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Software Requirement Specification

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2.8	S.F.C.	- CFR015	- Requirement's priority adjusted	-	22/02/2013

Content Table

Figure Table

Appendix Figures

Tables Table

1 Introduction

This document includes the *software requirements* for the *E-LEDA: E-Learning Data Analyser system*. This introduction section is divided in different subsections for explaining the purpose, scope, definitions, references, and overview of the document. This document follows the format described in the IEEE 830-98 for *software requirement specification* (IEEE Computer Society, 1998).

1.1 Purposes

The purpose of the *software requirement specification* is to provide a full description of the *E-LEDA system*, so the client can verify that all the necessary content is included and the designers have the complete, unambiguous understanding of the project to develop.

1.2 Scope

The *E-LEDA: E-Learning Data Analyser* is a *system* designed for helping lecturers to test the suitability of *e-learning* management systems (LMS) by providing graphs with student information. The *E-LEDA system* allows the lecturers to view information about the managed courses and students, but does not allow modifying any information in the *e-learning* platform.

The *E-LEDA system* will provide the necessary information for making decisions like, changing the *e-learning* platform or to change the way for managing the courses by the lecturers, so the student results can be optimized.

This document is part of the *E-LEDA: E-Learning Data Analyser* project, and respects the format and definitions of the *E-LEDA: E-Learning Data Analyser Final Thesis* document.

1.3 Definitions, acronyms, and abbreviations

The definitions, acronyms and abbreviations of the *software requirement specification* can be found at the end of the document in the *glossary* section.

1.4 References

The references of the *software requirement specification* can be found at the end of the document in the *bibliography* section.

1.5 Overview

The *software requirement specification* document is divided in two mayor sections, general description of the product, and the product software requirements, each of them are also divided in different subsections. At the end of the document are placed the bibliography, containing the references of the document, and the glossary, specifying the definitions, acronyms and abbreviations.

2 Overall Description

This section describes all factors affecting the system allowing a better understanding of the problem for the later requirement specification. This section is divided in six different subsections, every section explains a different part of the problem, the described sections are: product perspective, product functions, user characteristics, constraints, assumptions and dependences, and future requirements.

2.1 Product perspective

The *E-LEDA system* consists in an *iOS application*, a *web application* for register the *e-learning* platforms in the system, and *cloud services* for administrating the different LMS's in the system. The *E-LEDA system* shall work with *e-learning* platforms which course structure conforms to the *SCORM* standard format for *LSM*. The Figure 2-1 *E-LEDA system architecture* represents the architecture of the *E-LEDA system* and how the communications take place between the different parts and actors of the system.

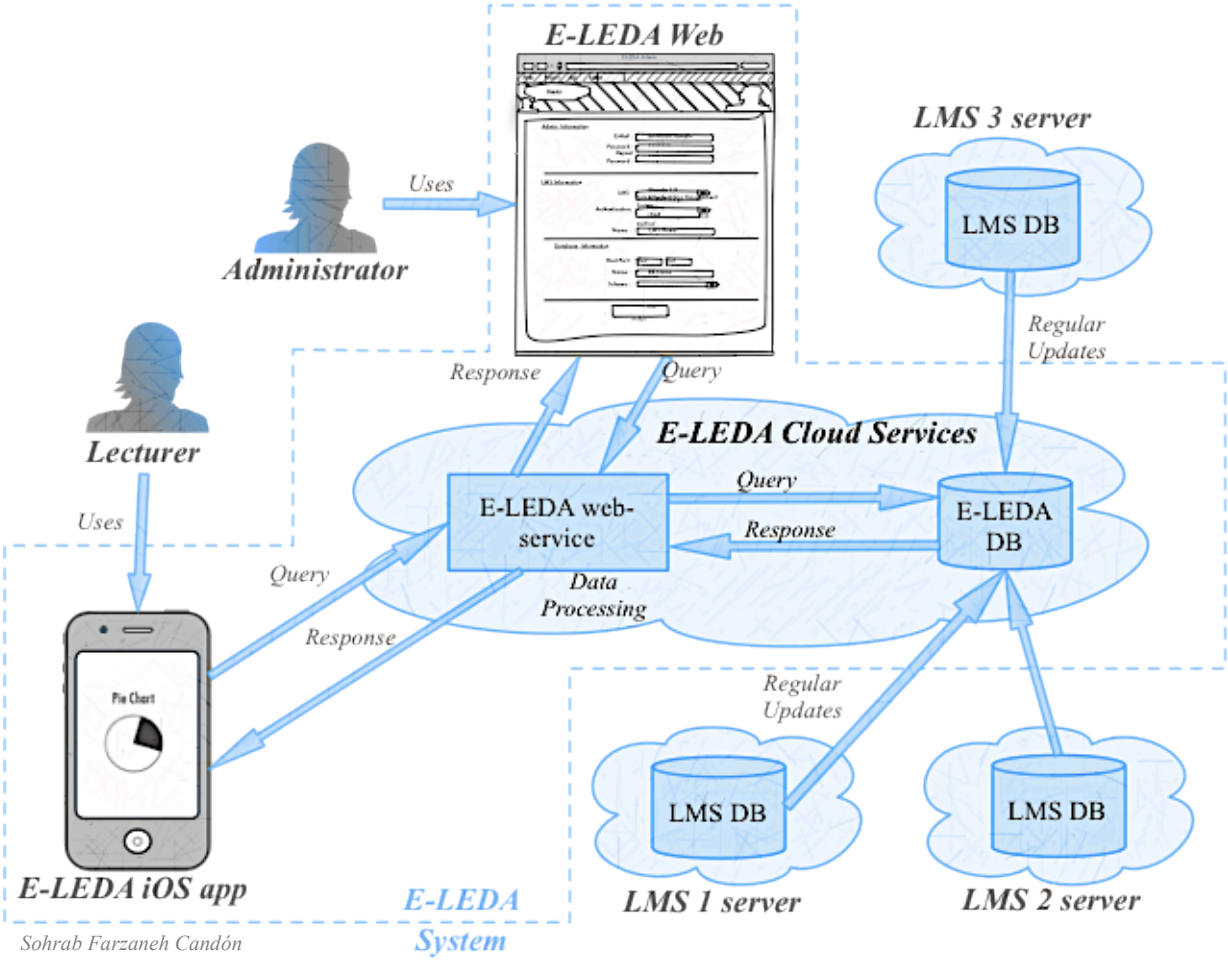

Figure 2-1 *E-LEDA system architecture*

The *E-LEDA system* is composed by different modules, all the modules together provide the full functionality of the *E-Learning Data Analyser*. The next lines describe briefly the different modules parts of the system.

- **E-LEDA Cloud Services:** The *E-LEDA cloud services* include the web services and storage for the *E-Learning Data Analyser system*.
- **E-LEDA iOS app (*or E-LEDA app or iOS app*):** iOS application that allows the lecturers to see and analyse the result of their courses in the LMS using an iOS 6 compatible device (*excluding iPad*).
- **E-LEDA web app:** web application made for the managing and administration of the LSMs by administrators, allowing the lecturers the access to the cloud services from the iOS app.

- **E-LEDA system:** includes the different parts of E-LEDA (cloud services, iOS app and web app).

The following list of features describes the expected behaviour and actions of the different sub-systems of the *E-LEDA system.*

- **E-LEDA iOS app:** The *E-LEDA iOS app* shall be able to *authenticate users,* and provide *course, tasks,* and *students information*
- **E-LEDA web app:** The *E-LEDA web application* shall be able to *authenticate users* and let the *admins manage LMS's*
- **E-LEDA Cloud Services:** The *E-LEDA cloud services* shall be able to *authenticate the users* (in the *E-LEDA system* and *LMS's*), *manage the databases and LMS's* and *analyse data.*

The Figure 2-2 *E-LEDA Business Processes* represents the possible business processes in the *E-LEDA system* taking into account the actors of the system.

