LEARNING MANAGEMENT SYSTEM AS AN EXTENSION MODULE FOR OPENERP

Capstone Design
April 2016
Hanane Oulasri
Supervised by: Omar Houssaini Iraqi
Before going any further on this report, I would like to acknowledge the people who contributed to the success of this capstone project. First, I would like to thank Professor Omar Houssaini Iraqi for suggesting the idea of this project and helping me throughout the semester in order to deliver a successful project. I would also like to thank him for providing me with all the necessary assistant and knowledge in Network and Internet Technology which made the basis of my project. I would also like to thank the community of Stackoverflow and Github who provided solutions to problems I was facing during the implementation phase.

Last but not least, I would like to thank my friends and family who supported me throughout my years here in AUI and helped me get through the stressful times.
# Table of Contents

Abstract .............................................................................................................................................. iv  
1. Introduction ...................................................................................................................................... 1  
2. OpenERP (Odoo) ......................................................................................................................... 2  
  2.1. What is Odoo? .................................................................................................................. 2  
  2.2. Why Odoo? ....................................................................................................................... 3  
3. Development Cycle ..................................................................................................................... 4  
4. Plan .................................................................................................................................................. 5  
5. Feasibility Study .......................................................................................................................... 6  
  5.1. Benefits ................................................................................................................................... 6  
  5.2. Cost and Risks ...................................................................................................................... 6  
  5.3. Outcome .................................................................................................................................. 7  
6. Requirement Specification ........................................................................................................... 7  
  6.1. Functional Requirements ...................................................................................................... 7  
  6.1.1. Use Case Diagram ......................................................................................................... 8  
  6.2. Non Functional Requirements ............................................................................................ 10  
7. Technology Enablers .................................................................................................................. 10  
8. Architecture and Design ............................................................................................................. 12  
  8.1. Application Architecture ...................................................................................................... 12  
  8.2. Entity Relation Diagram ...................................................................................................... 12  
  8.3. Android Application Design ............................................................................................... 15  
9. Implementation Progress ............................................................................................................. 17  
10. Implementation Results ............................................................................................................. 20  
11. STEEPLE Analysis ..................................................................................................................... 24  
  11.1. Social .................................................................................................................................... 24  
  11.2. Technology .......................................................................................................................... 24  
  11.3. Economic .............................................................................................................................. 24  
  11.4. Environment ....................................................................................................................... 24  
  11.5. Political ............................................................................................................................... 25  
  11.6. Legal ...................................................................................................................................... 25  
  11.7. Ethical .................................................................................................................................... 25
Abstract

It has always been a struggle for students and specially parents to check the performance of the kids in school since they had to drive all the way to school to talk to the professors or the principle. However, we have witnessed a great shift in technology for the past century which made our lives much easier. With a click, you can buy anything from your favorite store, order from your favorite restaurant and even stay updated with your school work.

Odoo which is formally known as OpenERP is a powerful platform that exposes its web services to developers to they can design application efficiently on different platforms. I’m using Odoo’s web services to develop a mobile application called OdooEducation that will save a lot of trouble and time for students and their parents in schools. With this app they will be able to authenticate to their accounts where they will brows a menu so they can check their attendance records, assignments, announcements and grades.
1. Introduction

In today’s world, everything and everyone uses technology to perform many tasks and one of them is communication. It helps people keep in touch with their loved ones, with their work, with their environment and with the world in general. Moreover, technology has facilitated everything today by just a click you can do wonders.

Educational establishment are no exception when it comes to using technology, they have developed websites and Facebook pages to keep in touch with students, parents, staff and anyone overall who is interested in their establishment. However, not all of these establishments have integrated themselves in this world of social media and that is due to several factors.

This is where the project comes in handy; the idea of this project is to develop a mobile application that enables students or their parents to access their school records. It will allow them to check their attendance record for a specific course they are enrolled in, check assignments, check grades and check announcements or news related to a course or school in general.

The main purpose of this project is to bring comfort and ease to the user so they can perform the various tasks mentioned above just by a button click on their smart phone in the comfort of their homes. They won’t need to get in touch personally with the professors or the principal as it can be a hassle sometimes, but rather browse the application on their device.

This application will be within a new module which is “Education” that leverages existing web services provided by a powerful platform OpenERP (Odoo) through its web services’ API.
2. **OpenERP (Odoo)**

2.1. **What is Odoo?**

Odoo (ex OpenERP) is a comprehensive suite of business applications including CRM, Warehouse management, Sales, Manufacturing, Project management, Human Resources, Financial management, etc... Odoo offers a variety of choice of hundreds modules. Odoo is available on-site or in the cloud and is suited mostly for small to mid-sized companies. With more than hundreds of installations/downloads per day, Odoo is one of the most used open source software around the globe. It is flexible, can be adapted easily to any needs and has a dynamic community. Thanks to Odoo’s ease of use and modularity, it can be rapidly put in production.

