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Towards an Effective Management Information Systems for the Blended Learning Model: A Case from the Egyptian E-Learning University

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Abstract: E-learning in its various forms is the future of flexible and effective learning that takes advantage of the capabilities of the contemporary technological revolution. At a time when universities are increasingly using the blended learning model, this study aimed to provide an insight into the management information systems that support the blended learning process in universities. As evidenced by its name, the Egyptian University for E-Learning (EELU) was born as an electronic university, so, it did not need digital transformation like other universities that started with the traditional learning system. EELU adopted the blended learning model that combines part of the study that takes place face to face and the other part using E-learning technologies such as virtual classrooms and the like. The main objective of this paper is to shed light on management information systems in universities that adopt the blended learning model and to take a closer look at both the learning management system and the university management system through a case study of EELU where the use of those systems in the university was monitored over a period of approximately five Years and define the challenges they face. Through EELU case study, the paper shows that the learning management system and the university information system work independently, there is some compatibility between the two systems that can be described as a partial compatibility regarding the exchange of data between one system and another. The paper recommended a step-by-step approach in implementing the information systems integration strategy within the university.

Key words: E-Learning, blended learning, University Management System, Learning Management System, LMS, Moodle, higher education, virtual classes, quality of learning, digital transformation

INTRODUCTION

The steady growth in internet access has prompted universities and other higher education institutions to take advantage of this technological development in the educational process in whole or in part (Huang *et al*., 2012).

E-learning environments in their various forms provide students with flexibility to learn in terms of space or time in time and space (Virvou and Alepis, 2013).

As a result, traditional learning was affected by the growth of E-learning and a new form appeared that combines them which is blended learning where blended learning is a mixture of face-to-face learning and e-learning activities that depend on a virtual environment in an educational scheme(Picciano, 2009).

Researchers have argued about the importance of blended learning that takes advantage of the interaction of traditional learning and the flexibility that E-learning brings(Giannousi *et al*., 2014).

As a result, there has been an increase in the use of blended learning as a flexible and successful learning model. For this purpose, management information systems have been developed for educational institutions that serve e-learning in its various forms including learning management systems, university management systems and tools such as virtual classrooms and video conferences, to achieve an integrated blended learning environment.

In our contemporary world, it is no longer possible to manage electronic university or any university that offers blended learning programs or distance learning programs without a university management system.

According to the blended learning model in EELU, the student uses only one portal to access the learning management systems provided by the university as the different learning activities are integrated within the portal, with the possibility of exchanging data, information, student's grades and so on without the need to move between more than one portal.

A university that adopts blended learning cannot achieve excellence without the support of management information systems. Therefore, this study aims to shed light on the management information systems at EELU University that adopt blended learning and identify the challenges they face and how to achieve the effectiveness of information systems in the university.

BLENDED LEARNING MODEL

According to Oxford dictionary, blended learning is defined as: A method of studying a topic that combines

classroom instruction with the use of various technologies including online learning. While the Cambridge Dictionary defines blended learning as: a learning method that combines traditional classroom lessons and lessons via computer technology and can be presented over the internet as blended learning is a means of removing barriers to education.

Blended learning is a more complex process than just downloading some video lectures, it means relying on modern technology not only to complete the educational process but to improve it and increase its quality (Sharma, 2010). Blended learning is successfully achieved when a model is developed that combines the benefits of technology and teaching competence together.

Mixing E-learning activities with traditional learning activities is called blended learning (Perez *et al*., 2011).

Although, many researchers praise the blended learning method, the simple combination of the two different forms of learning is not sufficient for the success of this method (George-Walker and Keeffe, 2010).

The main advantages of blended learning emerge when the number of students increases, as the presence of ICTs is used to expand knowledge with greater quality (Cooner, 2010). In this context, some have argued that the diversity of methods used in learning enables students to achieve better, helps them understand the objectives of the course and gives them more flexibility and the possibility of self-learning (Perez *et al*., 2011).

One of the most important goals of blended learning is to connect students with multiple styles of learning and to transform virtual classrooms on the web into spaces for interaction between teachers and students.

In the context of university education, blended learning is an attractive but relatively recent method and not all faculty members use it in the same way (Caner, 2012).

Hamid, etc ., study concluded that blended learning approaches provide the most flexible and scalable pathway in E-learning (Hameed *et al*., 2008). As for the Egyptian E-Learning University, it adopts the blended learning model in providing its educational services and preferred to use this model because it allows flexibility in learning, in addition to other considerations such as fulfilling the requirements for accrediting academic programs and gradually building community confidence in E-learning.

