

Adopting an e-Exam Platform in Lebanese French University to Enhance the University Academic Examinations

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Abstract

Due to the widespread use of information and communication technologies in education environment to enhance learning activities, many universities and colleges around world are adopting to e-exam systems to provide a better quality exam with the effective teaching and learning environment.

The significant idea behind this paper is to highlight the experience of the first e-Exam platform officially used in Kurdistan Region of Iraq.

The developed e-Exam was implemented upon client/server network architecture on three computer laboratories at the department of IT in LFU (Lebanese French University). This e-Exam platform was being used to replace most of the paper based examinations since October 2015. By the end of 2016/2017 academic year, around 180 e-Exams (Final and Midterm exams) were done for morning and evening undergraduate students in IT programme.

The conceptual design, the main components and his subsystems were explained in this paper. A usability test of LFU e-Exam platform and questionnaires for both lecturers and students were carried out to assess satisfaction and effectiveness. Finally, the empirical outcomes were achieved and mentioned in this paper.

Keywords:

Lebanese French University (LFU), e-Exam, Computer based Test (CBT), Computer based Exam (CBE), e-Exam Package.

I. INTRODUCTION

The first use of computer for assessments dates back to the early 1990s, as an initiative to develop the education environment [1]. The use of information and communication technologies is skyrocketing, young people today live in a world characterized by enforcing the ICT and the modern media culture [2]. In response to this fact, the philosophy of education of many universities began shifted gradually towards integrating computers and ICT in teaching and learning to establish effective education environment. And many universities had been adopted on advanced learning strategies like Blended Learning Strategy, Flip Learning Strategy, Social Media Learning Strategy and so on [3].

The modern educational environment has special attention to strategies that generate awareness, initiative, inquiry, collaboration, and contribution to new knowledge in obvious ways based computers [4]. For examples, there are 400 University in India using Akash strategy learning [5], 42.000 Schools in Turkey using Fatih strategy learning [6], 141.000 laptops were distributed on schools by Australian government [7]; BYOD (Bring Your Own Device) strategy for education has led to an environment where students use their own devices for daily school related tasks in mature market countries of BYOD such as UK, France, and Germany [8]. And most popular tests such as TOEFL, IELTS, IC3, ICDL and more all of them are conducted either partially or fully computer based [9].

All of these initiative and strategies have generated a new face for education style, but most of them have added reason to adopt the new style of exams, the current e-Exam systems that have been used in modern education environment are still suffering from many problems, but in spite they solved some traditional exam problems. Lebanese French University (LFU) highlighted these issues and have developed a new e-Exam platform to provide a better quality exam in terms of saving cost, time, effort and cheating probability.

The significant idea behind this paper is to highlight the experience of the first e-Exam platform officially used in Kurdistan Region of Iraq which satisfies both lecturers and students in term of provide a better quality exam using ICT within an existing effective teaching environment; and to open the door for

the research community to perform newer research works on the related e-Exam systems.

For that, this paper presented in the following structure. In the next section, the literature review will be presented. E-Exam’ term and benefits will be presented. The conceptual design of developed e-Exam platform using data flow diagram will be followed. This is followed by explaining the details of main subsystems which are integrated and worked together to deliver the e-Examinations. The implemented solution of conducting e-Exam will be followed. This is followed by the usability test, questionnaires and empirical outcomes at the department of IT in LFU. The paper ends with a conclusion section.

II. LITERATURE REVIEW

Many universities and colleges around world are adopting to e-exam systems to provide a better quality exam with the effective teaching and learning environment as shown in table 1.

Table 1. The Adopted e-Exam

Country	University	The Adopted e-Exam
Australia	University of Tasmania (www.utas.edu.au)	eExam system is used for university entrance since 2013 [6].
	University of Queensland (uq.edu.au)	e-Exam system is used for six courses since 2014, these exams depended on bring-your-own-device (BYOD) to classroom [6].
Emirates	Hamdan Bin Mohammed Smart University (hbmsu.ac.ae)	The examinations of students in this university might be online or traditional exams depending on the course type [7].
Finland	University of Helsinki (helsinki.fi)	eExams have been conducted in computer classrooms for around ten years, while traditionally exams written with pen on paper are most often used till now [12].

