A Solution for the Management of Supervision in a Blended Learning On-line PhD Program: Case Study of SUST Computer Science PhD Program

This thesis is presented as a partial fulfillment for the degree of MSc in Information Technology

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الآية

"فَعَالَى اللهُ آلِ الملكِ الْحَقُّ وَلاَ تَعْجِلْ بِالْقُوَّانِ مِنْ قَبْلِ أنْ يَعْمَلَ إِلَيْكَ وَحِيْهُ وَقُلْ رَبِّ نَزِعُ وَعَلِمُنا.[طه (114)"
Dedication

To my parents, my husband, my son, sisters and brothers.
Acknowledgement

Thanks to Mighty Allah, for giving me the power to complete this research.

I would like to express my sincere gratitude to my advisor Prof. Izzeldin Mohamed Osman for the continuous support, for his patience, motivation, and immense knowledge.

All thanks to Sudan University of Science and Technology College of Computer Science and Information Technology staff for their continuous help in gathering information and requirements to come up with this work.
Abstract

Blended learning describes the way e-learning is being combined with traditional classroom methods and independent studies to create a new or hybrid teaching methodologies. Sudan University of Science and Technology (SUST) College of Computer Science and Information Technology (SCIT) used blended learning in their PhD program. But they apply it by making hybrid teaching ways so they find difficulties in managing their two different groups of lecturers which make the top management facing difficulties in sharing information to handle management processes.

This study aims to enhance the management of this PhD blended learning by enabling coordinators to manage students and supervisors, connecting supervisor’s payments with student’s progress, and covering all payments which related to this programme. The study presents some related works to blended learning processes and creating criteria according to the needs of SUST CSIT management staff. The proposed solution covers lecturer’s teaching information and researches supervision process regarding phases that each research go through. It also handles lecturer’s visits for those who come from outside Sudan and their payments for visits, teaching and supervision. Also, covers payments to third parties like travel agencies and hotels which hosts lecturers who come from outside Sudan.
المستخلص

التعليم المختلط يصف الطريقة التي تجمع بين التعليم الإلكتروني و الطريقة التقليدية للتعليم عن طريق قاعات الدراسة والدراسة عن بعد لإنشاء طريقة جديدة للتعليم. تستخدم هذه الطريقة بجامعة السودان للعلوم والتكنولوجيا بكلية علوم الحاسوب وتكنولوجيا المعلومات لطلاب الدكتوراه. ولكن أيضاً يتم تطبيقها مع اختلاف بين أعضاء التدريس من داخل وخارج السودان، لذلك تجد صعوبة في التعامل مع مجموعتين من المدرسین مما يجعل الإدارة العليا تواجه بعض الصعوبات في الحصول على المعلومات المطلوبة ومشاركتها.

هذه الدراسة ترمي إلى تحسين إدارة برنامج الدكتوراه وذلك عن طريق مساعدة المنصین على إدارة الطلاب والمحاضرين، ربط دفعات المحاضرين بتقدم دراسة الطلاب، و تغطية جميع الدفعات المتعلقة بهذا البرنامج. هذه الدراسة تعرض مجموعة من الدراسات المتعلقة بالتعليم المختلط و تقوم بإنشاء معايیر بناء على احتياجات الإدارة في جامعة السودان للعلوم والتكنولوجيا بكلية علوم الحاسوب وتكنولوجيا المعلومات. النظام المقترح يشمل معلومات المحاضرين ومعالومات خاصة بالتدريس والإشراف على الباحث مع مراوآة المراحل التي يمر بها كل بحث. أيضاً يغطي زيارات المحاضرين القادمين من خارج السودان ودفعات المحاضرين الخاصة بالزيارات والتدريس والإشراف على الباحث. كما يغطي دفعات لأطراف أخرى مثل وثائق السفر والفنادق التي تستضيف المحاضرين القادمين من خارج السودان.
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CHAPTER ONE

INTRODUCTION
CHAPTER ONE

INTRODUCTION

1.1. Background

Blended learning describes the way e-learning is being combined with traditional classroom methods and independent studies to create a new or hybrid teaching methodologies[1].

In order to encourage teaching assistants and other Master holders to increase their level of education and to do more deep research in specific areas of specialization, Sudan University of Science and Technology (SUST) start the on-line PhD program for the MSc holders who reside in or outside Sudan. The program makes use of the world-wide resources in computer science to guide the research of the students.

1.2. Problem

The management of the program includes contacting external supervisors and choosing between them, then monitoring the progress of each batch of student through their study semesters and their thesis after that.

Currently the program has supervisors from 19 countries supervising students from 7 countries in many research areas. Managing such a huge program manually had put a tremendous load on program coordinators on managing, collecting, storing, retrieving, analysing and reporting on data from papers or excels forms.
1.3. Objectives

The research aims to achieve the following goals:

- Enable university coordinators to manage supervisors.
- Enable supervisors and university coordinators to monitor each student progress through his Ph.D. semesters.
- Enable coordinators to create payments for supervisors according to progress of their students.
- Enable coordinators to create payments for third parties e.g. hotels and travel agencies.
- Enable top management to be up to date by viewing the data entered by coordinators.