As shown in Fig. 1, the educational style offered by EELU is based on the blended learning model and includes the following:

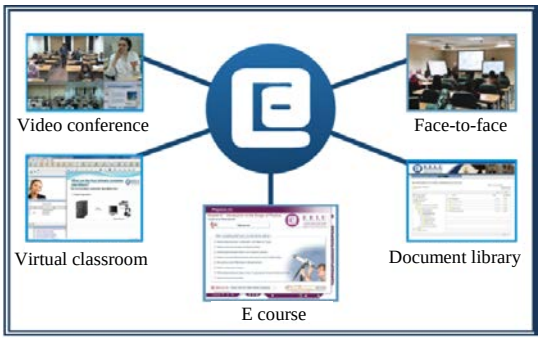

Fig. 1: EELU blended learning model

- Weekly lectures are given by professors face to face or via video conferencing and students attend in learning centers with full interaction between professors and students
- Face-to-face sessions between tutors and students
- Synchronous virtual classes that are offered through the internet and the university's intranet
- Uploading assignments through the document library which includes other assessment methods
- Asynchronous self-paced via. EELU portal, to access the E-courses prepared by the university specifically for its students and to access the electronic contents

This blended model is characterized by merging the advantages of traditional education and E-learning together as this model takes advantage of the possibilities of traditional education in direct communication between teachers and students and also benefits from the capabilities of E-learning in allowing the student to use modern technologies that develop communication skills, information search skills and personal skills. In this way, the graduate is distinguished by a combination of cognitive and technological skills which are competitive advantages that are much in demand in the job market.

The success of universities in applying the blended learning model requires the support of management information systems. Under the blended learning model, there should be a University Management System (UMS) that organizes students 'enrollment both academically and financially. Learning Management Systems (LMS) should be used with platforms that allow students to access lecture videos, download scientific materials and additional supporting materials such as PowerPoint presentations, etc., follow up on assignments and communicate with professors.

In the next section, we will highlight the Learning Management System (LMS) as one of the basic components of management information systems in universities that adopt blended learning.

LEARNING MANAGEMENT SYSTEMS

Learning Management Systems (LMS) can be used widely in a blended learning environment. They are characterized by their scalability and the ability to be used efficiently to support academic programs at the university.

LMS can successfully meet the needs of universities, especially universities that offer their courses through blended learning. They allow professors to design and manage their courses appropriately. This provides stronger support for blended learning that relies on integrating multimedia designed to complement each other with traditional learning activities to enhance the learning process.

Learning management systems integrates interactive learning activities under the blended learning model. The success of a learning management system requires strong institutional and cultural commitment from all stakeholders (Dias and Diniz, 2014). They have many advantages that work together to serve the educational process, including course management, assessment, tracking learner progress, grade book, ability to communicate effectively and other activities important to the academic process (MCneill *et al*., 2012).

E-learning systems have evolved to become available via. smart phones as well which increases the flexibility of their use and increases their spread. The main tools provided by learning management systems are: (Kabassi *et al*., 2016):

- Synchronous and Asynchronous communication
- Content development and delivery
- Assessments (formative and summative)

Asynchronous and simultaneous communication may include, email, announcements, forums, chat, etc. The development and delivery of content may include educational resources, educational materials, files, links to web resources. The assessments may include tools for self evaluation, MCQ questions, true and false questions, etc.

As a result of the above-mentioned advantages, several learning management systems have been developed to support integrated learning, such as WebCT, Blackboard, IBM Lotus Workplace, Moodle and others.

These systems can provide diverse teaching techniques, multiple and flexible learning methods, different mechanisms of interaction between teachers and students and other educational resources which can be applied in a blended learning environment to overcome traditional classroom constraints (Wu *et al*., 2010).

Learning management systems are either paid where the customers like universities pay for their use or they are free and open-source.

The most important functions of LMS can be explained as follows: (Chugh *et al*., 2017; Thornburg, 2014).

Course management: The LMS enables continuous delivery of course materials to enrolled learners. It is also possible, through LMS, to manage and control content, schedule classes and determine who has access to some folders and it is also characterized by the ability for users to create content within the limits of their permissions.

Tracking progress: One of the concerns in e-learning is the fear of learners dropping out of programs due to poor communication with them, so, the learning management system is characterized by the ability to track user engagement in the courses.

The tracking capability includes a wide range of analytics such as the number of times users logged into the system, the time since logging in to logout, the sections and folders they logged into, uploading and downloading files they made. Reports are issued so that course administrators can monitor learners' performance and improve communication with them.

Assessment: An important function of a learning management system is student assessment, as this includes evaluating assignments, quizzes, projects and other coursework that learners must undertake.

It is very important that the system allows students to track their course progress and scores directly with comments made by the faculty member on grades. The reports issued by the learning management system in this regard are extremely important for universities that adopt blended learning, as they facilitate the achievement of quality requirements.

Gradebook: Assessment information is posted to students through the Gradebook. The learning management system allows students through the gradebook to follow their detailed grades, student attendance and professors ’evaluation, with the ability to submit reports on grades at the course level in a total or detailed manner. The learning management system can also generate reports on students who may fail with an alert sent to them.

Communication tools: Learning management systems provide communication tools; these tools may be synchronous or asynchronous.

Asynchronous tools allow one-way communication such as wikis or E-mail, it is best to start with these tools because of the flexibility that asynchronous

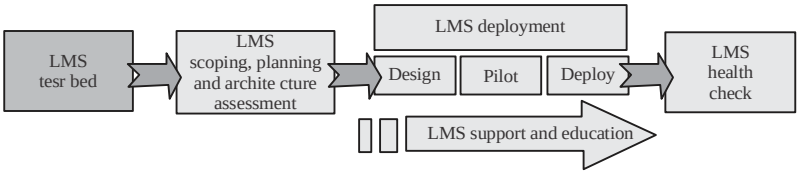

Fig. 2: A possible Lotus Workplace project approach (Mike *et al*., 2003)

communication offers. Synchronous communication tools are two-way communication tools through which data is exchanged at the same time such as broadcasting lectures through video conferencing. Synchronous communication tools are very important in blended learning as they enhance the communication process between learners and teachers.