	Turku University of Applied Sciences (tuas.fi)	Soft Tutor e-Exam system is used since June 2014. Essentially, the situation is improving, but the number of teachers actively using the e-Exam system is still low [13].
France	Universite Joseph Fourier (www.ujf-grenoble.fr)	Pharmacy exams have been organized electronically using tablet computers since 2014 [14].
Netherland	VU University Amsterdam (www.vu.nl)	Computer based exams is using for test Bachelor students of three departments (Medicine, Life Science, Art) [12].
	Utrecht University (uu.nl)	Remindo digital assessment software is used since 2015 [12].
Nigeria	Federal University of Technology Minna (futminna.edu.ng), University of Ilorin (unilorin.edu.ng), Covenant University Ota (covenantuniversity.edu.ng), National Open University of Nigeria (nou.edu.ng).	Using different e-Exam systems for their test and exams [15].
UK	University College London (ucl.ac.uk)	Moodle is being used for online quizzes and examinations beside used it as a course management system [16].
	University of Nottingham (nottingham.ac.uk/rogo)	Rogō e-Exam system is used for conducting e-assessments [21].

Regarding Iraq experience in the field of e-Exams, up to our knowledge:

- In Kerbala University, College of Science have designed and implemented a secure client/server e-Examinations system for colleges of sciences students [17].

- In University of Kufa, Faculty of Archaeology and Heritage also have adopted e-Examinations for students of both the two departments, the old Iraqi antiquities and Islamic antiquities through the e-learning environment using Moodle [18].
- In Lebanese French University, department of IT have designed and implemented a client/server e-Exam platform to replace all traditional exams with e-Exams for morning and evening students since October 2015 [19].

Besides that, there are many researchers focused on adopting and transition to e-Exams systems:

- Akinsanmi et al. developed a web application for e-assessments which runs through a web browser then it depends on the internet, and it has only multiple choices questions [20].
- Adebayo and Muhammad proposed an eExam system and deployed it in six of Nigerian's universities, it runs on internet and intranet, and it starts by taking fingerprints as security measure, then the students will get a multiple choice questions which will be corrected directly after students finish the answers and show their results [15].
- Magdi el al proposed a web-based exam system with an auto-grading feature for four types of multiple choices, fill-in the blanks, matching, numeric, and essay questions which require grading by a lecturer [21].
- Tufekci et al proposed an online exam system called Mobi which works good in mobile and web modules; sometimes there were problems with reading questions because some mobile phones do not have graphic display function besides a difficulty in reviewing answers in mobile rather than the web [22].
- Al-Hakeem and Abdulrahman developed a new e-Exam Platform called LFU-eExam which runs through a web browser over flexible client/server network architecture with many features that related to easy web-based application, friendly user interface, multiple question types, multimedia, auto marking, rapidly available scores, resume capability, and auto-submit feature to enhance the university academic examinations for department of IT at Lebanese French University [19].

III. e-EXAMS' TEAM AND BENEFITS

e-Exam module is a part of e-learning platforms. e-Exam (Electronic examination) usually is a timed, supervised, closed tasks exam (short answer task) that students take independently in the e-Exam room using a standalone computer or connected computer to a network [23]. The closed tasks e-exam is in a form of multiple choices, fill-in the blanks, matching, numeric, and essay questions, which enriched with multimedia contents and other features like time measurement or a choice of questions in a random manner. Much more difficult is automatic evaluation of the open task, because the set of proper solutions may be infinite. Moreover, incomplete or inaccurate solutions should be graded with a reduced score [23].