1.4. Scope of work

Develops a web-based computerized system to cover SUST management of the Ph.D. program.

1.5. Methodology

We will go through Waterfall software methodology steps to implement the system.
1.6. Thesis organization

Ch1: Introduction
This chapter contains background introduction to this research, problem statement, objectives of the research and scope of work.

Ch2: Literature review
In this part of the research, we will introduce some related works.

Ch3: Methodology
This chapter will analyze and design through the best software methodology to implement the system.

Ch4: Implementation and Results
This chapter presents the conclusions of the work and some recommendations.

Ch5: Conclusion and Future work
CHAPTER TWO

LITRITURE REVIEW AND RELATED WORK
CHAPTER TWO
LITERATURE REVIEW AND RELATED WORK

2.1 Introduction

This chapter discusses previous related work about the research problem and how others cover their studies about blended learning management.

2.2 Previous studies

This section discusses previous related studies to blended learning management.

2.2.1 A Didactical Framework for the Design of Blended Learning Arrangements

Blended learning basically refers to (at least) the mix of different:

- Didactical methods (expository presentations, discovery learning, cooperative learning, etc.).
- Delivery formats (personal communication, publishing, broadcasting, etc.).

3C-didactical components of a learning arrangement

Any learning environment consists of three components:

- a content component that makes learning material available to a learner;
- a communication component that offers interpersonal exchange between learners or learners and tutors; and
- a constructive component that facilitates and guides individual as well as cooperative learning activities to actively operate on learning tasks (or assignments) with different degrees of complexity (from multiple choice to projects or problem based learning)[2].
2.2.2 Evaluating a Learning Management System for Blended Learning in Higher Education

This paper examines the literature on the use of different Learning Management Systems for blended learning in higher education in Greek Universities and Technological Educational Institutions and reviews on the advantages and disadvantages.

The Blackboard Learning System provides traditional instruction and powers pure distance learning providing specific utilities such as content management and sharing, assessment management, gradebook and assignment management, collaboration and communication, student and instructor portfolio, etc. It also has some drawbacks: some resources published in the Blackboard system cannot be shared by other users due to copyright problems, and other technical limitation is associated with the management of hyperlinks between and within documents.
Moodle, on the other hand, is an open-source learning platform designed to provide educators, administrators and learners with a single robust, secure and integrated system to create learning environments. The main advantage of Moodle in comparison to other commercial LMSs is that the courses developed are based on the constructionist pedagogy.

The Greek University Network has developed the platform E-class. The users can create learning paths compatible to the eLearning standard SCORM and provides a set of utilities for composing exercises, structuring agenda with tasks and deadlines, post notifications, writing collaborative documents, asynchronous communication such as forums, links to internet resources, publishing documents in any format, group management, learning objects[3].

2.2.3 USE OF A CONTENT MANAGEMENT SYSTEM FOR BLENDED LEARNING: Perceptions of Pre-Service Teachers

CMS can be used to create, store, update, publish and present information. Furthermore, using CMS as a support to classroom instruction will form the structure for blended learning.

ENIYISI: A CMS developed for Blended Learning

ENIYISI is a content management system, which aims at providing an environment for knowledge makers to collect, share, distribute and re-organize their materials within a specific community. The users are categorized in three levels as administrator, instructor and learner. The system users, pre-service teachers and classroom instructors, adopted ENIYISI as a collaboration and communication tool for carrying out classroom activities like group projects, file sharing and commenting on peer reviews within their own community of practice[4].
2.2.4 The use of Moodle e-learning platform: a study in a Portuguese University

Moodle platform is characterized by a set of functionalities grouped in two different classes: resources and modules. Resources instructional materials that are usually created in digital formats and then uploaded to the platform. Web pages, PowerPoint files, word documents, flash animations, video and audio files represent some examples of these resources. Modules are components created via Moodle in order to provide interaction among students and teachers towards manipulation and content transformation. The Moodle platform provides several modules, such as Database, Lessons, Assignments, Workshops, Chats, Forums, News, Glossary, Wikis, Choice, Quiz, Survey, Feedback, SCORM (Sharable Content Object Reference Model) and External tools[5].
2.2.5 OPEN SOURCE LEARNING MANAGEMENT SYSTEMS IN DISTANCE LEARNING

This study shows the results of comparisons of open source LMSs. In particular, the purpose of these comparisons is two-faceted. One is to analyze general features of open source LMSs considering the requirements of an LMS in an e-learning process. The other purpose is to conduct comparisons of these features among the mostly preferred four LMSs: Moodle, ATutor, DOKEOS and OLAT.

