



MINISTRY OF EDUCATION AND TRAINING

FPT UNIVERSITY

Capstone Project Document

Equipment's Classroom Management

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Capstone Project Code	ECRM

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Definitions, Acronyms and Abbreviations

Name	Definitions
ECRM	Equipment's Classroom Management
HTTP	Hyper Text Transfer Protocol
App	Application
API	Application Program Interface
SMS	Short Message Service
JRE	Java Runtime Environment

A. Introduction

1. Project Information

- Project Name: **Equipment’s Classroom Management.**
- Project Code: **ECRM.**
- Product Type: **Web Application, Mobile Application.**
- Start Date: **May 11, 2015.**
- End Date: **August 17, 2015.**

2. Introduction

Nowadays, numbers of equipment in school are increasing with the increasing number of students and makes the equipment management become more and more important. Therefore, our project looks to meet the demand of managing equipment. We provide website and mobile application for staff to manage equipment of school. In the other hand, teacher can send report about damaged equipment in their classroom, staff receives notification immediately about damaged equipment, system automatically analyze damaged level to make recommendations, find available classroom, do change room, send SMS for related persons and also view system statistics.

3. Current Situation

At the moment, all the equipment in the school is not managed by any software. Staff has to gather much information such as number of classroom, status of classroom, status of equipment in each room..., in the certain time, they must check all the equipment for maintenance. All information had saved in document files. When there is any problem occurred, teacher has to report directly to staff and it causes wasting time to report. After that, staff will track status, notice to fixer to fix this. In the other hand, staff must check which room is available if changing is needed.

4. Problem Definition

Advantages:

- Requires less human resources.

Disadvantages:

- Wasting time to report problem.
- Hard to manage equipment by document, book...
- Hard to find available room when needed.

5. Proposed Solution

Building the application supports the staff manage the classroom’s equipment in school. The classroom type represents the equipment and it’s position. Teacher can use web application or mobile application to do check

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schedule in each day. They can report about damage equipment when teaching or after class by choose equipment, fill information about damaged. After report was sent, system will automatically analyze damaged level, check schedule of classroom and do change room if needed. The staff also receives notification about damaged, does change room if system didn’t do it and resovles problems.

5.1. Feature Function

Staff can:

- Manage room type: Staff can create and mapping room type for each classroom in school.
- Manage equipment in school: Staff can manage equipment using web application.
- Create schedule by import schedule excel file or do it manually.
- Statistic: Staff can see statistic about equipment of school.
- Manage classroom: Staff can manage classroom by using web application and easily check status of classroom.
- Resolve report and notice to reporter: Staff can receive and resolve report about damage equipment.
- Change room when needed: Staff can change room or change schedule of teacher when needed.
- Receive notification and SMS about report.
- Manage configuration of system.

Admin can:

- Manage account: Admin can create, manage all account of system

Teacher can:

- Create report: Teacher can create report about damage equipment
- View schedule: Teacher can check schedule in each day.
- Receive notification and SMS about changing room: Teacher can receive notification about change room if damaged level of room is high.

System can:

- Find available classroom and suggest to staff: System will automatic find available classroom with same options with current class and suggest to staff when needed.
- Send SMS and notification: System will automatic send SMS message to user when needed such as change room, send report...
- System will automatically analyze damaged level and do change room.

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- System will automatically count time remains of equipment and send notification to staff about maintenance.
- System will automatically check status of classroom and change schedule of teacher if needed.

5.2. Advantages and disadvantages

- **Advantages**
 - The report is created easier and faster. Saving time for teacher.
 - Easy to find the available room if changing room is needed.
 - The notifications are received real-time, so the staff can easy to check or resolve.
 - Easy to make decision thanks to recommendations from system.
 - Staff easily finds the position of failure equipment which shows in classroom map.
 - Equipment reporting histories are researched exactly and quickly.
 - Show statistics about equipment’s status, using time and the rate changing room in each month...
 - All report will be automatically analyzed by system.
 - Teacher can report when internet connection breakdown.
 - Reduce staff’s work.
- **Disadvantages**
 - The system would not check the behavior of user, so if the report is not correct, the notification will be wrong.
 - System can’t apply to complicated classroom likes discuss room...
 - The system could not check validate data imported from excel file.
 - Staff must have internet connection to use this application.
 - Systems haven’t evaluated priority based on subject yet.

6. Functional Requirement

Function requirements of the system are listed as below:

6.1. Equipment Management

- Support to manage all equipment in school.
- Track status equipment.
- Support to manage equipment category in school.

6.2. Notification

- Report the damage about equipment by checking. This also send notify to staff.
- Check the notification and fixing the equipment.

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- Notify to reporter about that fix.
- Send SMS.

6.3. Classroom Management

- Support to manage all classrooms in school.
- Track status of classroom.
- Support to create room type and mapping with each classroom.

6.4. Damaged Analysis And Recommendations

- Automatic analyze damaged level of classroom
- Find a similar available classroom with the current classroom and give recommend for staff.

6.5. Manage Account

- Admin can manage user’s account
- Admin is the person creates all account of system.

6.6. Manage Report

- Support staff to manage all report from teacher.
- Teacher can create report about damage equipment

6.7. Tracking Schedule

- Staff can create schedule manual or import excel file with template.
- Staff can tracking schedule of teacher in each day
- Teacher can see their schedule in each day.

7. Role and Responsibility

No	Full Name	Role	Position	Contact
1	Kiều Trọng Khánh	Project Managers	Instructor	khanhkt@fpt.edu.vn
2	Trần Vĩnh Quang	Developer	Leader	quangtvse61078@fpt.edu.vn
3	Tăng Việt Hưng	Developer	Member	hungtvse61019@fpt.edu.vn
4	Đoàn Nguyễn Minh Chí	Developer	Member	chidnmse60717@fpt.edu.vn

Table 1: Role and Responsibility

B. Software Project Management Plan

1. Problem Definition

1.1. Name of this Capstone Project

- **Official Name:** Equipment’s Classroom Management.
- **Vietnamese Name:** Ứng dụng hỗ trợ quản lý trang thiết bị cho các phòng học.
- **Abbreviation:** ECRM.

1.2. Problem Abstract

Reporting damaged equipment in classroom is very important. It affects the quality of teaching badly since it caused wasting time. If we can optimize it, the quality of teaching will be improved. So the ECRM system will provide the platform where people can reduce reporting damaged equipment time, manage equipment and receive suggestions via web site and mobile application.

1.3. Project Overview

1.3.1. Current Situation

The ECRM is the system that helps manages equipment in classroom more convenient way. With teacher, they just click (with web app version) or touch (with mobile app version) on the equipment which is damaged and system will notify to the staff immediately. With staff, they can see specific equipment was damaged in which classroom and who reported it. They can also check which classroom is available due to the schedule excel file imported to the system. Staff can read the statistic about equipment in school if they want to.

The system also has restrictions and it comes from the data in schedule excel file. If staff imports incorrect data but match the template, the result will be wrong. One more thing is the system couldn’t check user’s behaviors. So if teacher report wrong position of the damaged equipment, there are no way the system can deal with it.

1.3.2. The proposed system

Our system includes three main subsystems: an online website application for teacher and staff, a mobile application for teacher and a mobile application for staff.

1.3.2.1. Website application

- **Classroom management:**
 - Staff can manage classroom of school.
 - Staff can apply each classroom with the specific room type.
 - Staff can manage room type of school.
- **Account management:**

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- Admin can manage all account of system.
- Admin can activate or deactivate specific account.
- **Report management:**
 - Staff can receive report about the damaged equipment from teacher.
 - Teacher can send report about damaged equipment when they are teaching and after teach in class.
- **Equipment management:**
 - Staff can manage equipment.
 - Staff can manage equipment category in school.
 - Staff can tracking time remain of specific equipment.
- **Tracking schedule:**
 - Staff can create manual schedule for teacher or import schedule by excel file.
 - Staff can track schedule of all teacher in system.
 - Teacher can see schedule in each day.
- **Statistic:**
 - Staff can read statistic about the equipment likes life time, current status...
- **Analysis:**
 - System automatically analyzes the damaged level, gives suggestions.
- **Send SMS:**
 - System sends SMS to related peoples.
- **Suggest available classroom:**
 - System find similar available classroom base on some conditional and give suggestion.

1.3.2.2. Mobile application for teacher (ECRM Teacher)

- Teacher sends report about damaged equipment.
- Teacher views the map of room with interactive graphic in their account.
- Teacher views the schedule in current date.
- Teacher receives notification and SMS about changing room if needed.
- Teacher can edit or remove report in a certain time.

1.3.2.3. Mobile application for staff (ECRM Staff)

- Staff can get notification from damaged equipment which reported by teacher.
- Staff can send notification to teacher about fixing equipment of changing room if needed.
- Staff can send SMS to relative people such as: teacher, security...
- Staff can resolve report when needed.

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- Staff can change room manually.

1.3.3. Boundaries of the System

- The ECRM is used by teacher and staff, run in laptop, PC and android smart phone.
- Language: Vietnamese.
- The lasted product contain:
 - The website application for staff and teacher.
 - The android application for staff (ECRM Staff).
 - The android application for teacher (ECRM Teacher).

1.3.4. Development Environment

1.3.4.1. Hardware requirements

For system

Windows	Minimum Requirements	Recommended
Operating System	Window Sever 2008	Window Server 2012
Computer Processor	1GB RAM	2GB RAM or more
Computer Memory	Intel® Core 2 duo	Intel® Core™ i5 CPU, M460 @2.53 GHz
Internet Connection	Cable, WIFI (2 Mbps)	Cable, WIFI (4Mbps)

Table 2: Hardware Requirement for system

1.3.4.2. Software requirements

- Window Server 2008: Operating system for deploy web service.
- MySQL 5.6: used to create and manage the database for system.
- StarUML v5.0: used to created models and diagrams.
- Skype 7.0: used for communication and meeting.
- IntelliJ IDEA 14.0.3, Android Studio, JDK 7, Apache Tomcat 7, Apache Maven and Android SDK 14: used to implement web application, web service, and mobile application.
- Github & TortoiseSVN 1.8: used for source control.

2. Project organization

2.1. Software Process Model

The model for project is: Iterative Development Model

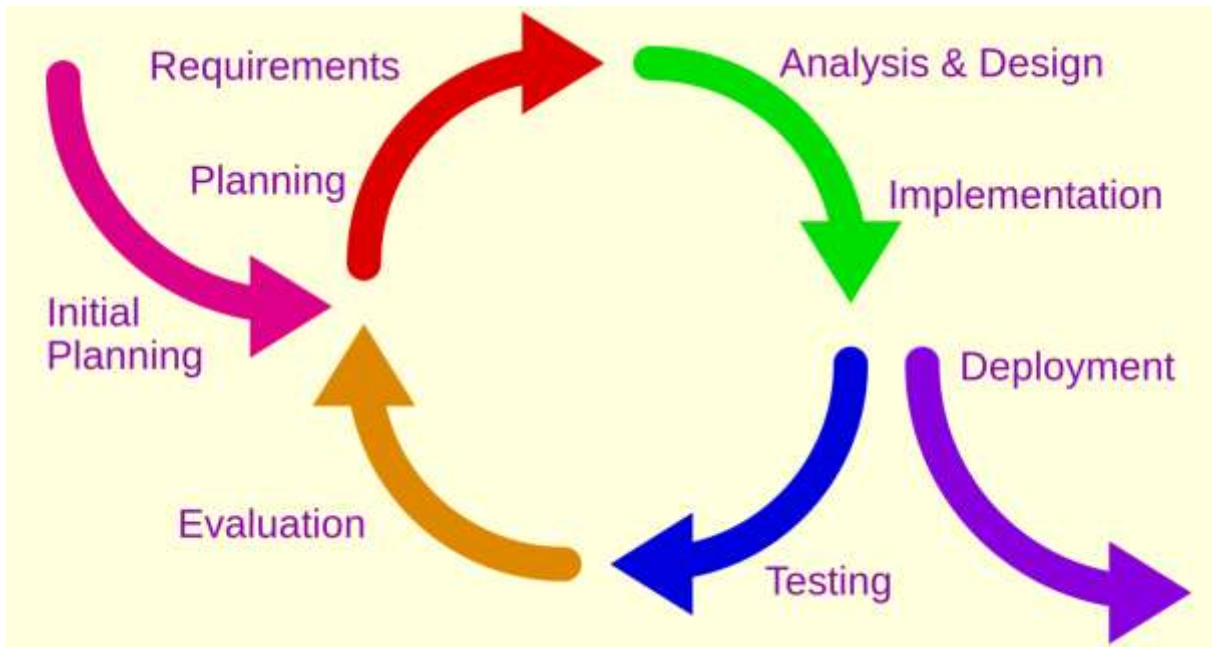


Figure 1: Iterative Development Model

Source: http://en.wikipedia.org/wiki/Iterative_and_incremental_development

The reasons for choose iterative development are:

- Members are active but lack of experience so we need to receive feedback during project evolving.
- We have 14 weeks for this project. So we can defined this is small project. Iterative model is suitable for this project to approaching the user thinking.
- This project does not exist, so we must take the survey to customer to know the equipment management in each school.
- In each phase, members only focus for their function. This will make the result better.
- Customer is more actively involved, get higher priority.
- Requirement changed frequently.

2.2. Roles and responsibilities

No	Full name	Role in Group	Responsibilities
1	Kieu Trong Khanh	Project manager	<ul style="list-style-type: none">• Specify user requirement• Control the development process• Give out technique and business analysis support
2	Tran Vinh Quang	Team Leader, BA, Developer, Tester	<ul style="list-style-type: none">• Managing process• Designing database• Clarifying requirements• Prepare documents

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			<ul style="list-style-type: none"> • GUI design • Create test plan • Coding • Testing
3	Tang Viet Hung	Team Member, Developer, Tester	<ul style="list-style-type: none"> • Designing database • Clarifying requirements • Prepare documents • GUI design • Create test plan • Coding • Testing
4	Doan Nguyen Minh Chi	Team Member, Developer, Tester	<ul style="list-style-type: none"> • Designing database • Clarifying requirements • Prepare documents • GUI design • Create test plan • Coding • Testing

Table 3: Roles and Responsibilities Details

2.3. Tools and Techniques

- Front-end: HTML 5, Bootstrap, CSS3, JavaScript, jQuery.
- Back-end: RESTful Web service, Spring MVC, Hibernate, JSP.
- Web-server: Apache Tomcat 7.0.
- Development Tools: IntelliJ IDEA 14
- Database Management System: MySQL 5.6

3. Project Management Plan

3.1. Software development life cycle

Phase	Description	Deliverables	Resource needed	Dependencies and Constrains	Risk
Classroom Management	<ul style="list-style-type: none"> • Support to create, edit room type in school. • Support to create, edit classroom with room type. • Support to import, mapping schedule. • Support to 	<ul style="list-style-type: none"> • Website application allowed creating, editing, removing room type. • Website application allowed creating, editing, removing classroom. • Related 	30 man-days	N/A	<ul style="list-style-type: none"> • Lack of experience. • Technology is difficult. • Not have a clear understanding about business process.

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	remove, update classroom.	document (SRS, SDD, User Guide...)			
Equipment Management	<ul style="list-style-type: none"> • Support to manage equipment on school. • Support to check time remain, position in classroom... of equipment. • Support to manage equipment category on school. • Support to mapping equipment to each classroom on school. 	<ul style="list-style-type: none"> • Website application allowed managing equipment. • Related document (SRS, SDD, User Guide...) 	20 man-days	Dependence on “Classroom Management”	<ul style="list-style-type: none"> • Lack of experience. • Technology is difficult. • Not have a clear understanding about business process.
Account Management	<ul style="list-style-type: none"> • Support admin to create, update or remove account from system • Support admin to activate or deactivate account from system 	<ul style="list-style-type: none"> • Website application allows manage account. • Related document (SRS, SDD, User Guide...) 	30 man - days	N/A	<ul style="list-style-type: none"> • Lack of experience. • Technology is difficult. • Not have a clear understanding about business process.
Tracking Schedule	<ul style="list-style-type: none"> • Support staff to create schedule manual or import excel file • Support staff to check schedule of user • Support user to view schedule in each day. 	<ul style="list-style-type: none"> • Website application allow import schedule, check schedule. • Related document (SRS, SDD, User Guide...) 	20 man - days	Dependence on “Account Management”, “Classroom Management”.	<ul style="list-style-type: none"> • Lack of experience. • Technology is difficult. • Not have a clear understanding about business process.
Report Management	<ul style="list-style-type: none"> • Support user to create report about damaged equipment. • Support staff to notify about fixing. • Support user to 	<ul style="list-style-type: none"> • Website application allowed user create and receive report. • Related document (SRS, 	30 man - days	Dependence on “Classroom Management”, “Equipment Management”	<ul style="list-style-type: none"> • Lack of experience. • Technology is difficult. • Not have a clear understanding

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	edit or remove report.	SDD, User Guide...)			about business process.
Web Service	<ul style="list-style-type: none"> • Build web service to develop android application. 	<ul style="list-style-type: none"> • Web service provides API. • Related document (SRS, SDD, User Guide...) 	20 man-days	Dependence on “Notify damage and fixing”	<ul style="list-style-type: none"> • Lack of experience. • Technology is difficult. • Not have a clear understanding about business process.
Android Application	<ul style="list-style-type: none"> • Support user to notify about damaged equipment and receive notification in their smartphone using Android OS with internet connection. 	<ul style="list-style-type: none"> • Android application allow user send notify about damage. • Related document (SRS, SDD, User Guide...) 	30 man-days	Dependence on “Web Service”	<ul style="list-style-type: none"> • Lack of experience. • Technology is difficult. • Not have a clear understanding about business process.

Table 4: Software development life cycle

3.2. Phase Detail

3.2.1. Phase 1: Classroom Management.

Task	Description	Author
Planning	<ul style="list-style-type: none"> - Identify start date, end date of iteration. - Identify what team should implement in this iteration. 	Tran Vinh Quang
Requirements	<ul style="list-style-type: none"> - Collect requirements from customer - Identify and clarify requirements 	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Analysis & Design	<ul style="list-style-type: none"> - Research and identify technology to implement function - Identify how to implements function - Create ER diagram, database - Create detail design for this function 	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Implementation	<ul style="list-style-type: none"> - Implement function base on detail design, technology had research. 	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Deployment	<ul style="list-style-type: none"> - Create deployment documents, user guide. - Deploy this function to server 	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh

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		Chi
Testing	<ul style="list-style-type: none"> - Write and run test case for this function - Do unit test and integration test. - Create testing document 	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Evaluation	- Receive feedback	Tran Vinh Quang

Table 5: Phase 1: Classroom Management

3.2.2. Phase 2: Equipment Management.

Task	Description	Author
Planning	<ul style="list-style-type: none"> - Identify start date, end date of iteration. - Identify what team should implement in this iteration. - Notice about feed of customer about previous iteration to team member. 	Tran Vinh Quang
Requirements	<ul style="list-style-type: none"> - Collect requirements from customer - Identify and clarify requirements 	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Analysis & Design	<ul style="list-style-type: none"> - Research and identify technology to implement function - Identify how to implements function - Create, update ER diagram, database - Create detail design for this function 	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Implementation	- Implement function base on detail design, technology had research.	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Deployment	<ul style="list-style-type: none"> - Create deployment documents, user guide. - Deploy this function to server 	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Testing	<ul style="list-style-type: none"> - Write and run test case for this function - Do unit test and integration test. - Update testing document 	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Evaluation	- Receive feedback	Tran Vinh Quang

Table 6: Phase 2: Equipment Management

3.2.3. Phase 3: Account Management.

Task	Description	Author
Planning	<ul style="list-style-type: none"> - Identify start date, end date of iteration. - Identify what team should implement in this iteration. - Notice about feed of customer about 	Tran Vinh Quang

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	previous iteration to team member.	
Requirements	<ul style="list-style-type: none"> - Collect requirements from customer - Identify and clarify requirements 	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Analysis & Design	<ul style="list-style-type: none"> - Research and identify technology to implement function - Identify how to implements function - Create, update ER diagram, database - Create detail design for this function 	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Implementation	- Implement function base on detail design, technology had research.	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Deployment	<ul style="list-style-type: none"> - Create deployment documents, user guide. - Deploy this function to server 	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Testing	<ul style="list-style-type: none"> - Write and run test case for this function - Do unit test and integration test. - Update testing document 	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Evaluation	- Receive feedback	Tran Vinh Quang

Table 7: Phase 3: Account Management

3.2.4. Phase 4: Tracking Schedule.

Task	Description	Author
Planning	<ul style="list-style-type: none"> - Identify start date, end date of iteration. - Identify what team should implement in this iteration. - Notice about feed of customer about previous iteration to team member. 	Tran Vinh Quang
Requirements	<ul style="list-style-type: none"> - Collect requirements from customer - Identify and clarify requirements 	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Analysis & Design	<ul style="list-style-type: none"> - Research and identify technology to implement function - Identify how to implements function - Create, update ER diagram, database - Create detail design for this function 	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Implementation	- Implement function base on detail design, technology had research.	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi

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Deployment	- Create deployment documents, user guide. - Deploy this function to server	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Testing	- Write and run test case for this function - Do unit test and integration test. - Update testing document	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Evaluation	- Receive feedback	Tran Vinh Quang

Table 8: Phase 4: Tracking Schedule.