Although they are witnessing benefits of using technology in the life, the education sector is still suffering from a real problem related to the type of traditional paper and pen exams. These traditional exams are still used in this technological era where electronic computer devices have replaced most of the paper-based test systems (PBT). Researchers highlighted some problems that related to the traditional paper and pen exam which is also called PBT as a following: The PBT is not being able to provide interaction with test items, to provide real-life environment by using dynamic graphics and sound and enabling immediate score/result report. Educational experts consider those features that are increasingly used to enhance educational assessments [24]. In a PBT it is not likely to record accurate information, such as item response times [13]. The PBT requires printing, storage, and distribution of booklets, in addition to the collection and scanning of answer sheets, these are no longer suitable [24]. Traditional pen and paper exams have a few methods for assessment [13].

By using e-Exams many common problems of traditional exam could be solved to provide a better quality exam in terms of saving cost, time and effort.

Table 2 below summarizes the issues addressed by conducting e-Exams. There are some other papers also cited these advantages of e-Exams over paper based exams [25] [21] [26].

Table 2. E-Exam Benefits

Beneficiaries	Benefits
Students	Less stress, fair grading and punctual timing.
Teachers	Question banks, no grading time, and responses time analysis.
Faculty or Department	Less papers, and reduce cheating by questions randomization.

IV. DESIGN OF DEVELOPED LFU E-EXAM PLATFORM

e-Exams is a new approach that has been used nowadays around the world. Basically, the computers are used instead of the papers in the exam. And a special system called e-Exam system is used to browse and answer the questions.

The conceptual design of implemented LFU e-Exam platform was carried out using the Data Flow Diagram (DFD), which is a graphical representation of functions performed by a system, the data flow among the functions and the relationship among the entities. Fig. 1 presents the data flow diagram for the developed LFU e-Exam platform.

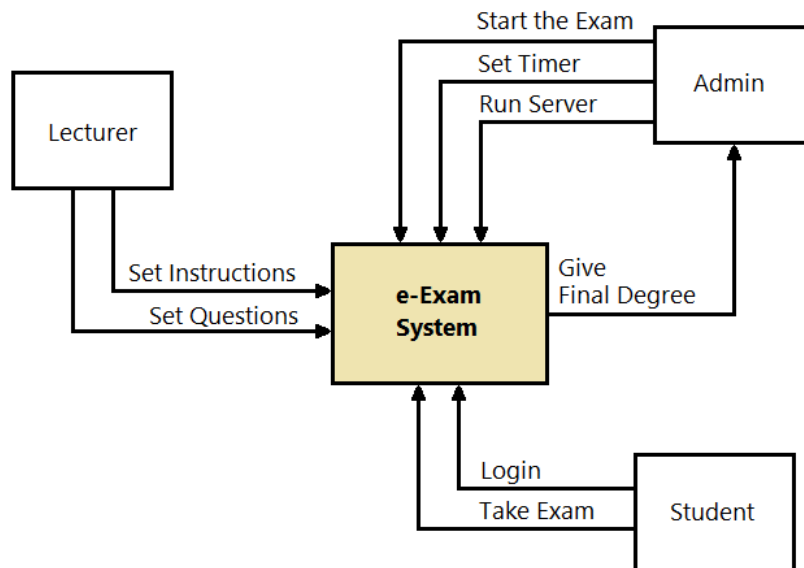


Figure (1): DFD of LFU e-Exam Platform

V. DEVELOPED SUBSYSTEMS

The implemented LFU e-Exam platform includes three main subsystems that are integrated and worked together to deliver the e-Examinations. These subsystems are:

A. The Offline Subsystems

QuizMaker: LFU e-Exam adopts iSpring QuizMaker 7 as a software to create questions database and to generate e-Exam package by randomize set of questions from this questions database. Lecturers (Examiners) who will use QuizMaker offline to create questions database rather than question sheet, set exam's time and special instructions, then upload it to e-Exam Server online. QuizMaker has many important features such as the availability of several types of questions and it can export the exam in HTML 5 format. The selection of iSpring QuizMaker is based on these vital features:

- **Easy quiz creation and publishing:** Its interface is easy to be used and learned by lecturers and other staff. After creating the exam, there three possible options; the first is to publish into single Flash (.SWF) file output, second is to publish into HTML 5 file. In addition, publishing quiz can be made as a combined Flash + HTML5 output. As a result of the easy creation and publishing of e-Exams, the lecturers become motivated and attracted to use this software.
- **Settings and Delivery:** Quiz time limit, number of attempts for quiz, receive quiz result by email or server, and printing results. All these features give flexibility for lecturers and administrators of the e-Exam by choosing how they want to collect results, and limitations of the e-Exam to become valid.
- **Quiz design and control:** It has 11 graded question and ability to create question groups with shuffled questions and answers. Add different images, videos and equations to the question slide. The variety of questions made lecturers and students more satisfied with the e-Exam usability and credibility. Shuffled questions and answers play important role in decrease cheatings. While using various forms of media aims to make students more engaged with the e-Exam.

- Flexible scoring: Lecturers can grade quiz takers by choosing the suitable scoring system details such as set question marks, partial answer options, and determine passing score. It is also possible to apply same scoring rules for the entire test, or treat each question individually in order to set the question difficulty. This type of flexible scoring enables lecturers to conduct fair and accurate e-Exams according to their course, department, and university requirements.

B. The Server Side Subsystem

Apache Server: The apache software is the core of client/server model, it serves the LFU e-Exam by hosting, running and managing the e-Exam package.

C. The Client Side Subsystem

The LFU e-Exam work with two Client / Side Subsystem, there are:

- e-Exam Package: The LFU e-Exam with HTML5 format that generated by QuizMaker will be an ‘e-Exam Package’, it is easy to be displayed in the clients' computers through special e-Exam browser that was developed for this purpose.
- e-Exam Browser: It’s a special browser implemented using C# to connect the apache server and establish the client/server model. And to access and browse the e-Exam package in a window without the three buttons of minimize, maximize, and close. Removing these three buttons aims to decrease the case of closing the exam window accidentally by students. Additionally, three icons of the special browser for the three stages have been inserted as shortcuts on all client computers' desktops to facilitate the access to exam process for the students.

However, Fig. 3 below show the interface of the browser, the icons of accessing to LFU e-Exams, sample questions, and screen of sending e-exams’ results to the server.

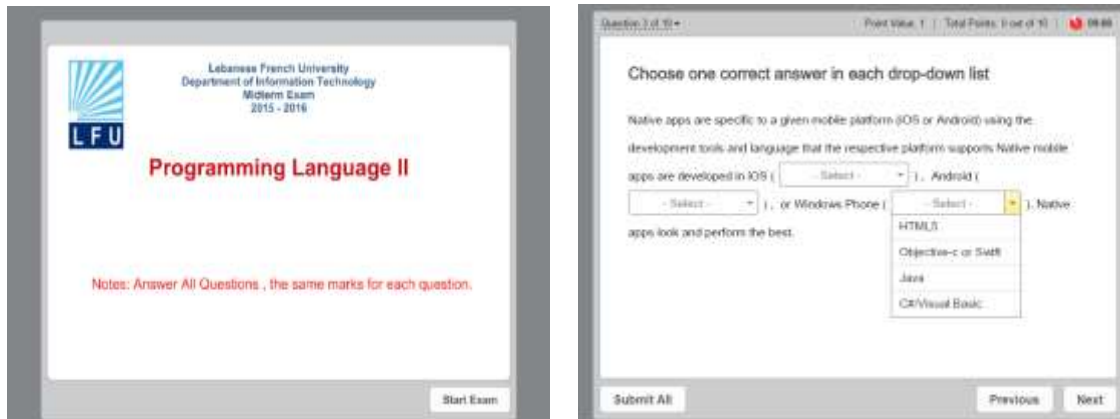


Figure (3): Desktop, the Special Browser Interface, Sample e-Exam Question, and Sending Results to Server Window.

VI. THE IMPLEMENTED LFU E-EXAM PLATFORM

The main purpose of the implemented LFU e-Exam platform is to provide a new solution to enhance the university academic paper based examinations by adopting an electronic application that has different types of questions.