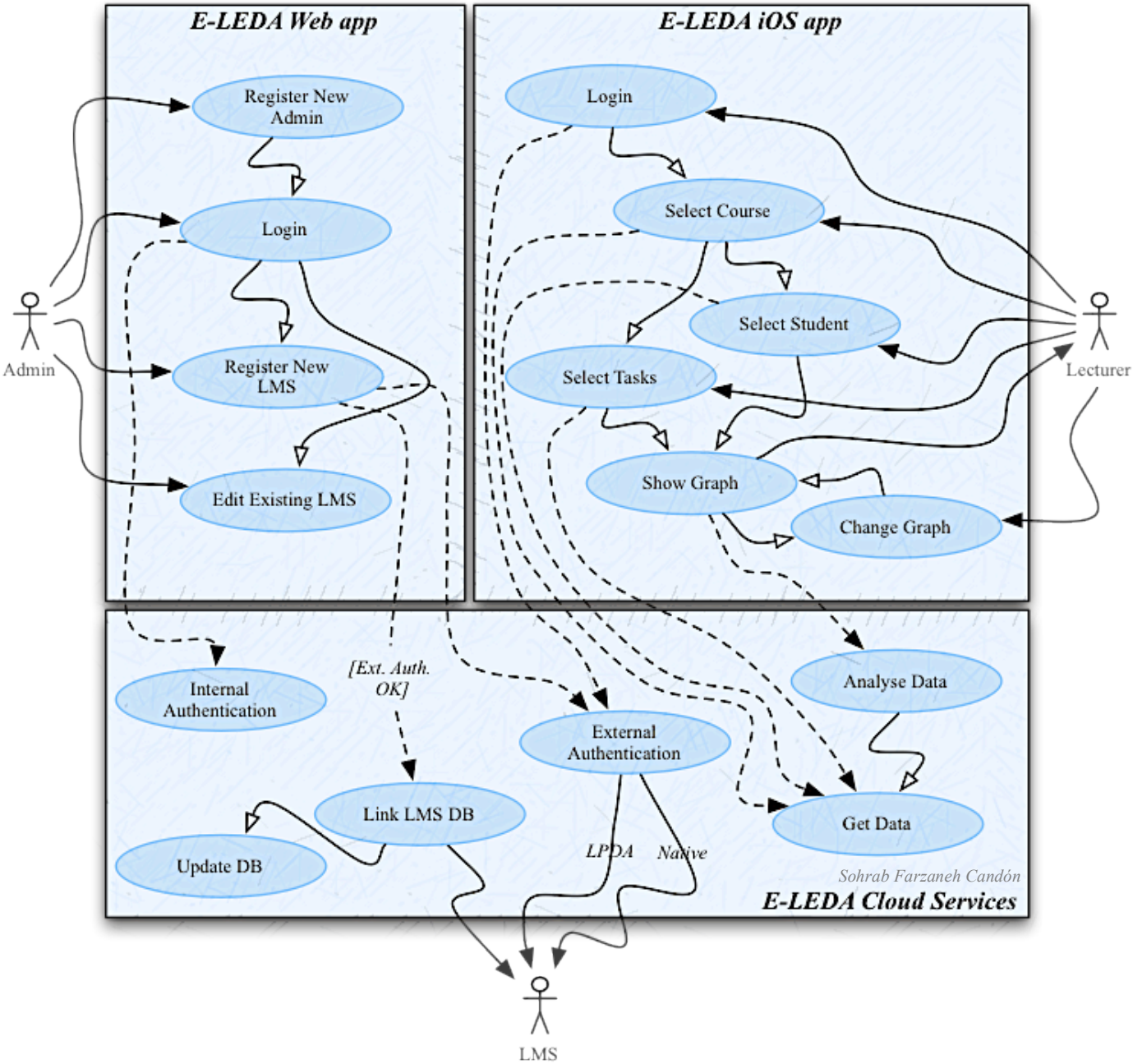

Figure 2-2 *E-LEDA Business Processes*

In the Figure 2-2 *E-LEDA Business Processes* the circles represent the business process that could be performed by an actor or the system, the black arrowed lines represent input/output signals in the *E-LEDA system*, the white arrowed lines represent the sequence of the actions to be performed in the system and the dashed lines represent communication between different sub-systems of the *E-LEDA system.*

2.2 Product functions

The *E-LEDA system* main functionality is to provide graphic information about the usage of an *e-learning* platform by the students, it will be able to identify the users *(lecturers of the e-courses)*, and show the courses related to them.

The *E-LEDA app* shall be able to let the user select tasks or students of one course and present relevant information in a graphical way.

The *E-LEDA cloud services* shall process the data from the E-LEDA database, in an understandable way for the *E-LEDA* app.

The *E-LEDA web app* shall manage the LMS administrators and provide them the tools for managing the LMS's in the system.

2.3 User characteristics

Based on knowledge skills two kinds of users are expected for the *E-LEDA system*, a user with LMS administration knowledge and a lecturer having basic LMS usage knowledge. Each kind of user should perform different operations within the *E-LEDA system*.

- **Administrator (or *Admin*), *users with LMS administrator knowledge*:** this kind of user should know the structure, location and all relevant information about the database used in the host *LMS*.
- **Lecturers, *users with LMS usage knowledge*:** this kind of user shall be able to manage the information in a specific LMS, but does not need to have any advanced technical knowledge.

Lecturers shall be familiar with iOS devices and interfaces, and have at least basic knowledge in managing mobile and desktop devices. The *Administrators* shall be familiar with web applications and shall configure the environment for the rest of the users who does not have the LMS database knowledge or information so they can use the *E-LEDA* system without problems.

The following user groups might be the potential users for the *E-LEDA system.*

- *University or School Teachers from any field*
- *Business managers leading on-line courses*
- *Quality assurance professionals (student/process performance analysers)*
- *Multicultural users (from different countries in any continent)*
- *Adults in working age (between ~20 and ~60 years old)*

The following sections describe a series of personas and possible scenarios for the *E-LEDA system*.

2.3.1 Personas

This section describes a series of personas fitting in different ways into the expected users of the *E-LEDA system*.

- **Alice:** LMS administrator. She has installed the LMS for a university and manages the LMS database. She is used to different kinds smartphone devices and works fluently with computers. Alice wants to configure the *E-LEDA system* so her colleges can test the suitability of the tasks using the *E-LEDA web application.*
- **Bob:** Arts teacher in high school. He does not have any technical knowledge and does not know what a database is. Bob has been using LMS with his students for several years and owns an iOS device since more than 1 year; he is in contact with the high school LMS administrator. Bob wants to check the student results using the *E-LEDA app.*
- **Denise:** Philosophy teacher and researcher. She has basic computer knowledge and is using a LMS in university for the first time this year. Denis works using the same LMS that her college Alice, sharing the database. Denis has recently acquired an iOS device, he she has no experience with other smartphone device, and wants to analyse whether the LMS is working for his lectures using the *E-LEDA app.*
- **Edgar:** Small business teaching director. He has recently installed a LMS for providing courses to its employees, he has teaching experience, basic LMS installation knowledge and has basic experience with

smartphone devices, but not using iOS, he has recently acquire a new iOS device. Edgar wants to supervise the knowledge improvements of his employees using the *E-LEDA app*.

2.3.2 Scenarios

This section describes different scenarios in which the personas of section 2.3.1 above are involved.

Personas	Prerequisites	Tasks	Possible Problems	Comments
Alice	Installed and working LMS	- Link LMS Database - Register - Edit Database Information		*Alice* might not directly use the *E-LEDA app,* but configure it other people using the *E-LEDA web application*
Bob	Installed and working LMS	- Register - Access to his courses - Access to the students in his courses - See graphs about students performance in a course - See graphs about a single student performance in each task	The LMS system might not be yet configured	*Bob* might have to register the LMS in the *E-LEDA system*, by asking the LMS administrator to do it, or he shall ask the LMS administrator the needed information to register the LMS himself by using the *E-LEDA web application*
Denise	Installed and working LMS LMS configured in the *E-LEDA system*	- Register - Access to her courses - Access to the students in her courses - See graphs about student performance in a course - Access to the tasks in each course - See graphs about all students performance on a single task	*Denise* might not be use to the iOS shortcuts like multi-touch actions *Denise* might have to compare the results form the *E-LEDA app* with previous results in other media	A possible solution for inexperienced iOS users might be a user manual or an in-app tutorial
Edgar	Installed and working LMS	- Link LMS Database - Register - Edit Database Information - Access to his courses - See graphs about students performance in a course - See task in his courses - See graphs about all students performance on a single task - See graphs about each student performance on a single task	*Edgar* might not be familiar with the specific shortcuts and UI design of iOS devices	The UI shall be as familiar as possible with users from other platforms, that might be solved by using basic graphical libraries

Table 2.3-1 Scenarios

2.4 Constraints

As a client requirement the *E-LEDA app* shall be an *iOS 6* app for *iPhone (3GS or later)* and *iPod (3rd Generation or later)*. For the *E-LEDA iOS* app the *Objective-C* language has to be used, because if the required programming language for *Apple iOS* applications.

For the data management and the communication between databases, all the *e-learning* platforms shall follow the SCORM standard for *learning management systems* for the course structuration, in order to be compatible with the *E-LEDA* system.

Due to the expected lightweight of the required communications, in order to simplify them, *JSON* shall be used for the communications between the *E-LEDA app* and the *E-LEDA web services.*

The *E-LEDA system* shall be compatible with *Chamilo 1.9* and *Moodle 2.2 LMS's*, in the future other LSM's might be included.

The *E-LEDA web app* shall be compatible with the most used multiplatform web browsers, *Mozilla Firefox 16.0.2* and *Google Chrome 22.0.1229.94.*

2.5 Assumptions and dependences

It is assumed that the LMS's linked in the *E-LEDA system* follows the *SCORM* standard for the course organization.

The requirements shall change if the *E-LEDA system* is intended to be universal, and any user can belong to a different organization with their particular database system.

2.6 Future Requirements

The *E-LEDA system* could be extended with some of the following features in the future:

- *iPad* application providing more information, due to the bigger screen size.
- Possibility of editing data rather than read-only functionality.
- Student access for consulting marks and learning evolution.
- Universal access, allowing users of different organizations use the system without a previous web-service installation.
- Historical graphs providing comparison among different lecture periods.
- Include more compatible LMS's.
- Include more authentication methods.
- Include other languages support.
- Include more functionality to the web application.
- Develop mobile app for other platforms
- Increase the mobile app time performance
- Include local files for in-app chart generation
- Allow the mobile app to perform some operations without internet connection

3 Specific Requirements

This section contains the specific requirements of the system, in order to define completely the system the requirement should be, when possible:

- **Correct:** the requirement shall represent a real need for the system.
- **Not ambiguous:** each requirement shall have only one possible interpretation.
- **Complete**: the requirements shall cover all the possible system responses.
- **Consistent**: the requirements shall not be contradictory.
- **Classified**: the requirements shall be classified taking into account the importance of each of them.
- **Verifiable**: a requirement is verifiable if there is a finite, not expensive process to verify it.
- **Modifiable**: a requirement should be modifiable in an easy, complete and consistent way.
- **Traceable**: a requirement is traceable if its origin is known and is easy to reference it.

3.1 Requirements Format

For identifying the specific requirements an *ID* will be given to each of them, composed by the requirement type initials and a number. (*E.g.: User Interface: UIR001; Performance: PR011)*. In order to track changes in the requirements, each of them includes a version and revision number. Each requirement will be represented with the format of the Table 3.1-1 Requirement Template. The functional requirements include a letter specifying the sub-system for which the requirement was created: ***I*** *for iOS app;* ***W*** *for Web app;* ***C*** *for cloud services. (E.g.: IFR001, WFR023, CFR 001)*

Field	Value	Field	Value
ID	Requirement Type + Number	**Name**	Requirement Name
Version	V.R *(Version. Revision)*	**Module**	*System / Cloud / Web App / iOS app*
Priority	*High / Medium / Low*	**Stability**	*Stable / Not Stable*
Necessity	*Essential / Desirable*	**Verifiability**	*Verifiable / Non-Verifiable / NA*
Description	Requirement Description		

Table 3.1-1 Requirement Template

3.2 External Interface Requirements

This section represents all the requirements related with external interfaces including, user interfaces, hardware interfaces, software interfaces and communication interfaces.

3.2.1 User Interfaces

The appendix A shows the prototypes for the *E-LEDA iOS app* user interfaces including the needed content to be displayed, the appendix B includes the *E-LEDA Web app* user interfaces.

The next tables describe the user interface specific requirements for the *E-LEDA system*.