3.2.5. Phase 5: Report Management

Task	Description	Author
Planning	- Identify start date, end date of iteration. - Identify what team should implement in this iteration. - Notice about feed of customer about previous iteration to team member.	Tran Vinh Quang
Requirements	- Collect requirements from customer - Identify and clarify requirements	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Analysis & Design	- Research and identify technology to implement function - Identify how to implements function - Create, update ER diagram, database - Create detail design for this function	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Implementation	- Implement function base on detail design, technology had research.	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Deployment	- Create deployment documents, user guide. - Deploy this function to server	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Testing	- Write and run test case for this function - Do unit test and integration test. - Update testing document	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Evaluation	- Receive feedback	Tran Vinh Quang

Table 9: Phase 5: Report Management.

3.2.6. Phase 6: Web Service

Task	Description	Author
Planning	- Identify start date, end date of iteration.	Tran Vinh Quang

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	<ul style="list-style-type: none"> - Identify what team should implement in this iteration. - Notice about feed of customer about previous iteration to team member. 	
Requirements	<ul style="list-style-type: none"> - Collect requirements from customer - Identify and clarify requirements 	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Analysis & Design	<ul style="list-style-type: none"> - Research and identify technology to implement function - Identify how to implements function - Create, update ER diagram, database - Create detail design for this function 	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Implementation	<ul style="list-style-type: none"> - Implement function base on detail design, technology had research. 	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Deployment	<ul style="list-style-type: none"> - Create deployment documents, user guide. - Deploy this function to server 	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Testing	<ul style="list-style-type: none"> - Write and run test case for this function - Do unit test and integration test. - Update testing document 	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Evaluation	<ul style="list-style-type: none"> - Receive feedback 	Tran Vinh Quang

Table 10: Phase 6: Web Service

3.2.7. Phase 7: Android Application

Task	Description	Author
Planning	<ul style="list-style-type: none"> - Identify start date, end date of iteration. - Identify what team should implement in this iteration. - Notice about feed of customer about previous iteration to team member. 	Tran Vinh Quang
Requirements	<ul style="list-style-type: none"> - Collect requirements from customer - Identify and clarify requirements 	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Analysis & Design	<ul style="list-style-type: none"> - Research and identify technology to implement function - Identify how to implements function - Create, update ER diagram, database - Create detail design for this function 	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Implementation	<ul style="list-style-type: none"> - Implement function base on detail 	Tran Vinh Quang,

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	design, technology had research.	Tang Viet Hung, Doan Nguyen Minh Chi
Deployment	- Create deployment documents, user guide. - Deploy this function to server	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Testing	- Write and run test case for this function - Do unit test and integration test. - Update testing document	Tran Vinh Quang, Tang Viet Hung, Doan Nguyen Minh Chi
Evaluation	- Receive feedback	Tran Vinh Quang

Table 11: Phase 7: Android Application

3.3. All Meeting Minutes

Refer to Meeting Minutes folder

<https://www.github.com/tranquang9a1/ECRM>

4. Coding Convention

Java: Using to develop desktop application.

Summary:

- Naming Convention.
 - Use camel case for both variable and function name.
 - Use Pascal case for class, interface name.
 - The names of variables declared constants should be all uppercase with words separated by under-scores (“_”).
- Four spaces should be used as the unit of indentation. The exact construction of the indentation (spaces vs. tabs) is unspecified. Tabs must be set exactly every 8 spaces (not 4).
- When an expression will not fit on a single line, break it according to these general principles:
 - Break after a comma.
 - Break before an operator.
 - Align the new line with the beginning of the expression at the same level on the previous line.
- Declaration.
 - One declaration per line is recommended since it encourages commenting.
 - In absolutely no case should variables and functions be declared on the same line.
 - Do not put different types on the same line.
- Code Examples

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Follow “Code Conventions for the Java TM Programming Language, by Sun Microsystems, rev April 20, 1999”.

<http://www.oracle.com/technetwork/java/codeconventions-150003.pdf>.

C. Software Requirement Specification

1. User Requirement Specification

1.1. Guest Requirement

Guest is a person who does not login to the system. Guest can use some function in the system. These are some functions guest can use:

- Login

1.2. User Requirement

User is guest, who uses his account to login to the system. In this system, we can define user is a teacher. Member can use some additional function, such as:

- View Report History.
- View Room Map.
- Manage Report include
 - o Create Report
 - o Delete Report
 - o Edit Report

1.3. Staff Requirement

Staff is manager of the system, we can define staff is an equipment manager in school. Staff can use these function:

- Manage Room Type include:
 - o Create Room Type.
 - o Update Room Type.
 - o Remove Room Type.
- Manage Classroom include:
 - o Create Classroom.
 - o Update Classroom.
 - o Remove Classroom.
- Manage Schedule include:
 - o Mapping Schedule Import File.
 - o Mapping Schedule Manual.
- Statistic.
- Configuration schedule.
- Manage Report include:
 - o Resolve Report.
 - o Remove Report.
 - o Change Room
- Manage Equipment include:
 - o Create Equipment.

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- Remove Equipment.
 - Update Equipment.
 - Map equipment to classroom.
- Manage Category include:
 - Create Category.
 - Remove Category.
 - Update Category.

1.4. Administrator Requirement

Admin is the person who manages the system. Admin is super user can use following functions:

- Manage Account include:
 - Create Account
 - Update Account
 - Activate/Deactivate Account
- Manage configuration

1.5. Authorized User Requirement

Authorize User is the person who login to system include user, staff, administrator. Authorize user can use following functions:

- Logout.
- Change Password.

2. System Requirement Specification

2.1. External Interface Requirement

2.1.1. User Interface

- The user interface uses language Vietnamese.
- The user interface display best on 1024x768-screen size for web application and 4-inches for mobile application.

2.1.2. Hardware Interface

- N/A

2.1.3. Software Interface

- Web Application: Firefox (v30 or above), Chrome (v14 or above) browser, enable JavaScript
- Mobile Application: Smartphone with Android operating system (v4.0 or above).

2.1.4. Communication Protocol

- Website using HTTP protocol for communication between the web browser and the web server.
- Mobile app using HTTP protocol for communication between app and web service.

2.2. System Overview Use Case

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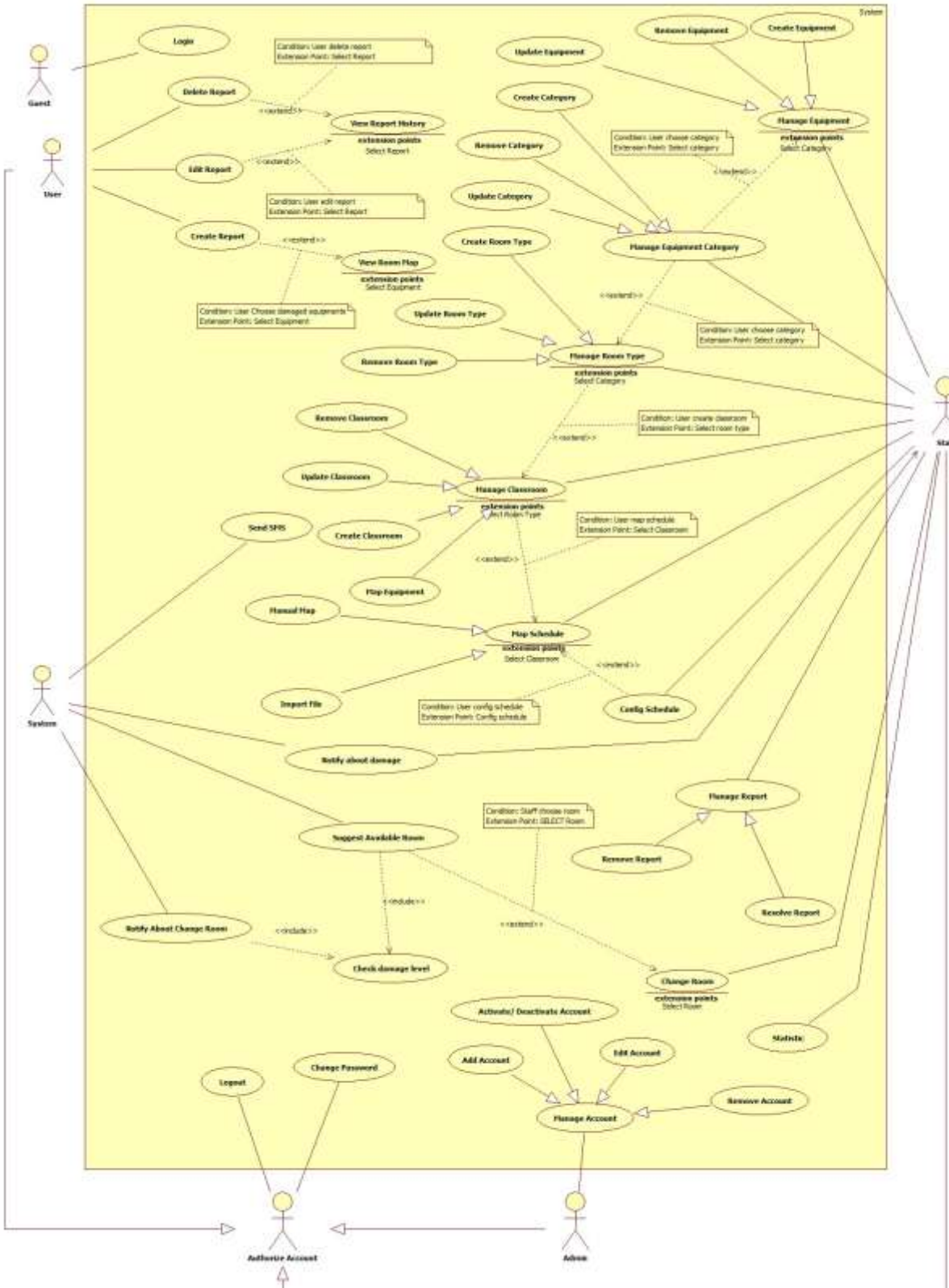


Figure 2: System Overview Use Case

2.3. List of Use Case

2.3.1. <Guest> Overview Use Case

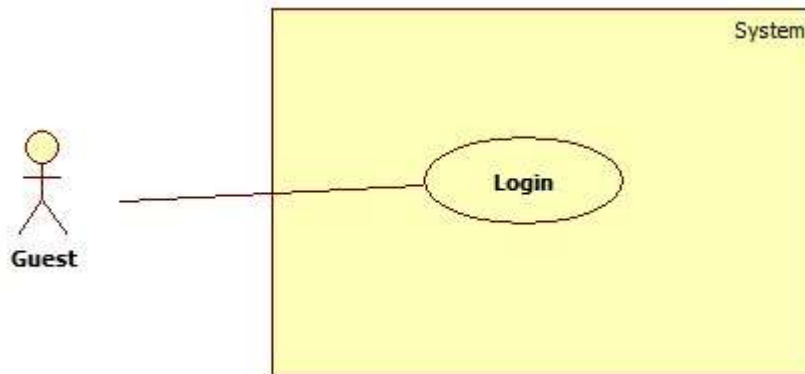


Figure 3: Guest Overview Use Case

2.3.2. <Guest> Login

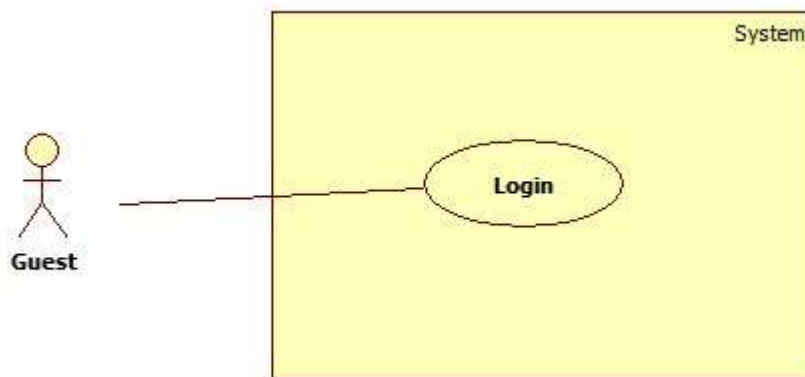


Figure 4: <Guest> Login

Use case Specification

USE CASE – ECRM001			
Use Case No.	ECRM001	Use Case Version	2.0
Use Case Name	Login		
Author	Tran Vinh Quang		
Date	05/21/2015	Priority	Normal
Actor: Guest			
Summary: This use case allows guest to login.			
Goal: Authentication and authorization			
Triggers: Guest send “Đăng nhập” request to system.			
Preconditions: N/A			

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Post Conditions:

- **Success:** Guest will be logged in system with their roles. Show welcome message.
- **Fail:** Unsuccessful message will be shown.

Main Success Scenario:

Step	Actor Action	System Response
1	Guest send Login request.	System navigates to “Đăng nhập” page. <ul style="list-style-type: none">- Username: free text input, min length: 6, max length: 20 required.- Password: free text input, min length: 6, max length: 20, required.- Đăng nhập: command
2	Input field.	
3	Guest send “Đăng nhập” request.	Guest will login system with their roles. [Exception 1,2,3]

Alternative Scenario: N/A

Exceptions:

No	Cause	System Response
1	Wrong username or password.	Show unsuccessful message: “Sai username hoặc password. Hãy thử lại!”
2	“Username” field or “Password” field is empty	Show error message: “Bạn chưa nhập Username or Password. Hãy thử lại”
3	“Username” or “Password” field data length is longer than 20 character or lower than 6 character	Show error message: “Username và Password phải lớn hơn 6 và nhỏ hơn 20 ký tự!”

Relationships: N/A

Business Rules:

- After login successfully, guest will login with their role: user, staff and administrator.
- Only active user can login to system.
- If it is first time user login to system. They will be redirect to “Change Password” page to change password.
- On mobile application, user can only login ECRM Teacher Application. Staff can only login ECRM Staff Application.
- On website application, if guest login with role user will be redirect to

homepage. If guest is staff, they will be redirected to staff page and if they login with role admin, they will be redirected to administrator page.

Table 12: <Guest> Login

2.3.3. <User> Overview Use Case

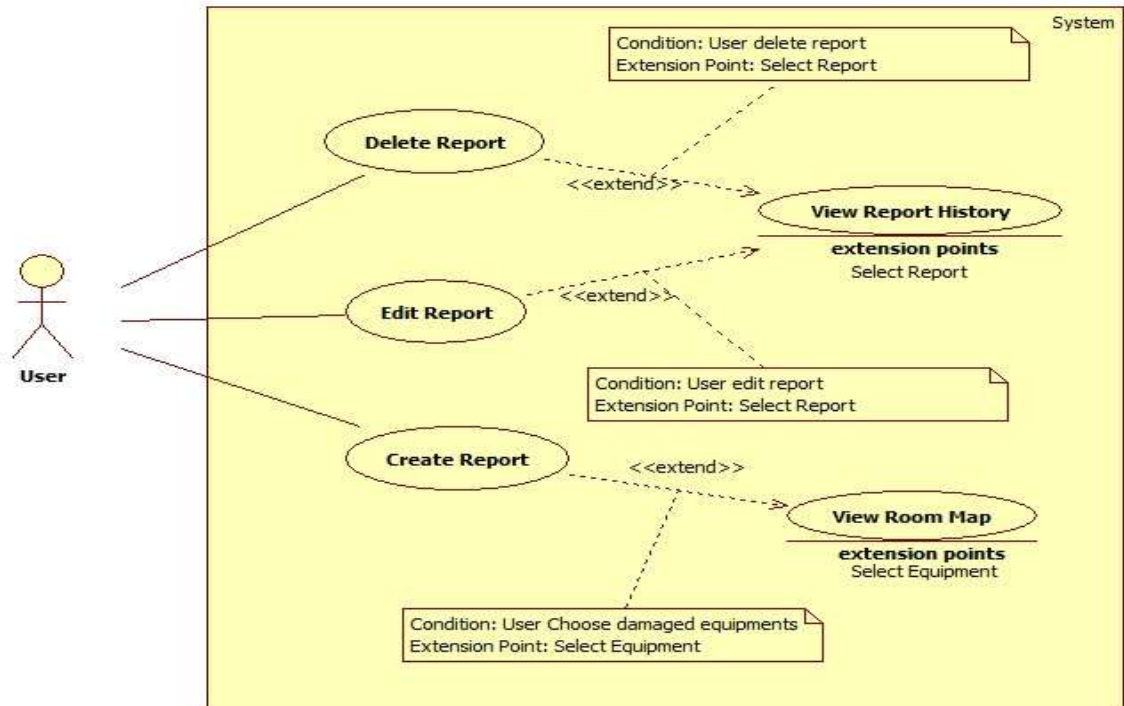


Figure 5: <User> Overview Use Case

2.3.4. <User> View Report History

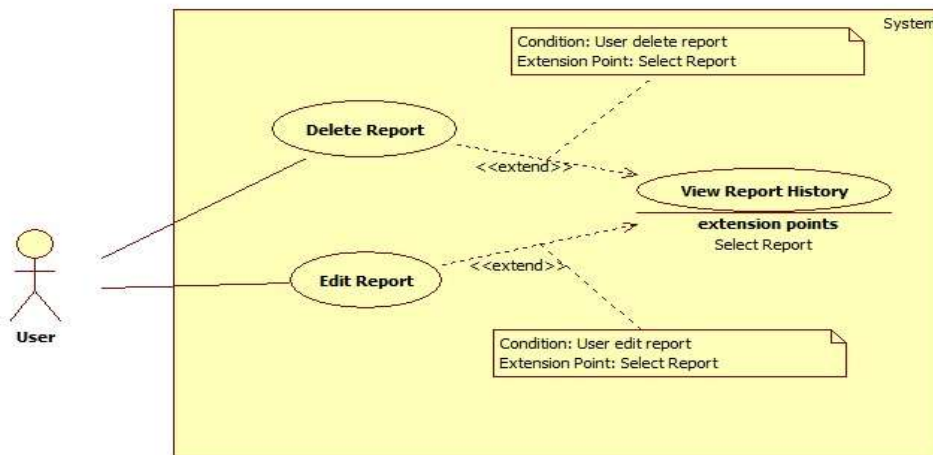


Figure 6: <User> View Report History

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Use case specification

USE CASE – ECRM002			
Use Case No.	ECRM002	Use Case Version	2.0
Use Case Name	View Report History		
Author	Doan Nguyen Minh Chi		
Date	05/21/2015	Priority	Low
Actor: User			
Summary: <ul style="list-style-type: none">- This use case allows user to view detail resolve for them report.			
Goal: <ul style="list-style-type: none">- User can view report detail is resolved.			
Triggers: <ul style="list-style-type: none">- User sends request view report history.			
Preconditions: <ul style="list-style-type: none">- User must be teacher.- This report must be created by user.			
Post Conditions: <ul style="list-style-type: none">- Success: Show report detail and resolve of staff.- Fail: Show error message.			
Main Success Scenario:			
Actor Action		System Response	
User sends request view report history. [Alternative 1]		System will show report with two part: <ul style="list-style-type: none">- Part “Thông tin”:<ul style="list-style-type: none">• “Phòng”: label• “Người báo cáo”: label• “Trạng thái”: label, list status[“Chưa sửa”, “Đang sửa”, “Đã sửa”]• “Thiết bị”: label + “Xem bản đồ” send command• “Thời gian báo cáo”: label• “Mô tả từ giáo viên”: label- Part “Sơ đồ phòng”: list equipment and they position in the room. “Quay lại” send command [Exception 1][Exception 2]	
Alternative Scenario:			
No	Actor Action	System Response	
1	User sends request in		

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	resolve notify when report is resolved.	<p>System will show report with two part:</p> <ul style="list-style-type: none"> - Part “Thông tin: <ul style="list-style-type: none"> • “Phòng”: label • “Người báo cáo”: label • “Trạng thái”: label, list status[“Chưa sửa”, “Đang sửa”, “Đã sửa”] • “Thiết bị”: label + “Xem bản đồ” send command • “Thời gian báo cáo”: label • “Mô tả từ giáo viên”: label - Part “Sơ đồ phòng”: list equipment and they position in the room. - “Quay lại” send command
Exceptions:		
No	Cause	System Response
1	Report history not exist	Show warning message: “Báo cáo hiện không tìm thấy.”
2	User views report of other user	Show warning message: “Bạn không có quyền truy cập báo cáo này”.
<p>Relationships: extend by Delete Report, Edit Report.</p> <p>Business Rules:</p> <ul style="list-style-type: none"> - Teacher only views them report. - When view report, they can delete or edit report from this page. 		