To achieve this mission, the implemented platform has been designed and implemented upon client/server network architecture and depends on some software technologies to be functional and reliable with its five integrated subsystems. The general diagram of implemented LFU e-Exam environment shown in Fig. 4.

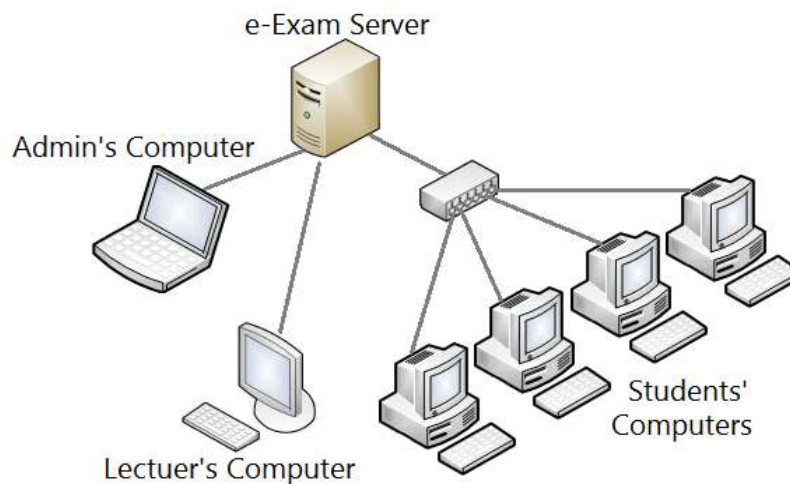


Figure (4): General Diagram of Implemented LFU e-Exam Environment

The LFU e-Exam environment was implemented upon client/server network architecture, and depended on three main work-sides as following:

1. ***Students side:*** Includes the students who are using the implemented LFU e-Exam software on their computers rather than papers, to achieve their examinations. They have access to their computers only, each student just to his computer, and they haven't access to any other part.
2. ***Lecturer(Examiner) side:*** Includes the person (lecturer in default) who create questions database on his computer offline rather than question sheet, set exam's time and special instructions (if there), then upload it to e-Exam Server online. He has limited access to e-Exam server and no access to computers of students.
3. ***Admin side:*** Includes the person (technical staff in default) who manage the network and Subsystems' of e-Exam. He has full access to e-Exam server and computers of students. Lecturer can play both role Examiner and Admin. Also, Admin side includes e-Exam server that works based on Apache Server and MySQL Database.

However, the implemented network includes one server (e-Exam Server), one Switch, 60 clients (Computers of Students) for each one of the three computer laboratories in LFU. All of them are connected with Star LAN network topology and working based on client/server model.

First of all, lectures (examiners) had finished the generated e-Exam package by randomize set of questions (from questions database), after that they will upload the e-Exam packages to apache host server. When Admin activate the exam at the specified date and time, Apache Server allows for clients to access the e-Exam Package that includes questions of exam via e-Exam Browser. The e-Exam Browser allows for students to access and browse the e-Exam, and allows to upload the Final Degree of exams to the Server when the time of exam is finished, as shown in Fig. 2 of this LFU e-Exam model in section VI above.

VII. THE USABILITY TEST, QUESTIONNAIRES AND EMPIRICAL OUTCOMES

A. The Usability Test

This LFU e-Exam platform has been tested and set up by IT department then used in three computer laboratories in the Lebanese French University.

At the beginning the system was used by a few lecturers to make daily quizzes and after it proved its reliability, the IT department decided to engage this LFU e-Exam platform in the midterm and final exams to replace most of the paper based examinations.

A total of 158 participants (142 morning and evening students, 14 teachers and 2 administrators) were chosen to administer the usability test of the platform developed. And a total of 28 subjects were chosen to deliver with the implemented LFU e-Exam platform. All students in department of IT made their final exams for semester one and two since academic years 2015-2016 by using implemented LFU e-Exam platform.

The users' behaviors while carrying out these tasks were also observed. While the thought of the radically change of exam's style may intimidate those who are unfamiliar with this style of exam, LFU e-Exams require only minimal computer knowledge, and the staff of IT department have held many seminars for students to get acquainted with how to move the mouse, answer questions and navigate through the LFU e-Exam.