The previously mentioned LMS functions contribute greatly to the effectiveness of the blended learning model. Regarding the Egyptian E-learning University, from 2009 to 2015, the university used IBM Lotus Workplace learning management system with the blended learning model. As of 2015, the university moved to using Moodle for a number of reasons including that IBM no longer supports its E-learning portfolio as before, including worldwide spread of Moodle and proof of its efficiency.

Lotus workplace collaborative learning: Lotus Workplace LMS was released by IBM in 2004 as a quick rendering tool for producing courses without having the performance constraints of a browser-based application and for easy importation into the system.

The knowledge producer tool has been used with great success, the authoring tool compatible with the Lotus Learning Management System and Lotus Workplace Collaborative Learning has gained wide popularity in this field. This LMS has achieved tangible success at that time due to its success in providing the capabilities to create and manage courses satisfactorily for educational institutions.

Lotus workplace LMS can perform many functions with great efficiency which has made it very popular as a learning management system (Ebel, 2004).

One of the most important features of Lotus workplace LMS is that it achieves the separation of responsibilities which is a very important point when dealing with an integrated learning environment.

Figure 2 shows the exact sequence of a possible Lotus workplace project approach. In general, it can be said that Lotus Workplace LMS has a solid software architecture that supports many functions within an integrated learning environment.

In 2015, EELU decided to stop using IBM Lotus Workplace and replace it with Moodle because IBM no longer supports its E-learning portfolio as before, also, Lotus Workplace Collaborative Learning allows students to view e-content only and no other academic activities. For example, assignments require the use of another tool called Question-Mark, this movement between one tool and another is undesirable if it is possible to stay within one environment. Moodle LMS that EELU moved to include these tools together.

Moodle LMS: Moodle is one of the most popular and widely used learning management systems in the world, elated statistics indicate that it is used by more than 100,000 applications in various countries and it supports >150 million learners in the world.

Moodle meets the learning needs of universities and other educational and training institutions around the world. It is characterized as a free and open-source system. Moodle stands for "Modular Object-Oriented Dynamic Learning Environment".

Moodle is an open, robust and secure platform for creating and providing customized learning environments, it is very easy to use for learning management. Moodle is built on the basis of a participatory philosophy that emphasizes that learners can be effective creative agents in building content rather than just recipients of scientific material.

EELU gradually switched from using IBM Lotus Workplace to Moodle LMS as of 2015-2016, applying Moodle to newcomer students in the blended learning model.

As it appears from Fig. 3, the course includes e-content, a set of assignments and activities, in addition to video lectures.

LMS: Self- hosting versus cloud hosting: The idea of cloud hosting is suitable for educational institutions that do not have sufficiently qualified staff to manage the learning management system as the system managing time is saved and the time is used to focus on the quality of E-learning process.

As for the self-hosting of the learning management system, it requires time, talent and ambition. It requires extensive internal experience capable of providing the necessary technical support to all students and users of the system including the functions of code management, implementation, design and selection of the themes, in addition to the plugins that the concerned department wants to install (Moodle Guide, 2014). In other words,

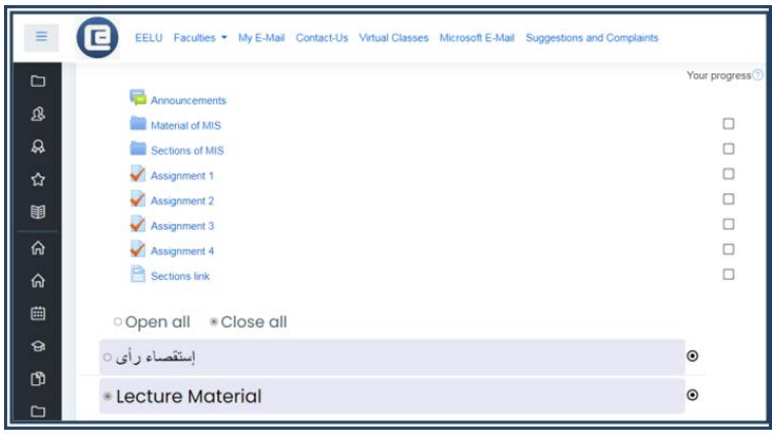

Fig. 3: An E-course from the blended learning model as it appears in moodle

self-hosting requires an administration that is able to perform these tasks within the educational institution.

In general, the choice of this or that alternative depends on the conditions and capabilities of each educational institution.

As for the Egyptian E-Learning University, it adopts hosting Moodle on its servers inside its own data center. The university's goal is to have complete control over all aspects of the Learning Management System.

Since, there are many blended learning tools used in EELU through the LMS environment, it will be covered in the next section.

BLENDED LEARNING TOOLS USED IN LMS ENVIRONMENT

There is a set of blended learning tools commonly used in an LMS environment, the most prominent of which are the following:

Virtual classroom: The virtual classroom is one of the learning environments used in the blended learning model. Virtual classes allow synchronous lessons to be delivered through the use of computers and internet. The classroom enables effective communication between the parties to the educational process, this leads to providing students with educational experiences as well as improving the effectiveness and quality of the learning process (Ayad and Rigas, 2010).