Table 13: <User> View Report History

2.3.5. <User> View Room Map

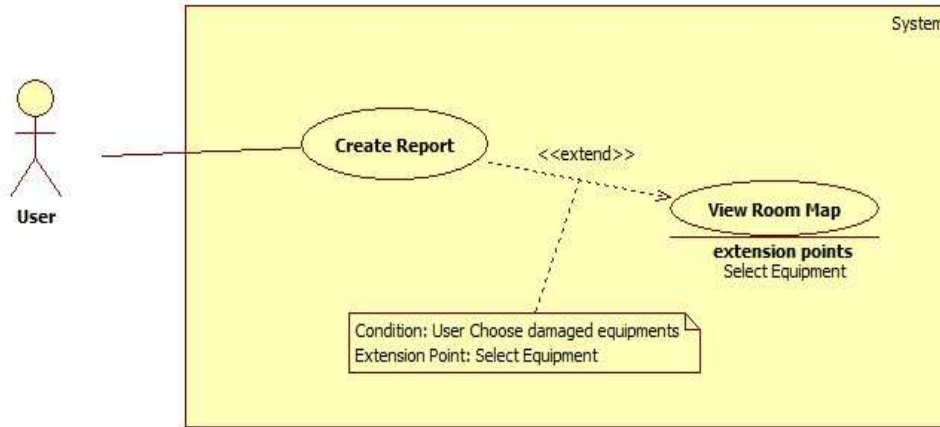


Figure 7: <User> View Room Map

Use case specification

USE CASE – ECRM003			
Use Case No.	ECRM003	Use Case Version	2.0
Use Case Name	View Room Map		
Author	Tran Vinh Quang		
Date	05/21/2015	Priority	Normal
Actor: User			
Summary: This use case allows user to view map of classroom they teach.			
Goal: View map of classroom user teaching. (Apply for web application and mobile application)			
Triggers: User send “View Room Map” request in Home page.			
Preconditions:			
<ul style="list-style-type: none"> ○ User has successfully logged in system. ○ User must have schedule teaching this classroom at the moment. 			
Post Conditions:			
<ul style="list-style-type: none"> ○ Success: User will see map of classroom they are teaching. ○ Fail: Unsuccessful message will be shown. 			
Main Success Scenario:			
Step	Actor Action	System Response	
1	User sends “View Room Map” request.	System navigates to “Map” page. It contains the following information <ul style="list-style-type: none"> ○ Map of room they teaching, show location of all equipment in class include board, table, chair, projector, fan.... ○ Cancel: button [Exception 1,2]	

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Alternative Scenario: N/A

Exceptions:

Step	Actor Action	System Response
1	Connection error	Show error message: “Lỗi kết nối, vui lòng tải lại”
2	User does not teach any class	Show error message: “Bạn không dạy lớp nào! Vui lòng thử lại sau hoặc liên hệ với quản lý”.
3	Classroom did not had type	Show error message: “Hiện tại chưa có sơ đồ phòng học này, vui lòng liên hệ với quản lý”.

Relationships: extend by Create Report

Business Rules:

- From map page, user can create report about damage equipment by click to equipment in map (web application) or touch to equipment (mobile application).
- Only user have schedule teaching this classroom at the moment can see map of room.
- If class had damaged equipment, that equipment will be showed with red color. Other equipment will be showed with white color.
- System will check type of classroom and show map to screen.
- Room map had created by staff and mapping for each classroom when staff create new classroom.
- Classroom only has one map, map had saved in database in table RoomType

Table 14: <User> View Room Map

2.3.6. <User> Create Report

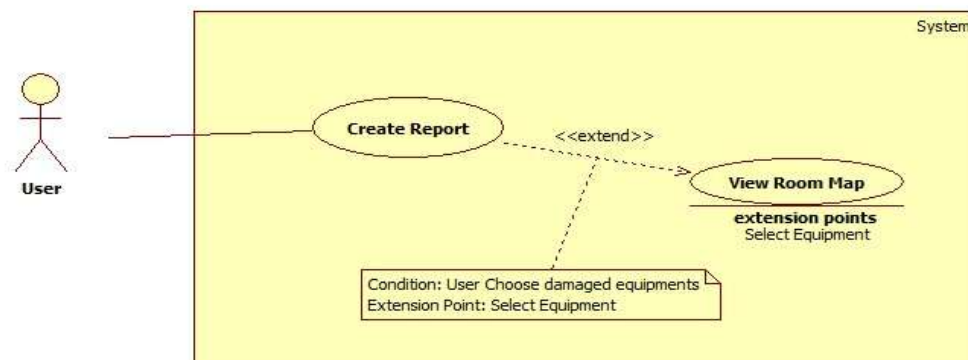


Figure 8: <User> Create Report

2.3.6.1. Create Report In Web Application

Use case specification

USE CASE – ECRM004			
Use Case No.	ECRM004	Use Case Version	2.0
Use Case Name	Create Report		
Author	Doan Nguyen Minh Chi		
Date	05/21/2015	Priority	High
Actor: User			
Summary: <ul style="list-style-type: none">- In this use case allows user to send report for staff about damaged equipment. (At web application)			
Goal: <ul style="list-style-type: none">- Staff will be received damaged report from user.- Teacher sends report about damaged equipment.			
Triggers: <ul style="list-style-type: none">- User send “Tạo Báo Cáo” request in website.			
Preconditions: <ul style="list-style-type: none">- User has login successful on system with role teacher.- User have schedule teaching this classroom at the moment.			
Post Conditions: <ul style="list-style-type: none">- Success: Report must be send to staff.- Fail: Show error message.			
Main Success Scenario:			
Actor Action		System Response	
1. User sends “Tạo Báo Cáo” request.		2. System will show room detail with two part: <ul style="list-style-type: none">a. “Phòng”: value list (list room can be reported)b. Part “Thông tin”: list equipment by category and status report of equipment.<ul style="list-style-type: none">i. Equipment imageii. “Hư hại”: checkboxiii. Equipment evaluate: value list [“Có thể sử dụng”, “Không thể sử dụng”]iv. Equipment statusc. “Đánh giá của bạn”: value list [“Không thể dạy được”, “Vẫn dạy được”]d. Part “Sơ đồ phòng”: list	

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<p>3. User chooses damaged equipment, and send “Gửi báo cáo” request. [Alternative 1] [Alternative 2]</p>	<p>equipment and they position in the room. e. “Gửi báo cáo”: send command f. “Quay lại”: send command</p> <p>4. Report will be saved. [Exception 1] 5. Notify to staff about report.</p>
---	---

Alternative Scenario:

No	Actor act on	System Response
1	User chooses other room in list “Phòng”	System will show this room detail.
2	User sends “Quay lại” command	System will show history report page.

Exceptions:

No	Cause	System Response
1	User hasn’t teaching in class	Show message: “Báo cáo không thể gửi vì bạn không có lịch dạy trong lớp này”.

Relationships: N/A

Business Rules:

- Only user can report equipment in classroom which they are teaching at the moment and after that.
- Report has 4 statuses include “New”, “Going”, “Finish” and “Remove”.
- If staff or system change room for report, report status will be changed from “New” to “Going”
- If staff resolves report, report status will be changed to “Finish”.
- If staff or teacher removes report, report status will be change to “Remove”.
- All data user input will be saved in databased after validated.
- If equipment evaluate is “Không thể sử dụng”, you must input damaged description.
- System will get value of “Đánh giá của bạn”, equipment evaluates, and priority of equipment, before calculate damage level of them. It will be notify for staff in resolve form.
- If damage level is larger than 50%, system will call Suggest Available Room.
- A notification will be sent to staff. Staff can check it later
- If teacher evaluate “Không thể dạy được”, SMS message will be sent direct to staff to check immediately.
- Teacher can edit report after they create, but when them room has fix, they can

not edit report.

Table 15: <User> Create Report in Web Application

2.3.6.2. Create Report In Mobile Application

Use case specification

USE CASE – ECRM005			
Use Case No.	ECRM005	Use Case Version	2.0
Use Case Name	Create report		
Author	Tran Vinh Quang		
Date	05/21/2015	Priority	High
Actor: User			
Summary:			
<ul style="list-style-type: none"> - In this use case allows user to send report for staff about damaged equipment. (At mobile application) 			
Goal:			
<ul style="list-style-type: none"> - Staff will be received damaged report from user. - Teacher sends report about damaged equipment. 			
Triggers:			
<ul style="list-style-type: none"> - User send “Gửi Báo Cáo” request in mobile application. 			
Preconditions:			
<ul style="list-style-type: none"> - User has login successful to mobile application with role teacher. - User have schedule teaching this classroom at the moment. 			
Post Conditions:			
<ul style="list-style-type: none"> - Success: Report must be send to staff. - Fail: Show error message. 			
Main Success Scenario:			
Actor Action		System Response	
1. User logins to mobile application.			
		2. Application show list classroom they teach in day	
3. User chooses classroom to report			
		4. Navigate to list equipment of classroom with two tabs: <ul style="list-style-type: none"> - Equipment Tab: Show list equipment of classroom. - Classroom Tab: Show map of classroom [Exception 1] 	
5. User chooses equipment to report			
6. User sends “Tạo Báo Cáo” request			
		7. Show dialog confirm to user [Exception 2]	
8. User fills information to dialog			
9. User sends “Gửi Báo Cáo” request			
		10. Send report to server	

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		[Exception 3]
Alternative Scenario:		
No	Actor action	System Response
1	User sends “Back” command	Navigate to previous screen.
Exceptions:		
No	Cause	System Response
1	User hasn’t teaching in class	Show message: “Bạn không thể báo cáo vì bạn chưa dạy lớp này”.
2	User did not choose any equipment	Show message: “Bạn phải chọn ít nhất 1 thiết bị”
Relationships: N/A		
Business Rules:		
<ul style="list-style-type: none"> - If user is not connecting to internet, system will calculate damage level and ask user about send SMS message to server. Report will send to server when device connect internet. - Report has 4 statuses include “New”, “Going”, “Finish” and “Remove”. - If staff or system change room for report, report status will be changed from “New” to “Going” - If staff resolves report, report status will be changed to “Finish”. - If staff or teacher removes report, report status will be change to “Remove”. - Only user can report equipment in classroom which they are teaching. - If equipment evaluate is “Hư hại nặng”, you must input damaged description. - System will get value of “Đánh giá của bạn”, equipment evaluates, and priority of equipment, before calculate damage level of them. It will be notify for staff in resolve form. 		

Table 16: <User> Create Report in Mobile Application

2.3.7. <User> Delete Report

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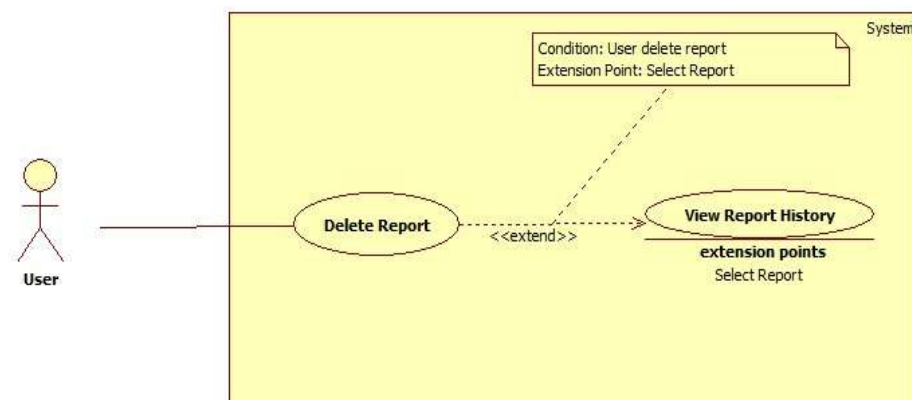


Figure 9: <User> Delete Report

Use case specification

USE CASE – ECRM006			
Use Case No.	ECRM006	Use Case Version	2.0
Use Case Name	Delete Report		
Author	Tran Vinh Quang		
Date	05/21/2015	Priority	Normal
Actor: User Summary: <ul style="list-style-type: none"> - This use case allows user to remove existed report (applied for web application and mobile application) Goal: Remove existed report to system. Triggers: User sends request “Xóa” in report management page. Preconditions: <ul style="list-style-type: none"> ○ User must login into the system with user role. ○ Report must be existed in system Post Conditions: <ul style="list-style-type: none"> ○ Success: Report will be removed from system. Success message will be shown. ○ Fail: Error message will be shown. Main Success Scenario:			
Step	Actor Action	System Response	
1	User sends request “Xóa” in report manage page. [Alternative 1]	System shows confirm box: <ul style="list-style-type: none"> ○ Bạn có muốn xóa báo cáo: message. ○ Xóa: command. ○ Thoát: command. 	
2	User sends “Xóa” request.	System shows successful message: “Báo cáo đã bị xóa khỏi hệ thống!”	

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Alternative Scenario:

No	Actor Action	System Response
1	User clicks “Thoát”	System navigation to “Report Management Page”

Exceptions: N/A

Relationships: N/A

Business Rules:

- All the equipment in the report that is deleted will be change status to fixed
- All the report detail will be check delete.
- The report will be check delete
- Update damage level of classroom has report
- Report will be changed status to “Remove”

Table 17: <User> Delete Report

2.3.8. <User> Edit Report

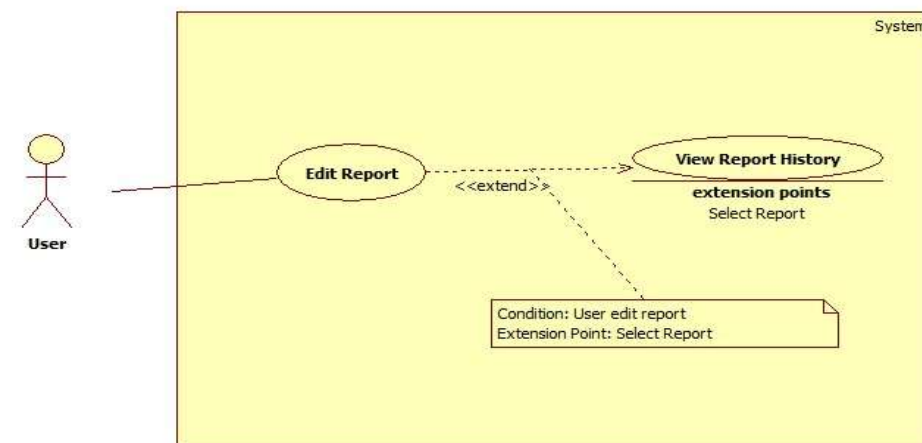


Figure 10: <User> Edit Report

Use case specification

USE CASE – ECRM007			
Use Case No.	ECRM007	Use Case Version	2.0
Use Case Name	Edit Report		
Author	Doan Nguyen Minh Chi		
Date	05/21/2015	Priority	High
Actor: User			
Summary:			
<ul style="list-style-type: none"> - In this use case allows user to edit report and send it to staff about damaged equipment. 			
Goal:			
<ul style="list-style-type: none"> - Staff will be received damaged report from user. 			

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- Teacher edits report about damaged equipment.

Triggers:

- User send “Sửa Báo Cáo” report manage page.

Preconditions:

- User has login successful on system with role teacher.
- User has teaching schedule in this classroom.

Post Conditions:

- **Success:** Report must be edit and send to staff.
- **Fail:** Show error message.

Main Success Scenario:

Actor Action	System Response
<p>User sends “Sửa Báo Cáo” request.</p>	<p>System will show room detail with two part:</p> <ul style="list-style-type: none"> ○ “Phòng”: value list (list room can be reported) ○ Part “Thông tin”: list equipment by category and status report of equipment. ○ Equipment image ○ “Hư hại”: checkbox ○ Equipment evaluate: value list [“Có thể sử dụng”, “Không thể sử dụng”] ○ Equipment status ○ “Đánh giá của bạn”: value list [“Không thể dạy được”, “Vẫn dạy được”] <p>Part “Sơ đồ phòng”: list equipment and they position in the room.</p> <p>“Gửi báo cáo”: send command</p> <p>“Quay lại”: send command</p>
<p>Users must choose damaged equipment, and sends “Gửi báo cáo” request.</p> <p>[Alternative 1] [Alternative 2]</p>	<p>Report will be saved.</p> <p>[Exception 1]</p> <p>Notify to staff about report.</p>

Alternative Scenario:

No	Actor action	System Response
1	User chooses other room in list “Phòng”	System will show this room detail.
2	User sends “Quay lại” command	System will show history report page.

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Exceptions:		
No	Cause	System Res onse
1	User hasn’t teaching in class	Show message: “Báo cáo không thể gửi vì bạn không có lịch dạy trong lớp này”.
Relationships: N/A		
Business Rules: <ul style="list-style-type: none">- Only user can edit report equipment in classroom which they are teaching.- If equipment evaluate is “Không thể sử dụng”, you must input damaged description.- System will get value of “Đánh giá của bạn”, equipment evaluates, and priority of equipment, before calculate damage level of them. It will be notify for staff in resolve form.- If damage level is larger than 50%, system will call Suggest Available Room.- If classroom has been fixed, user can not edit report.- A notification will be sent to staff when teacher finishes edit report.- If “Đánh giá của bạn” field is “Phải đổi phòng”, system will send SMS direct to staff		

Table 18: <User> Edit Report

2.3.9. <Staff> Use Case Overview

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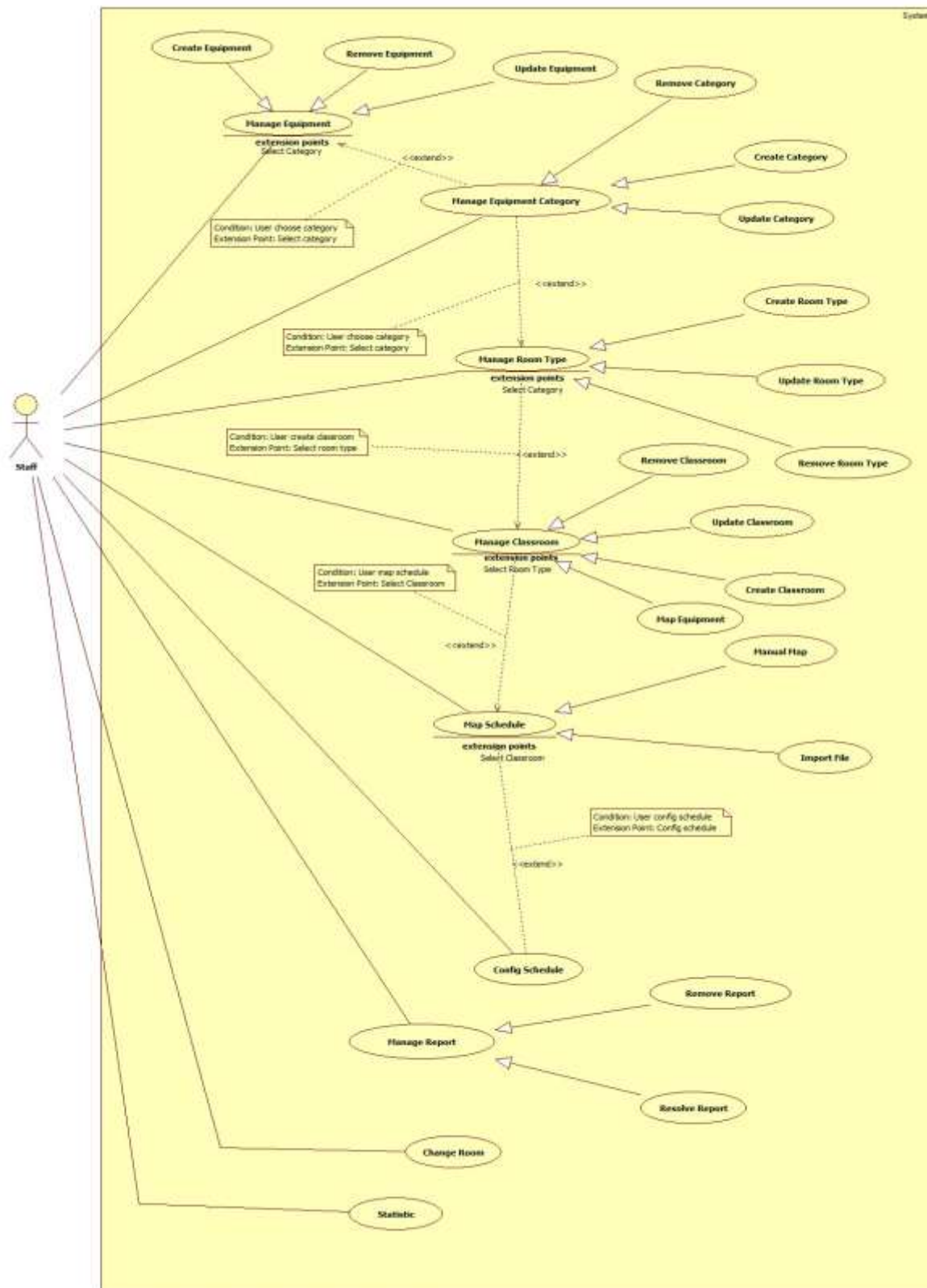