Odoo was published first under the name of OpenERP and TinyERP, where ERP stands for Enterprise Resource Planning. An ERP is a generic software that is flexible to any modification and customize and fulfills generic needs. Odoo is a modular system where its services are represented as modules, and the ones that are necessary come installed with the ERP and can be adapted to the workforce and growth of the company that uses the system. Odoo has a powerful process engine which allows the allocation of validation modes, tasks and deadlines. According to the ERP’s official website, Odoo has 5525 module; production management, logistic, human resources, accounting, management control, payroll, customer relationship management or CRM, marketing, inventory management, documents management, etc. Odoo is used by many organizations such as Hyundai, Auchan, Sodexo, Danone, Veolia, and many others.

Odoo is represented in 120 countries by more than 550 partners, and it is used by almost 2,000,000 users.
Odoo is known for a number of features such as:

- Social networking
- Website creation using CMS
- Employee assessment and evaluation
- Recruitment process

These and other features are exploited by the users to make the management of their business as organized and smooth as possible.

2.2. **Why Odoo?**

Odoo insures a significant progress and growth for the organization/company that decides to opt for it as a management system for its transactions and businesses:

- Odoo boosts the productivity and reactivity of the services given any entity that uses it thanks to its robustness in managing the various aspects of the business.
- Odoo also optimizes the internal process thanks to its well designed structure, which allows the company to invest more in opportunities and save its operational resources.
- Its internal structure ensures a flow of information among the different departments in a company which ensures the consistency and coherence of the information. Therefore an external and internal communication.
- Odoo boost the motivation and productivity of a company’s staff since all the basic work is already performed by the ERP.
- Odoo gives an advantage to the company that adopts it since it is a powerful and robust software which makes it a nontraditional company.
• Odoo is open and flexible to any changes the company may which to perform on it. New modules can be developed, or installed, according to the company’s specific needs.

• Odoo is open source.

• Odoo uses open and modern technologies: PostgreSQL, Python, developing competitive mobile interface and strong integration of web services.

3. Development Cycle

The steps that need to be followed in order to reach the final software product are the following:

• Feasibility Study

Through this phase, we will be gathering the necessary specifications of the mobile application and analyzing them to conclude if the application is feasible or not

• Requirements

Through this phase, we will be translating the specifications gathered in the feasibility study phase into specific requirements that would be later translated to functionalities to be implemented. This phase is also about grouping these requirements into functional and non functional.

• Architecture and Design

In this phase, we will be deciding about the tools and technology enablers to be used along with getting familiarized with the new ones.

After that, we will be designing the application’s architecture along with specifying its components and the protocols and API’s to be used
• Implementation and Testing

In this phase, we will start translating the system’s requirements into implementation. Then comes the testing phase to detect any possible anomaly in the system that hasn’t been detected before.

• Delivering the final mobile application as the final step.

4. Plan

<table>
<thead>
<tr>
<th>Week(s)</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Project setting and agreement with the supervisor</td>
</tr>
<tr>
<td>2</td>
<td><strong>Feasibility Study:</strong> Gathering the initial specifications of the project</td>
</tr>
<tr>
<td>3</td>
<td><strong>Requirements’ phase:</strong> Gathering more requirements and studying the feasibility of the project</td>
</tr>
</tbody>
</table>
| 4,5,6,7 | - Getting familiarized with the new technologies to be used in the implementation  
             - **Architecture and Design phase**  
             - Submission of the interim report |
| 8,9,10,11,12 | - **Implementation phase** |
| 13      | - Work on the final report of the capstone |
Table 4: Capstone project plan

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 14 | -Getting ready for the project defense  
-Testing phase  
Project defense. |
| 15 | Checking the whole work and make changes if needed. |

5. Feasibility Study

5.1. Benefits

It has always been a struggle for students in school (primary, secondary, high school) to keep up with school records in terms of grades, GPA, attendance and so on not forgetting their parents who constantly want to check their performance but didn’t have an easy access. Nowadays, technology had made a great turn and became very essential in anyone’s life, where you can access anything from your mobile phone. This application will allow these users to perform many read mode only tasks for a client perspective, and it will also introduce me to the world of android development as well as working in a professional framework.