Al-Nuaim (2012) has argued that virtual classrooms are generally successful in directing attention to electronic learning. Centra was chosen by EELU to offer virtual classes as part of the blended learning model. Saba Centra is a web-based learning environment in which virtual classroom are offered.

Figure 4 shows virtual classroom scheduling for students in EELU. Classrooms are used to support the teaching process within the blended learning model. It also used to provide office hours. Virtual classes are recorded and made available to students via Moodle LMS.

Classroom video conferencing: Technology has made it possible to use video conferencing which is one of the important learning tools that allow professors to create a more interactive environment in the learning process. Learning through video conferencing is characterized by the interaction between professors and learners which is an important attraction of student interest.

Video conferencing allows people in different locations to communicate simultaneously with audio and video with the ability to demonstrate using a smart board or presentations.

As a result, universities and other educational institutions are increasingly relying on the use of video conferencing and live broadcasting in a blended learning environment.

Video conferencing, if used appropriately, has many benefits such as: (Lawson and Comber, 2014). Video conferencing brings a new dimension to the classroom as it allows communication between classes in different places and the exchange of knowledge, as well as allowing guests and experts from different countries to participate positively in the classroom.

One of the benefits of using video conferencing is also to save time and money for universities. Instead of holding lectures at different times in different places, it is possible to integrate them into a video conference which means cost-effectiveness in the working language while achieving the efficiency of the learning process.

The learning philosophy of EELU, according to the blended learning model, relies on providing lectures using video conference which allows taking advantage of the possibility of interaction between learners and professors. Since, there are many EELU study centers and spread in

Fig. 4: A typical Centra virtual class schedule in EELU blended learning

many Egyptian cities, the use of video conferencing has made it possible to have the best professors in every discipline, regardless of the city they live in.

EELU uses Cisco Video conferencing to deliver the lectures due to the high quality it has (Cisco System, 2017).

Lectures are recorded via videoconferencing and made available to students through Moodle LMS within 48 h.

Self-paced learning: One of the blended learning tools is Asynchronous self-paced learning through a learning management system that includes E-courses and E-content.

Self-paced learning gives learners flexibility in setting their own timing as learning can continue and move from one topic to another depending on each learner's circumstances. Self-learning has recently gained importance with the spread of blended learning (Naylor and Senior, 2017).

One of the most important advantages self-paced learning is the elimination of time pressure during the learning process as the learning tasks for learners should not be completed at the same speed. It also gives them the opportunity to review scientific content further.

Learning management systems contribute to enabling self-paced learning by hosting E-courses and e-content that learners can access. Multiple types of assignments and tests can be created and shared through LMS.

For EELU, as we mentioned earlier in Fig. 1, one of the essential elements of the blended learning model is Self-paced learning. To achieve this, EELU has established the Electronic Course Production Center (ECPC).

The aforementioned center produced all the courses. E-courses and other E-contents were provided to the students through Moodle for the purpose of Self-paced learning.

Students Self-paced learning is tracked through Moodle where the time the student spends in each topic or educational unit is recorded. This tracking contributes to raising the efficiency of the learning process.

University mail system: E-mail is an effective means of communication within the blended learning model, so, it is indispensable for any university to have a mail system that provides an account for each student and faculty member in addition to the rest of the university staff.

The university's email system supports the blended learning model As for EELU, it chose IBM Lotus Domino as the university's email system. IBM Lotus Domino is used as a messaging and collaboration system for universities and other institutions (IBM Developer, 2017).

EELU chose this mail system because it is characterized by flexibility and choice in the hardware platform and the operating system as well as security in electronic correspondence at the entire university level which is the basis of the Lotus Domino server, in addition to the ability to manage and exclude spam, so that, it does not appear to students or faculty members.

It is clear from Fig. 5, that besides being able to send and receive mail, there are some other advantages of using university mail such as calendar, scheduling and other functions.

The university mail system integrates with other information systems within the university, where the university information system can send mail to the student, for example, to complete his enrolment in a course. The learning management system can send an alert mail to the student about a new assignment, video lecture or other academic activities in LMS.

As is evident from the above, learning management systems strongly support the blended learning model, its environment expands to include all the tools necessary for the success of the learning process, but on the other hand, it does not support the administrative functions of the university such as student registration, payment of tuition fees, official archiving of student data or other