When the items are analyzed under General Aspects, Moodle is the only LMS which has wider options with different access possibilities, modular structure, and advanced backup tools. Then, the LMSs are analysed according to their didactic functionality. Comparisons show that, Moodle and OLAT have the ability to view full user logging and tracking and activity reports for each student are available with graphs and details about each module (last access, number of times read) as well as a detailed "story" of each student involvement including postings etc. on one page. Moodle and ATUTOR have an advanced online exam module with time, date and duration constraints[6].
2.2.6 University management system full report

UMS (UNIVERSITY MANAGEMENT SYSTEM) makes management to get the most updated information always by avoiding manual accounting process. This system has three functional divisions: University Administrator, College Administrator and User (Students / Faculties).

University Administrator has the functionality of registering new colleges and courses. College Administrator has the rights of creating department, allocating courses to departments, creating faculties, students and allocating subjects to faculties, and modifications in the data entered by the user can also be done by the college administrator. User of this may be faculty or students. Faculty has the facility of entering the marks and attendance of the students. Students can check their marks and attendance but there is no chance of modifications. Reports must be generated for the existing data i.e. for attendance and marks of the students, which are used to assess the performance of the students. These reports should be viewed by the in charge and user[7].

2.2.7 Paradiso LMS Blended Learning

Paradiso LMS Blended learning brings together the best of both classroom learning and eLearning. It combines the support of classroom learning with the flexibility of online education. Blended Learning uses Paradiso Learning Management System to teach and support learning in a classroom.

2.2.8 MasterSoft University Management System

This software has 23+ pro modules and in-built 45+ modules and can be hosted easily to the university data center or on cloud servers. Modules are designed keeping in mind the different dynamics of operation, and can be customized according to the needs of the university.
2.3 Conclusion

This chapter has presented list of studies which discussed blended learning from different perspectives. We find that most of them discussing blended learning according to students and the functions which help the learning process. Some systems covered some administration features like student registration process. Also, the financial operations of staff are covered as a payroll module but not connected properly with the progress of learning process.

2.3.1 Solution Criteria

Here are criteria that will be covered by our proposed solution for managing supervisors:

- Monitoring progress of the students.
- Classifying lecturers into two groups one for local lecturers and the other one for the international supervisors.
- Paying local lecturers in Sudanese Pound and the international in United States Dollar.
- Paying international staff for visits when they come to present subjects they teach.
- Paying supervisors for researches according to progress of students.
- Paying third parties like hotels and travel agencies.
CHAPTER THREE

RESEARCH METHODOLOGY
CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

This chapter represents the methodology used to come up with the management system and the technology used to build it.

As mentioned in chapter two the proposed solution covers features that didn’t appear in other solutions after making comparison with many Learning Management Systems and University Management Systems. These features are:

- Monitoring progress of the students.
- Classifying lecturers into two groups one for local lecturers and the other one for the international supervisors.
- Paying local lecturers in Sudanese Pound and the international in United States Dollar.
- Paying international staff for visits when they come to present subjects they teach.
- Paying supervisors for researches according to progress of students.
- Paying third parties like hotels and travel agencies.

3.2. Systems Analysis & Design

As stated in the purpose of intended systems is to facilitate and Enhance The management of the program includes supervisors from 19 countries supervising students from 7 countries in many research areas, Managing such a huge program manually had put a tremendous load on program coordinators on managing, collecting, storing, retrieving, analysing and reporting on data from papers or excel forms.
3.2.1 Functional Requirements

The required system would do the following:

- **Manage Courses:**
  The System allows the coordinators to manage their programme course Information and it’s Subjects.

- **Manage Batches:**
  The Systems allows coordinators to manage Batches and students details and manage their progress and reports their progress on course and the progress of the researches.

- **Manage the supervisors ( professors ):**
  Provides the program Coordinators with Access to add new professors and manage their information starting from personal data and specialization subjects then list of current and history of the subject he teaches. Also lists researches supervision and payments paid or to be paid, and be able to retrieve their data and report on.

- **Manage Financial Transactions and Payments:**
  The Systems allows coordinators to manage and access the financial transaction that related to external professors and their financial contracts, and their payments information and provide details informations about course expenses.

- **Manage research**
  The System would allow the coordinators to manage Student researches and their progress with their supervisor details.

- **Manage Students**
  The System would allow the coordinators to manage Course and Research Students and the informations
3.2.2 System Relations

Figure 3.1 System relations

Figure 3.1 describes the relationships between the entities and how they interact in the system.
3.2.3 Many-to-many Relations

Here are relations which come to handle many-to-many relations with higher database performance by creating intermediate tables to minimize redundancy.

Lecturer-subjects:

One lecturer can teach different subjects related to his specialization and one subject can be taught by many lecturers in different batches that why another table should be created to handle this relation.

Figure 3. 2 Lecturer-subject relation
Batch-stages:

Batch goes through many stages. This table handles stages for each batch along with their start and end dates.

