learners' paths through instructional materials, diagnosis, and reflection and self-assessment. The assessment tools can be in one of the many known forms ranging from fully automated test generation, grading, feedback, and so on, to partially automated tests. Whatever the testing strategy is, authentication will remain a bottle neck for many VLEs with no face-to-face tutorial option.

Security issues are at the core of any VLE, particularly for the e-Testing part of the environment. There are a number of approaches to deal with the security issues. An expensive and restricted approach (yet a viable approach in the AOU pedagogical model) is to enforce testing under protected conditions in a monitored laboratory or classroom. Another approach is to relax time, but still enforce testing under controlled conditions. In this approach testing is accomplished online and the student authentication takes place once a student gets into the testing area. A third approach is to relax time and place by allowing students to take a test off-line and then submit it at a later time. The last approach is economic and flexible option that requires constant monitoring of the student progress through email, conferencing as well as other CMC means.

Feedback for any assessment activity is a vital issue in the success of learning in general and to VLEs in particular. In e-Testing, feedback generation can be automated by associating feedback with every question which may include links to reinforce the correct response or explain the rationale and guide the student to a more appropriate answer. Technically this is realized by using Java scripts to compare student filled forms, radio buttons, check boxes, or other types of tests against preset answers in a database. Through these scripts, individual students will get deeper explanation on their answers and active links can guide them to additional information. Furthermore, additional scripts can also be written to capture students' answers and then hold them in a database for detailed tutor critique when more open-ended questions are used.

Tracking is needed in an e-Testing system to record the student's performance on test questions and answers. In addition to computation of student grades, the tracking record can be used by sophisticated Java scripts to build individualized feedback on the student performance in a given test.

4.5 Electronic Tutoring (e-Tutoring)

In our context, an e-tutorial is an interactive and real time tutorial conducted by the tutor to a number of students using computer communication technology (possibly including voice and picture). Students and their tutor can be a long distance away from each other in such a setting. This can be an alternative to face-to-face tutorials especially in remote areas where students and tutors can be hundreds of kilometers apart. CMC described above and in particular video conferencing technology can be utilized to accomplish e-tutoring.

The e-tutoring component of the RIVLE is arguably the most expensive in terms of setup and maintenance. However, it provides many advantages and newer possibilities to the institution applying the RIVLE. E-tutorials should be scheduled and treated as regular tutorials. It provides a more automated way of tracking students' progress and tutors' performance. Figure 2 below shows the various ways students and tutors can interact in this system.

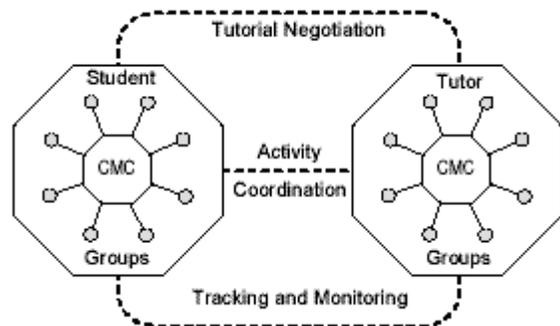


Figure 2: Student-tutor interaction in e-Tutoring system.

Implementing e-Tutoring with audio-video support in the AOU pedagogical model will be supported by the UNESCO's initiative to

build a VSAT network connecting the university branches. Such facilities will enable the AOU to conduct regular e-tutorials or conduct tutor training sessions, where the course coordinator might hold some training sessions for tutors. Also, staff meetings can be held through the same technology.

4.5 Student Information System (SIS)

An important issue of any VLE is how it interacts with the existing SIS system and what type of information is exchanged between the two systems. Our RIVLE requires various information from the SIS these include:

- *New students:* Whenever a new student is registered the RIVLE has to know about it so that this student can be given a user name and password to access the specified RIVLE components.
- *Student course registration:* Once the RIVLE is notified, it will allow the student access to the course website and grant additional privileges to access the corresponding RIVLE resources for that course.
- *Tutor course load:* RIVLE needs this information to grant the tutor the necessary privileges for the corresponding course resources.

The SIS requires that grades in e-quizzes and e-TMAs be delivered so that it can be properly posted. We suggest that the SIS/RIVLE interface be a separate module with its own specifications to facilitate the possibility of porting the RIVLE to other institutions with a different SIS system.

4.6 Digital Libraries and Off-line Learning Resources

To complement the RIVLE the need for online libraries is very crucial. Such a resource can be utilized by course designers when writing the course material. Hence, an efficient search utility is needed to aid the designers in selecting the appropriate resource. Students and staff can also benefit from such a library and can also benefit from the existence of traditional offline libraries so that they can complement the teaching process.

4.7 Quality Assurance

The quality assurance process is vital for any educational institute, it is even more crucial for open learning institutions. The various components of the RIVLE makes the quality assurance process a manageable task for those who are responsible for it. The RIVLE allows for various levels of access authorizations so that persons participating in quality assurance can monitor the various processes being performed via the RIVLE.

5 Conclusion

In this paper we describe the elements of a RIVLE to be implemented for the AOU which is a non-profit higher education institute located across many Arab countries. We outlined the main characteristics of the pedagogical model in the AOU and how the RIVLE can be very instrumental in facilitating an efficient operation of many processes in the AOU which makes the RIVLE an absolute necessity rather than a luxury in the AOU context. We gave a detailed description of each component of the RIVLE and how these components interact to form an integrated environment. We are currently at the early stages of implementing some of the components of the RIVLE in one branch. It remains to be seen what type of stages we go through to implement the full RIVLE. It is also important to note what type of cross-cultural and administrative issues we face especially that the RIVLE should be spread across many countries.

References

- [1] Bourne, J. R., "Net-Learning: Strategies for On-Campus and Off-Campus Network-enabled Learning," *Journal of Asynchronous Learning Networks*, Vol. 2, No. 2, 1998, pp. 70-88.
- [2] Ingraham, B., Watson, B., McDowell, L., Brockett, A., & Fitzpatrick, S. "Evaluating and Implementing learning Environments: A United Kingdom Experience," *Educational Technology Review*, Vol. 10, No. 2, 2002, pp. 28-51.
- [3] Mario Barajas and Martin Owen, "Implementing Virtual Learning Environments: Looking for Holistic Approach," *Educational Technology and Society*, Vol. 3, No. 3, 2000, pp. 39-53.
- [4] Sandy Britain and Oleg Liber, "A Framework for Pedagogical Evaluation of Virtual Learning Environments," JTAP Report 573, <http://www.jtap.ac.uk/reports/htm/jtap-041.html>
- [5] Thaiupathump, C., Bourne, J. & Campbell, J. O., "Intelligent Agents for Online Learning," *Journal of Asynchronous Learning Networks*, Vol. 3, No. 2, 1999, pp. 1-19.
- [6] Thelma Looms, "Survey of Course and Test Delivery/Management Systems for Distance Learning," online and regularly updated survey <http://student.seas.gwu.edu/~tlooms/assess.html>