Figure 11: <Staff> Use case Overview

2.3.10.<Staff> Create Room Type

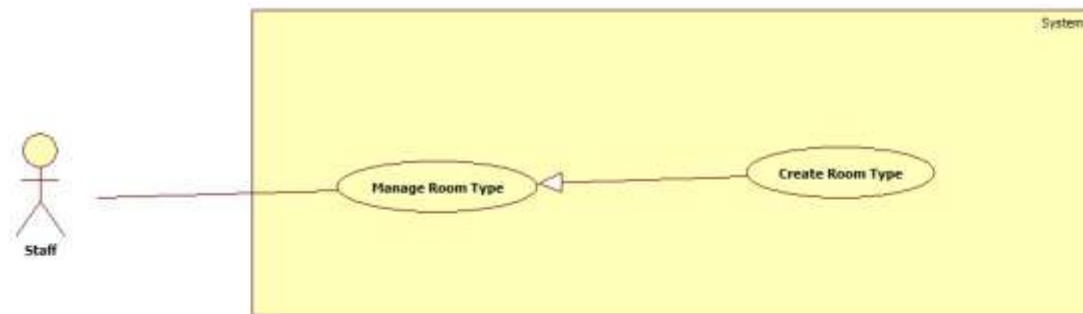


Figure 12: <Staff> Create Room Type

Use case specification

USE CASE – ECRM008			
Use Case No.	ECRM008	Use Case Version	2.0
Use Case Name	Create Room Type		
Author	Tang Viet Hung		
Date	05/21/2015	Priority	Normal
Actor: Staff			
Summary: This use case allows staff to create new room type.			
Goal: Create room type to the system.			
Triggers: Staff sends request “Tạo Loại Phòng” in “Loại Phòng” page.			
Preconditions:			
<ul style="list-style-type: none"> ○ User must login into the system with staff role. 			
Post Conditions:			
<ul style="list-style-type: none"> ○ Success: New room type will be created and show successful message. ○ Fail: Unsuccessful message will be shown. 			
Main Success Scenario:			
Step	Actor Action	System Response	
1	Staff clicks on “Phòng Học” and then clicks on tab “Loại phòng”.	System navigates to “Kiểu Phòng” page. Page includes: <ul style="list-style-type: none"> - Table with columns: <ul style="list-style-type: none"> ❖ Loại phòng ❖ Số chỗ ngồi ❖ Quản lý - Xem: command. - Xóa: command - Tạo loại phòng: command 	
2	Staff sends “Tạo loại phòng”		

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	request. [Alternative 1]	System open pop-up to “Tạo loại phòng”. Pop-up includes: <ul style="list-style-type: none"> - Tên loại phòng: free text input, max length: 20, required. - List of equipments: check box - Số dãy bàn: value list. - Số hàng: value list. - Số ghế: value list. - Xem trước: command. - Thoát: command.
3	Staff sends “Xem trước” request. [Alternative 2]	System will show: <ul style="list-style-type: none"> - Classroom map. - Tạo mẫu: command. - Quay lại: command.
4	Staff sends “Tạo mẫu” request.	System show successful message: “Tạo loại phòng thành công!” and navigate to “Kiểu Phòng” page. [Exception 1]

Alternative Scenario:

No	Actor Action	System Response
1	Staff sends “Thoát” request.	System closes pop-up.
2	Staff send request “Quay lại” .	Re-open previous pop-up.

Exceptions:

No	Actor Action	System Response
1	“Tên loại phòng” is empty.	Show error message: “Tên loại phòng không được bỏ trống!”
2	“Tên loại phòng” is existed.	Show confirm message: “Tên loại phòng đã tồn tại, bạn có muốn cập nhật?”

Relationships: N/A

Business Rules:

- List of equipment is loaded from database in EquipmentCategory table.
- If staff creates new room type with existed room type name, system will update the room type with that room type name.
- Each room type is created with list of equipment quantity that is presented

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the equipment in that room type. If staff didn’t choose any equipment, the room type wouldn’t have any equipment and classroom using the room type will have no equipment inside.

Table 19: <Staff> Create Room Type

2.3.11. <Staff> Update Room Type

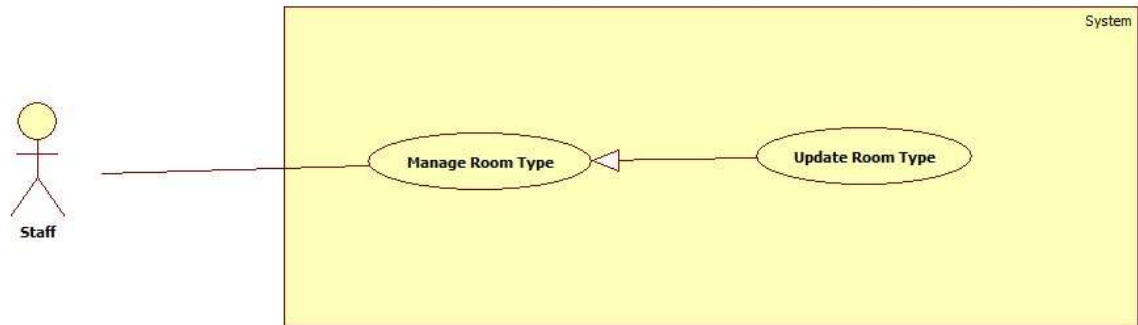


Figure 13: <Staff> Update Room Type

Use case specification

USE CASE – ECRM009			
Use Case No.	ECRM009	Use Case Version	2.0
Use Case Name	Update Room Type		
Author	Tang Viet Hung		
Date	05/21/2015	Priority	Normal
Actor: Staff			
Summary: This use case allows staff to update room type.			
Goal: Update room type to the system.			
Triggers: Staff sends request “Cập nhật” in “Loại Phòng” page.			
Preconditions:			
<ul style="list-style-type: none"> ○ User must login into the system with staff role. ○ Room type must be existed in database. 			
Post Conditions:			
<ul style="list-style-type: none"> ○ Success: Room type will be updated and show successful message. ○ Fail: Unsuccessful message will be shown. 			
Main Success Scenario:			
Step	Actor Action	System Response	
1	Staff clicks on “Phòng Học” and then clicks on tab “Loại phòng”.	System navigates to “Kiểu Phòng” page. Page includes: <ul style="list-style-type: none"> - Table with columns: <ul style="list-style-type: none"> ❖ Loại phòng 	

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		<ul style="list-style-type: none"> ❖ Số chỗ ngồi ❖ Quản lý - Xem: command. - Xóa: command - Tạo loại phòng: command
2	Staff sends “Xem” command. [Alternative 1]	System open pop-up includes: <ul style="list-style-type: none"> - Tên loại phòng: label. - Classroom map. - Chỉnh sửa: command. - Thoát: command.
3	Staff sends “Chỉnh sửa” request. [Alternative 2]	System open pop-up includes: <ul style="list-style-type: none"> - Tên loại phòng: free text input, max length: 20, required. - List of equipments: check box - Số dãy bàn: value list. - Số hàng: value list. - Số ghế: value list. - Xem trước: command. - Thoát: command.
4	Staff sends “Xem trước” request. [Alternative 3]	System will show: <ul style="list-style-type: none"> - Classroom map. - Tạo mẫu: command. - Quay lại: command.
5	Staff sends “Cập nhật” request.	System show successful message: “Cập nhật loại phòng thành công!” and navigate to “Kiểu Phòng” page. [Exception 1]

Alternative Scenario:

No	Actor Action	System Respons
1	Staff sends “Thoát” request.	System closes pop-up.
2	Staff sends “Thoát” request.	System closes pop-up.
3	Staff sends request “Quay lại”	Re-open previous pop-up.

Exceptions:

No	Actor Action	System Response
----	--------------	-----------------

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1	“Tên loại phòng” is empty.	Show error message: “Tên loại phòng không được bỏ trống!”
	“Tên loại phòng” is existed.	Show confirm message: “Tên loại phòng đã tồn tại, bạn có muốn cập nhật?”

Relationships: N/A

Business Rules:

- List of equipment is loaded from database in EquipmentCategory table.
- If staff updates new room type with existed room type name, system will update the room type with that room type name.
- All the old equipment quantity in the updated room type will be deleted. In the other hand, the new equipment quantity will be created.
- If there is any classroom is using the updated room type, all the equipment in that classroom will be removed. Staff has to add new equipment into that classroom by sending “Cập nhật thiết bị” command.

Table 20: <Staff> Update Room Type

2.3.12. <Staff> Remove Room Type

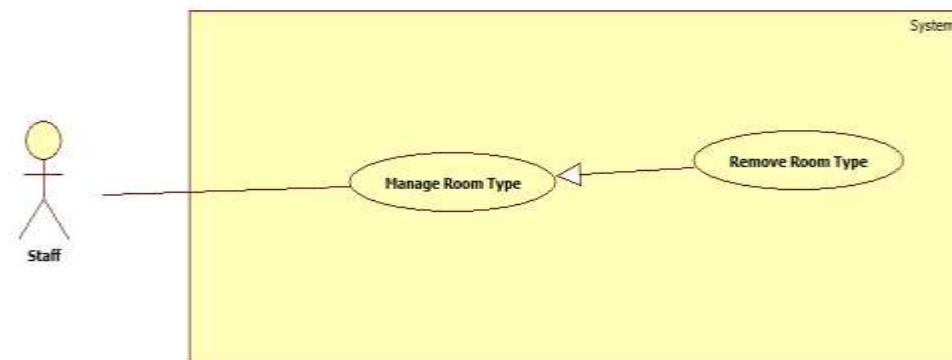


Figure 14: <Staff> Remove Room Type

Use case specification

USE CASE – ECRM010			
Use Case No.	ECRM010	Use Case Version	2.0
Use Case Name	Remove Room Type		
Author	Tang Viet Hung		
Date	05/21/2015	Priority	Normal
Actor: Staff			
Summary: This use case allows staff to remove room type.			
Goal: Update room type to the system.			
Triggers: Staff sends request “Xóa” in “Loại Phòng” page.			
Preconditions:			

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- User must login into the system with staff role.
- Room type must be existed in database and there are no classroom using this room type.

Post Conditions:

- **Success:** Room type will be removed and show successful message.
- **Fail:** Unsuccessful message will be shown.

Main Success Scenario:

Step	Actor Action	System Response
1	Staff clicks on “Phòng Học” and then clicks on tab “Loại phòng”.	System navigates to “Kiểu Phòng” page. Page includes: <ul style="list-style-type: none"> - Table with columns: <ul style="list-style-type: none"> ❖ Loại phòng ❖ Số chỗ ngồi ❖ Quản lý - Xem: command. - Xóa: command - Tạo loại phòng: command
2	Staff sends “Xóa” command. [Alternative 1][Alternative 2]	System show successful message: “Xóa loại phòng thành công!” and navigate to “Kiểu Phòng” page. [Exception 1]

Alternative Scenario:

No	Actor Action	System Response
1	Staff sends “Xem” request.	System navigates to view detail room type screen.
2	Staff sends “Tạo loại phòng” request.	System navigate to create room type pop up

Exceptions:

N	Actor Action	System Response
1	There is at least one classroom is using this room type.	Show error message: “Không thể xóa loại phòng này! Bạn phải gỡ ra khỏi phòng học trước!”

Relationships: N/A

Business Rules:

- Staff can only delete one room type when there is no classroom is using this room type. If there is any classroom using this room type, these classrooms must be updated to another room type or deleted.

Table 21: <Staff> Remove Room Type

2.3.13.<Staff> Create Classroom

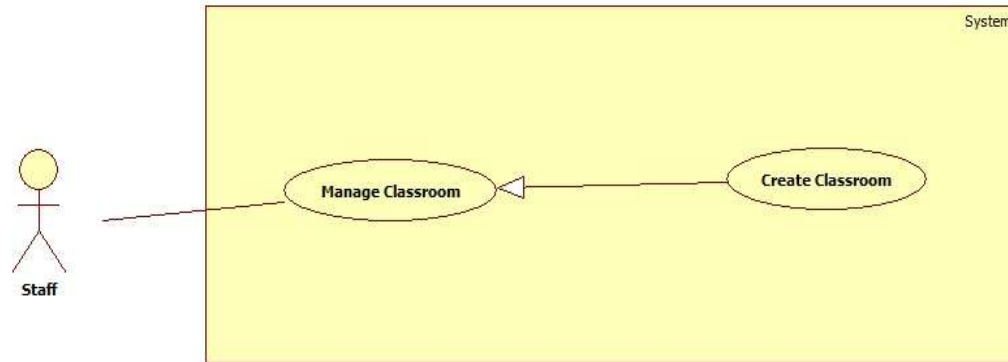


Figure 15: <Staff> Create Classroom

Use case specification

USE CASE – ECRM011			
Use Case No.	ECRM011	Use Case Version	2.0
Use Case Name	Create Classroom		
Author	Tang Viet Hung		
Date	05/21/2015	Priority	Normal
Actor: Staff			
Summary: <ul style="list-style-type: none"> - This use case allows staff to create new classroom (applied for web application) 			
Goal: Add new classroom to system.			
Triggers: Staff sends request “Thêm Lớp Học” in classroom management page.			
Preconditions: <ul style="list-style-type: none"> ○ User must login into the system with staff role. ○ System must have at least one room type. 			
Post Conditions: <ul style="list-style-type: none"> ○ Success: New classroom will be added to database. Success message will be shown. ○ Fail: Error message will be shown. 			
Main Success Scenario:			
Step	Actor Action	System Response	
1	Staff sends request “Tạo phòng học” in tab “Phòng học” in manage page. [Alternative 1]	System shows pop-up with information: <ul style="list-style-type: none"> - Số phòng: free text input, min length: 1, max length: 10, numeric required. - Chọn: command. - Tạo phòng: command 	

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		- Thoát: command
2	Staff fills necessary information into the form.	
3	Staff sends “Chọn” request. [Alternative 2]	System shows pop-up includes: <ul style="list-style-type: none"> - Loại phòng: list of values (Loại 30 chỗ, loại 25 chỗ...). - Classroom map. - Chọn: command. - Thoát command.
4	Staff sends “Chọn” request and then sends “Tạo phòng” request.	Classroom is added to database, success message “Thêm mới lớp học thành công” is shown. System is navigation to “Classroom Management Page”. [Exception 1,2,3,4]

Alternative Scenario:

No	Actor Action	System Response
	Staff click “Thoát”	System navigation to “Classroom Management Page”
2	Staff click “Thoát”	System navigation to “Classroom Management Page”

Exceptions:

No	Cause	System Response
1	“Số phòng” field is empty	Error message “Số phòng không được để trống!” is shown.
2	“Số phòng” is not numeric type.	Error message “Số phòng không hợp lệ!” is shown.
3	“Số phòng” field is duplicated in database	Confirm message “Bạn có muốn cập nhật cho phòng này!” is shown.
4	Staff didn’t choose any room type and then send “Tạo phòng” request.	Error message “Phải chọn loại phòng!” is shown.

Relationships: N/A

Business Rules:

- Each classroom only has one room type.
- The new classroom is created don’t have any equipment in it. There is “Cập nhật thiết bị” command to insert equipment into the classroom.
- Classroom without equipment inside cannot be reported.

Table 22: <Staff> Create Classroom

2.3.14. <Staff> Update Classroom

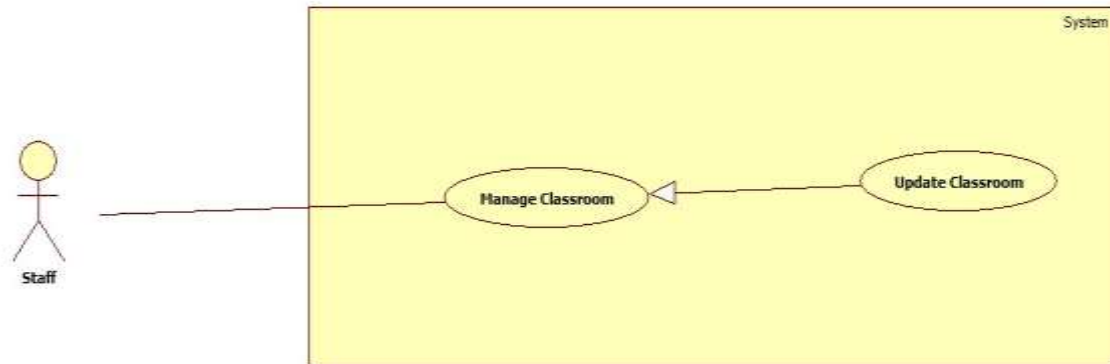


Figure 16: <Staff> Update Classroom

Use case specification

USE CASE – ECRM012									
Use Case No.	ECRM012	Use Case Version	2.0						
Use Case Name	Update Classroom								
Author	Tang Viet Hung								
Date	05/21/2015	Priority	Normal						
Actor: Staff									
Summary: <ul style="list-style-type: none">- This use case allows staff to update existed classroom (applied for web application) Goal: Update existed classroom to system. Triggers: Staff sends request “Cập nhật” in classroom management page. Preconditions: <ul style="list-style-type: none">○ User must login into the system with staff role.○ Classroom must be existed in system Post Conditions: <ul style="list-style-type: none">○ Success: Classroom will be updated to database. Success message will be shown.○ Fail: Error message will be shown. Main Success Scenario: <table><tr><th>Step</th><th>Actor Action</th><th>System Response</th></tr><tr><td>1</td><td>Staff sends request “Xem sơ đồ” in tab “Phòng học” in manage page. [Alternative 1]</td><td>System shows pop-up with information:<ul style="list-style-type: none">○ “Sơ đồ phòng”: title.○ Classroom map.○ Chỉnh sửa: command.○ Thoát: command.</td></tr></table>				Step	Actor Action	System Response	1	Staff sends request “Xem sơ đồ” in tab “Phòng học” in manage page. [Alternative 1]	System shows pop-up with information: <ul style="list-style-type: none">○ “Sơ đồ phòng”: title.○ Classroom map.○ Chỉnh sửa: command.○ Thoát: command.
Step	Actor Action	System Response							
1	Staff sends request “Xem sơ đồ” in tab “Phòng học” in manage page. [Alternative 1]	System shows pop-up with information: <ul style="list-style-type: none">○ “Sơ đồ phòng”: title.○ Classroom map.○ Chỉnh sửa: command.○ Thoát: command.							

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2	Staff sends “Chỉnh sửa” request. [Alternative 2]	System shows pop-up with information: <ul style="list-style-type: none"> - Số phòng: free text input, min length: 1, max length: 4, numeric required. - Chọn: command. - Tạo phòng: command - Thoát: command
2	Staff fills necessary information into the form.	
3	Staff sends “Chọn” request. [Alternative 3]	System shows pop-up includes: <ul style="list-style-type: none"> - Loại phòng: list of values (Loại 30 chỗ, loại 25 chỗ...). - Classroom map. - Chọn: command. - Thoát command.
3	Staff sends “Chọn” request and then sends “Cập nhật” request.	Classroom is added to database, success message “Cập nhật lớp học thành công” is shown. System is navigation to “Classroom Management Page”. Exception 1,2,3]

Alternative Scenario:

No	Actor Action	System Response
1	Staff clicks “Thoát”	System navigation to “Classroom Management Page”
2	Staff clicks “Thoát”	System navigation to “Classroom Management Page”
3	Staff clicks “Thoát”	System navigation to “Classroom Management Page”

Exceptions:

No	Cause	System Response
1	“Số phòng” field is empty	Error message “Số phòng không được để trống!” is shown.
2	“Số phòng” is not numeric type.	Error message “Số phòng không hợp lệ!” is shown.
3	“Số phòng” field is duplicated in database	Confirm message “Bạn có muốn cập nhật cho phòng này!” is shown.

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4	Staff didn’t choose any room type and then send “Cập nhật” request.	Error message “Phải chọn loại phòng!” is shown.
---	---	---

Relationships: N/A

Business Rules:

- Each classroom only has one room type.
- All the equipment in the updated classroom will be removed out of it and updated status to unused equipment.
- There is “Cập nhật thiết bị” command to insert equipment into the classroom.