5.2. Cost and Risks

A good planning and a wise time management are what the application would take to see the light at the end of Spring 2016. The tools that will be used are free and open source which will reduce the cost. The only constraint is time; three months for the implementation of a professional mobile application using tools I have never worked with. Another challenge worth mentioning is that the realization of the project will be done in parallel with three regular classes.
5.3. **Outcome**

As an outcome from this study, I came to the conclusion that this project is feasible. Because I was able to narrow down the specification and conduct a well planned study about this project. In addition that this project uses many existing open resources that I will be leveraging which will make it easy.

6. **Requirement Specification**

After studying the feasibility of the project and making sure that its realization is possible within the duration of the spring semester and using the tools and facilities which are available, I had to collect the requirements of the application, and this task was accomplished under the supervision of my supervisor.

6.1. **Functional Requirements**

The application should allow the student or their parents to:

- **Login**

  In order to access the application the students or their parents need to authenticate through a login page that will allow them to perform different tasks provided by the application. After the user authenticates the server loads their information concerning their courses, assignments, grades, attendance records and any announcements available at that time.

- **Consult Courses**
After the login, the user will be able to browse through their courses on a read only mode in order to check any information provided by the server.

- Consult Attendance Records

This service is meant for the parents especially so they can consult their kids’ attendance records and be updated about their kids’ performance.

- Consult Grades

This service will allow students or parents to check course grades and especially each assignment’s grade

- Consult News and Announcements

This will allow the user to see any news or announcements related to their course or school in general depending on its type. Once they’ve logged in they will be directed to a page that has announcements where they will be able to click on a specific one to get more information about it.

- Get Notifications

Using Google notification, this will allow the user to get notified each time there is something new in the server side: They will be notified if there was a new announcement, new assignment, a grade that has been assigned to an assignment and so on.

6.1.1. Use Case Diagram
Figure 6.1.1: Odoo Education system’s use case

The users which are either the parents of the student or the student are the actors and they will be able to authenticate and access the account where they will be able to perform the action above: Check Courses, Check Assignments, Check Grades, Check Attendance and Check Announcements
6.2. Non Functional Requirements

- **Access channels:** the application should be a client mobile app running under Android

- **Security:**
  - Confidentiality: Performed operations should be confidential
  - Integrity: Protection against unauthorized modifications
  - Availability: Available when needed, no single point of failure

- **Integration:** the application should use web services provided by OpenERP and Google notification

7. Technology Enablers

Since I’m designing the client side application there will be fewer technologies involved in this process.

The mobile application needs a mastery of *Android*, because it is an open source operating system that was developed by Google for cars, TVs, smart watches and smart phones. Most of today’s smart phones operate on Android which holds a huge market share. The IDE I will be using is *Android Studio*.
Along with that I will be using Apache XMLRPC to access the web services provided by the server OpenERP (Odoo).

Odoo formally known as OpenERP is a powerful platform that exposes its web services to ease the creating of applications that will help the good management of businesses. This server will be accesses by Apache XMLRPC.

PostgreSQL is a DBMS that is used by Odoo so I won’t be dealing with is directly but through the server.

As we are in the third week of the semester, learning how to work with these tools should be done in parallel with requirements’ gathering and analysis.
8. **Architecture and Design**

8.1. **Application Architecture**

The application uses the web services provided by OpenERP which are accessible using the XML RPC under an MVC model.

![Entity Relation Diagram](image)

**Figure 8.1:** Odoo Education’s architecture

8.2. **Entity Relation Diagram**

Even if I’m using Odoo’s web services that will allow me to access the DBMS easily, I need to create entities to meet the application’s requirements.
The description of the entities:

**Student:** This is an entity that inherits from the partner’s entity that already exists in Odoo, this way I won’t need to create another entity that represents the student’s account because partner already has a user account. This will allow the easy authentication where the user will enter their credentials and it will be checked at the level of the server Odoo.

**Course:** This entity represents the courses taken by the student that has a course id \( Cr\_id \) and \( Cr\_info \) that represents the information about it (Pre-requisite, what is the course about, etc…)
**Section:** This entity is linked to the Course entity by a relation of 1 to many and it has a section id and the Cr_id as a foreign key, it also has the name of the professor it is teaching, the time and the capacity.

**Professor:** This entity represents the professor that teaches a specific section of a course it is linked to the Course through two entities which are the bridge entity Taught by and the Section entity.

**Taught by:** This is a bridge entity that represents the relation between a Professor and a Section and by that we mean that a professor teaches a section or many and the other way around.

**Enrolled in:** This is another bridge entity that represents the relationship between a Student and a Section which is that a student enrolls in one or many section and a section has one or many students.