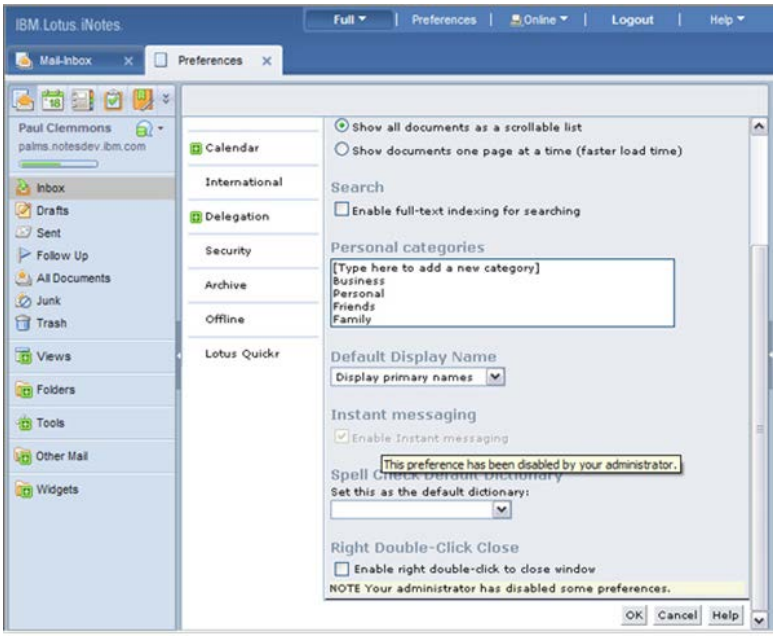

Fig. 5: Preferences available to students in IBM Lotus mail system

administrative functions such as employee hiring data, purchase orders, stock keeping, payroll, etc. This means that a robust learning management system does not replace the need for a University Management System. Therefore, in the next part, we will deal with the university management system as one of the strongly required information systems.

UNIVERSITY MANAGEMENT SYSTEM

Data is the pulse of life of any university while students are at the heart of the educational process. University Management System (UMS) is one of the solutions offered by the software world. It was developed to meet the difficulties that universities face in administrative work. University Management System is an interactive web-based system that provides an excellent complete university management solution and is indispensable for any E-university.

UMS integrates software and internet development to improve the quality of the educational process by creating an environment suitable for communication, control and monitoring (Adamov, 2010). It is considered a central repository for university data, its role is not limited to merely collecting, organizing and storing student data for various academic programs but also processing, analysis and reporting along with effective means of communication with all university staff. University management system has many characteristics, as it was designed to me*et al*l the needs of universities, especially electronic universities. The university management system should improve communication between learners, professors and the university administration. It monitors the performance of the academic programs offered by the university and thus has an effective role in helping universities develop their academic activities (Borden *et al*., 2013).

UMS has become essential in implementing comprehensive education management solutions and raising the quality of academic activities.

Advantages of using the university management system: Using the university management system has many advantages that universities may benefit from, including.

Improving the quality of educational process management. Usually, employees in universities face different burdens of administrative work; the university management system can reduce the daily workload to a great extent which gives the opportunity to enhance the quality of the educational process management.

Data management: The existence of an electronic university management system allows storing all university data in digital form, thus saving a lot of time used in managing, recording, organizing and saving the data manually. The system also performs data processing and analysis operations which increases the accuracy and speed of data access.

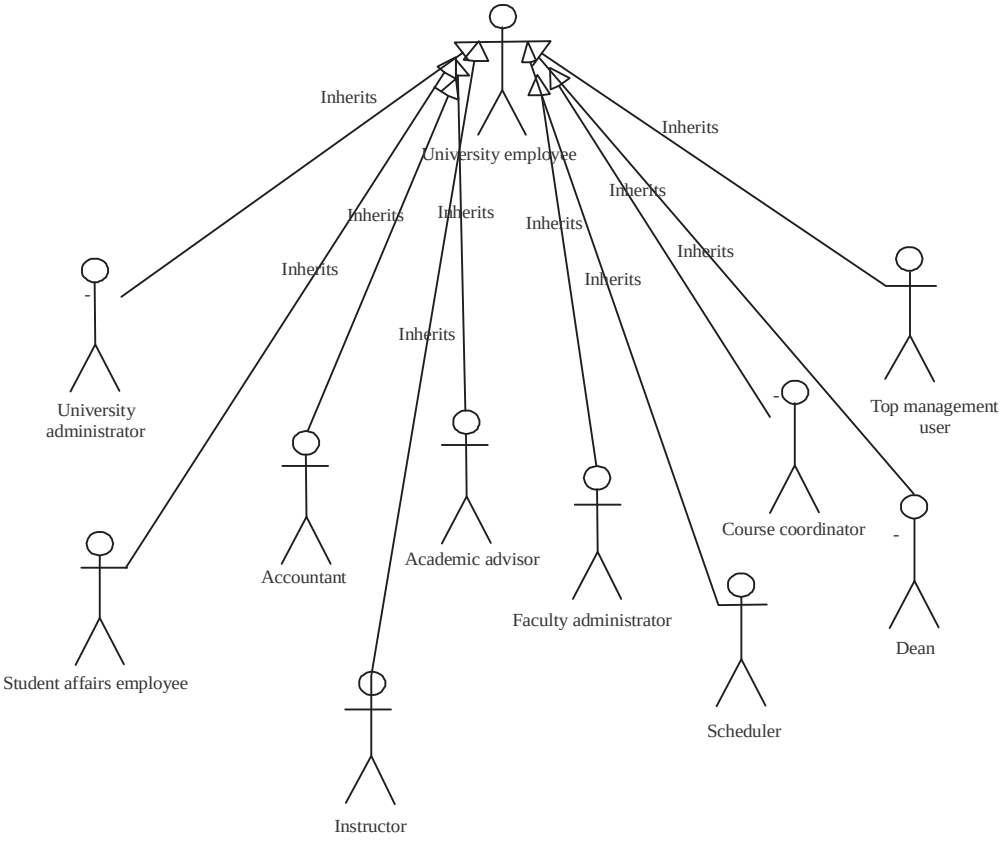

Fig. 6: Diagram of relationships within UMS

Organizing the university resource management: The university management system helps in organizing the use of classrooms and laboratories according to the designed timetables which leads to saving time, effort and money and enhancing the management of university resources.