Table 23: <Staff> Update Classroom

2.3.15. <Staff> Remove Classroom

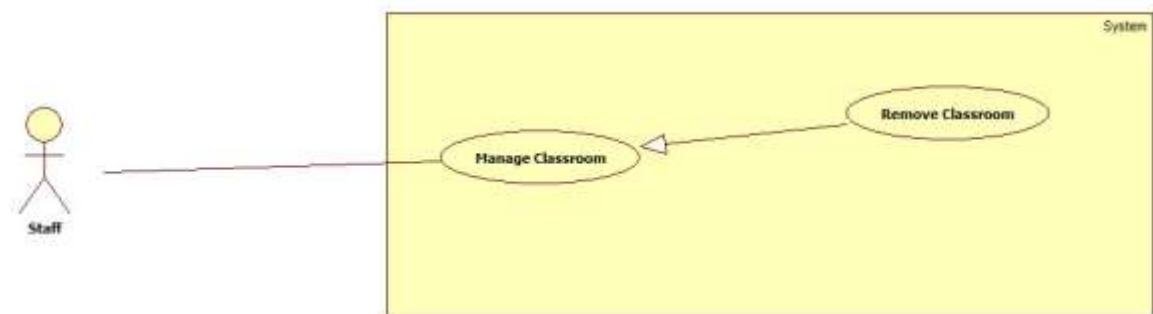


Figure 17: <Staff> Remove Classroom

Use case specification

USE CASE – ECRM013			
Use Case No.	ECRM013	Use Case Version	2.0
Use Case Name	Remove Classroom		
Author	Tang Viet Hung		
Date	05/21/2015	Priority	Normal
Actor: Staff			
Summary:			
<ul style="list-style-type: none"> - This use case allows staff to remove existed classroom (applied for web application) 			
Goal: Remove existed classroom to system.			
Triggers: Staff sends request “Xóa” in classroom management page.			
Preconditions:			
<ul style="list-style-type: none"> ○ User must login into the system with staff role. ○ Classroom must be existed in system. 			
Post Conditions:			
<ul style="list-style-type: none"> ○ Success: Classroom will be removed from system. Success message will be shown. ○ Fail: Error message will be shown. 			

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Main Success Scenario:

Step	Actor Action	System Response
1	Staff sends request “Xóa” in tab “Phòng học” in manage page. [Alternative 1]	System shows confirm box: <ul style="list-style-type: none"> ○ Bạn có muốn xóa phòng học: message. ○ Xóa: command. ○ Thoát: command.
2	Staff sends “Xóa” request.	System shows successful message: “Phòng học được xóa thành công!”

Alternative Scenario:

No	Actor Action	System Response
1	Staff clicks “Thoát”	System navigation to “Classroom Management Page”

Exceptions: N/A

Relationships: N/A

Business Rules:

- All the equipment in the classroom that is deleted will be removed out of this classroom and updated its status to unused equipment.
- All schedules in the classroom that is deleted will be removed from system.

Table 24: <Staff> Remove Classroom

2.3.16. <Staff> Resolve Report

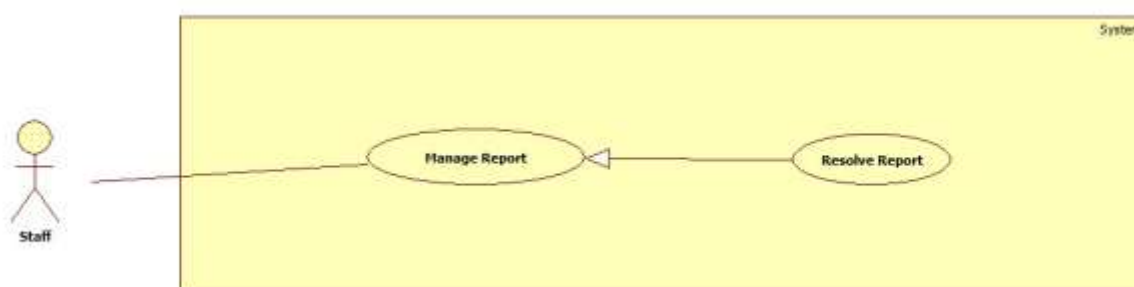


Figure 18: <Staff> Resolve Report

Use case specification

USE CASE – ECRM014			
Use Case No.	ECRM014	Use Case Version	2.0
Use Case Name	Resolve report		
Author	Doan Nguyen Minh Chi		
Date	05/21/2015	Priority	High

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Actor: Staff

Summary:

- This use case allows staff to resolve damaged equipment of this report, or all of damaged equipment in room.

Goal:

- Report will be resolved, and user will receive notify.

Triggers:

- Staff sends request view new report notification.

Preconditions:

- User must be staff.
- Report must be existed in database and it hasn’t resolved yet.

Post Conditions:

- **Success:** Report must be resolved and user receives resolved message.
- **Fail:** Show error message.

Main Success Scenario:

Actor Action	System Response
1. Staff sends request view new report notification.	<div>2. System will show report detail of notify with three part:</div> <ul style="list-style-type: none">- Part “Thông tin”: information of reports in room.<ul style="list-style-type: none">• “Phòng”: label• “Người báo cáo”: label• “Thiết bị”: label, list damaged equipment• “Thời gian báo cáo”: label, the time of last report• “Mô tả từ giáo viên”: label• “Đề nghị đổi phòng”: label, suggest the best room + “Đổi phòng” send command• “Mức độ hư hại”: value ranges [0-100]- Part “Sơ đồ phòng”: list equipment and they position in the room.- Part “Danh sách thiết bị”: list damaged equipment category.<ul style="list-style-type: none">• Equipment image• Equipment name• Number of damaged equipment in category• List real equipment have serial number in category.- “Khắc phục” send command

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3. Staff chooses equipment and send “Khắc phục” request [Alternative 1] [Alternative 2] [Alternative 3] [Alternative 4]	<ul style="list-style-type: none"> - “Khắc phục tất cả” send command - “Quay lại” send command 4. System saves resolve data. [Exception 1]
---	---

Alternative Scenario:

No	Actor Action	System Response
1	Staff sends “Xem bản đồ” command	Show classroom map with position of damaged equipment
2	1. Staff sends “Đổi phòng” request 3. Staff sends “Đổi phòng” request in this form	2. Show change room form with: <ul style="list-style-type: none"> - “Phòng trống”: label - “Phòng khác”: send command - “Đổi phòng” send command - “Thoát” send command 4. Change to new classroom, and show success message
3	Staff sends “Quay lại” command	Show list report page.
4	1. Staff sends “Khắc phục tất cả” request 3. Staff sends “Khắc phục” request	2. System will show message: “Bạn muốn khắc phục tất cả thiết bị”. <ul style="list-style-type: none"> - “Khắc phục” send command - “Thoát” send command 4. System saves resolve data.

Exceptions:

No	Cause	System Response
1	Staff did not choose any equipment	Show message: “Bạn phải chọn ít nhất 1 thiết bị.”

Relationships: N/A

Business Rules:

- All damaged equipment always update when user report other equipment in this room.
- If damaged level of room is higher than 50%, the system will show available

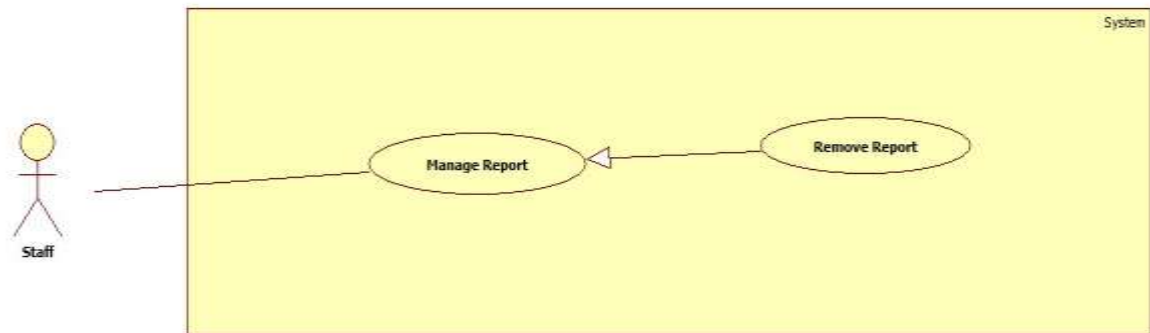
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rooms.

- When staff resolves a report, it notifies for other staff.
- Equipment in other report are fixed in report, it will update in other report.
- Report’s status will change to “going” when all the damaged equipment was not fixed. A damaged equipment change to “finish” status after it was fixed.
- After change other room, report’s status will change “going”.
- Report’s status will be changed to “finish” when all damaged equipment was fixed.

Table 25: <Staff> Resolve Report

2.3.17. <Staff> Remove Report



USE CASE – ECRM015			
Use Case No.	ECRM015	Use Case Version	2.0
Use Case Name	Remove Report		
Author	Tran Vinh Quang		
Date	05/21/2015	Priority	High
Actor: Staff			
Summary:			
<ul style="list-style-type: none"> - This use case allows staff to remove report 			
Goal:			
<ul style="list-style-type: none"> - Report will be removed - User will be added penalty to account 			
Triggers:			
<ul style="list-style-type: none"> - Staff sends request reject report 			
Preconditions:			
<ul style="list-style-type: none"> - User must login to system with role staff. - Report must be existed in database. 			
Post Conditions:			
<ul style="list-style-type: none"> - Success: Report must be removed. Show success message - Fail: Show error message. 			
Main Success Scenario:			
Actor Action		System Response	
Staff sends request view all report		System will navigate user to report management page includes:	

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Staff sends “Báo cáo sai” request	<ul style="list-style-type: none"> - List report with status “NEW” and “GOING” - “Báo cáo sai”: command - “Xem”: command <p>System change status report to remove. Add penalty for user created report [Exception 1]</p>
-----------------------------------	---

Alternative Scenario:

No	Actor Action	System Response
1	Staff sends “Xem” request	Navigate to view detail report screen. Reference: <Staff> Resolve Report.

Exceptions: N/A

Relationships: N/A

Business Rules:

- Report will be change status to “Remove”.
- Add penalty for user create report
- All report detail will be changed status to fixed
- All equipment of report will be changed status to fixed
- If user has 5 penalties, user will be banned from system.

Table 26: <Staff> Remove Report

2.3.18. <Staff> Mapping Schedule Manual

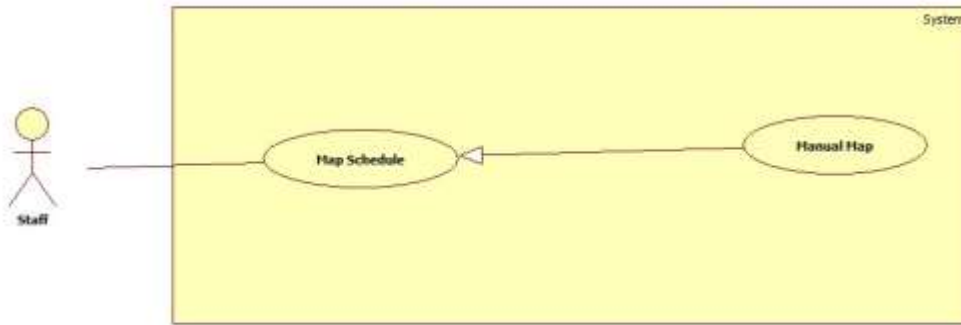


Figure 19: <Staff> Mapping Schedule Manual

Use case specification

USE CASE – ECRM016			
Use Case No.	ECRM016	Use Case Version	2.0
Use Case Name	Manual Map		
Author	Tang Viet Hung		
Date	21/05/2015	Priority	Normal

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Actor: Staff

Summary: This use case allows staff to import file schedule.

Goal: Import a schedule file.

Triggers: Staff sends “Tạo” request on “Nhập Lịch” page.

Preconditions:

- User must login into the system with staff role.

Post Conditions:

- **Success:** Schedule file will be imported and show successful message.
- **Fail:** Unsuccessful message will be shown.

Main Success Scenario:

Step	Actor Action	System Response
1	Staff sends “Nhập Lịch” request. [Alternative 1]	System navigates to “Xếp lịch” page. Page includes: <ul style="list-style-type: none">- Tạo mới: command.- Nhập file: command.
2	Staff sends “Tạo mới” request.	System shows pop-up includes: <ul style="list-style-type: none">- Giáo viên: text input, min length: 6, max length: 30, required.- Tiết bắt đầu: list of value (1-7:00:00, 2-8:45:00...)- Số tiết: list of value (1, 2, 3, 4...)- Từ ngày: text input, date type, required.- Đến ngày: text input, date type.- Số lượng học sinh: text input, number type, required.- Tìm phòng trống: command.- Phòng học: free text input or dropdown list, required.- Gửi tin nhắn: check box.- Tạo: command.- Thoát: command. [Exception 1, 2, 3, 4, 5, 6, 7, 8]
3	Staff fills all require information and sends “Tạo” request. [Alternative 1, 2]	System shows successful message.

Alternative Scenario:

No	Actor Action	System Response
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1	Staff sends “Tìm phòng trống” request.	System will find available classroom based on information that staff inputted and then change “Phòng học” text input to dropdown list and put list of available classroom to dropdown list. If staff sends “Tìm phòng trống” again, “Phòng học” will be changed to text input and so on.
2	Staff sends “Thoát” command.	System closes current pop-up.

Exceptions:

No	Actor Action	System Response
1	“Giáo viên” field is empty.	System shows error message: “Giáo viên không được bỏ trống!”
2	“Giáo viên” field is not existed in database.	System shows error message: “Giáo viên không tồn tại!”
3	“Số học sinh” field is empty.	System shows error message: “Số học sinh không được bỏ trống!”
4	“Số học sinh” field is not numeric.	System shows error message: “Số học sinh không hợp lệ!”
5	“Từ ngày” text input is empty or not date type.	System shows error message: “Ngày dạy bắt đầu không hợp lệ!”
6	“Đến ngày” text input is not date type.	System shows error message: “Ngày dạy kết thúc” không hợp lệ!”
7	“Từ ngày” field is bigger than “Đến ngày” field.	System shows error message: “Ngày bắt đầu không được nhỏ hơn ngày kết thúc!”
8	“Phòng học” is empty.	System shows error message: “Phòng học không được bỏ trống!”
9	Staff sends “Tìm phòng trống” but didn’t fill all require field.	System shows error message: “Phải điền đầy đủ thông tin!”

Relationships: N/A

Business Rules:

- If check box “Gửi tin nhắn” is checked, system will send SMS to user in “Giáo viên” field.
- If in database has one schedule that has the same teacher with the inserted schedule but different classroom and in the same time, system will delete the old one and insert the new one with note.
- If in database has one schedule that has the same classroom in the same time but different teacher, system will delete the old one and insert the new one with note.

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- Every schedule is unique by its schedule configuration, classroom and teacher.

Table 27: <Staff> Mapping Schedule Manual

2.3.19. <Staff> Mapping Schedule Import File

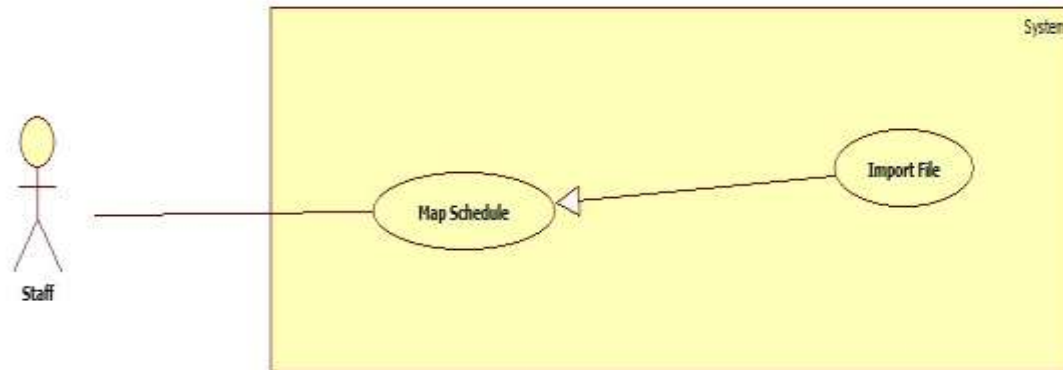


Figure 20: <Staff> Mapping Schedule Import File

Use case specification

USE CASE – ECRM017			
Use Case No.	ECRM017	Use Case Version	2.0
Use Case Name	Import File		
Author	Tang Viet Hung		
Date	21/05/2015	Priority	Normal
Actor: Staff			
Summary: This use case allows staff to import file schedule.			
Goal: Import a schedule file.			
Triggers: Staff sends “Nhập lịch” request on “Xếp Lịch” page.			
Preconditions:			
<ul style="list-style-type: none"> ○ User must login into the system with staff role. 			
Post Conditions:			
<ul style="list-style-type: none"> ○ Success: All schedules on file will be imported and save in database and show successful message. ○ Fail: Unsuccessful message will be shown. 			
Main Success Scenario:			
Step	Actor Action	System Response	
1	Staff sends “Nhập Lịch” request. [Alternative 1]	System navigates to “Xếp lịch” page. Page includes: <ul style="list-style-type: none"> - Tạo mới: command. - Nhập file: command. 	

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2	Staff sends “Nhập file” request.	System shows pop-up includes: <ul style="list-style-type: none"> - Bấm vào để tải mẫu: command. - Chọn file excel: command. - Nhập lịch: command. - Thoát: command.
3	Staff sends “Chọn file excel” request and choose schedule excel file from their computer.	System shows the name of schedule file.
4	Staff clicks “Nhập lịch” button.	System shows successful message. [Exception 1, 2, 3]

Alternative Scenario:

No	Actor Action	System Response
1	Staff sends “Bấm vào để tải mẫu” request.	Staff will get template excel file from server.

Exceptions:

No	Actor Action	System Response
1	Staff import a wrong template excel file.	System shows error message.
2	Teacher name is not existed in database.	Error message “Giáo viên không tồn tại!” is shown.
3	Classroom number is not existed in database.	Error message “Phòng học không tồn tại!” is shown.

Relationships: N/A

Business Rules:

- After receiving request, system will check validate the file that got from user. If it’s incorrect template, system will show error. The new schedule will be saved in database.
- If staff imports one more teacher has more than two schedules in the same class in the same time, system will not save the newest one.
- If staff import one teacher has more than two schedules in different class but in the same time, system will not save the newest one.
- Every schedule is unique by its schedule configuration, classroom and teacher.

Table 28: <Staff> Mapping Schedule Import File

2.3.20.<Staff> Create Equipment

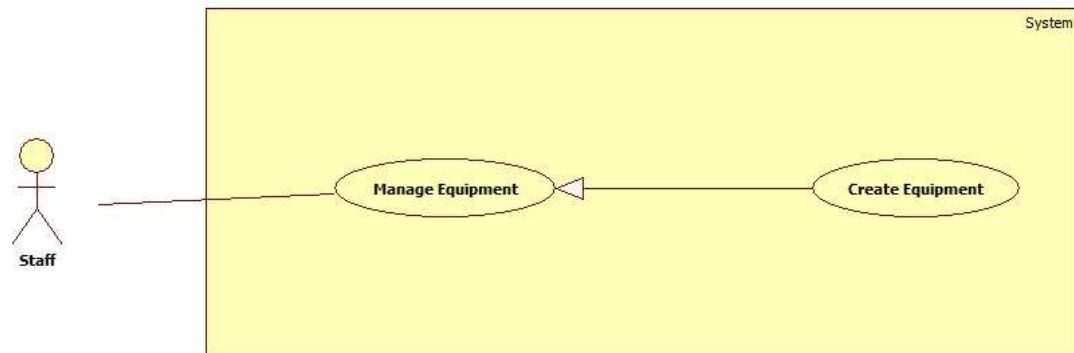


Figure 21: <Staff> Create Equipment

Use case specification

USE CASE – ECRM018			
Use Case No.	ECRM018	Use Case Version	2.0
Use Case Name	Create Equipment		
Author	Tang Viet Hung		
Date	05/21/2015	Priority	Normal
Actor: Staff			
Summary: <ul style="list-style-type: none"> - This use case allows staff to create new equipment (applied for web application) Goal: Add new equipment to system. Triggers: Staff sends request “Tạo thiết bị” in equipment management page. Preconditions: <ul style="list-style-type: none"> ○ User must login into the system with staff role. ○ System must have at least one equipment category. Post Conditions: <ul style="list-style-type: none"> ○ Success: New equipment will be added to database. Success message will be shown. ○ Fail: Error message will be shown. Main Success Scenario:			
Step	Actor Action	System Response	
1	Staff sends request “Tạo thiết bị” in tab “Thiết bị” in manage equipment page. [Alternative 1]	System shows pop-up with information: <ul style="list-style-type: none"> - Loại thiết bị: list of value (Máy chiếu, máy lạnh...). - Tên thiết bị: free text input, min length 1, max length 30, required. - Số seri: free text input, min length 1, max length 30, required. 	

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		<ul style="list-style-type: none"> - Thời gian sử dụng: free text input, min length 1, max length 5, numeric required. - Tạo: command - Thoát: command
2	Staff fills necessary information into the form.	
3	Staff sends “Tạo” request.	<p>System shows successful message “Thiết bị đã được tạo thành công!”</p> <p>[Exception 1, 2, 3, 4, 5]</p>

Alternative Scenario:

No	Actor Action	System Respons
1	Staff click “Thoát”	System closes current pop-up.

Exceptions:

No	Cause	System Response
1	“Tên thiết bị” field is empty	Error message “Tên thiết bị không được để trống!” is shown.
2	“Số seri” field is empty	Error message “Số seri không được để trống!” is shown.
3	“Thời gian sử dụng” field is empty.	Error message “Thời gian sử dụng không được để trống!” is shown.
4	“Thời gian sử dụng” is not numeric type.	Error message “Số phòng không hợp lệ!” is shown.
5	“Số seri” field is duplicated in database.	Confirm message “Số seri đã tồn tại” is shown.
6	“Thời gian sử dụng” is smaller than its category’s “Thời gian bảo hu”	Error message “Thời gian sử dụng không được nhỏ hơn thời gian bảo hu!” is shown.