Field	Value	Field	Value
ID	UIR001	**Name**	Fast information access
Version	1.0	**Module**	*iOS app*
Priority	*Low*	**Stability**	*Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	The user shall be able to access all the information in three *clicks* or less once he is logged in		

Table 3.2-1 UIR001

Field	Value	Field	Value
ID	UIR002	**Name**	Familiar Input to the user
Version	1.0	**Module**	*iOS app*
Priority	*NA*	**Stability**	*Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	The input actions shall be the standard iOS actions[1]		

Table 3.2-2 UIR002

Field	Value	Field	Value
ID	UIR003	**Name**	Familiar Output to the user
Version	1.0	**Module**	*iOS app*
Priority	*NA*	**Stability**	*Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	The *iOS app* output and icons shall be the iOS standard output and icons[1]		

Table 3.2-3 UIR003

Field	Value	Field	Value
ID	UIR004	**Name**	Back navigation
Version	1.0	**Module**	*iOS app*
Priority	*NA*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The user shall be able to go to the previous screen in the hierarchy level of the *iOS app*		

Table 3.2-4 UIR004

Field	Value	Field	Value
ID	UIR005	**Name**	Loading Symbol
Version	1.0	**Module**	*iOS app*
Priority	*NA*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The user shall be able to show a loading icon if the operation to perform last longer than 1 second[2]		

Table 3.2-5 UIR005

3.2.2 Hardware Interfaces

There are no hardware interfaces interacting with the *E-LEDA system*.

3.2.3 Software Interfaces

The next tables describe the software interface specific requirements for the *E-LEDA system*.

Field	Value	Field	Value
ID	SIR001	**Name**	Database connectors
Version	1.0	**Module**	*Cloud Services*
Priority	*NA*	**Stability**	*Not Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The *cloud services* shall connect to each database with an specific connector		

Table 3.2-6 SIR001

[1] Following the iOS Human Interface Guidelines (Apple Inc.)
[2] "1 second keeps our flow of thought seamless" – Jakob Nielsen (Nielsen, 2010)

Field	Value	Field	Value
ID	SIR002	**Name**	Authentication connectors
Version	1.0	**Module**	*Cloud Services*
Priority	*NA*	**Stability**	*Not Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The *cloud services* shall use a specific connector for each authentication method.		

Table 3.2-7 SIR002

3.2.4 Communication Interfaces

The next tables describe the communication interface specific requirements for the *E-LEDA system.*

Field	Value	Field	Value
ID	CIR001	**Name**	Web Service – iOS *App*
Version	1.1	**Module**	*Cloud Services - iOS app*
Priority	*NA*	**Stability**	*Not Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The *cloud services* shall communicate with the *iOS app* shall be done using *JSON* files		

Table 3.2-8 CIR001

Field	Value	Field	Value
ID	CIR002	**Name**	LMS Authentication Communications
Version	1.0	**Module**	*System*
Priority	*NA*	**Stability**	*Not Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The system shall be able to communicate with the supported LMS using the specific authentication communication method required by the LMS while performing authentication queries		

Table 3.2-9 CIR002

Field	Value	Field	Value
ID	CIR003	**Name**	Web Service – Web *App* communication
Version	1.0	**Module**	*Cloud Services - Web app*
Priority	*NA*	**Stability**	*Not Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The *cloud services* shall communicate with the *Web app* shall be done using an standard communication method.		

Table 3.2-10 CIR003

3.3 Functional Requirements

Functional user requirements describe the system features and the desirable features describing the functionality of the system. The following tables describe uniquely the functional requirements.

The functional requirements are divided in different sections each of them corresponding with one of the *E-LEDA sub-systems*. The functional requirements in each section are grouped accordingly to the different features of the *E-LEDA system.*

3.3.1 iOS App Requirements

This section specifies the functional requirements for the *E-LEDA iOS app*. The requirements in this section are grouped accordingly to the different features of the *E-LEDA iOS app*: Authentication, courses information, tasks information and student information.

3.3.1.1 Authentication

Field	Value	Field	Value
ID	IFR001	**Name**	Lecturer Login
Version	1.0	**Module**	*iOS app*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	A *lecturer* shall be able to login in the system		

Table 3.3-1 IFR001

Field	Value	Field	Value
ID	IFR02	**Name**	Remember Password
Version	1.0	**Module**	*iOS app*
Priority	*Low*	**Stability**	*Not Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	The *iOS app* should be able to allow the lecturer to save in the device his username and password		

Table 3.3-2 IFR002

Field	Value	Field	Value
ID	IFR019	**Name**	*E-LEDA DB update*
Version	1.1	**Module**	*iOS app*
Priority	*Low*	**Stability**	*Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	The user should be able to ask the *E-LEDA DB* for an update of courses, students & tasks		

Table 3.3-3 IFR019

Field	Value	Field	Value
ID	IFR020	**Name**	*Logout*
Version	1.1	**Module**	*iOS app*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The user should be able to logout of the system		

Table 3.3-4 IFR020

3.3.1.2 Course Information

Field	Value	Field	Value
ID	IFR003	**Name**	Course Access
Version	1.0	**Module**	*iOS app*
Priority	*High*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The lecturers shall be able to see a list with all his courses[3]		

Table 3.3-5 IFR003

[3] A user shall manage one or more courses in the LMS in which the user is registered.

Field	Value	Field	Value
ID	IFR004	**Name**	Course Selection
Version	1.0	**Module**	*iOS app*
Priority	*High*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The user shall be able to select one course to see its tasks or students		

Table 3.3-6 IFR004

3.3.1.3 Tasks Information

Field	Value	Field	Value
ID	IFR005	**Name**	Tasks Access
Version	1.0	**Module**	*iOS app*
Priority	*High*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The user shall be able to see a list with all the tasks of each course[4]		

Table 3.3-7 IFR005

Field	Value	Field	Value
ID	IFR006	**Name**	Task Selection
Version	1.0	**Module**	*iOS app*
Priority	*High*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The user shall be able to select one task to see its statistics		

Table 3.3-8 IFR006

Field	Value	Field	Value
ID	IFR007	**Name**	Task Pie Chart
Version	1.0	**Module**	*iOS app*
Priority	*High*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The *iOS app* shall be able to display a pie chart with classified students by mark ranges for the task selected by the user		

Table 3.3-9 IFR007

Field	Value	Field	Value
ID	IFR008	**Name**	Task Bar Chart (mark)
Version	1.0	**Module**	*iOS app*
Priority	*Medium*	**Stability**	*Not Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	The *iOS app* should be able to display a bar chart with the mark of each student enrolled in the course for the selected task.		

Table 3.3-10 IFR008

[4] Each course shall have one or more tasks

Field	Value	Field	Value
ID	IFR009	**Name**	Task Bar Chart (time)
Version	1.0	**Module**	*iOS app*
Priority	*Low*	**Stability**	*Not Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	The *iOS app* should be able to display a bar chart with the time spent by each student enrolled in the course for the selected task.		

Table 3.3-11 IFR009

Field	Value	Field	Value
ID	IFR010	**Name**	Task Line Chart
Version	1.0	**Module**	*iOS app*
Priority	*Low*	**Stability**	*Not Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	The *iOS app* should be able to display a line chart with the average mark of the students the selected task		

Table 3.3-12 IFR010

3.3.1.4 Students Information

Field	Value	Field	Value
ID	IFR011	**Name**	Students Access
Version	1.0	**Module**	*iOS app*
Priority	*High*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The user shall be able to se a list with all the students enrolled in one course[5]		

Table 3.3-13 IFR011

Field	Value	Field	Value
ID	IFR012	**Name**	Student Selection
Version	1.0	**Module**	*iOS app*
Priority	*High*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The user shall be able to select one student to see its statistics		

Table 3.3-14 IFR012

Field	Value	Field	Value
ID	IFR013	**Name**	Student Pie Chart
Version	1.0	**Module**	*iOS app*
Priority	*High*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The *iOS app* shall be able to display a pie chart with classified tasks in the *current course* by mark ranges for the selected student		

Table 3.3-15 IFR013

[5] Each course shall have one or more students; each student shall be enrolled in one or more courses.

Field	Value	Field	Value
ID	IFR014	**Name**	Student Bar Chart (mark)
Version	1.0	**Module**	*iOS app*
Priority	*Medium*	**Stability**	*Not Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	The *iOS app* should be able to display a bar chart with the mark of the selected student in each task of the current course		

Table 3.3-16 IFR014

Field	Value	Field	Value
ID	IFR015	**Name**	Student Bar Chart (time)
Version	1.0	**Module**	*iOS app*
Priority	*Low*	**Stability**	*Not Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	The *iOS app* should be able to display a bar chart with the time spent by the selected student in each task of the current course		

Table 3.3-17 IFR015

Field	Value	Field	Value
ID	IFR016	**Name**	Student Line Chart
Version	1.0	**Module**	*iOS app*
Priority	*Low*	**Stability**	*Not Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	The *iOS app* should be able to display a line chart with the average mark of the student in each task		

Table 3.3-18 IFR016

3.3.1.4.1 Chart Properties

Field	Value	Field	Value
ID	IFR017	**Name**	Change Between Charts
Version	1.0	**Module**	*iOS app*
Priority	*Low*	**Stability**	*Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	The user should be able to switch between pie chart and bar chart by changing the orientation of the device from vertical to horizontal and vice versa		

Table 3.3-19 IFR017

Field	Value	Field	Value
ID	IFR018	**Name**	Resize Charts
Version	1.0	**Module**	*iOS app*
Priority	*Low*	**Stability**	*Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	The user should be able to resize bar charts using multi-touch gestures		

Table 3.3-20 IFR018

3.3.2 Web App Requirements

This section specifies the functional requirements for the *E-LEDA web app*. The requirements in this section are grouped accordingly to the different features of the *E-LEDA web app:* Authentication and LMS management

3.3.2.1 Authentication

Field	Value	Field	Value
ID	WFR001	**Name**	Registration
Version	1.0	**Module**	*Web app*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	An *admin* shall be able to register in the *E-LEDA system*		

Table 3.3-21 WFR001

Field	Value	Field	Value
ID	WFR002	**Name**	Admin Login
Version	1.0	**Module**	*Web app*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	An *admin* shall be able to login in the system		

Table 3.3-22 WFR002

Field	Value	Field	Value
ID	WFR005	**Name**	Admin Logout
Version	1.1	**Module**	*Web app*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	An *admin* shall be able to logout of the system		

Table 3.3-23 WFR005

3.3.2.2 LMS Management

Field	Value	Field	Value
ID	WFR003	**Name**	Edit Existing LMS
Version	1.1	**Module**	*Web app*
Priority	*High*	**Stability**	*Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	An *admin* should be able to edit an existing LMS for which he has permissions in the system		

Table 3.3-24 WFR003

Field	Value	Field	Value
ID	WFR004	**Name**	Register New LMS
Version	1.0	**Module**	*Web app*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	An *admin* shall be able to register a new LMS in the system		

Table 3.3-25 WFR004

Field	Value	Field	Value
ID	WFR006	**Name**	Admin Information Change
Version	1.1	**Module**	*Web app*
Priority	*High*	**Stability**	*Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	An *admin* should be able to change its information (name and password)		

Table 3.3-26 WFR006

3.3.3 Cloud Services Requirements

This section specifies the functional requirements for the *E-LEDA cloud services.* The requirements in this section are grouped accordingly to the different features of the *E-LEDA cloud services:* Authentication, Database and LMS management and Data Analysis.