Improve communication: The university management system contains many modules that improve communication between the administration, faculty members, students and employees including the E-mail system, sending notifications, SMS and other available means of communication (Fig. 6). EELU university administration system consists of two modules that can be explained as follows:

Module 1: Student affairs module: The student affairs module consists of a set of packages as follows:

University administration package: This package includes the following components:

- University profile, faculty and department
- Learning center
- Evaluation method
- Area of study
- Educational year
- Semester courses (Fig. 7)

Student services package: This package includes the following components:

- Courses selection
- Payment order
- Add and drop courses
- Withdrawal request
- Degree transfer request
- University transfer information
- Student record
- Alumni profiles
- Generating final exam attendance sheet (Fig. 8)

Scheduling package: This package includes the following components:

- Determining teaching periods
- Allocating classrooms
- Observing professors availability
- Determining lecture times
- Determining sections times
- Determining labs times

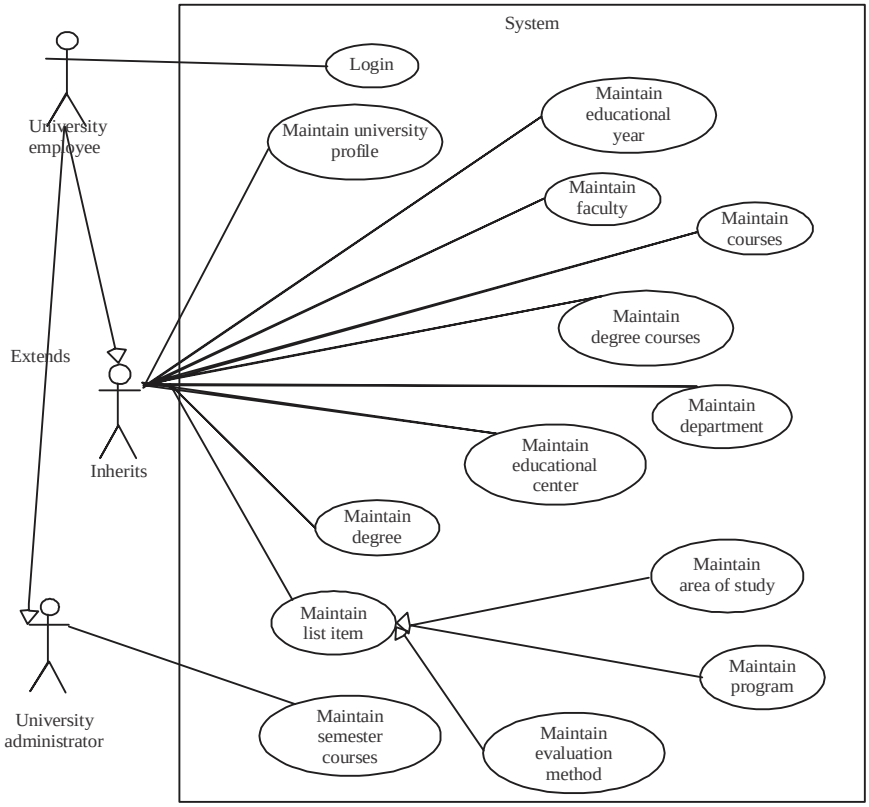

Fig. 7: Administration functions in UMS

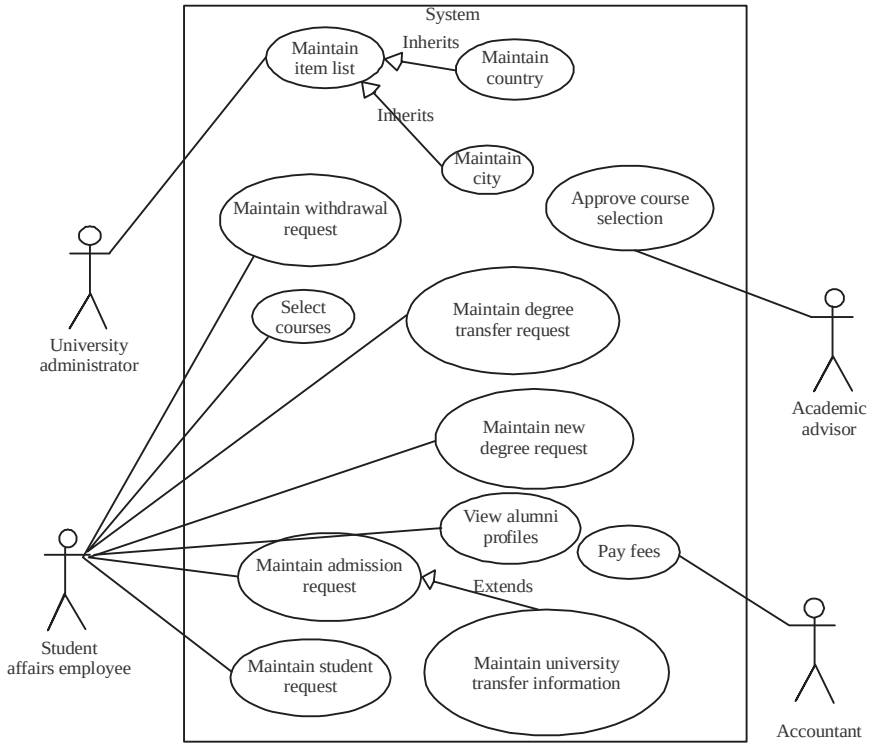

Fig. 8: Student Services functions in UMS

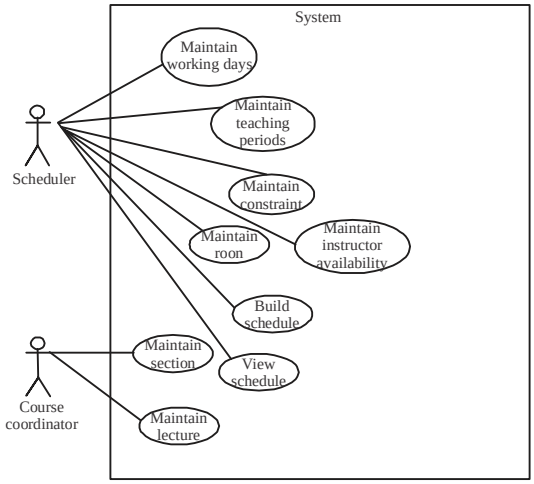

Fig. 9: Preparing schedules in UMS

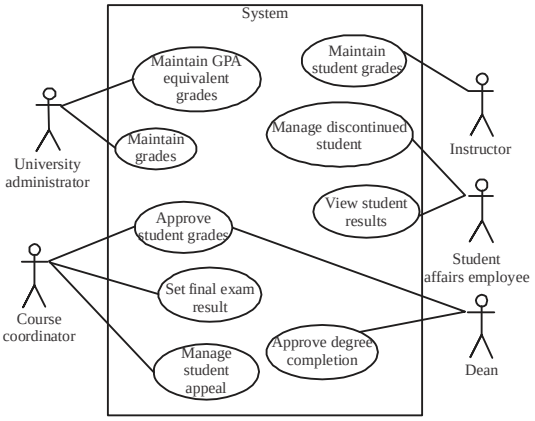

Fig. 10: Grading functions in UMS

- Observing constraints
- Building schedule
- Viewing schedule (Fig. 9)

Grading package: This package includes the following components:

- Maintaining student grades
- Inserting final exam result
- Approving student grades
- GPA equivalent grades
- Approving degree completion
- Viewing student results
- Managing discontinued students
- Managing student appeals (Fig. 10)

Reports package: This package includes the following components:

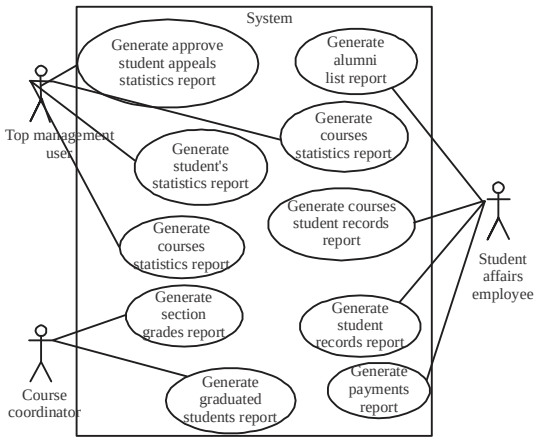

Fig. 11: Issuing reports and relationship with officials

- Generating student's statistics report
- Generating degrees statistics report
- Generating courses results statistics report
- Generating student records report
- Generating course student records report
- Generating section grades report
- Generating approved student appeals report
- Generating graduated students report
- Generating payments report
- Generating final exam attendance report
- Generating course result report
- Generating alumni list report (Fig. 11)