Figure 3. 3 Batch-stages relation
**Batch-subjects:**

Batch subject is a relation that record subjects for each batch with regard to lecturers who teach those subjects and the stages of learning.

![Batch-subjects relation diagram](image)

**Figure 3. 4 Batch-subjects relation**
3.2.4 Schema

This section describes database tables and fields with brief definition to each field in each table.

**Lecturer:**

This table contains lecturer’s basic information.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lec_id</td>
<td>Primary key. Number that distinguish each lecturer.</td>
</tr>
<tr>
<td>Lec_name</td>
<td>String. Lecturer name</td>
</tr>
<tr>
<td>Nationality</td>
<td>String. Country to which the lecturer belongs.</td>
</tr>
<tr>
<td>Lec_email</td>
<td>Email address of the lecturer</td>
</tr>
<tr>
<td>Degree</td>
<td>Degree of the lecturer e.g. (Phd, Prof.).</td>
</tr>
<tr>
<td>Passport_photo</td>
<td>Photo copy of the lecturer passport.</td>
</tr>
<tr>
<td>Note</td>
<td>String for any other information about the lecturer</td>
</tr>
</tbody>
</table>
Student:

Save students basic data.

Table 3. 2 Student table fields definition

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Std_id</td>
<td>Primary key. Number that distinguish each student.</td>
</tr>
<tr>
<td>Std_uid</td>
<td>Unique number for each student used in processes inside university.</td>
</tr>
<tr>
<td>Std_nid</td>
<td>National ID of the student.</td>
</tr>
<tr>
<td>Std_email</td>
<td>Email address of the student</td>
</tr>
<tr>
<td>Std_address</td>
<td>Location address where the student resides.</td>
</tr>
<tr>
<td>Std_gender</td>
<td>Male or female</td>
</tr>
<tr>
<td>Std_phone</td>
<td>Phone number of the student.</td>
</tr>
<tr>
<td>Std_employer</td>
<td>Place where the student work if exists.</td>
</tr>
<tr>
<td>Batch_id</td>
<td>Foreign key from batch table.</td>
</tr>
<tr>
<td>College_id</td>
<td>Foreign key from colleges table</td>
</tr>
<tr>
<td>Stage_id</td>
<td>Foreign key from stages table. Represent the stage of the student in the PHD program.</td>
</tr>
</tbody>
</table>

Batches:

Record all batches information.

Table 3. 3 Batch table fields definition

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batch_id</td>
<td>Primary key.</td>
</tr>
<tr>
<td>Batch_label</td>
<td>Sequence of letters and numbers reference to specific batch</td>
</tr>
<tr>
<td>Batch_start_date</td>
<td>Date when the batch begin studying.</td>
</tr>
<tr>
<td>Local_lec_fees</td>
<td>Fees of local lecturers for the batch.</td>
</tr>
<tr>
<td>Global_lec_fees</td>
<td>Fees for the lecturers who come from other countries.</td>
</tr>
<tr>
<td>Cor_id</td>
<td>Foreign key from users table used to identify batch coordinator.</td>
</tr>
<tr>
<td>College_id</td>
<td>Foreign key from colleges table</td>
</tr>
<tr>
<td>Status</td>
<td>Integer 0 for the past batch or 1 for active batch.</td>
</tr>
</tbody>
</table>
Subjects:

Lookup table for subject’s data.

Table 3. 4 Subjects table fields definition

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub_id</td>
<td>Primary key.</td>
</tr>
<tr>
<td>Sub_name</td>
<td>Subject title</td>
</tr>
<tr>
<td>College_id</td>
<td>Foreign key from colleges table</td>
</tr>
</tbody>
</table>

College:

Lookup table for subject’s data.

Table 3. 5 College table fields definition

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>College_id</td>
<td>Primary key.</td>
</tr>
<tr>
<td>College_name</td>
<td>Name of the college</td>
</tr>
</tbody>
</table>

Stages:

Lookup table for stage’s data.

Table 3. 6 Stages table fields definition

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage_id</td>
<td>Primary key.</td>
</tr>
<tr>
<td>Stage_lebel</td>
<td>Name of the stage</td>
</tr>
</tbody>
</table>
Payments:

This table contains payments information.

Table 3. 7 Payments table fields definition

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pay_id</td>
<td>Primary key.</td>
</tr>
<tr>
<td>Pay_type</td>
<td>0 for semester payment and 1 for research payment.</td>
</tr>
<tr>
<td>Pay_amount</td>
<td>Amount should be paid to lecturer.</td>
</tr>
<tr>
<td>Pay_currency</td>
<td>USD or SDG.</td>
</tr>
<tr>
<td>Description</td>
<td>Description of the payment.</td>
</tr>
<tr>
<td>Status</td>
<td>Status of payment until full payment finished.</td>
</tr>
<tr>
<td>College_id</td>
<td>Foreign key from colleges table.</td>
</tr>
<tr>
<td>Sub_id</td>
<td>Foreign key from subjects table. Reference to subject id for which the lecturer having payment (if it is payment for teaching).</td>
</tr>
<tr>
<td>Research_id</td>
<td>Foreign key from researches table. Reference to research id for which the lecturer having payment (if it is payment for supervision).</td>
</tr>
<tr>
<td>Batch_id</td>
<td>Foreign key for batch table</td>
</tr>
<tr>
<td>Stage_id</td>
<td>Stage of payment whether it is one of semesters or research</td>
</tr>
</tbody>
</table>

Payment_statuses:

Lookup table for status data.