Relationships: N/A

Business Rules:

- Staff only create equipment that has equipment category with property “Quản lý” is checked when it was created.
- “Loại thiết bị” field is only loaded equipment category with property “isManaged” is true in table equipment category.
- Equipment has only one equipment category.
- “Thời gian sử dụng” represents life time of this equipment.
- “Thời gian sử dụng” field can be 0. “Thời gian sử dụng” and “Thời gian còn lại” is only equal every time the equipment is created.
- Equipment’s “Thời gian sử dụng” must be bigger than its category’s “Thời gian bảo hu”

Table 29: <Staff> Create Equipment

2.3.21.<Staff> Remove Equipment

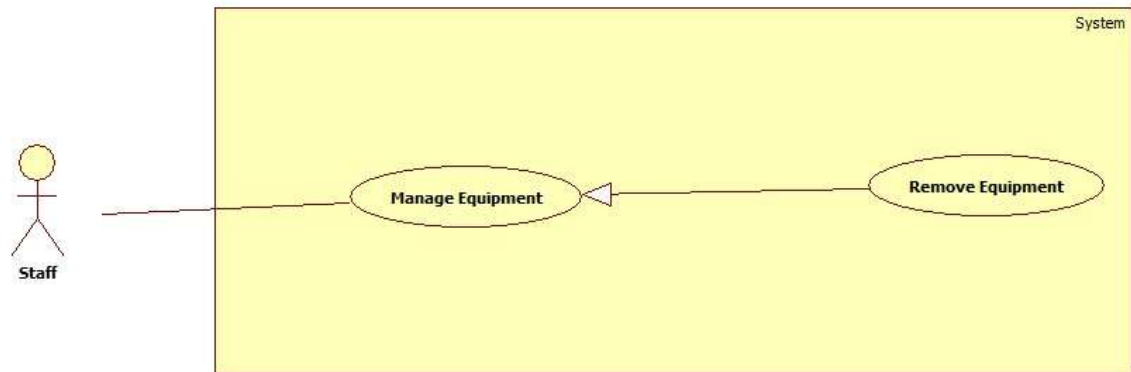


Figure 22: <Staff> Remove Equipment

Use case specification

USE CASE – ECRM008												
Use Case No.	ECRM008	Use Case Version	2.0									
Use Case Name	Remove Equipment											
Author	Tang Viet Hung											
Date	05/21/2015	Priority	Normal									
Actor: Staff												
Summary: <ul style="list-style-type: none">- This use case allows staff to delete an existed equipment (applied for web application) Goal: Update existed equipment to system. Triggers: Staff sends request “Xóa” in equipment management page. Preconditions: <ul style="list-style-type: none">○ User must login into the system with staff role.○ The equipment must be existed in system.○ There are no unresovle reports about this equipment. Post Conditions: <ul style="list-style-type: none">○ Success: Equipment will be deleting from database. Success message will be shown.○ Fail: Error message will be shown. Main Success Scenario: <table><tr><th>Step</th><th>Actor Action</th><th>System Response</th></tr><tr><td>1</td><td>Staff sends request “Xóa” in tab “Thiết bị” in manage equipment page. [Alternative 1]</td><td>System shows confirm message: “Bạn có muốn xóa thiết bị?”</td></tr><tr><td>2</td><td>Staff sends request “Xóa”.</td><td></td></tr></table>				Step	Actor Action	System Response	1	Staff sends request “Xóa” in tab “Thiết bị” in manage equipment page. [Alternative 1]	System shows confirm message: “Bạn có muốn xóa thiết bị?”	2	Staff sends request “Xóa”.	
Step	Actor Action	System Response										
1	Staff sends request “Xóa” in tab “Thiết bị” in manage equipment page. [Alternative 1]	System shows confirm message: “Bạn có muốn xóa thiết bị?”										
2	Staff sends request “Xóa”.											

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		System shows successful message “Thiết bị đã được xóa thành công!” [Exception 1]
Alternative Scenario:		
No	Actor Action	System Response
1	Staff sends request “Xóa” while equipment is using by one classroom.	System show confirm message: “Bạn có muốn gỡ thiết bị ra khỏi phòng?”
Exceptions:		
No	Actor Action	System Response
1	Staff sends request “Xóa” but equipment has unresovle report.	System show confirm message: “Bạn phải xóa report liên quan tới thiết bị này trước!”
Relationships: N/A		
Business Rules:		
<ul style="list-style-type: none"> - If equipment is using by one classroom, the equipment will not be deleted but removed out of this classroom. If not, equipment will be deleted. - All reports belong to equipment will be deleted. 		

Table 30: <Staff> Remove Equipment

2.3.22. <Staff> Update Equipment

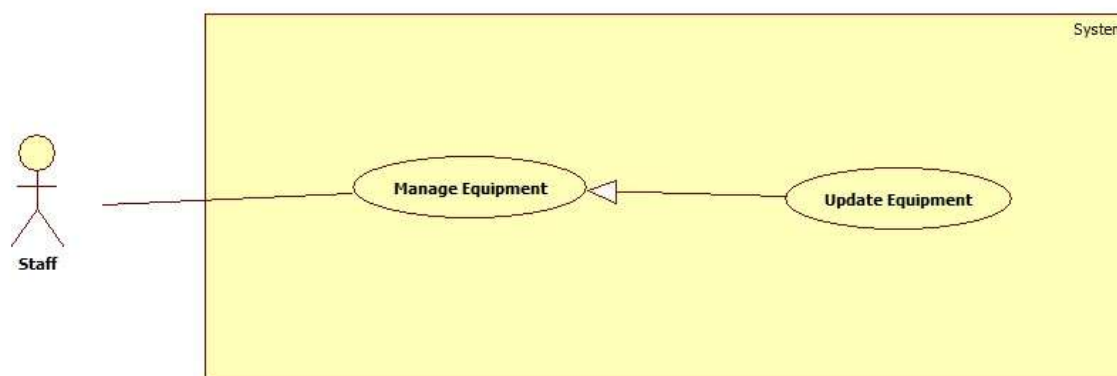


Figure 23: <Staff> Update Equipment

Use case specification

USE CASE – ECRM020			
Use Case No.	ECRM020	Use Case Version	2.0
Use Case Name	Update Equipment		

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Author	Tang Viet Hung		
Date	05/21/2015	Priority	Normal
Actor: Staff			
Summary: <ul style="list-style-type: none">- This use case allows staff to update an existed equipment (applied for web application)			
Goal: Update existed equipment to system.			
Triggers: Staff sends request “Cập nhật” in equipment management page.			
Preconditions: <ul style="list-style-type: none">○ User must login into the system with staff role.○ The equipment must be existed in system.			
Post Conditions: <ul style="list-style-type: none">○ Success: Equipment will be updated to database. Success message will be shown.○ Fail: Error message will be shown.			
Main Success Scenario:			
Step	Actor Action	System Response	
1	Staff sends request “Cập nhật” in tab “Thiết bị” in manage equipment page. [Alternative 1]	System shows pop-up with information: <ul style="list-style-type: none">- Loại thiết bị: list of value (Máy chiếu, máy lạnh...).- Tên thiết bị: free text input, min length 1, max length 30, required.- Số seri: free text input, min length 1, max length 30, required.- Thời gian sử dụng: free text input, min length 1, max length 5, numeric required.- Thời gian còn lại: free text input, min length 1, max length 5.- Cập nhật: command- Thoát: command	
2	Staff fills necessary information into the form.		
3	Staff sends “Cập nhật” request.	System shows successful message “Thiết bị đã được tạo thành công!” [Exception 1, 2, 3, 4, 5, 6, 7, 8]	
Alternative Scenario:			
No	Actor Action	System Response	
1	Staff click “Thoát”	System closes current pop-up.	

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Exceptions:

No	Cause	System Response
1	“Tên thiết bị” field is empty	Error message “Tên thiết bị không được để trống!” is shown.
2	“Số seri” field is empty	Error message “Số seri không được để trống!” is shown.
3	“Thời gian sử dụng” field is empty.	Error message “Thời gian sử dụng không được để trống!” is shown.
	“Thời gian sử dụng” is not numeric type.	Error message “Thời gian sử dụng không hợp lệ!” is shown.
6	“Thời gian còn lại” field is empty.	Error message “Thời gian sử dụng không được để trống!” is shown.
7	“Thời gian còn lại” is not numeric type.	Error message “Thời gian còn lại không hợp lệ!” is shown.
8	“Thời gian còn lại” is bigger than “Thời gian sử dụng”.	Error message “Thời gian còn lại không được lớn hơn thời gian sử dụng!” is shown.

Relationships: N/A

Business Rules:

- “Loại thiết bị” field is loaded from table “EquipmentCategory”.
- Equipment has only one equipment category.
- “Thời gian sử dụng” presents life time of this equipment.
- “Thời gian còn lại” represents using time remain untill the expired time of this equipment. If time remain of equipment is 0, equipment will be updated to damaged equipment. When staff updates time remain equals “Thời gian sử dụng”, equipment will be updated to be fixed.
- If “Thời gian sử dụng” equals 0, it means this equipment doesn’t have expired time.

Table 31: <Staff> Update Equipment

2.3.23. <Staff> Map Equipment

Use case specification

USE CASE – ECRM021			
Use Case No.	ECRM021	Use Case Version	2.0
Use Case Name	Map equipment		
Author	Tang Viet Hung		
Date	05/21/2015	Priority	Normal
Actor: Staff			
Summary:			
<ul style="list-style-type: none"> - This use case allows staff to map equipment into classroom (applied for web application) 			
Goal: Mapping equipment into classroom			
Triggers: Staff sends request “Cập nhật thiết bị” in classroom management page.			

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Preconditions:

- User must login into the system with staff role.
- The needed equipment must be existed in system.
- System must have at least one classroom do not have equipment.

Post Conditions:

- **Success:** Equipment will be mapped into classroom and update to database. Success message will be shown.
- **Fail:** Error message will be shown.

Main Success Scenario:

Step	Actor Action	System Response
1	Staff sends request “Cập nhật thiết bị” in tab “Phòng học” in manage classroom page.	System shows successful message “Cập nhật thiết bị cho phòng học thành công!” [Exception 1]

Alternative Scenario: N/A

Exceptions:

No	Actor Action	System Response
1	Staff sends request “Cập nhật thiết bị” but not enough equipment in database.	System show error message: “Không đủ thiết bị!”

Relationships: N/A

Business Rules:

- Each classroom has specific equipment base on their room type. For example: room type 1 has one projector, two air condition. Classroom 101 has type 1 so it will have this equipment too. If in database doesn’t have any projector or air conditioning which is not belong to any classroom the mapping action will not be executed until there enough equipment for this classroom.

Table 32: <Staff> Map Equipment

2.3.24. <Staff> Create Category

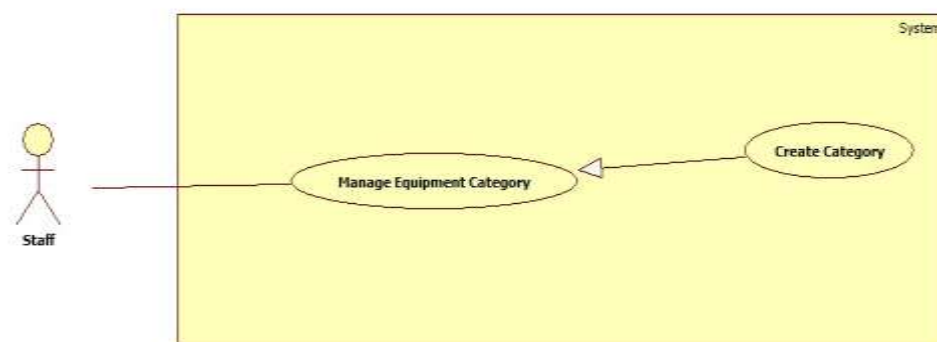


Figure 24: <Staff> Create Equipment Category

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Use case specification

USE CASE – ECRM022			
Use Case No.	ECRM022	Use Case Version	2.0
Use Case Name	Create Category		
Author	Doan Nguyen Minh Chi		
Date	05/21/2015	Priority	Normal
Actor: Staff			
Summary: <ul style="list-style-type: none">- This use case allows staff to create new equipment category(applied for web application) Goal: Add new equipment category to system. Triggers: Staff sends request “Tạo loại thiết bị” in equipment management page. Preconditions: <ul style="list-style-type: none">o User must login into the system with staff role. Post Conditions: <ul style="list-style-type: none">o Success: New equipment category will be added to database. Success message will be shown.o Fail: Error message will be shown. Main Success Scenario:			
Step	Actor Action	System Response	
1	Staff sends request “Tạo loại thiết bị” in tab “Thiết loại bị” in manage equipment page. [Alternative 1]	System shows pop-up with information: <ul style="list-style-type: none">- Tên loại: free text input, min length 1, max length 30, required.- Hình ảnh: image file input.- Quản lý: check box.- Thời gian bảo hư: free text input, min length 1, max length 3, numeric required disabled.- Tạo: command- Thoát: command	
2	Staff fills necessary information into the form. [Alternative 2]		
3	Staff sends “Tạo” request.	System shows successful message “Thiết bị đã được tạo thành công!” [Exception 1, 2, 3, 4]	
Alternative Scenario:			
No	Actor Action	System Response	
1	Staff click “Thoát”	System closes current pop-up.	

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2	Staff checks “Quản lý” [Alternative 3]	“Thời gian bảo hu” text input will be changed to be enabled.
3	Staff uncheck “Quản lý”	“Thời gian bảo hu” text input will be changed to be disabled.

Exceptions:

No	Cause	System Response
1	“Tên loại” field is empty	Error message “Tên loại thiết bị không được để trống!” is shown.
2	“Hình ảnh” field is empty or not image type.	Error message “Hãy chọn tập tin có đuôi là: .jpg, .jpeg, .png, .gif!” is shown.
3	“Tên loại” field is duplicated in database	Confirm message “Tên loại đã tồn tại” is shown.
4	“Thời gian bảo hu” is empty or not numeric type.	Error message “Thời gian bảo hu không hợp lệ!” is shown.

Relationships: N/A

Business Rules:

- If “Quản lý” field is checked, staff can create new equipment has that equipment category.
- Equipment has equipment category with “Thời gian bảo hu” is bigger than 0 will be changed status to be damaged when “Thời gian còn lại” is smaller than “Thời gian bảo hu” and system will notify to staff about it.

Table 33: <Staff> Create Equipment Category

2.3.25. <Staff> Remove Category

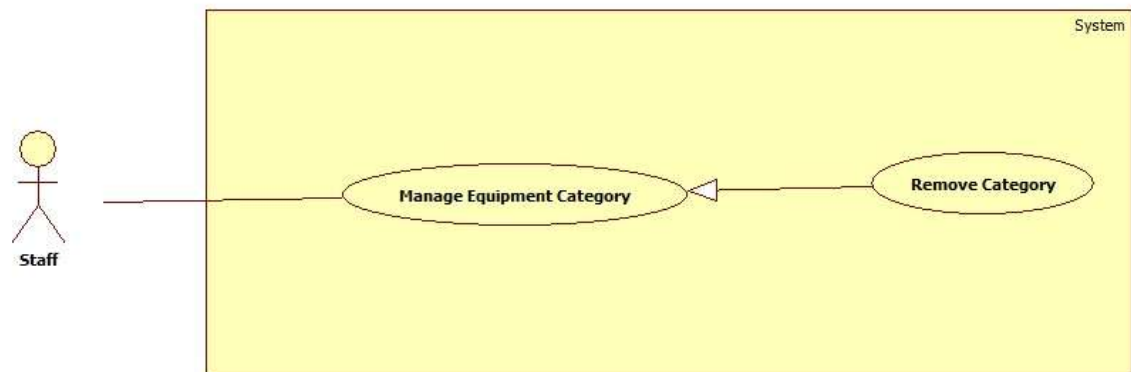


Figure 25: <Staff> Remove Equipment Category

Use case specification

USE CASE – ECRM023			
Use Case No.	ECRM023	Use Case Version	2.0
Use Case Name	Remove Category		
Author	Doan Nguyen Minh		

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	Chi		
Date	05/21/2015	Priority	Normal
Actor: Staff			
Summary: <ul style="list-style-type: none">- This use case allows staff to remove an existed equipment category(applied for web application)			
Goal: Remove an existed equipment category to system.			
Triggers: Staff sends request “Xóa” in equipment management page.			
Preconditions: <ul style="list-style-type: none">○ User must login into the system with staff role.○ Equipment category must be existed.			
Post Conditions: <ul style="list-style-type: none">○ Success: Equipment category will be removing from database. Success message will be shown.○ Fail: Error message will be shown.			
Main Success Scenario:			
Step	Actor Action	System Response	
1	Staff sends request “Xóa” in tab “Thiết loại bị” in manage equipment page. [Alternative 1]	System shows confirm message “Bạn có muốn xóa loại thiết bị ra khỏi hệ thống? Điều này sẽ ảnh hưởng tới các thiết bị có loại này!” <ul style="list-style-type: none">○ Xóa: command.○ Đóng: command.	
2	Staff sends “Xóa” request.	System shows successful message “Loại thiết bị đã được xóa thành công!”	
Alternative Scenario:			
No	Actor Action	System Response	
1	Staff click “Thoát”	System closes current confirm message.	
Exceptions: N/A			
Relationships: N/A			
Business Rules: <ul style="list-style-type: none">- Before equipment category is removed, all equipment have this category will be removed out of classroom and then deleted from database. All report of this equipment will be deleted as well.			

Table 34: <Staff> Remove Equipment Category

2.3.26. <Staff> Update Category

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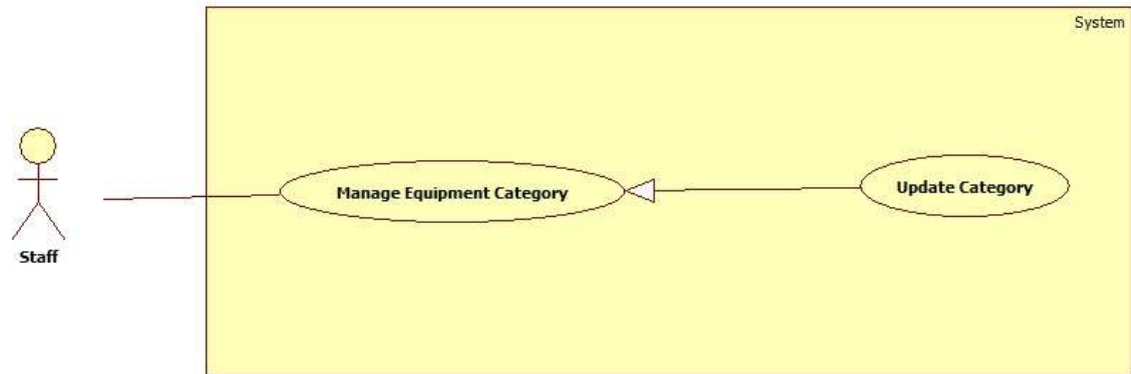


Figure 26: <Staff> Update Equipment Category

Use case specification

USE CASE – ECRM024			
Use Case No.	ECRM024	Use Case Version	2.0
Use Case Name	Update Category		
Author	Doan Nguyen Minh Chi		
Date	05/21/2015	Priority	Normal
Actor: Staff			
Summary: <ul style="list-style-type: none"> - This use case allows staff to update an existed equipment category(applied for web application) Goal: Update an existed equipment category to system. Triggers: Staff sends request “Cập nhật” in equipment management page. Preconditions: <ul style="list-style-type: none"> ○ User must login into the system with staff role. ○ Equipment category must be existed in database. Post Conditions: <ul style="list-style-type: none"> ○ Success: Equipment category will be updated to database. Success message will be shown. ○ Fail: Error message will be shown. Main Success Scenario:			
Step	Actor Action	System Response	
1	Staff sends request “Cập nhật” in tab “Thiết loại bị” in manage equipment page. [Alternative 1]	System shows pop-up with information: <ul style="list-style-type: none"> - Tên loại: free text input, min length 1, max length 30, required. - Hình ảnh: image file input. - Thời gian bảo hư: free text input, min length 1, max length 3, 	

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		numeric required. - Tạo: command - Thoát: command
2	Staff fills necessary information into the form.	
3	Staff sends “Cập nhật” request.	System shows successful message “Thiết bị đã được cập nhật thành công!” [Exception 1, 2, 3, 4]

Alternative Scenario:

No	Actor Action	System Response
1	Staff click “Thoát”	System closes current pop-up.