**Announcement:** This entity represents the announcements specific to a section and it has an id Ann_id, Sec_id that represents the section that is concerned with the announcement and announcement information

**Coursework:** This entity represents the relationship between assignments and section and it has an id Crsw_id and Sec_id that represents the section it belongs to.

**Grade:** This entity represents the overall grade of the section specific to a student and it is linked to the coursework where Crsw_id is the foreign key.

**Assignment:** This entity represents the assignments a coursework has and it has a grade and a type.
Type: This entity is specific to assignment because it shows the assignment type and the grade percentage it makes from the overall grade.

8.3. Android Application Design

Android studio provides a user interface that is built around activities and each activity related directly to the application’s functional requirements. The first activity is the Login activity which represents the login functional requirement that will allow the user to authenticate and redirected to their account’s space where they can perform various tasks according to the functional requirements.

Figure 8.3: Odoo Education’s design

Activity description:

LoginActivity: This is the first activity that pops out when you run the application; in this activity the user is required to enter the credential to access their account
Menu: After the user logs in, there is a fragment shown which the AnnouncementFragment then there is a small icon that when the user click it shows a navigation drawer that the user chooses from and gets to a specific fragment that leads them to a specific activity.

AnnouncementFragment: This fragment shows a list of announcement fetched from the server that when clicked lead to the AnnouncementActivity that shows more information about that specific announcement.

AnnouncementActivity: This activity shows more information about a specific announcement clicked from the list provided in the AnnouncementFragment.

GradesFragment: This fragment shows a list of courses fetched from the server that when the user clicks it leads them to the GradesActivity which shows each course’s grade.

GradesActivity: This activity shows the grade of a specific course from the list provided in GradesFragment.

AssignmentFragment: This fragment shows a list of courses fetched from the server that when the user clicks they get directed to the AssignmentActivity which shows the list of assignments in each course clicked.

AssignmentActivity: This activity shows a list of assignments along with their grades if found to a specific course clicked in the previous fragment.

AttendanceFragment: This fragment shows a list of courses fetched from the server that when the user clicks they get directed to the AttendanceActivity which shows the attendance record of the course clicked.
**AttendanceActivity:** This activity shows a record of attendance to a specific course clicked in the previous fragment.

**CourseworkFragment:** This fragment shows a list of courses fetched from the server that when the user clicks they get directed to the *CoursesActivity* which shows information about the course clicked.

**CoursesActivity:** This activity shows information about a specific course clicked in the previous fragment.

**LogOutFragment:** This fragment when clicked the user will be logged out from the application.

### 9. Implementation Progress

The implementation phase took place in the last three months with the supervision of my supervisor. It was about designing different Android activities which are similar to web pages, designing and implementing the database in Postgres and accessing them using the web services provided by OpenERP API (Odoo) through XMLRPC calls. Whenever I created and activity or added a functionality, I would test it either using an android mobile phone or the emulator provided by the IDE Android Studio to get an idea about how the application looks like on the client’s mobile phone.
Since the application requires access to internet in order to access the database, I had to add a piece of code in the AndroidManifest.xml file because this file presents important information about the Android application along with the Android system such as content providers, permissions, activities and classes, so that the application is granted the permission to open network sockets and communicate with OpenERP server.

```xml
<uses-permission android:name="android.permission.INTERNET" />
```

In order to access the web services provided by Odoo I had to add special libraries as the screenshot shows.
To make the application user friendly I added a navigation drawer that is accessed by a simple slide which will lead the user to wherever fragment as shown in Android application design section.

This screenshot shows the icons along with the different menu items that the user can click in the activity_welcome_drawer.xml under the menu folder that is located under the res folder:

```
<group android:checkableBehavior="single">
    <item
        android:id="@+id/nav_course"
        android:icon="@drawable/ic_courses_24dp"
        android:title="CourseWork" />
    <item
        android:id="@+id/nav_assignments"
        android:icon="@drawable/ic_assignment_24dp"
        android:title="Assignments" />
    <item
        android:id="@+id/nav_grades"
        android:icon="@drawable/ic_grade_24dp"
        android:title="Grades" />
    <item
        android:id="@+id/nav_logout"
        android:icon="@drawable/ic_clear_24dp"
        android:title="Logout" />
</group>
```