Table 3. 8 Payment_statuses table fields definition

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Id</td>
<td>Primary key.</td>
</tr>
<tr>
<td>Lebel</td>
<td>Name of the status</td>
</tr>
</tbody>
</table>
**Researches:**

Contains data about research with link to student and supervisor

Table 3. 9 Researchs table fields definition

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R_id</td>
<td>Primary key.</td>
</tr>
<tr>
<td>R_topic</td>
<td>Title of the research.</td>
</tr>
<tr>
<td>R_start_date</td>
<td>Date starting the research.</td>
</tr>
<tr>
<td>Std_id</td>
<td>Foreign key to student table reference to student who is doing the research.</td>
</tr>
<tr>
<td>Lec_id</td>
<td>Foreign key to lecturer table reference to lecturer who is supervising the research.</td>
</tr>
</tbody>
</table>

**Batch stages:**

Record each stage for each batch along with the start and end date of the stage.

Table 3. 10 Batch_satges table fields definition

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batch_stage_id</td>
<td>Primary key.</td>
</tr>
<tr>
<td>Batch_id</td>
<td>Foreign key to batch table.</td>
</tr>
<tr>
<td>Stage_id</td>
<td>Foreign key to stage table.</td>
</tr>
<tr>
<td>stage_start_date</td>
<td>Date of starting the stage.</td>
</tr>
<tr>
<td>Stage_end_date</td>
<td>Date of finishing the stage.</td>
</tr>
</tbody>
</table>


**Batch subjects:**

Record each stage for each batch along with the start and end date of the stage.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub_batch_id</td>
<td>Primary key.</td>
</tr>
<tr>
<td>Batch_id</td>
<td>Foreign key to batch table.</td>
</tr>
<tr>
<td>Stage_id</td>
<td>Foreign key to stage table.</td>
</tr>
<tr>
<td>Sub_id</td>
<td>Foreign key to subjects table.</td>
</tr>
<tr>
<td>Lec_id</td>
<td>Foreign key to lecturers table.</td>
</tr>
</tbody>
</table>

**Lecturer_subjects:**

Represents many_to_many relations between subject and lecturer tables.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lec_sub_id</td>
<td>Primary key.</td>
</tr>
<tr>
<td>Sub_id</td>
<td>Foreign key to subjects table.</td>
</tr>
<tr>
<td>Lec_id</td>
<td>Foreign key to lecturers table.</td>
</tr>
</tbody>
</table>
**Users:**

Saves user login details.

Table 3. 13 Users table fields definition

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Id</td>
<td>Primary key.</td>
</tr>
<tr>
<td>Name</td>
<td>Name used to refer to user.</td>
</tr>
<tr>
<td>Email</td>
<td>User email used in login process and sending emails to and from the system</td>
</tr>
<tr>
<td>Password</td>
<td>User password.</td>
</tr>
<tr>
<td>User_type</td>
<td></td>
</tr>
<tr>
<td>College_id</td>
<td>Foreign key to college table</td>
</tr>
<tr>
<td>Last_login</td>
<td>Last time the user logged into the system</td>
</tr>
</tbody>
</table>

**Suppliers:**

contains suppliers data. Works as lookup table.

Table 3. 14 Suppliers table fields definition

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Id</td>
<td>Primary key.</td>
</tr>
<tr>
<td>Name</td>
<td>Name of supplier</td>
</tr>
</tbody>
</table>
**Supplier_payments:**

Records payment’s data for suppliers.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Id</td>
<td>Primary key.</td>
</tr>
<tr>
<td>Supplier_id</td>
<td>Foreign key to supplier table</td>
</tr>
<tr>
<td>Batch_id</td>
<td>Foreign key to batches table</td>
</tr>
<tr>
<td>Lec_id</td>
<td>Foreign key to lecturers table</td>
</tr>
<tr>
<td>Amount</td>
<td>The amount to be paid for supplier</td>
</tr>
<tr>
<td>Description</td>
<td>Description why we pay the supplier</td>
</tr>
<tr>
<td>College_id</td>
<td>Foreign key to colleges table</td>
</tr>
<tr>
<td>Cancelled</td>
<td>Is payment canceled or not</td>
</tr>
</tbody>
</table>

**Common fields:**

There are common fields in most of the system tables used to help in log information.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Created_at</td>
<td>The date and time the record created.</td>
</tr>
<tr>
<td>Updated_at</td>
<td>Time stamp changed with every update of the record.</td>
</tr>
<tr>
<td>Created_user</td>
<td>Id of the user who created the record.</td>
</tr>
</tbody>
</table>
3.3. Technology used

This section describes the technology used to producing this system.