Exceptions:

No	Cause	System Response
1	“Tên loại” field is empty	Error message “Tên loại thiết bị không được để trống!” is shown.
2	“Hình ảnh” field is empty or not image type.	Error message “Hãy chọn tập tin có đuôi là: .jpg, .jpeg, .png, .gif!” is shown.
3	“Thời gian bảo hu” is empty or not numeric type.	Error message “Thời gian bảo hu không hợp lệ!” is shown.
4	“Tên loại” field is different from current “Tên loại” and duplicated in database	Confirm message “Tên loại đã tồn tại” is shown.

Relationships: N/A

Business Rules:

- All equipment have updated equipment category will be updated.
- Equipment has equipment category with “Thời gian bảo hu” is bigger than 0 will be changed status to be damaged when “Thời gian còn lại” is smaller than “Thời gian bảo hu” and system will notify to staff about it.

Table 35: <Staff> Update Equipment Category

2.3.27. <Staff> Change Room

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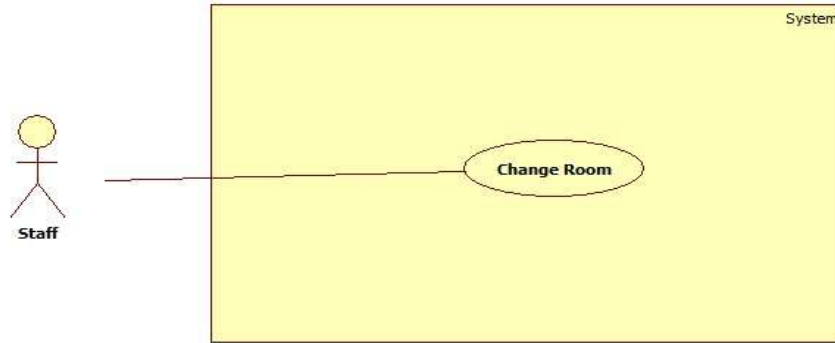


Figure 27: <Staff> Change Room

Use case specification

USE CASE – ECRM025			
Use Case No.	ECRM025	Use Case Version	2.0
Use Case Name	Change room		
Author	Tang Viet Hung		
Date	05/21/2015	Priority	Normal
Actor: Staff			
Summary: <ul style="list-style-type: none">- This use case allows staff to change specific classroom to another classroom in system in a certain period time(applied for web application) Goal: Add new equipment category to system. Triggers: Staff sends request “Đổi” in classroom management page. Preconditions: <ul style="list-style-type: none">○ User must login into the system with staff role.○ Classroom which staff wants to change must be existed. Post Conditions: <ul style="list-style-type: none">○ Success: Change specific classroom to another classroom in system in a certain period time. Success message will be shown.○ Fail: Error message will be shown. Main Success Scenario:			
Step	Actor Action	System Response	
1	Staff sends request “Đổi phòng” in tab “Phòng học” in manage equipment page. [Alternative 1]	System shows pop-up with information: <ul style="list-style-type: none">- Từ ngày: free text input, date type required.- Đến ngày: free text input, date type.- Tìm phòng trống: command- Thoát: command	
2	Staff fills necessary		

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	information into the form.	
3	Staff sends “Tìm phòng trống” request. [Alternative 2]	System shows pop-up with information: <ul style="list-style-type: none"> - Phòng trống cho buổi sáng: list of number of classroom. - Phòng trống cho buổi chiều: list of number of classroom. - Đổi: command. - Quay lại: command. [Exception 1, 2]
4	Staff sends “Đổi” request.	System shows successful message “Đã đổi phòng thành công!” [Exception 3]

Alternative Scenario:

No	Actor Action	System Response
1	Staff sends “Thoát” command.	System closes current pop-up.
2	Staff sends “Quay lại” command.	System closes current pop-up and re-opens previous pop-up.

Exceptions:

No	Cause	System Response
1	“Từ ngày” field is empty or not date type.	Error message “Sai kiểu ngày tháng yyyy-mm-dd!” is shown.
2	“Đến ngày” field is not date type	Error message “Sai kiểu ngày tháng yyyy-mm-dd!” is shown.
3	Staff didn’t choose any value in list “Phòng trống cho buổi sáng” and “Phòng trống cho buổi chiều”.	Error message “Không có gì thay đổi!” is shown.

Relationships: N/A

Business Rules:

- Changing room is simply move all schedule in morning classes or noon classes or both of them in current classroom to another classroom that staff choose.
- If staff chooses the date range when current classroom don’t have any schedule, instead of show list of number classroom, system will show “Không có phòng cho buổi sáng (chiều) hoặc không có lịch dạy!”
- If system can’t find any available classroom for morning classes or noon classes or even both of them, system will show “Không có phòng cho buổi sáng (chiều) hoặc không có lịch dạy!”

Table 36: <Staff> Changing Room

2.3.28. <Staff> Schedule Configuration

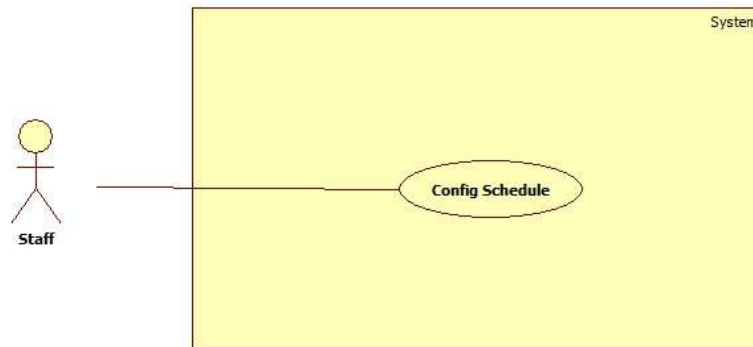


Figure 28: <Staff> Schedule Configuration

Use case specification

USE CASE – ECRM026			
Use Case No.	ECRM026	Use Case Version	2.0
Use Case Name	Schedule configuration		
Author	Tran Vinh Quang		
Date	21/05/2015	Priority	Normal
Actor: Staff			
Summary: This use case allows staff to manage schedule configuration in system.			
Goal: Import a schedule file.			
Triggers: Staff sends “Lưu” request on “Tiết học” page.			
Preconditions:			
<ul style="list-style-type: none"> ○ User must login into the system with staff role. 			
Post Conditions:			
<ul style="list-style-type: none"> ○ Success: Schedule configuration will be save and show successful message. ○ Fail: Unsuccessful message will be shown. 			
Main Success Scenario:			
Step	Actor Action	System Response	
1	Staff sends “Tiết học” request. [Alternative 1]	System navigates to “Cấu hình tiết học” page. Page includes: <ul style="list-style-type: none"> - Cập nhật: command. - Số phút mỗi tiết: free text input, numeric, disabled. - List of slot in database. Each slot has: <ul style="list-style-type: none"> + Time from: free text input, time type, disabled. 	

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		+ Time to: free text input, time type, disabled.
2	Staff sends “Cập nhật” request.	System shows pop-up includes: <ul style="list-style-type: none"> - Số phút mỗi tiết: free text input, min length 1, max length 3, time type, required. - OK: command. - Thoát: command.
3	Staff fills all require information and sends “OK” request. [Alternative 1]	System close pop-up and page now includes: <ul style="list-style-type: none"> - Xóa tiết: command. - Thêm tiết: command. - Số phút mỗi tiết: free text input, numeric, disabled. - List of slot in database. Each slot has: <ul style="list-style-type: none"> + Time from: free text input, time type. + Time to: free text input, time type, disabled. - Lưu: command. - Hủy: command. [Exception 1]
4	Staff fills in “Time from” field and then sends “Lưu” request. [Alternative 2, 3, 4]	System show successful message. [Exception 2]

Alternative Scenario:

No	Actor Action	System Response
1	Staff sends “Thoát” request.	System closes current pop-up.
2	Staff sends “Xóa tiết” command.	System will remove the last element of list slot. [Exception 4]
3	Staff sends “Thêm tiết” command.	System will add new slot to the last element.
4	Staff sends “Hủy” command.	System will reload page.

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Exceptions:

No	Actor Action	System Response
1	“Số phút mỗi tiết” field is empty or not numeric type.	System shows error message: “Số phút không hợp lệ!”
2	“Time from” is empty or not time type.	System shows error message: “Kiểu giờ phải là hh:MM:ss!”
3	Staff sends “Xóa tiết” but there are no slots left.	System shows error message: “Không còn tiết nào để xóa!”

Relationships: N/A

Business Rules:

- After staff had inputted “Time from” field, “Time to” field will be automatically generated based on “Time from” and value of “Số phút mỗi tiết”. “Time to” is equal “Time to” plus value of “Số phút mỗi tiết”.
- Each schedule configuration is unique by “TimeFrom”, “TimeTo” and slot.

Table 37: <Staff> Schedule Configuration

2.3.29. <Staff> Statistic

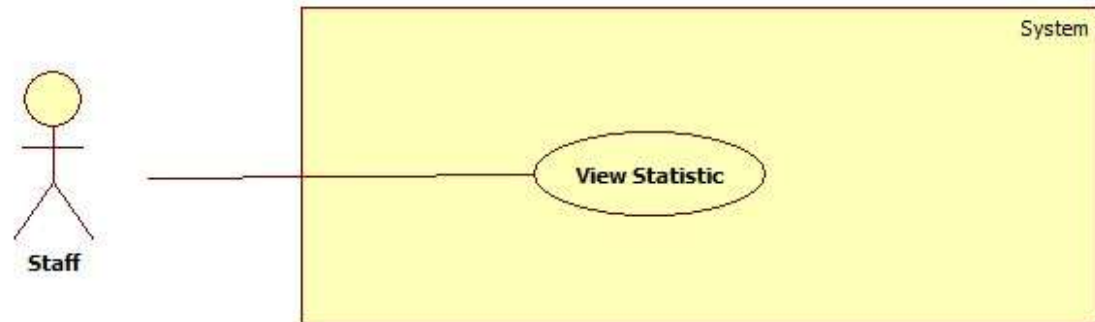


Figure 29: <Staff> View Statistic

Use case specification

USE CASE – ECRM027			
Use Case No.	ECRM027	Use Case Version	2.0
Use Case Name	Statistic		
Author	Doan Nguyen Minh Chi		
Date	08/08/2015	Priority	Low
Actor: Staff Summary: <ul style="list-style-type: none"> - This use case allows staff view statistics. Goal: <ul style="list-style-type: none"> - Staff can know number of change room of months in year. Triggers: <ul style="list-style-type: none"> - Staff sends view statistic request in management page. 			

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Preconditions:

- User must login into the system with role is staff.

Post Conditions:

- **Success:** Show chart in statistic page.
- **Fail:** Show error message.

Main Success Scenario:

Actor Action	System Response
1. Staff sends view statistic request.	2. System will show statistic page with 2 part: <ul style="list-style-type: none">a. Part 1, change room chart is number of change room in months<ul style="list-style-type: none">i. “Năm”: value list, list years has change room historyb. Part 2, damaged room chart is number of report of room<ul style="list-style-type: none">i. “Từ”: text input, date type, requiredii. “Đến”: text input, date type, required
3. Staff chooses other year in “Năm”, and send request [Alternative 1]	4. System will reload data in change room chart with new data in this year. [Exception 1]

Alternative Scenario:

No	Act r action	System Response
1	1. Staff choose other time in “Từ” and “Đến” text input, and send request	2. System will reload data in damaged room chart with new data in this time. [Exception 1]

Exceptions:

No	Cause	System Response
1	1. Lose connection when staff send request	2. System will show old data for chart and reset data in input text

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		3. Show message: “Có lỗi trong quá trình tải dữ liệu. Vui lòng kiểm tra kết nối!”
--	--	---

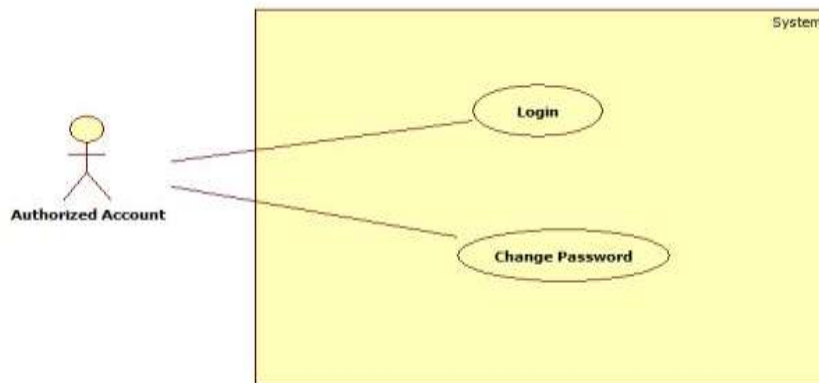
Relationships: N/A

Business Rules:

- When view statistic request was sent in first time, system will choose:
 - Default for “Năm” of change room chart is this year.
 - Default for “Từ” of damaged room chart is today, and default for “Đến” is 30 days ago.
- Value of “Từ” must be before value of “Đến”.
- Data of change room chart will be calculated by “ChangeRoom” field of report table.
- Damaged room chart is 10 rooms which were reported the most.

Table 38: <Staff> Statistic

2.3.30.<Authorized Account> Use case overview



2.3.31.<Authorized Account> Logout

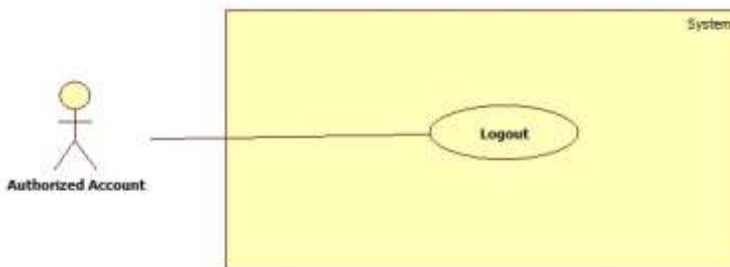


Figure 30: <Authorized Account> Logout

Use case specification

USE CASE – ECRM028			
Use Case No.	ECRM028	Use Case Version	2.0
Use Case Name	Logout		

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Author	Tang Viet Hung		
Date	05/21/2015	Priority	Normal
Actor: Authorized Account			
Summary: This use case allows user to logout.			
Goal: Logout of the system			
Triggers: User click on “Logout” button			
Preconditions:			
○ User has successfully logged in system.			
Post Conditions:			
○ Success: User will be logged out of system.			
○ Fail: Unsuccessful message will be shown.			
Main Success Scenario:			
Step	Actor Action	System Response	
1	User send “Đăng xuất” request.	System show dialog: “Bạn có chắc muốn đăng xuất?”	
2	User clicks “Yes” button.	System navigates to login screen.	
Alternative Scenario:			
Step	Actor Action	System Response	
1	User clicks “No” button in dialog.	System remains user in current page.	
Exceptions: N/A			
Relationships: N/A			
Business Rules:			
○ After logout, they will be redirect to login page.			

Table 39: <Authorized Account> Logout

2.3.32. <Authorized Account> Change Password

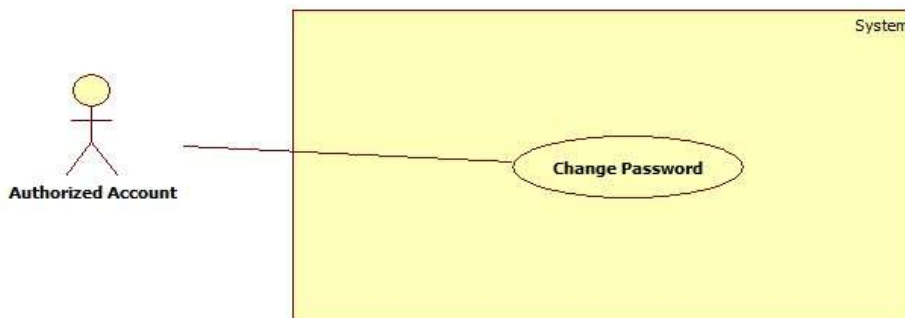


Figure 31: <Authorized User> Change Password

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Use case specification

USE CASE – ECRM029			
Use Case No.	ECRM029	Use Case Version	2.0
Use Case Name	Change Password		
Author	Doan Nguyen Minh Chi		
Date	08/08/2015	Priority	Low
Actor: Authorized Account			
Summary: <ul style="list-style-type: none">- This use case allows user to change them password.			
Goal: <ul style="list-style-type: none">- User will have a new password for account.			
Triggers: <ul style="list-style-type: none">- User send change password request in user page.			
Preconditions: <ul style="list-style-type: none">- User must login successful into the system			
Post Conditions: <ul style="list-style-type: none">o Success: Password was updated. And success message will be shown.- Fail: Show error message.			
Main Success Scenario:			
Actor Action		System Response	
1. User sends “Thay đổi mật khẩu” request.		2. System will show change password form: <ul style="list-style-type: none">- “Mật khẩu mới”: free text input, min length 6, required.- “Xác nhận mật khẩu”: free text input, min length 6, required.- “Đổi mật khẩu” send command.- “Thoát” send command.	
3. Input form and “Đổi mật khẩu” request.		4. System update user’s password [Exception 1][Exception 2] [Exception 3]	
5. User sends “Thay đổi mật khẩu” request.		6. System will show change password form: <ul style="list-style-type: none">- “Mật khẩu mới”: free text input, min length 6, required.- “Xác nhận mật khẩu”: free text input, min length 6, required.- “Đổi mật khẩu” send command.	

7. Input form and “Đổi mật khẩu” request.	<p>“Thoát” send command.</p> <p>8. System update user’s password [Exception 1][Exception 2] [Exception 3]</p>
---	---

Alternative Scenario: N/A

Exceptions:

No	Cause	System Response
1	Text input “Mật khẩu mới” has length least 6 characters.	Show warning message: “Mật khẩu phải có ít nhất 6 ký tự.”
2	Text input “Xác nhận mật khẩu” has value different to text input “Mật khẩu mới”	Show warning message: “Xác nhận mật khẩu không giống nhau”.
3	Text input “Mật khẩu mới” value is default password.	Show warning message: “Mật khẩu mới phải khác mật khẩu mặc định”.

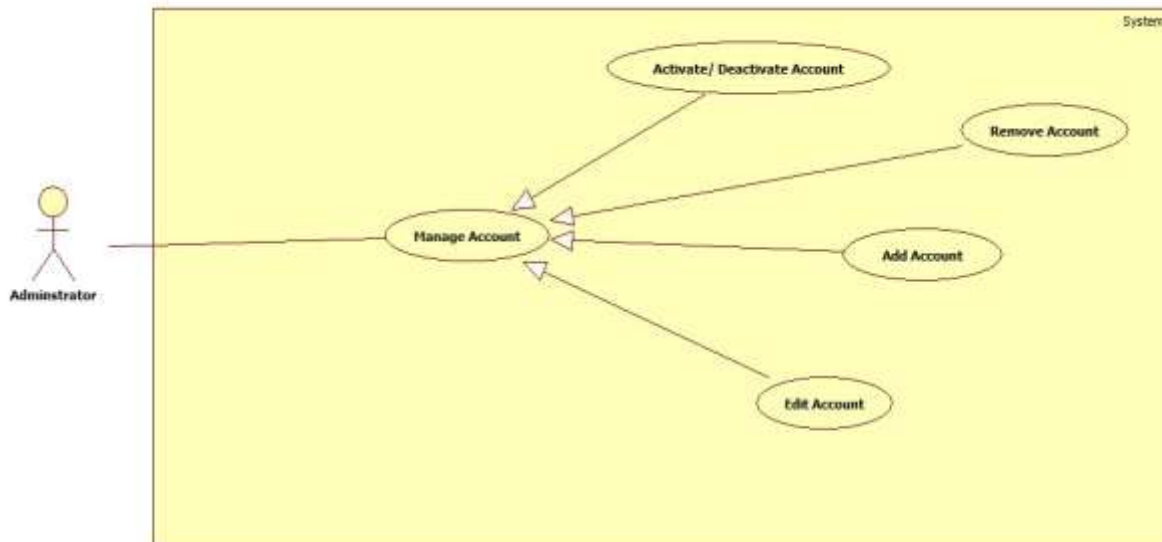
Relationships: N/A

Business Rules:

- User must change their password in the first times login to system.
- New password will be saved into system if provided information is correct.