3.3.3.1 Authentication

Field	Value	Field	Value
ID	CFR001	**Name**	User Native Authentication
Version	1.0	**Module**	*Cloud*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The system shall be able to authenticate an user with the LMS native authentication		

Table 3.3-27 CFR001

Field	Value	Field	Value
ID	CFR002	**Name**	User LDAP Authentication
Version	1.0	**Module**	*Cloud*
Priority	*Low*	**Stability**	*Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	An system should be able to authenticate an user with the LDAP authentication protocol in the selected LMS[6]		

Table 3.3-28 CFR002

Field	Value	Field	Value
ID	CFR003	**Name**	Administrator *E-LEDA* Authentication
Version	1.1	**Module**	*Cloud*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The system should be able to authenticate an administrator in the *E-LEDA system.*		

Table 3.3-29 CFR003

Field	Value	Field	Value
ID	CFR013	**Name**	Administrator Registration
Version	1.0	**Module**	*Cloud*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The admin shall be able to register in the *E-LEDA system*		

Table 3.3-30 CFR013

Field	Value	Field	Value
ID	CFR015	**Name**	Logout
Version	1.0	**Module**	*Cloud*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The users shall be able to log out from the *E-LEDA system*		

Table 3.3-31 CFR015

[6] Only if the LDAP authentication method is active for the selected LMS

3.3.3.2 Database and LMS Management

Field	Value	Field	Value
ID	CFR004	**Name**	Link New LMS DB
Version	1.0	**Module**	*Web app*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The system shall be able to link a new LMS DB with the information given by an admin		

Table 3.3-32 CFR004

Field	Value	Field	Value
ID	CFR005	**Name**	E-LEDA DB Updates
Version	1.1	**Module**	*Cloud*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The *system* shall keep the E-LEDA DB up to date		

Table 3.3-33 CFR005

Field	Value	Field	Value
ID	CFR006	**Name**	Edit LMS
Version	1.0	**Module**	*Cloud*
Priority	*High*	**Stability**	*Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	The *system* be able to edit the LMS attributes stored in the *E-LEDA DB*		

Table 3.3-34 CFR006

Field	Value	Field	Value
ID	CFR014	**Name**	Edit User Info
Version	1.1	**Module**	*Cloud*
Priority	*High*	**Stability**	*Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	The admin shall be able to edit some of its register information in the *E-LEDA system*		

Table 3.3-35 CFR014

3.3.3.3 Data Analysis

Field	Value	Field	Value
ID	CFR007	**Name**	Course List Transmission
Version	1.1	**Module**	*Cloud*
Priority	*High*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The *system* shall be able to provide the course list to the *iOS app*		

Table 3.3-36 CFR007

Field	Value	Field	Value
ID	CFR008	**Name**	Student List Transmission
Version	1.1	**Module**	*Cloud*
Priority	*High*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The *system* shall be able to provide the student list enrolled in a selected course to the *iOS app*		

Table 3.3-37 CFR008

Field	Value	Field	Value
ID	CFR009	**Name**	Tasks List Transmission
Version	1.1	**Module**	*Cloud*
Priority	*High*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The *system* shall be able to provide the task list of a selected course to the *iOS app*		

Table 3.3-38 CFR009

Field	Value	Field	Value
ID	CFR010	**Name**	Student Information Transmission
Version	1.0	**Module**	*Cloud*
Priority	*High*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The *system* shall be able to provide the student information to the *iOS app*		

Table 3.3-39 CFR010

Field	Value	Field	Value
ID	CFR011	**Name**	Task Information Transmission
Version	1.0	**Module**	*Cloud*
Priority	*High*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The *system* shall be able to provide the task information to the *iOS app*		

Table 3.3-40 CFR011

Field	Value	Field	Value
ID	CFR012	**Name**	Information Parsing
Version	1.0	**Module**	*Cloud*
Priority	*High*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The *system* shall be able to parse the information from the *E-LEDA DB* for the *iOS app*		

Table 3.3-41 CFR012

3.4 Performance Requirements

The performance requirements specify the static and dynamic numerical requirements for the interaction between human users and the system. The response times and percentages in this requirement are subjectively chosen based in the ideas and guidelines of Jakob Nielsen (Nielsen, 2010). Performance times are not accurate because no measures or case studies have been done for this project. The performance might be deeply studied in future versions of the *E-LEDA system.* (Lee) (IBM) (Apple Inc., 2013)

Field	Value	Field	Value
ID	PR001	**Name**	Transmission Time
Version	1.0	**Module**	*Cloud Services – Web app*
Priority	*Low*	**Stability**	*Not Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	Information shall be transmitted between *CS sub-system* and *Web sub-system* in less than 5 seconds 95% of the times		

Table 3.4-1 PR001

Field	Value	Field	Value
ID	PR002	**Name**	Users Limit
Version	1.0	**Module**	*Cloud Services*
Priority	*Low*	**Stability**	*Stable*
Necessity	*Desirable*	**Verifiability**	*Not Verifiable*
Description	The system has virtually no user limit, thus it depends on the used infrastructure		

Table 3.4-2 PR002

Field	Value	Field	Value
ID	PR003	**Name**	Transmission Time (WiFi)
Version	1.0	**Module**	*Cloud Services – iOS app*
Priority	*Low*	**Stability**	*Not Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	Information shall be transmitted between *CS sub-system* and *Web sub-system* in less than 5 seconds 90% of the times		

Table 3.4-3 PR003

Field	Value	Field	Value
ID	PR004	**Name**	Transmission Time (3G)
Version	1.0	**Module**	*Cloud Services – iOS app*
Priority	*Low*	**Stability**	*Not Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	Information shall be transmitted between *CS sub-system* and *Web sub-system* in less than 7 seconds 95% of the times while using the 3G transmission protocol		

Table 3.4-4 PR004

Field	Value	Field	Value
ID	PR005	**Name**	Transmission Time (2G)
Version	1.0	**Module**	*Cloud Services – iOS app*
Priority	*Low*	**Stability**	*Not Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	Information shall be transmitted between *CS sub-system* and *Web sub-system* in less than 7 seconds 90% of the times while using the 2G transmission protocol		

Table 3.4-5 PR005

Field	Value	Field	Value
ID	PR006	**Name**	Transmission Time (EDGE)
Version	1.0	**Module**	*Cloud Services – iOS app*
Priority	*Low*	**Stability**	*Not Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	Information shall be transmitted between *CS sub-system* and *Web sub-system* in less than 10 seconds 90% of the times while using the EDGE transmission protocol		

Table 3.4-6 PR006

3.5 Design Constraints

This section specifies the design constraints imposed by standards, client limitation, hardware limitations or third-party software limitations.

Field	Value	Field	Value
ID	DCR001	**Name**	iOS 6 application
Version	1.0	**Module**	*iOS app*
Priority	*High*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The *E-LEDA iOS app* shall be compiled for *iOS 6* and work with *iOS 6* compatible *iPhones* and *iPod* models		

Table 3.5-1 DCR001

Field	Value	Field	Value
ID	DCR002	**Name**	Chamilo 1.9 DB Link
Version	1.0	**Module**	*Cloud*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The system shall be able to link the database from Chamilo 1.9		

Table 3.5-2 DCR002

Field	Value	Field	Value
ID	DCR003	**Name**	Moodle 2.2 DB Link
Version	1.0	**Module**	*Cloud*
Priority	*Low*	**Stability**	*Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	The system shall be able to link the database from Moodle 2.2		

Table 3.5-3 DCR003

3.6 Software System Attributes

The software system attribute section specifies all the necessary quality requirements for the system including reliability, availability, security, maintainability and portability.

3.6.1 Reliability

This section specifies the requirements needed to maintain the necessary reliability for the *E-LEDA* system.

Field	Value	Field	Value
ID	NFRR001	**Name**	iOS Error Messages
Version	1.0	**Module**	*iOS app*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The iOS app shall be able to show error messages to the user when a problem is detected		

Table 3.6-1 NFRR001

Field	Value	Field	Value
ID	NFRR002	**Name**	Web Error Messages
Version	1.0	**Module**	*Web app*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The Web app shall be able to show error messages to the user when a problem is detected		

Table 3.6-2 NFRR002

Field	Value	Field	Value
ID	NFRR003	**Name**	Explicit Information Messages
Version	1.0	**Module**	*System*
Priority	*High*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The system shall be able to provide explicit error messages		

Table 3.6-3 NFRR003

Field	Value	Field	Value
ID	NFRR004	**Name**	Error Log
Version	1.0	**Module**	*Cloud*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	The system should keep a log of the found failures in the system		

Table 3.6-4 NFRR004

Field	Value	Field	Value
ID	NFRR005	**Name**	Email of Critical Errors
Version	1.0	**Module**	*Cloud*
Priority	*Low*	**Stability**	*Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	The *system* should email critical errors to the system administrator		

Table 3.6-5 NFRR005

Field	Value	Field	Value
ID	NFRR006	**Name**	Access Log
Version	1.0	**Module**	*Cloud*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	The system should keep a log of the accesses to the system		

Table 3.6-6 NFRR006

3.6.2 Availability

This section specifies the requirements needed guarantee the availability of the *E-LEDA* system.

Field	Value	Field	Value
ID	NFAR001	**Name**	Data Recovery
Version	1.0	**Module**	*System*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The information from the system shall be able to be recovered in case of failure		

Table 3.6-7 NFAR001

Field	Value	Field	Value
ID	NFAR002	**Name**	Backup Databases
Version	1.0	**Module**	*System*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The information from the system shall stored in a second database called backup database		

Table 3.6-8 NFAR002

3.6.3 Security

This section specifies the requirements needed assurance the security of the *E-LEDA* system.