Table 1 shows the available authorities at UMS for each employee or faculty member at the university according to the organizational structure.

As shown in Table 1, there is a precise definition of the information that each administrative level, employee, or faculty member is allowed to access and the authorities available to him/her through UMS.

Module 2: Financial and HR module: The financial and HR module consists of a set of packages as follows:

Personnel package: This package includes the following components:

- Maintaining staff records
- Searching staff
- Maintaining staff log
- Managing holidays and vacations
- Managing missions
- Managing leaves
- Managing personnel structure
- Managing staff groups
- Managing discipline
- Ending employee's service
- Renewing employee's contract

Table 1: Responsibilities available in the organizational structure through UMS

Name	Description
University employee	The university employee is a member of the university staff who will access the system through the portal then he will be redirected to his application according to the roles assigned to him
University administrator	The University Administrator is responsible on maintaining the university structure and rules. For example define the faculties, departments and courses
Faculty administrator	The Faculty Administrator is responsible on maintaining the faculty settings such as the minimum and maximum credits that the student should take per semester
Student affairs employee	The student affairs employee is responsible on handling all students' issues and students records, for example admission requests, enrollment
Instructor	The Instructor (Grader) is responsible on setting the students grades for the sections assigned to him
Course coordinator	The course coordinator is one of the academic staff who is responsible on the course contents, grades and instructor assignment to sections
Dean	The Faculty Dean is responsible on approving the student's grades which has been entered by the instructor and approved by the course coordinator
Academic advisor	The academic advisor is a university employee who is responsible on offering help and guidance to the students in their degree or course selections
Scheduler	The scheduler is a university employee who is responsible on setting the schedule parameters such as rooms and working days and Builds the schedule
Accountant	The accountant is a university employee who is responsible on collecting fees from students and record the payment into the system
Top management user	The top management users are allowed to view the high level reports that give statistics about the university progress