3.3.1 Programming Language: Hypertext Preprocessor PHP

A PHP is widely used scripting language, which was designed for the purpose of web development for producing dynamic web pages. For this same purpose, a PHP code is embedded inside the HTML source document. The web server along with a processor module, which generates web page, will interpret this document. PHP is a general-purpose programming language, a PHP code will be processed by an interpreter application inside the command line. This will be done while performing the desired operation of the operating system and producing a program output from the standard channel of output.

PHP is so popular that’s become the choice of programmers as is has many powerful features:

- Cross platform

  A single code written in PHP can be run in any platforms and interface with MySQL - the most popular open source database supported by PHP. Thus, this language is perfect for businesses seeking cost-effective solutions.
• **Extensible**

  PHP can be made powerful by implementing tiered programming. In this type multiple layers are created for various components, languages or ideas to keep them separate from each other. It makes the application highly scalable. In future, if any change seems mandatory then you can only make changes in the code of certain architectural layer and leave the other layers as it is. It makes your code organized, easily manageable and reusable. PHP also has abundant extension library which combined with the other features makes it highly extensible.

• **Security**

  Security of data is of utmost priority for enterprise applications. This can be easily achieved by deploying highly skilled developers who can fix the security loopholes right when they arise during the app development process. In this context, it is important to understand that there is no such thing as secure programming language. Any language can be insecure based on how the code is written, hence the language be it PHP or any other for that matter is not blameworthy.

• **Optimal performance**

  The secret of the great performance of the PHP applications is that it is configured with the opcode cache via OpCache by default since PHP 5.5 version. The opcode cache saves the output of compiled code into memory to be used in subsequent requests. Thus, it reduces execution time by skipping the parsing and compilation phases during subsequent requests and consequently increases app performance[8].
3.3.2 Programming Framework: Laravel

Laravel is a prominent member of a new generation of web frameworks. It is a free, open-source PHP web framework, created by Taylor Otwell back in 2011 and intended for the development of web applications following the MVC model.

Laravel help developers by easing common tasks used in the majority of web projects, such as authentication, routing, sessions, and caching. Laravel is accessible, yet powerful, providing powerful tools needed for large, robust applications[9].

Server Requirements

The Laravel framework has a few system requirements[10].

- PHP >= 7.1.3
- OpenSSL PHP Extension
- PDO PHP Extension
- Mbstring PHP Extension
- Tokenizer PHP Extension
- XML PHP Extension
- Ctype PHP Extension
- JSON PHP Extension
CHAPTER FOUR

IMPLEMENTATION AND RESULTS
CHAPTER FOUR

IMPLEMENTATION AND RESULTS

4.1. Introduction

This chapter represents the implementation of the implemented solution with explanation of how it works and looks.

4.2. System Users

The system has four kinds of users:

i. System administrator: the user who can create user accounts, new colleges any other things could be done by other user types.

ii. Professors: user who only see his own page and send message to other users.

iii. Program top management: this is the user who can see the progress of each batch and program student such as university management.

iv. Batch coordinator: user can create batch students and manage their files and create payments for professors.

4.3. Objectives

- Enable university coordinators to manage supervisors.
- Enable supervisors and university coordinators to monitor each student progress through his Ph.D. semesters.
- Enable coordinators to create payments for supervisors according to progress of their students.
- Enable coordinators to create payments for third parties e.g. hotels and travel agencies.
- Enable top management to be up to date by viewing the data entered by coordinators.
4.4. System Views (Result)

Figure 4.1 shows the login screen which needs username and password to login into the system.
Figure 4.2 illustrates system menu that user can navigate through its options. The first two options are available only to admin user. And the others option available to admin, coordinator and top management users.
Figure 4.3 represents colleges which are available in the system as it could work for many colleges each one have its own data and users. The two buttons for edit and delete only available for admin and coordinator users.

**Create college**

Figure 4.4 illustrates the form the user can create college through it.
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>الاسم</td>
<td>علوم الحاسب</td>
<td>1</td>
</tr>
<tr>
<td>الرقم</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>الدفعة الحالية</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>الرقم</td>
<td>IT-10-2017</td>
<td>1</td>
</tr>
<tr>
<td>الدفعة</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>الدفعة السابقة</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>الرقم</td>
<td>IT-10-2010</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>IT-6</td>
<td>3</td>
</tr>
</tbody>
</table>

**Figure 4. 5 College page**

Figure 4.5 represents college page which contain college basic information, previous and current batches.
Figure 4.6 Lecturers

Figure 4.6 represents lecturers who teach in colleges. The two buttons for edit and delete only available for admin and coordinator users.
Figure 4.7 Create lecturer

Figure 4.7 the form to create new lecturer
Figure 4. 8 Lecturer page

Figure 4.8 illustrates lecturer pages. Here is the first part of the page which shows lecturer’s basic information. The envelope icon is link to send message form to the lecturer in the page.