Figure 9.4: Designing the items of the menu
This next screen shot shows that there is a switch case in the Menu activity that based on the click of the user it redirects them to a fragment:

```java
@SuppressWarnings("StatementWithEmptyBody")
@override
public boolean onNavigationItemSelected(MenuItem item) {
    // Handle navigation view item clicks here.
    int id = item.getItemId();
    FragmentManager fm = getFragmentManager();

    if (id == R.id.nav_course) {
        fm.beginTransaction().replace(R.id.content_frame, new Fragment_Courses()).commit();
    } else if (id == R.id.nav_logout) {
        finish();
        Intent intent = new Intent(Welcome.this, Login.class);
        startActivity(intent);
    } else if (id == R.id.nav_assignments) {
        fm.beginTransaction().replace(R.id.content_frame, new Fragment_Assignments()).commit();
    } else if (id == R.id.nav_grades) {
        fm.beginTransaction().replace(R.id.content_frame, new Fragment_Grades()).commit();
    }

    DrawerLayout drawer = (DrawerLayout) findViewById(R.id.drawer_layout);
    drawer.closeDrawer(GravityCompat.START);
    return true;
}
```

![Figure 9.5: Switch case of the menu](image)

### 10. Implementation Results

This part shows the result of the process that begins from gathering the initial specifications until the end of the implementation phase. It shows how the application met the requirements specified in the application requirements section above. Below are screen shots of the application along with a description of their functionalities.
Figure 10.1: Login page

Figure 10.2: Login succeeded

Figure 10.3: Login failed

Figure 10.4: Slide menu
Figure 10.5: Announcement page

Quiz N.5 is next Tuesday

No class next Wednesday

Figure 10.6: List of courses in Coursework

Computer Architecture
Literature
Physics II
Advanced French
Calculus I

Figure 10.7: Computer Architecture information

This course will build on the strong base of problem solving and programming language skills reached in the preceding courses to give students the basics of the physical structure of a modern computer. It will cover digital logic and digital systems, machine level representation of data, assembly level machine organization, memory system organization and architecture, interfacing and communication, illustrated with projects implemented in assembly language and C.

Figure 10.8: List of courses in Assignments

Computer Architecture
Literature
Physics II
Advanced French
Calculus I
Figure 10.9: Literature assignments

- Assignment 1: Summary of chapter 7
- Assignment 2: Summary of chapter 8
- Assignment 3: Summary of chapter 9

Figure 10.10: List of courses in Grades

- Computer Architecture
- Literature
- Physics II
- Advanced French
- Calculus I

Figure 10.11: Physics II grades

- Grade of Quiz 1: 88/100
- Grade of Assignment 1: 78/100
11. **STEEPLE Analysis**

The STEEPLE analysis consists of looking at seven external factors that are to affect or might be affected by the business. In fact, before implementing the project, we should be aware of how it can interact with the macro-environment which opens up our eyes on the possible risks and challenges that we might be facing in later phases.

11.1. **Social**

The application will insure effective communication that will allow students, their parents and the school to communicate information in a convenient way and less time. It will be a solution of any conflict in time or miscommunication that could be raised.

11.2. **Technology**

The application will introduce a service that is accessible by one click which will allow clients (students and their parents) to consult any matter that relates to grades, assignment, news and so on from the comfort of their home. Schools will be encouraged to get more in touch with technology in this domain more than ever.

11.3. **Economic**

For the time being, the application will be free in the app store but it does use commercial resources that are free of charges.

11.4. **Environment**

This application would have an indirect effect on the environment. In fact, parents won’t have to go to the school in order to consult their kids’ performance. The application will make them find solutions for their needs while reducing their mobility, and so the environment pollution.
11.5. Political

The application depends on the policies and regulations of the educational system in Morocco. Any changes in these regulations will affect the content and hence the services that it will provide.

11.6. Legal

The application is based on respecting the educational system law in Morocco; it should support the constitution written laws and not provide any content that would be considered illegal.

11.7. Ethical

The application will allow parents to easily follow up on their kids’ performance in school; in addition to providing better communication between the parents and the teachers.

12. Future Work

Due to time constraint, I wasn’t able to implement Attendance. However, this is a requirement that I will be implementing in the future along with many new features to make this application adaptable to technology changes.
13. **Conclusion**

Being able to develop such an application was a big and important step in my academic career, I was able to apply the knowledge I accumulated throughout my studies in AUI and learn new concepts and put them to test. By doing so, it made me accumulate even more knowledge that will come in handy in my professional life. This was also a great opportunity to experience the professional environment because I was supervised and expected to meet a firm deadline to deliver this project. Even if it was stressful, it was a great preparation for my professional career. This is one of the most fruitful courses in AUI and I’m thankful to everyone who made it happen.
14. References


Gturri/aXMLRPC. (n.d.). Retrieved May 01, 2016, from https://github.com/gturri/aXMLRPC