Field	Value	Field	Value
ID	NFSR001	**Name**	Automatic Logout
Version	1.1	**Module**	*System*
Priority	*Low*	**Stability**	*Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	The system should be able to automatically logout an inactive user for more than 20 minutes		

Table 3.6-9 NFSR001

Field	Value	Field	Value
ID	NFSR002	**Name**	Encrypted Information
Version	1.0	**Module**	*System*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Desirable*	**Verifiability**	*Verifiable*
Description	The system should encrypt the user's important information (user/password information)		

Table 3.6-10 NFSR002

Field	Value	Field	Value
ID	NFSR003	**Name**	User Information Stored in Device
Version	1.0	**Module**	*iOS app*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The iOS app shall be able to store in the device relevant user authentication information		

Table 3.6-11 NFSR003

Field	Value	Field	Value
ID	NFSR004	**Name**	Encrypted User Information in Device
Version	1.0	**Module**	*iOS app*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The iOS app shall be able encrypt the relevant user authentication information stored in a device		

Table 3.6-12 NFSR004

Field	Value	Field	Value
ID	NFSR005	**Name**	RSA Encryption Method (iOS app)
Version	1.0	**Module**	*iOS app*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The iOS app shall be able to encrypt information using RSA		

Table 3.6-13 NFSR005

Field	Value	Field	Value
ID	NFSR006	**Name**	RSA Encryption Method (system)
Version	1.0	**Module**	*System*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The system shall be able to encrypt/decrypt information using RSA		

Table 3.6-14 NFSR006

Field	Value	Field	Value
ID	NFSR007	**Name**	LOPD
Version	1.0	**Module**	*System*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The system usage shall be voluntary and the system shall follow the European regulations about personal data protection		

Table 3.6-15 NFSR007

3.6.4 Portability

This section specifies the requirements needed to maintain the *E-LEDA* system portable.

Field	Value	Field	Value
ID	NFPR001	**Name**	Cloud Services Portability
Version	1.1	**Module**	*System*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The *E-LEDA cloud services* (server side components of the system) shall be platform independent		

Table 3.6-16 NFPR001

Field	Value	Field	Value
ID	NFPR002	**Name**	Web Browser Compatibility (Chrome)
Version	1.1	**Module**	*System*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The *E-LEDA web app* shall work with Google Chrome 10.0 (or later) web browser		

Table 3.6-17 NFPR002

Field	Value	Field	Value
ID	NFPR003	**Name**	Web Browser Compatibility (Firefox)
Version	1.1	**Module**	*System*
Priority	*Medium*	**Stability**	*Stable*
Necessity	*Essential*	**Verifiability**	*Verifiable*
Description	The *E-LEDA web app* shall work with Mozilla Firefox 3.6 (or later) web browser		