<table>
<thead>
<tr>
<th>رقم</th>
<th>الاسم</th>
<th>الجنسية</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>سامر خلاوي ابراهيم</td>
<td>سوداني</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>البريد الإلكتروني</th>
<th>اللفتة</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="mailto:s.a.jlawi@gmail.com">s.a.jlawi@gmail.com</a></td>
<td>البروفسور</td>
</tr>
</tbody>
</table>

Figure 4. 9 Lecturer view- part two

Figure 4.9 illustrates the second part of the lecture page which contains the subjects he can teach, subjects he is teaching now, the subjects he has taught before and researches he supervises.
Figure 4.10 Lecturer view- part three

Figure 4.10 represents lecturer’s payments of the researches he supervises and the visits that he comes to university. Each research has three payments. Here the coordinator can create payment by clicking the payment checkbox or chick the checkbox of the step so he can check them all if he has one or more research and create payments for researches step. In fact each lecturer (lecturers who came from outside Sudan) comes two times one for making presentation about the subject he may teach if students choose to learn it or to present researches proposals of students he supervises so he deserve payment in each visit here the view show the user if visits payments already paid or let him create them just by clicking the checkbox corresponding to the intended payment.
Figure 4.11 Edit lecturer

Figure 4.11 shows edit lecturer form with the existing data of intended lecturer. Also the subjects that lecturers teach appear so the user can delete them or let them as it is.
Table of Students

<table>
<thead>
<tr>
<th>مرحلة</th>
<th>الدفعة</th>
<th>الاسم</th>
<th>الرقم الجامعي</th>
</tr>
</thead>
<tbody>
<tr>
<td>جين</td>
<td>IT-2018</td>
<td>ahmed</td>
<td>1234</td>
</tr>
<tr>
<td>جين</td>
<td>IT-2018</td>
<td>mona ali</td>
<td>1235</td>
</tr>
<tr>
<td>جين</td>
<td>IT-2019</td>
<td>sara</td>
<td>2345</td>
</tr>
<tr>
<td>جين</td>
<td>IT-2019</td>
<td>nadia</td>
<td>3456</td>
</tr>
<tr>
<td>جين</td>
<td>IT-2017</td>
<td>باسم</td>
<td>2345</td>
</tr>
</tbody>
</table>

Figure 4. 12 Students

Figure 4.12 illustrates student’s page. The two buttons for edit and delete only available for admin and coordinator users.
Figure 4.13 Student page

Figure 4.13 represents the student basic information, the stage of the Ph.D. program, the research if exist, optional subjects of the second semester if he reaches it and the status of learning whether he still learning, suspends learning or finished learning. The buttons at the top of the page are for editing information, add research to student and add optional subjects.
Figure 4. 14 Edit student

Figure 4.14 shows the form of editing student’s data with the existing data to be changed.
Figure 4.15 Add research to student

Figure 4.15 shows the form of adding research to student by adding title then select supervisor. The warning message appears to inform the coordinator that the student already has research assigned to him and it will be deleted if he continues adding new one.
Figure 4. 16 Add optional subjects to student

Figure 4.16 shows the form of adding optional subjects of the second semester for student by selecting subjects from the lists. The warning message appears to inform the coordinator that the student already has optional subjects assigned to him and it will be deleted if he continues adding new subjects.
Figure 4. 17 Batches

Figure 4.17 represents batches which are available in college which the logged-in user related to. The two buttons for edit and delete only available for admin and coordinator users.

Figure 4. 18 Batch page part-1

Figure 4.18 represents the first part of the batch page which shows the basic information of the batch and the current stage. The message icon appear at the top of the page is to send email to batch student.
Figure 4.19 illustrates the second part of the patch page that contains the next stage of the batch and the subjects they learn.
Figure 4. 20 Create batch

Figure 4.20 represents form to create new batch with its stages beginning and ending dates.
Figure 4.21 Edit batch

Figure 4.21 represents the form to edit batch with the exiting data of the batch so the user can change what he need.
Figure 4. 22 Batch subjects

Figure 4.22 represents form through which we add subjects to this batch along with their lecturers.

Figure 4. 23 Student researches

Figure 4.23 represents student’s researches along with their supervisors and research stage.
Figure 4.24 Research page

Figure 4.24 represents the basic information of the research with their payments if exist.
Figure 4. 25 Payments page

Figure 4.25 shows two forms as there are two ways of search. The first one if for research payments for one supervisor, the other one is for teaching payments for lecturers who teach the batch students.