B. Questionnaires

LFU Researchers a questionnaire were distributed to all students, teachers and administrators who participated in performing LFU e-Exam to determine the acceptability or otherwise of the existing Paper based Exams (PBE) and the implemented LFU e-Exam platform of examining students in Department of IT in Lebanese French University.

The result of the questionnaire was discovered that out of 142 students who were presented in e-Examinations, 135 students are satisfied, 7 students are dissatisfied and no one were indifferent in the 1st Round Questionnaire. While with the 2nd Round Questionnaire, 140 students are satisfied, 2 students are dissatisfied and no one were indifferent.

Also, out of 14 full-time and part-time lecturers (Examiners) that were attested across the department of IT participated in the questionnaire, 12 lecturers are satisfied, 2 lecturers are dissatisfied (they were not excited and said the e-Exam is not Suitable for their subjects), and no one were indifferent in the 1st Round Questionnaire. While with the 2nd Round Questionnaire, 14 lecturers are satisfied.

By the end of 2016/2017 academic year, around 180 e-Exams (Final and Midterm exams) were done by department of IT using LFU e-Exam platform for their morning and evening undergraduate students.

C. The Empirical Outcomes

The problems that are encountered with the traditional methods concerning the cost, time, efforts and cheating probability are noticed during the implementation of the LFU e-Exam and solved as the following:

1. The LFU e-Exam use less number of papers, which will reduce the cost of examination and would preserve the environmental conditions.
2. The number of people are required to supervise each examination will be fewer, besides the using of auto-submit feature, which will reduce the effort and cost for examination.
3. Timing spent on correcting the papers and reviewing the answers will be eliminated, which will reduce the effort of lecturers.
4. The LFU e-Exam have the ability to produce random questions to each student, which will minimize the cheating probability to almost zero.
5. The LFU e-Exam have the ability to protect from an impersonation fraud during examination using power failure resume feature.

VIII. CONCLUSION

To the best of our knowledge based to review literature and our survey, the implemented LFU e-Exam platform represents the first official e-Exam platform in Kurdistan Region of Iraq. The following are some points derived from the implemented this platform and empirical works:

1. It is imperative to note that there is no 'plug and play' e-Exam system, whereas the features of any e-Exam system should be reconfigured to be consistent with rules and regulations of a local academic system of a country.
2. As a matter of fact, there is no such an e-Exam system that fits with all educational courses, the key issue for making a successful e-Exam is the nature of course besides willingness of the teacher to take advantages e-Exam. The awareness campaigns are very important to encourage and enthuse students to exploit e-Exams.
3. The key issue for adopting an e-Exam platform at any university is to find a reason to adopt the new style of exams, hold many awareness campaigns to get acquainted with how to use the e-Exam, observe user's behaviors thought of the radically change of exam's style especially those who are unfamiliar with new style of exam, questionnaire all users who participated in performing e-Exam to determine the acceptability and satisfied.
4. Beside the ability of LFU e-Exam system to solve many familiar problems of traditional exams and to provide a better quality exam in terms of saving cost, time, efforts and reduce the cheating probability. LFU e-Exam system offers many advantages to all academic institutes and universities, academics and students like the following:
 - a. For academic institutes and universities; LFU e-Exam system offers many advantages, like reducing the cost of examination by using less number of papers and would preserve the environmental conditions. One more advantage is reducing the cost and effort of exam supervisors by using less number of people.
 - b. For academics who are interested in applying e-Quizzes and LFU e-Exams; LFU e-Exam system offer many advantages, like saving their marking time by automatic evaluation, using question banks that can be used for future exams. One more benefit is to decrease cheating probability via questions randomization. Last but not least, using of multimedia to make the exam more interactive.

- c. Students: they can also get benefits out of LFU e-Exams where results are available rapidly and no disturbing changes in exams during the course.
5. Using an implemented special browser to access and browse the LFU e-exam package is a good way to provide a familiar environment for students which rely upon client/server network architecture.

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