Table 3.6-18 NFPR003

Appendix A: iOS app Prototypes

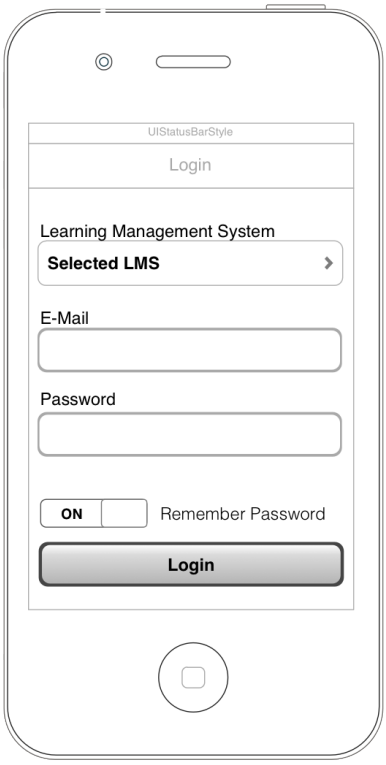

Figure I iOS app: Login

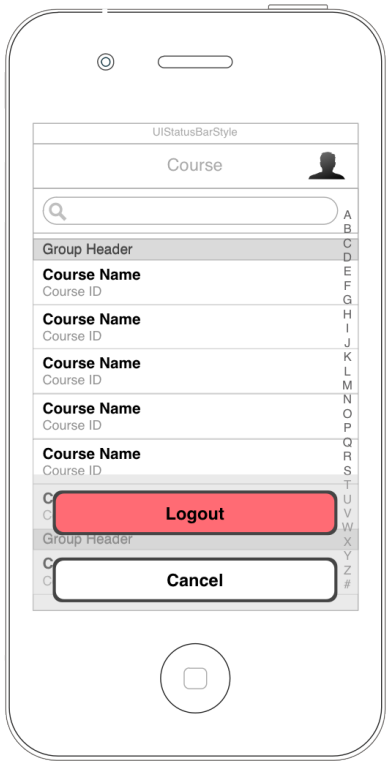

Figure III iOS app: Logout

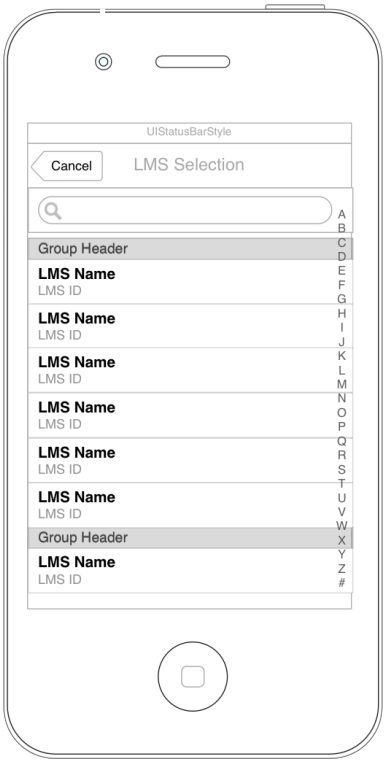

Figure II iOS app: Select LMS DB

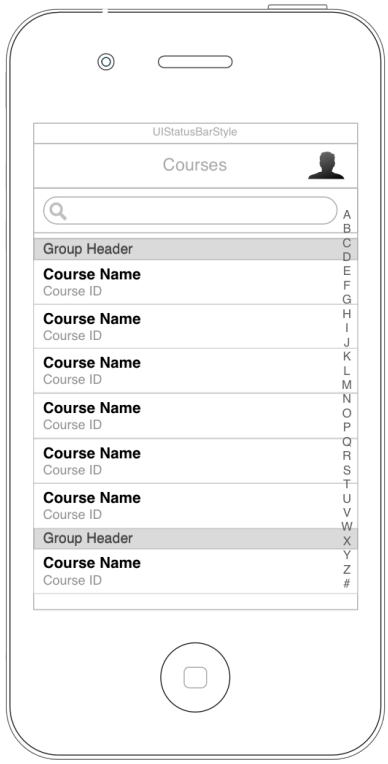

Figure IV iOS app: Courses

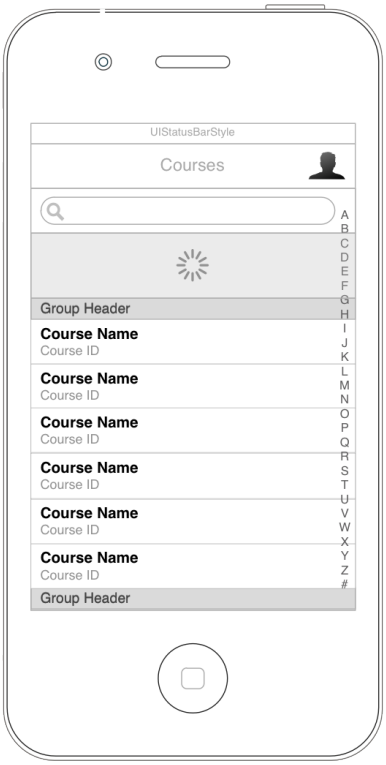

Figure ViOS app: Loading Update

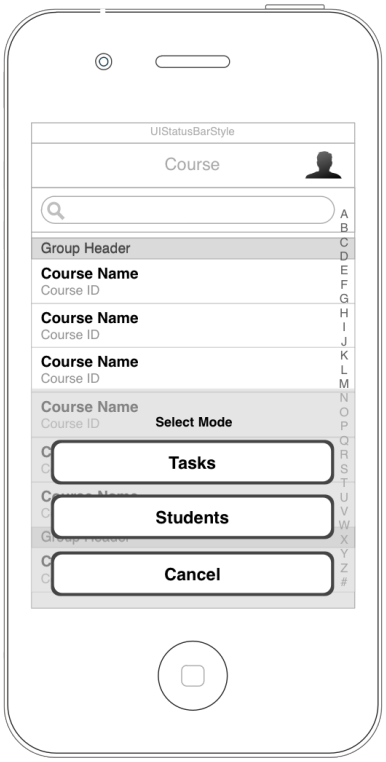

Figure VI iOS app: Courses Options

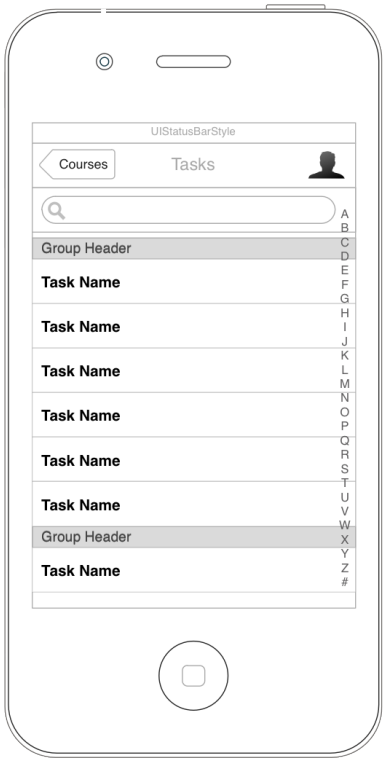

Figure VII iOS app: Tasks

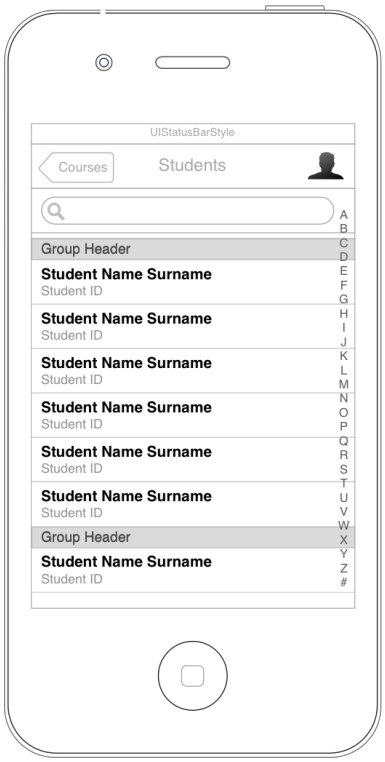

Figure VIII iOS app: Students

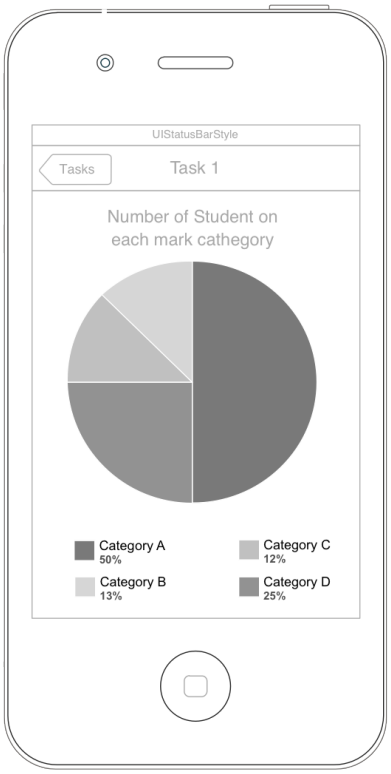

Figure IX iOS app: Task Pie Chart

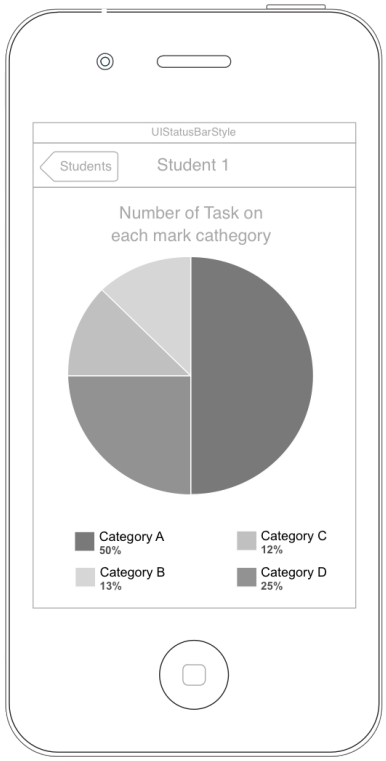

Figure XiOS app: Student Pie chart

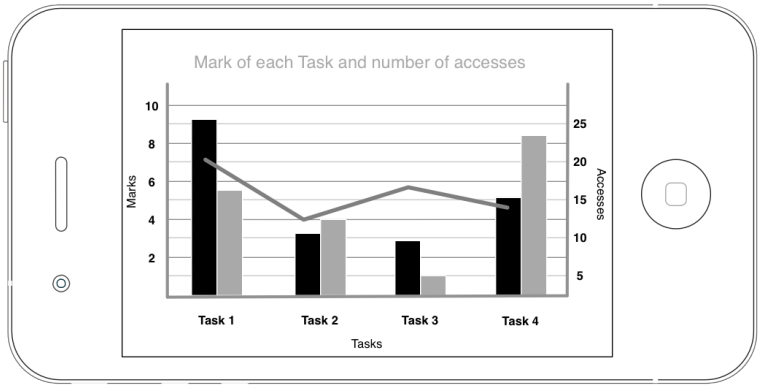

Figure XI iOS app: Task Line & Bars Chart

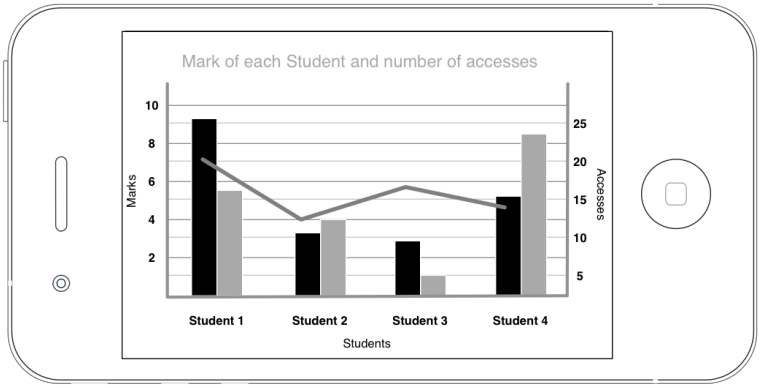

Figure XII iOS app: Student Line & Bars Chart

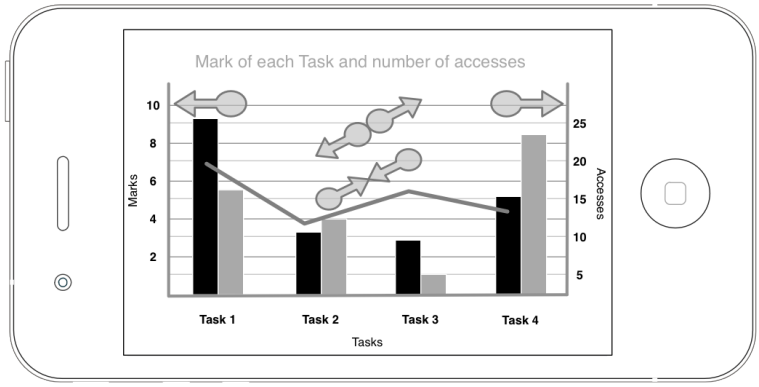

Figure XIII iOS app: Tasks Multi-touch Chart Events

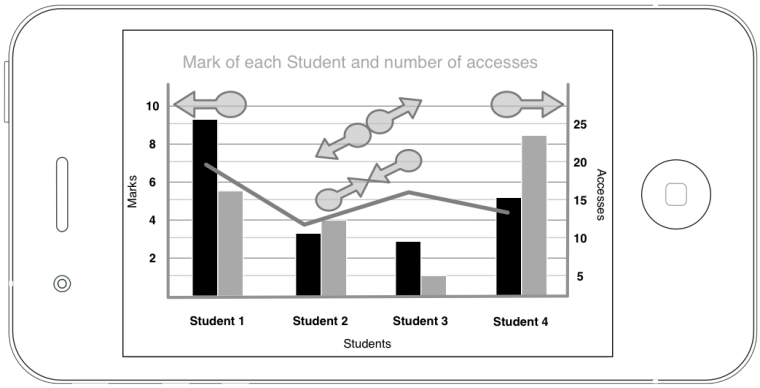

Figure XIV iOS app: Students Multi-touch Chart Events

Appendix B: Web app Prototypes