Figure 4. 26 Payments for research

Figure 4.26 is the search result for the first form in figure 4.19 which shows the payments for supervisor. This figure shows the user if payments are paid and enable him to make payment if they aren’t created -but they should be issued- just by checking the check box of the stage that he should be paid for.
Figure 4.27 Payments for semester

Figure 4.27 shows the payments of specific batch for lecturers who teach in each semester. This figure shows if payments have paid already or enable batch coordinator to create them just by checking the checkbox at the table header.

التقارير

Figure 4.28 Reports

Figure 4.28 represents the page through which the user creates reports. The page contains three tabs the first one to generate students report.
Figure 4. 29 Students report

Figure 4.29 shows the student of the batch selected from the list of batches in figure 4.28 each student along with status studying and research topic if exist.

التقارير

![Figure 4.30 Reports – payment tab](image)

Figure 4.30 is the second tab of the report page mentioned in figure 4.22. Here the user selects batch and type of payments (supervision payments, teaching payments, visits or all payments).
Figure 4.31 Payments report

Figure 4.31 shows the payments of the selected batch regarding the payment type selected by the user.
Figure 4. 33 Reports- research tab - 2

Figure 4.33 represents the form for generating report of researches for customized supervisor. The supervisors list appears according to selected batch and after checking the “with supervisor” option.

<table>
<thead>
<tr>
<th>حالة</th>
<th>المشرف</th>
<th>الطالب</th>
<th>عنوان البحث</th>
</tr>
</thead>
<tbody>
<tr>
<td>تسليم المشرف</td>
<td>سامر علذى ابراهيم</td>
<td>ahmed</td>
<td>LMS</td>
</tr>
<tr>
<td>تسليم المشرف</td>
<td>ali</td>
<td>mona ali</td>
<td>Blended learning</td>
</tr>
</tbody>
</table>

Figure 4. 34 Researches report

Figure 4.34 illustrates researches report for specific batch.
Figure 4.35 Reports – suppliers payments tab

Figure 4.35 shows the form to generate supplier’s payments report for specific batch also could be for specific supplier. Here suppliers refer to hotels, travel agencies and others.

<table>
<thead>
<tr>
<th>الدفعة</th>
<th>التفاصيل</th>
<th>المبلغ المدفوع</th>
<th>الاسم</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT-2018</td>
<td>شاكر الطيران</td>
<td>100000 جس</td>
<td>tigerland</td>
</tr>
<tr>
<td>IT-2018</td>
<td>مستمعات إقامة المحامين</td>
<td>20000 جس</td>
<td>grandholiday villa</td>
</tr>
</tbody>
</table>

Figure 4.36 Suppliers payments report

Figure 4.36 represent suppliers and the payments created for them for specific batch.
Figure 4.37 Create payment for supplier

Figure 4.37 illustrates the form through which the user creates payment for suppliers (travel agency, hotel or other) when lecturers come from outside Sudan in their visits to make presentation for subjects or present research proposal.
Figure 4.38 Supplier payment

Figure 4.38 represents the payment for supplier for tickets or residence of lecturers of specific batch. The cancel button appears in the top of payment will disappear if payment already cancelled and will be replaced by label to indicate that it’s cancelled payment.

Figure 4. 39 Messaging

Figure 4.39 shows messaging section which contains two parts for sent and received messages. Also link to send message to one of the system users. The blue colour used for unread messages.
Figure 4. 40 Send message

Figure 4.40 illustrates form for sending message to other system users.
Figure 4.1 Create account

Figure 4.41 show the form of creating new user account by the system admin.
CHAPTER FIVE

CONCLUSION AND FUTURE WORK
CHAPTER FIVE

CONCLUSION AND FUTURE WORK

5.1. Conclusion

The thesis has present a solution for the management of supervision in blended learning online PhD program in CSIT. The solution raised as a result of comparison with other systems related to Blended Learning management or university management. It has covered the management part as other systems don’t.

We used Laravel framework and Mysql to build management system for blended learning.

The result is working system that concern with management process specially financial process of payments with reports to the top management in CSIT college. The solution has enabled coordinators to manage students and supervisors, connected supervisor’s payments with student’s progress, and covered all payments which related to this programme such as lecturer’s visits payments and any other payments to third parties who participates in this programme e.g. hotels or travel agencies. Also, it has covered lecturer’s teaching information and researches supervision process with respect to the phases that each research should go through.

5.2. Future Work

The following additions are suggested to improve current work:

1. Adding portal for students to see their files and results also to communicate with their lecturer and batch coordinator.
2. Add files repository to contain each research documents so it will be easy for future students to find previous studies.
3. Add portal to post graduate studies college to inform CSIT College with registration data and to update status of payments, also to make communication easy between them.
References

[Accessed: 15-oct-2016 7:00 PM]


[Accessed: 03-Dec-2017].

[Accessed: 03- Dec- 2018].

[Accessed: 20-Jan-2018 9:00 AM].

[Accessed: 30-Jun-2018 5:30 PM].