Payroll package: This package includes the following components:

- Managing variable salary elements
- Assign new employee's salary
- Managing tax settings
- Managing insurance settings
- Managing medical insurance
- Assigning freelancer salary
- Managing allowances
- Managing deduction
- Managing salary variations
- Submitting monthly salaries
- Approving employees payments
- Managing staff promotions

Procurement and inventory package: This package includes the following components:

- Managing vendors
- Managing items
- Managing warehouses
- Managing bids
- Managing offers
- Managing purchase orders
- Approving bid response
- Managing items received
- Approving PO disbursements
- Managing item issue
- Return employee's custody item
- Adjusting item quantity

Treasuries management package: This package includes the following components:

- Treasury
- Managing student receipts
- Receiving other payments
- Managing employee disbursements
- Managing procurement disbursements
- Managing other disbursements
- Managing cash imprest settlement
- Reprint receipts
- Manage cash transfer

General ledger package: This package includes the following components:

- Managing GL account
- Managing fiscal year
- Managing transaction
- Closing fiscal year

With regard to financial and HR module, the system issues a series of reports, including the following:

- Personnel reports
- Payroll reports
- Procurement reports
- Inventory reports
- Treasuries reports
- General ledger reports

As is evident from the above, the university's management systems do not support the blended learning process itself but rather support the administrative functions associated with the learning process, either directly, such as student registration and academic achievement or indirectly, such as managing human

resources and managing financial issues necessary for the university to carry out its functions efficiently. This means that the existence of the university management system does not replace the need for a learning management system.

INTEGRATION BETWEEN LEARNING MANAGEMENT SYSTEMS AND UNIVERSITY INFORMATION SYSTEMS

There is a fundamental need for integration between the University Management System (UMS) and Learning Management System (LMS). There is also a need for integration between the tools used in blended learning and information systems.

Despite the existence of a distinct learning management system and a strong university management system in EELU, practices has revealed some cases of non-integration and are being addressed including the following:

For virtual classes offered through Centra, student attendance is recorded. Centra generates a student attendance report including check-in and check-out time, but attendance scores are not automatically recorded on moodle. To solve this problem, an intervention is made to transfer attendance scores to moodle. Centra is currently being replaced with a virtual classroom tool that integrates with Moodle.

Whenever IBM Lotus workplace collaborative learning was used, it allowed students to view E-content only and no other academic activities. For example, assignments require the use of another tool called question-mark, this movement and login and logout between one tool and another is unwanted if it is possible to stay within one environment. This problem has been overcome by moving to use moodle LMS that includes these tools together.

Scores for student's assignments, quizzes and other academic activities are recorded on Moodle LMS, but these scores are not automatically transferred from Moodle LMS to University Management System (UMS), due to a lack of integration between the two systems. A workaround to solve this problem is done using the Excel sheet files generated by UMS, the scores stored in Moodle LMS are uploaded to these files, then automatically re-uploaded to UMS.

The study in EELU is based on the credit hour system, there are many courses in which it is not possible to enroll in without achieving the prerequisites, as the role of academic advising appears strongly. Any incorrect academic advising may delay the student's graduation for a semester or a year. This requires an automated academic advising from UMS, based on the academic plan, but it actually doesn't exist yet.

Through the EELU case study, it is evident that the learning management system and the information system in the university operate independently and there is some compatibility between the two systems that can be described as a partial compatibility regarding the exchange of data between one system and another. Analyzing the current state of the university's heterogeneous information systems is a step on the road to long-term development.

CONCLUSION

The need for integration between university information systems arose out of the growing requirements for data integrity as evidenced by the blended learning model.

Learning management systems strongly support the blended learning model, its environment expands to include all the tools necessary for the success of the learning process but on the other hand, it does not support the administrative functions of the university such as student registration, payment of tuition fees, official archiving of student data, or other administrative functions such as employee hiring data, purchase orders, stock keeping, payroll, etc. This means that a robust learning management system does not replace the need for a University Management System. Therefore, in the next part, we will deal with the university management system as one of the strongly required information systems.

As for the university's management systems do not support the blended learning process itself, but rather support the administrative functions associated with the learning process, either directly such as student registration and academic achievement or indirectly such as managing human resources and managing financial issues necessary for the university to carry out its functions efficiently.

The main problem is that there are different identities that are kept in separate, isolated systems. In short, learning management systems cannot perform the necessary administrative functions to support universities and university management systems cannot support the blended learning process, so, the two systems are indispensable in any university that adopts blended learning and there must be integration between all information systems in the university to achieve the required quality and enhance higher education.

Through EELU case study, the paper shows that the learning management system and the university information system work independently, there is some compatibility between the two systems that can be described as a partial compatibility regarding the exchange of data between one system and another.

Analyzing the current state of the university's heterogeneous information systems is a step on the road to long-term development.

Keeping the development of software serving universities in line with detailed standards and creating a fully automated interaction will lead to better decision-making as well as a saving of time and effort. A step-by-step approach is recommended in implementing the information systems integration strategy within the university.

RECOMMENDATIONS

For future work, a detailed study is recommended towards the strategy of integrating information systems within higher education institutions that support blended learning models.

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