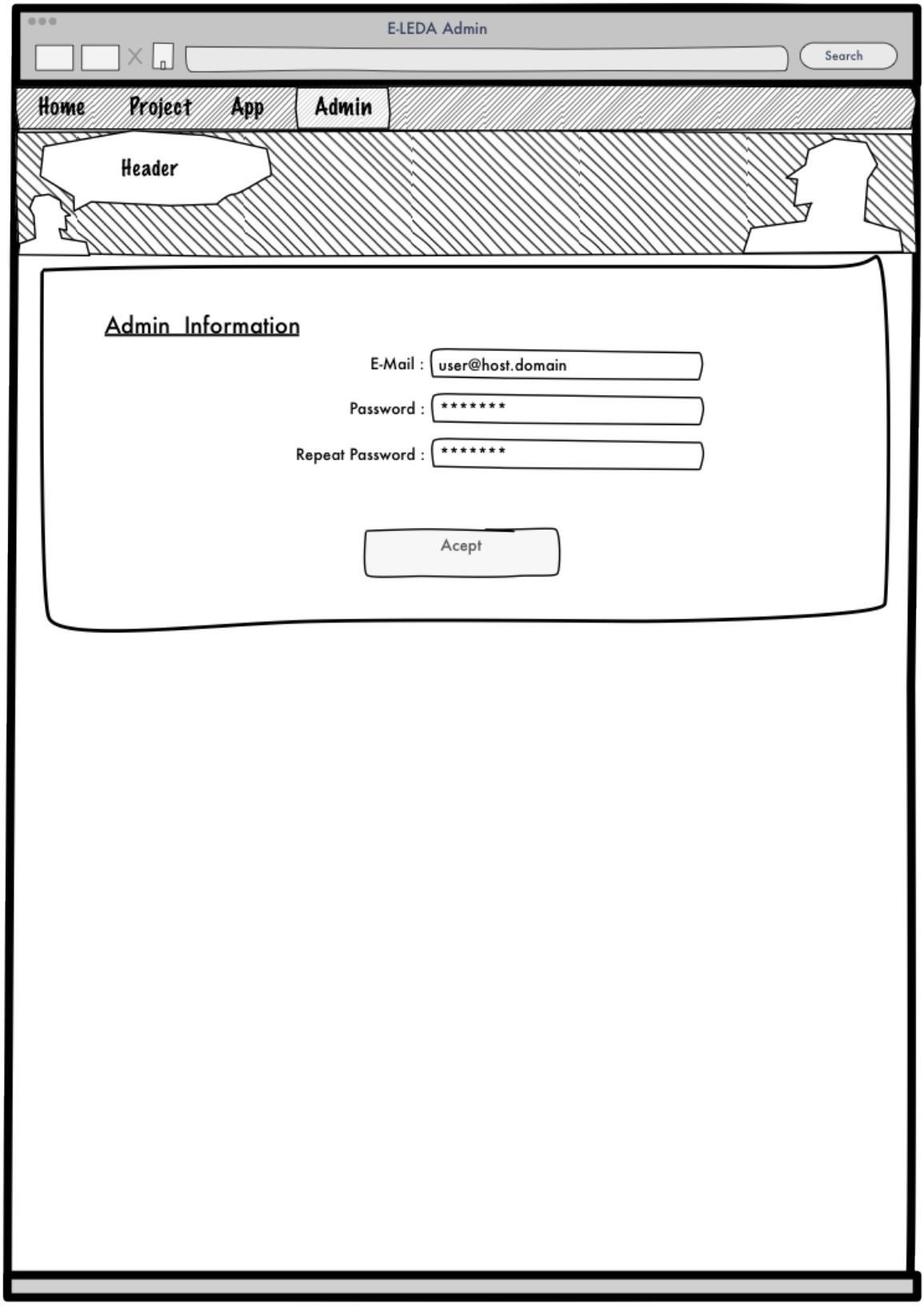

Figure XV Web app: Register

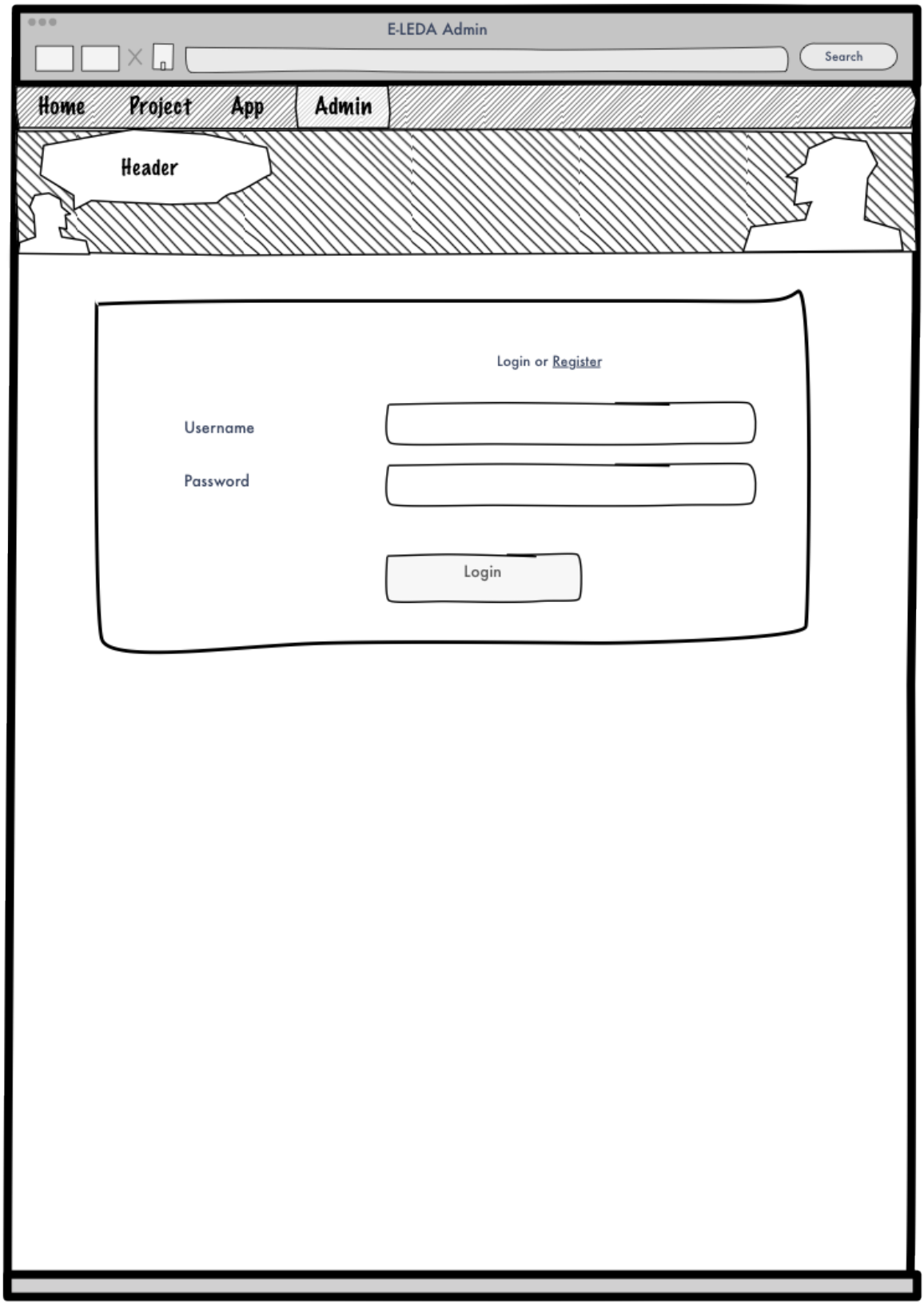

Figure XVI Web app: Login

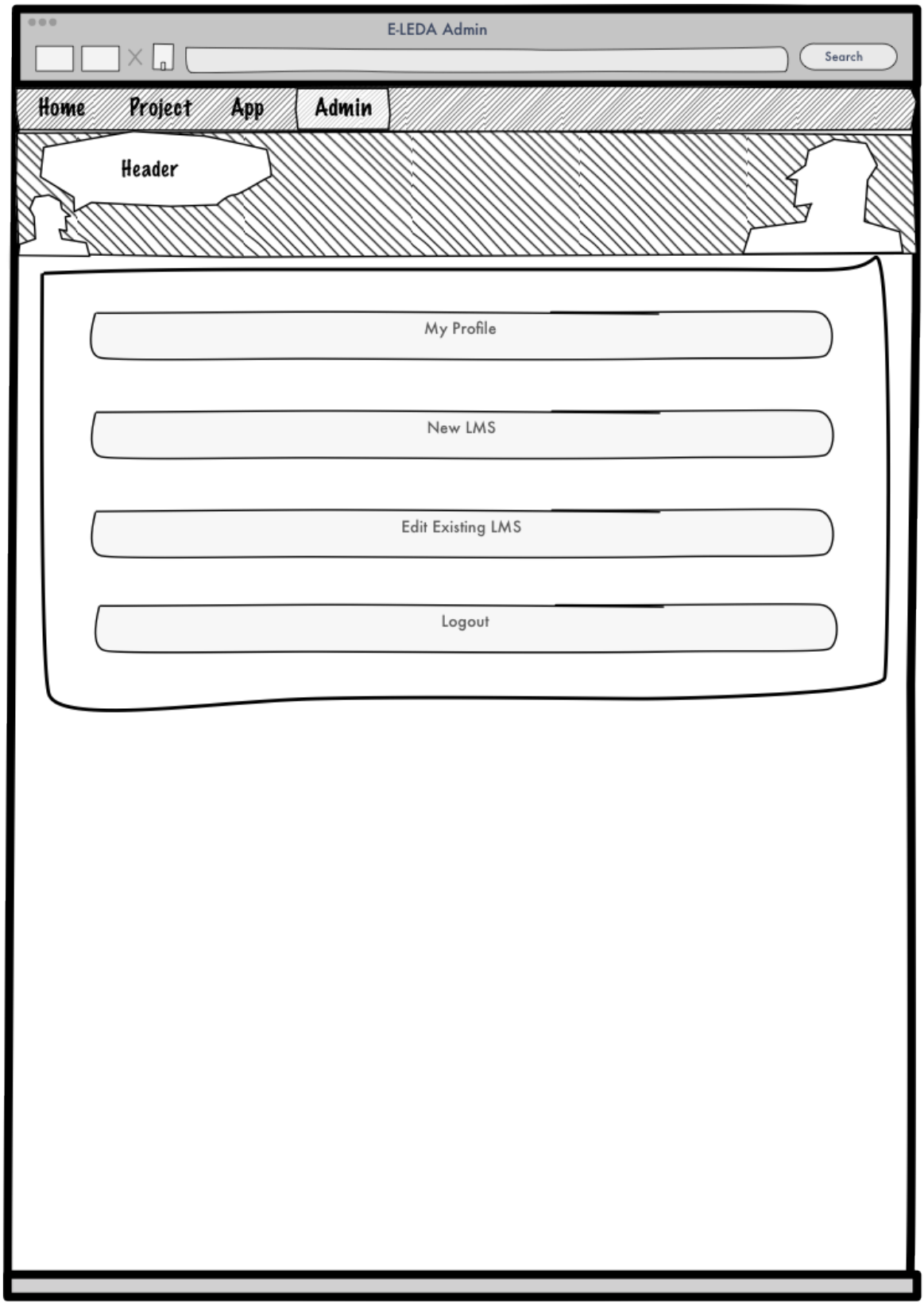

Figure XVII Web app: Session

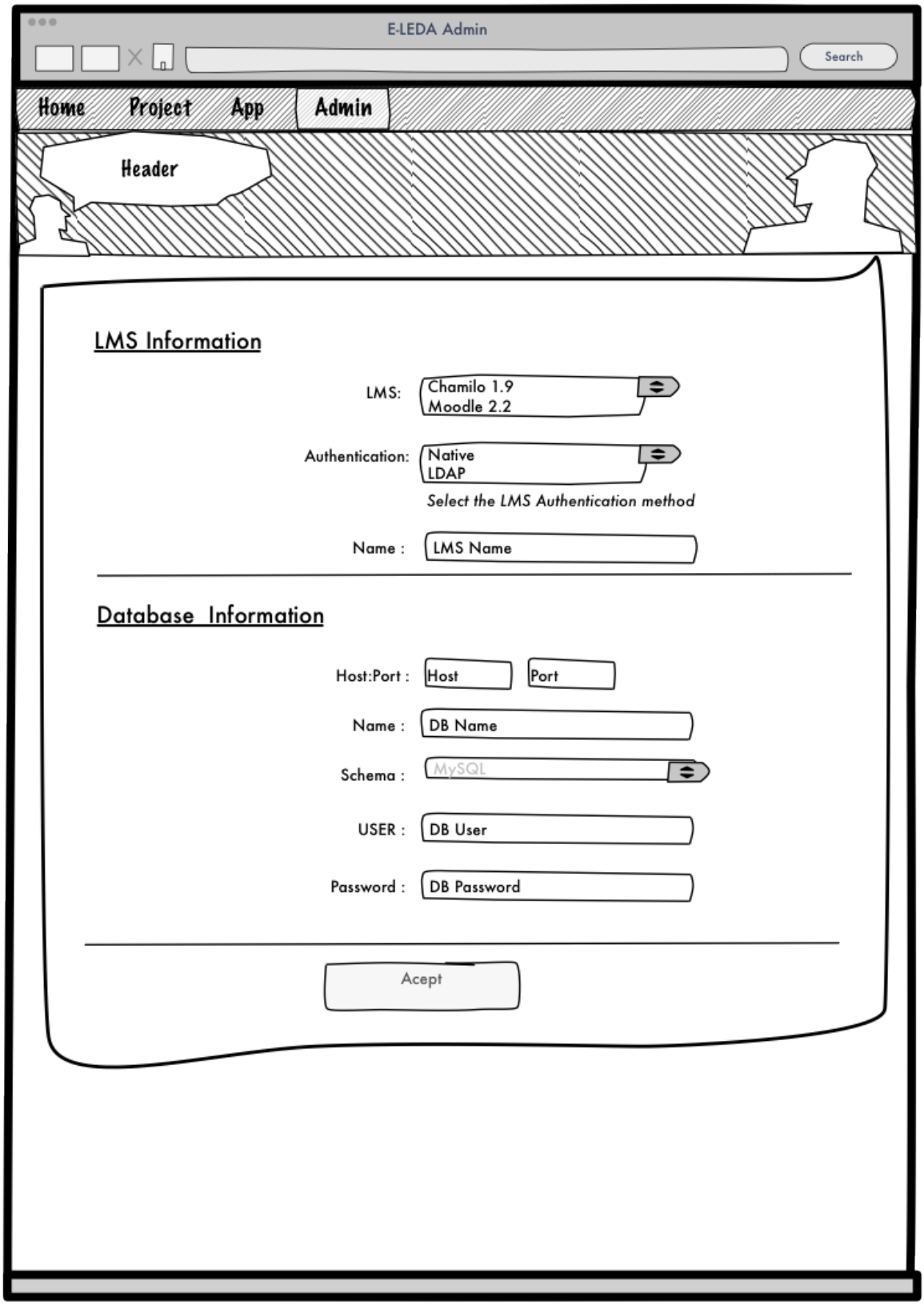

Figure XVIII Web app: New LMS

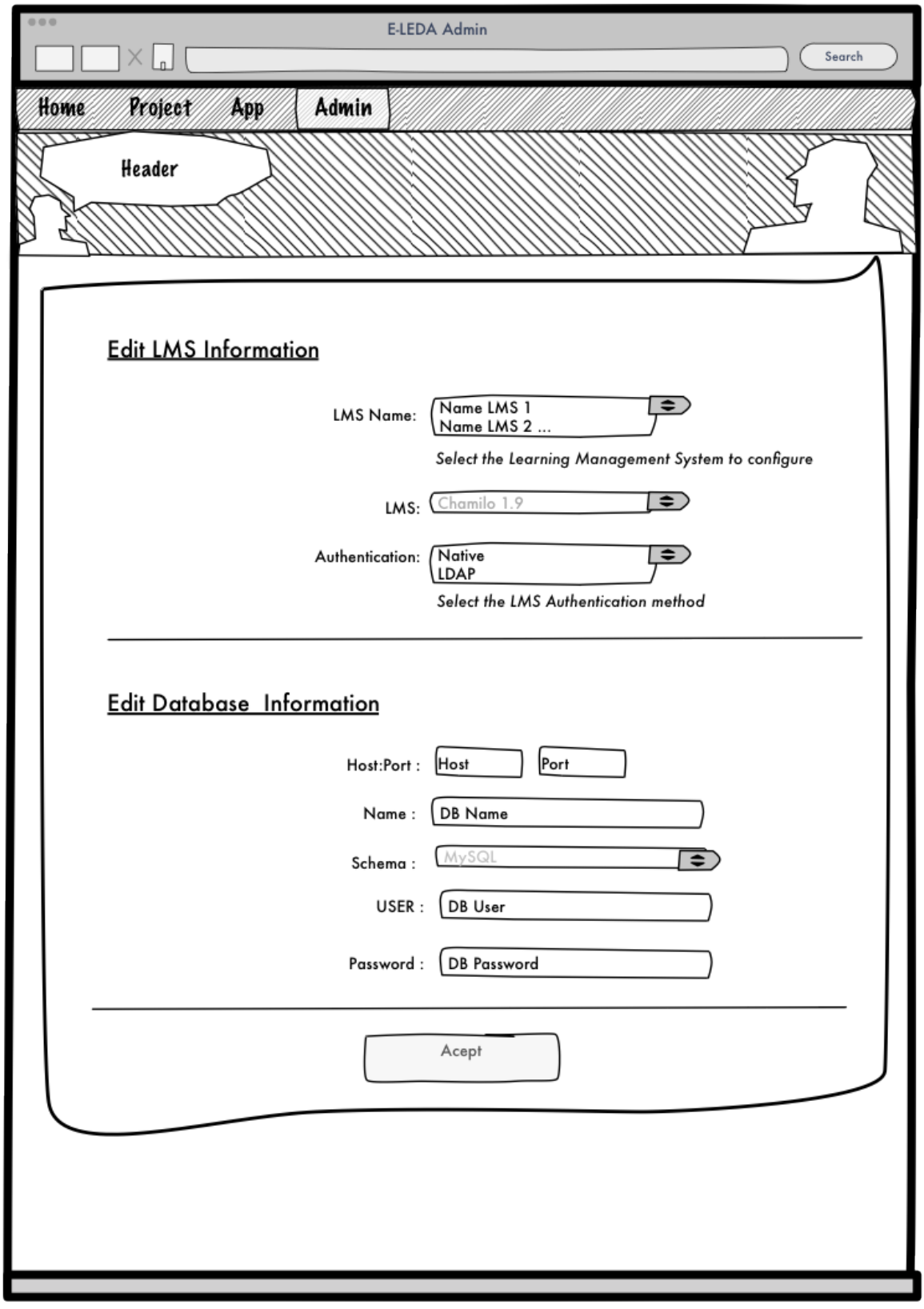

Figure XIX Web app: Edit LMS

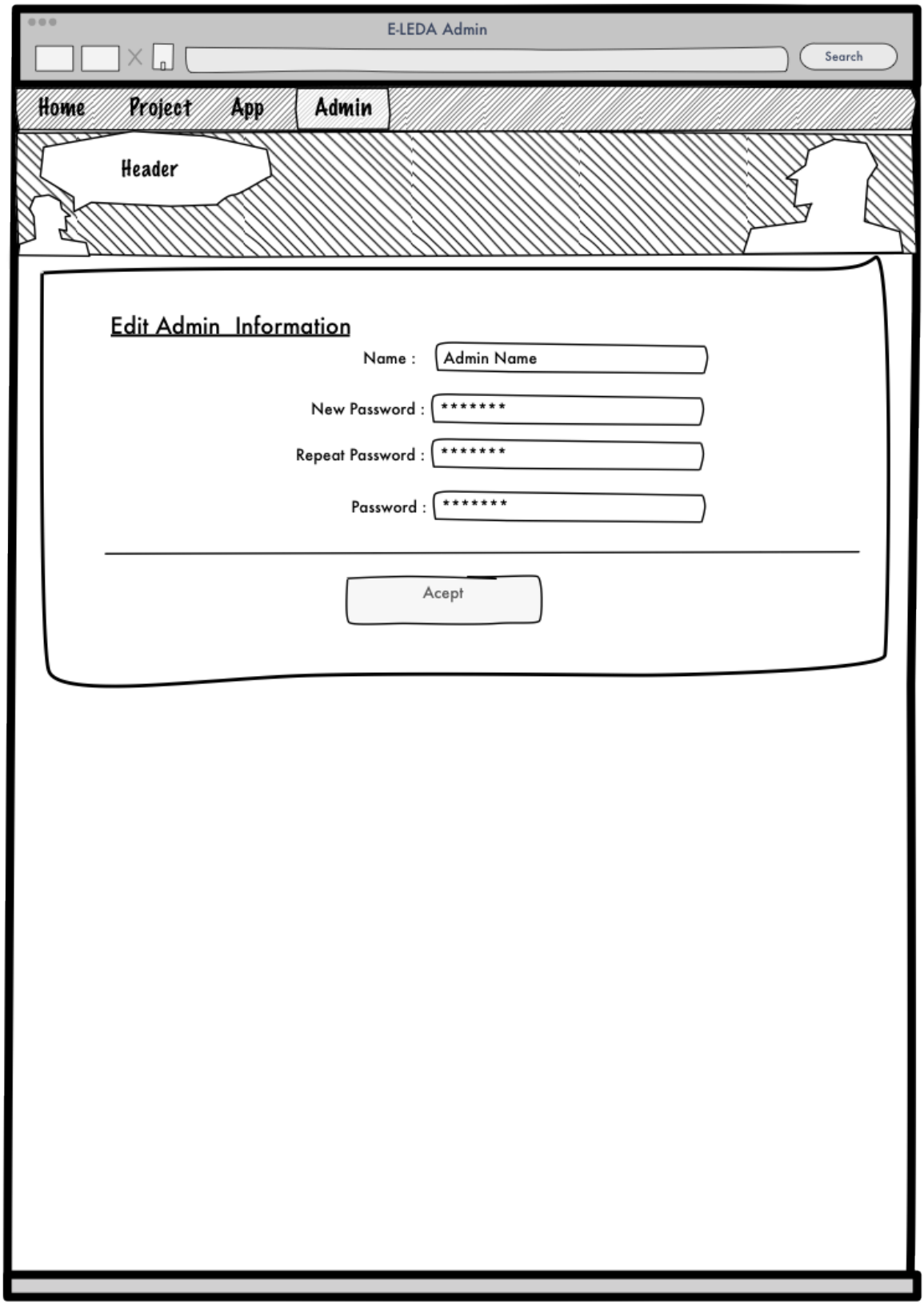

Figure XX Web app: Edit Admin Info

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Glossary

TERMS

Administrator (or **Admin**): User with administration permissions. The only user able to add and modify LSM's in the system

App: *Application.*

Click: One finger short screen touch

Cloud Services: Web services and storage for the *E-LEDA system.*

Current Course: *Course previously selected by the user.*

E-Learning Platform: (or **LMS**: *Learning Management System)*, On-line learning system with multiple functionalities

E-LEDA system: The E-LEDA system (or *system*) refers to the complete system including cloud services, iOS app and Web app

E-LEDA: ***E-Le****arning* ***D****ata* ***A****nalyser,* Name of the project

Hierarchy level: The hierarchy level of the *E-LEDA app* is referred to the hierarchy of the different accessible elements of the application. The hierarchy represented as a tree is: login->courses->(tasks->task ; students->student)

ID: Requirement Identifier

iOS app (or **app**): iOS application presenting the information for the lecturers

JSON: *JavaScript Object Notation,* open standard for data interchange

Lecturers: Users with read permissions, this users can access to the data in an LMS where they are already registered

LMS: *Learning Management System, see E-learning platform*

Multi-Touch Gestures: Gestures consisting of sliding, pinching or tapping with one or more fingers in an iOS device screen

NA*: Non-Aplicable*

SCORM:*Sharable Content Object Reference Model,* Collection of standards and specifications for LMS

Smartphone: Mobile device with cappability for installing applications and perform complex operations.

Time spent: Time spent by the user in the LMS solving a specific task

UI: *User Interface,* interaction interface between the human user and the system.

V.R: Version and revision of a requirement

Web app: *E-LEDA* web application for managing the LMS linked in the cloud services, the web app is an administrator tool.