Table 40: <Authorized User> Change Password

2.3.33. <Administrator> Use case Overview



2.3.34.< Administrator> Add Account

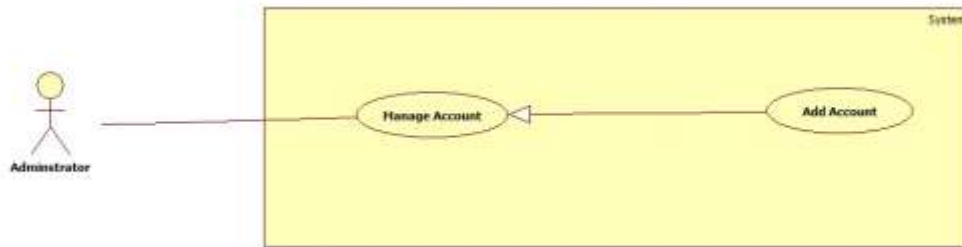


Figure 32: <Administrator> Add Account

Use case specification

USE CASE – ECRM030			
Use Case No.	ECRM030	Use Case Version	2.0
Use Case Name	Add Account		
Author	Tang Viet Hung		
Date	21/05/2015	Priority	Normal
Actor: Administrator			
Summary: This use case allows administrator to add new account.			
Goal: Add new account to the system.			
Triggers: Administrator wants to add new account.			
Preconditions:			
<ul style="list-style-type: none"> ○ User login as administrator role. 			
Post Conditions:			
<ul style="list-style-type: none"> ○ Success: New account will be created and show successful message. ○ Fail: Unsuccessful message will be shown. 			
Main Success Scenario:			
Step	Actor Action	System Response	
1	Administrator focuses on “Account” and clicks “Tạo Tài Khoản”	System navigates to “Tạo Tài Khoản” page. Page includes form: <ul style="list-style-type: none"> - Username: text input, min length: 6, max length: 30, required. - Họ tên: text input, min length: 6, max length: 50, required. - Số điện thoại: text input, min length: 10, max length: 11, type: number, required. - Thoát: command. 	

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		- Tạo tài khoản: command [Alternative 1]
2	Administrator enters information and then sends “Tạo tài khoản” request.	Create new account and show successful message: “Tài khoản được tạo thành công”. [Exception 1, 2, 3, 4, 5, 6]

Alternative Scenario:

No	Actor Action	System Response
1	Administrator sends “Thoát” request.	Close form and return management page

Exceptions:

No	Actor Action	System Response
1	Length of “username” is not in range.	Show unsuccessful message: “Username bao gồm từ 6 đến 10 ký tự. Xin thử lại!”
2	“Số điện thoại” is empty or contain characters.	Show unsuccessful message: “Số điện thoại không hợp lệ. Xin thử lại!”
3	“Họ tên” is empty.	Show unsuccessful message: “Họ tên không được bỏ trống. Xin thử lại!”
4	“Username” have been already existed.	Show unsuccessful message: “Username đã tồn tại, vui lòng nhập lại!”
5	“Số điện thoại” field data length is not in range	Show unsuccessful message: “Số điện thoại không hợp lệ. Xin thử lại!”
6	“Password” field data length is not in range	Show unsuccessful message: “Password không hợp lệ. Xin thử lại!”

Relationships: N/A

Business Rules:

- System has 2 status for account includes “Active” and “Inactive”
- Account is created with active status.
- “Số điện thoại” field data must start by “0”.
- Account is create with default password from system
- All information inputted by admin will be inserted to database.

Table 41: <Administrator> Add Account

2.3.35. <Administrator> Activate/Deactivate Account

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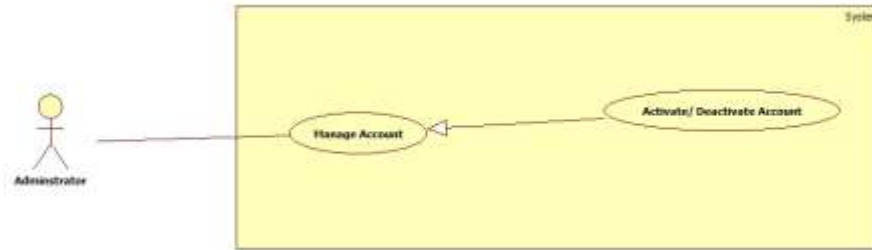


Figure 33: <Administrator> Activate/Deactivate Account

USE CASE – ECRM031			
Use Case No.	ECRM031	Use Case Version	2.0
Use Case Name	Activate/Deactivate Account		
Author	Doan Nguyen Minh Chi		
Date	08/08/2015	Priority	Low
Actor: Administrator			
Summary:			
- This use case allows admin to lock and reopen account.			
Goal:			
- User’s account can change to activate or deactivate.			
Triggers:			
- User send “Kích hoạt” request in admin page.			
Preconditions:			
- User must login into the system.			
- Account must be existed in database.			
Post Conditions:			
o Success: Password was updated. And success message will be shown.			
- Fail: Show error message.			
Main Success Scenario:			
Actor Action		System Response	
1. User sends “Kích hoạt” request. [Alternative 1]		2. System will change account status to activate. [Exception 1] 3. And return admin page.	
Alternative Scenario:			
No	Actor action	System Response	
1	User sends “Khóa” request.	System will change account status to deactivate. [Exception 1]	
Exceptions:			

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No	Cause	System Response
1	1. User’s account not found	2. Show error message: “Tài khoản không tồn tại trong hệ thống.” 3. Return list account page.

Relationships: N/A

Business Rules:

- User can login to system if account has active status.

Table 42: <Administrator> Activate/Deactivate Account

2.3.36. <Administrator> Update Account

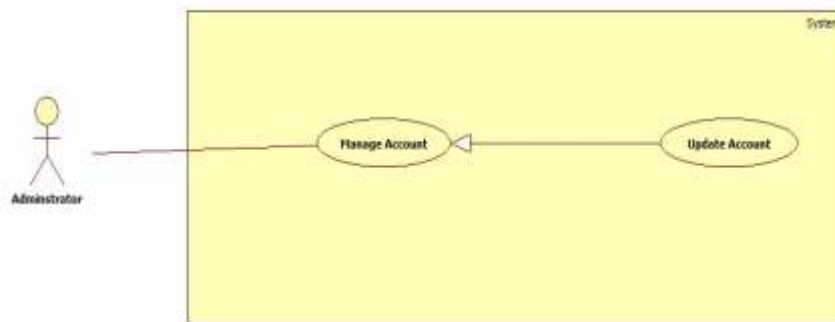


Figure 34: <Administrator> Update Account

Use case specification

USE CASE – ECRM032			
Use Case No.	ECRM032	Use Case Version	2.0
Use Case Name	Update Account		
Author	Tran Vinh Quang		
Date	05/21/2015	Priority	Normal
Actor: Administrator			
Summary: This use case allows administrator to change information includes password, real-name, phone number, role of account.			
Goal: Change information includes password, real-name, phone number, role of account.			
Triggers: Administrator clicks on “Account” link in Account manage page.			
Preconditions:			
<ul style="list-style-type: none"> Administrator has successfully logged in system. 			
Post Conditions:			
<ul style="list-style-type: none"> Success: Account will be changed information, show successful message. Fail: Unsuccessful message will be shown. 			
Main Success Scenario:			
Step	Actor Action	System Response	

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1	Administrator clicks “Account” link.	<p>System navigates to “Update Account” page.</p> <p>It contains form with the following information:</p> <ul style="list-style-type: none"> ○ Username: textbox, min length: 6, max length: 30, required. ○ Password: textbox, min length: 6, max length: 20, required ○ Họ tên: textbox, min length: 6, max length: 50, required. ○ Số điện thoại: textbox, min length: 10, max length: 11, type: number, required. ○ Chức vụ: dropdown list, required. ○ Thay đổi: button
2	Administrator fills information into the form and sends “Thay đổi” request.	<p>System show successful message and redirect to Profile page.</p> <p>[Exception 1, 2, 3, 4, 5, 6]</p>

Alternative Scenario: N/A

Exceptions:

No	Actor Action	System Response
1	Length of “username” is not in range.	Show unsuccessful message: “Username bao gồm từ 6 đến 10 ký tự. Xin thử lại!”
2	“Số điện thoại” is empty or contain characters.	Show unsuccessful message: “Số điện thoại không hợp lệ. Xin thử lại!”
	“Họ tên” is empty.	Show unsuccessful message: “Họ tên không được bỏ trống. Xin thử lại!”
4	“Username” have been already existed.	Show unsuccessful message: “Username đã tồn tại, vui lòng nhập lại!”
5	“Số điện thoại” field data length is not in range	Show unsuccessful message: “Số điện thoại không hợp lệ. Xin thử lại!”
6	“Password” field data length is not in range	Show unsuccessful message: “Password không hợp lệ. Xin thử lại!”

Relationships: N/A

Business Rules:

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- Admin can update information of staff and user.
- All information inputted will be inserting to database after validated.

Table 43: <Administrator> Update Account

2.3.37. <System> Use case Overview

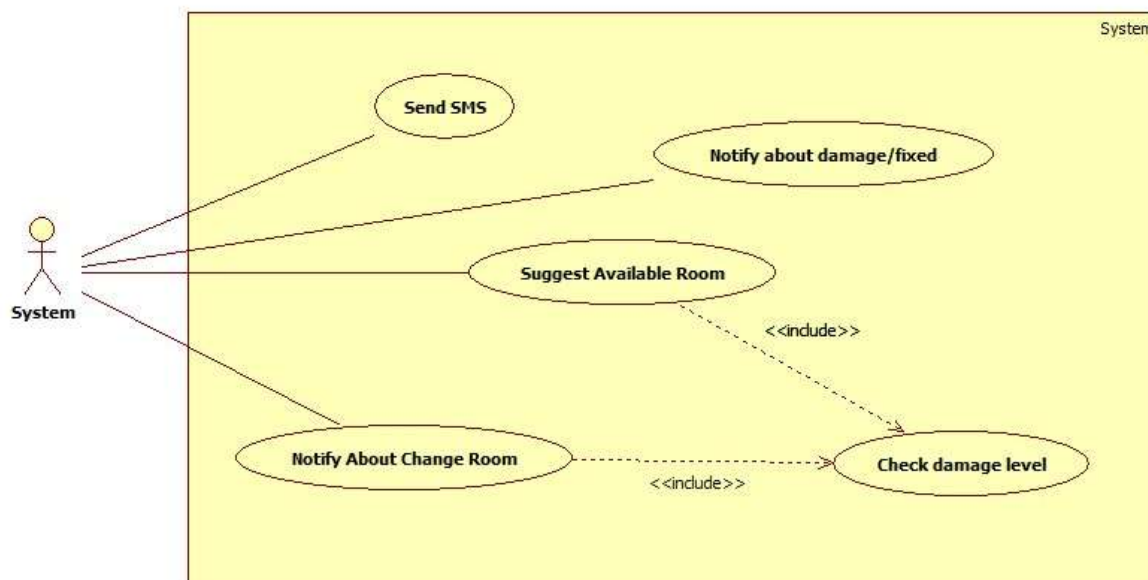


Figure 35: <System> Use case Overview

2.3.38. <System> Send SMS

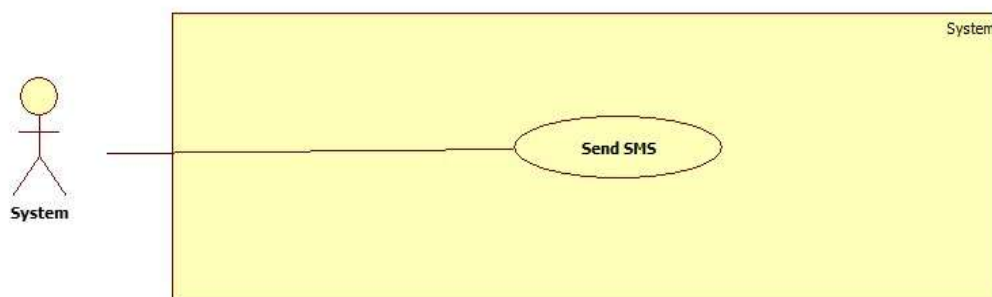


Figure 36: <System> Send SMS

Use case specification

USE CASE – ECRM033			
Use Case No.	ECRM033	Use Case Version	2.0
Use Case Name	Send SMS		
Author	Tran Vinh Quang		
Date	21/05/2015	Priority	Medium

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Actor: System

Summary:

- This use case describes how the system sends SMS to users when necessary.

Goal:

- System will send SMS to users.

Triggers:

- System run a timer task that trigger check event.

Preconditions:

- Their must be at least one report has resolved in the system.

Post Conditions:

- **Success:** Show the status of report and notify to user.
- **Fail:** System display error message.

Main Success Scenario:

Step	Actor Action	System Response
1	System run timer task to check report state and sends SMS	System response: <ul style="list-style-type: none">○ SMS that need to be sent to users. [Exception 1]

Exceptions:

No	Actor Action	System Response
1	System timer task is interrupted	No SMS will be sent. Error detail will be tracked in a log file.
2	User do not have phone number	No SMS will be sent. Error tracked in log file.

Relationships: N/A

Business rules:

- Using Twilio service to send and receive message.

Table 44: <System> Send SMS

2.3.39.<System> Suggest Available Room

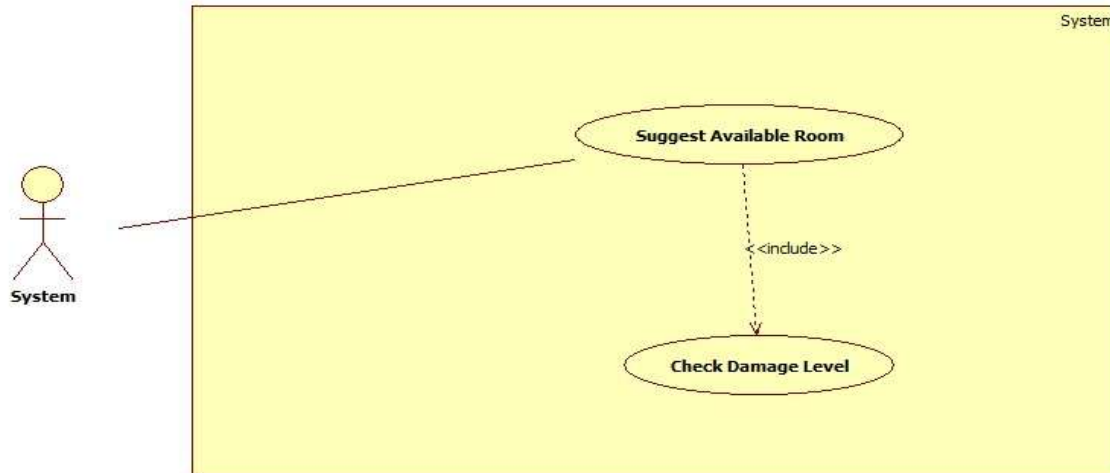


Figure 37: <System> Suggest Available Room

Use case specification

USE CASE – ECRM034			
Use Case No.	ECRM034	Use Case Version	2.0
Use Case Name	Sugges Available Room		
Author	Tran Vinh Quang		
Date	21/05/2015	Priority	Medium
Actor: System Summary: <ul style="list-style-type: none"> ○ This use case describes how the system suggests room to staff when necessary. Goal: <ul style="list-style-type: none"> ○ System will automatic check damage level and suggest room if necessary. Triggers: <ul style="list-style-type: none"> ○ System run a timer task that trigger check event. Preconditions: <ul style="list-style-type: none"> ○ Their must be at least one report has sent in the system. Post Conditions: <ul style="list-style-type: none"> ○ Success: Show the status of report and notify to user. ○ Fail: System display error message. Main Success Scenario:			
Step	Actor Action	System Response	
1	System run timer task to check damaged level.	System response: <ul style="list-style-type: none"> ○ Damage level of report ○ System suggest available room if necessary [Exception 1]	

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Exceptions:

No	Actor Action	System Response
1	System timer task is interrupted	No notification will be sent. Error detail will be tracked in a log file.

Relationships: include Check damage level

Business rules:

- If damaged level is larger than 50%, system will automatic suggest available room
- Room change will be order by priority with current room.

Table 45: <System> Suggest Available Room

2.3.40. <System> Notify about damaged

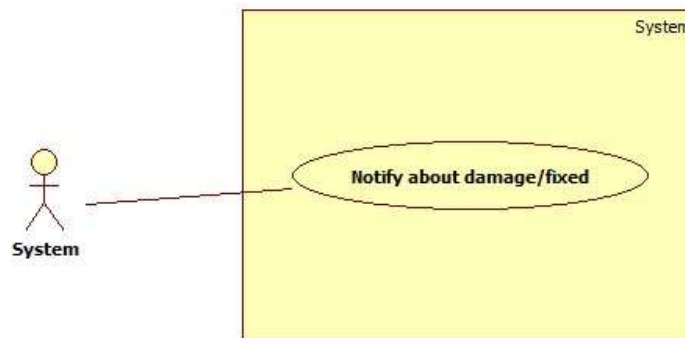


Figure 38: <System> Notify about damaged

Use case specification

USE CASE – ECRM035			
Use Case No.	ECRM035	Use Case Version	2.0
Use Case Name	Notify about damaged		
Author	Tran Vinh Quang		
Date	21/05/2015	Priority	Medium
Actor: System Summary: <ul style="list-style-type: none"> ○ This use case describes how the system notifies to staff when necessary. Goal: <ul style="list-style-type: none"> ○ System will sends notification to staff. Triggers: <ul style="list-style-type: none"> ○ System run a timer task that trigger check event. Preconditions: <ul style="list-style-type: none"> ○ Their must be at least one report has sent in the system. Post Conditions: <ul style="list-style-type: none"> ○ Success: Show the status of report and notify to user. ○ Fail: System display error message. 			

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Main Success Scenario:

Step	Actor Action	System Response
1	System runs timer task to check report state and sends notify	System response: <ul style="list-style-type: none"> Notifications that need to be sent to staff. [Exception 1]

Exceptions:

No	Actor Action	System Response
1	System timer task is interrupted	No notification will be sent. Error detail will be tracked in a log file.

Relationships: N/A

Business rules:

- System will send notify after report has sent.

Table 46: <System> Notify about damaged

2.3.41. <System> Notify About Change Room

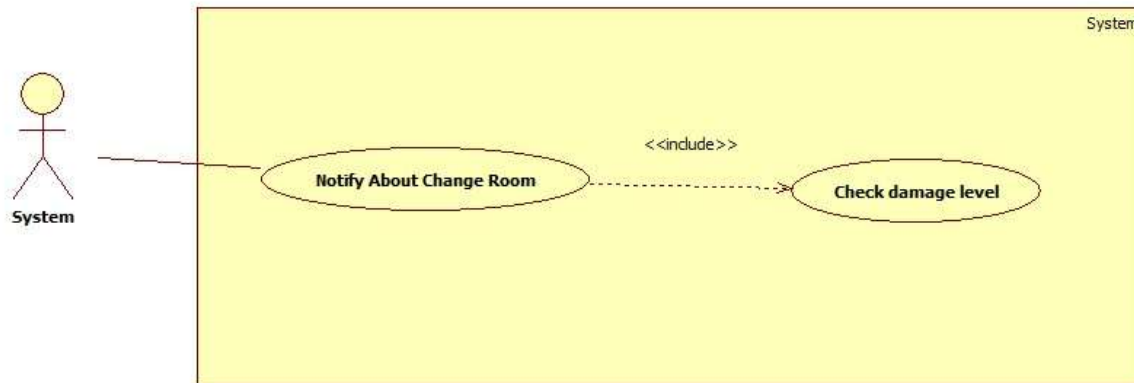


Figure 39: <System> Notify About Change Room

Use case specification

USE CASE – ECRM036			
Use Case No.	ECRM036	Use Case Version	2.0
Use Case Name	Notify about change room		
Author	Tran Vinh Quang		
Date	21/05/2015	Priority	Medium
Actor: System			
Summary:			
<ul style="list-style-type: none"> This use case describes how the system notifies to staff when necessary. 			
Goal:			
<ul style="list-style-type: none"> System will send notification to teacher. 			

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Triggers:

- System run a timer task that trigger check event.

Preconditions:

- Staff send request change room to server

Post Conditions:

- **Success:** Change room and send notification to teacher.
- **Fail:** System display error message.

Main Success Scenario:

Step	Actor Action	System Response
1	System runs timer task to check report state and sends notify	System response: <ul style="list-style-type: none">○ Check all schedule in room○ Notifications that need to be sent to teacher. [Exception 1]

Exceptions:

No	Actor Action	System Response
1	System timer task is interrupted	No notification will be sent. Error detail will be tracked in a log file.

Relationships: N/A**Business rules:**

- Notification will be sent by SMS, GCM and notification in website.

Table 47: <System> Notify About Change Room

3. Software System Attribute

3.1. Usability

3.1.1. Graphic User Interface

- All the texts, labels should be written in Vietnamese

3.1.2. Usability

- Staff should need less 2 days of training to be productive with the system
- User need 2 hours of training to use mobile app or web application
- User Manual should be clear, easy to understand and increase experience for user.

3.1.3. Installation

- User can follow installation and manual guide for installation. If there are any problems, they can contact developer for help.

3.2. Reliability

N/A

3.3. Availability

- System should be online 24/7

3.4. Security

- Privacy: Each role of user has a specific permission to interact with system
- System always checks authorization and authentication before doing anything
- All input data are validated before insert to database.

3.5. Maintainability

- The system is divided into separated modules
- The code is easy to maintain and upgrade

3.6. Portability

- Admin, Staff, User can use web application on every OS supported web browser.
- For mobile application, they must use Android smartphones that have version greater than 4.0.

3.7. Performance

- The speed of suggestion should be less than 10 seconds
- The speed of report from user to staff should be less than 10 seconds

4. Conceptual Diagram

ECRM – Equipment’s Classroom Management

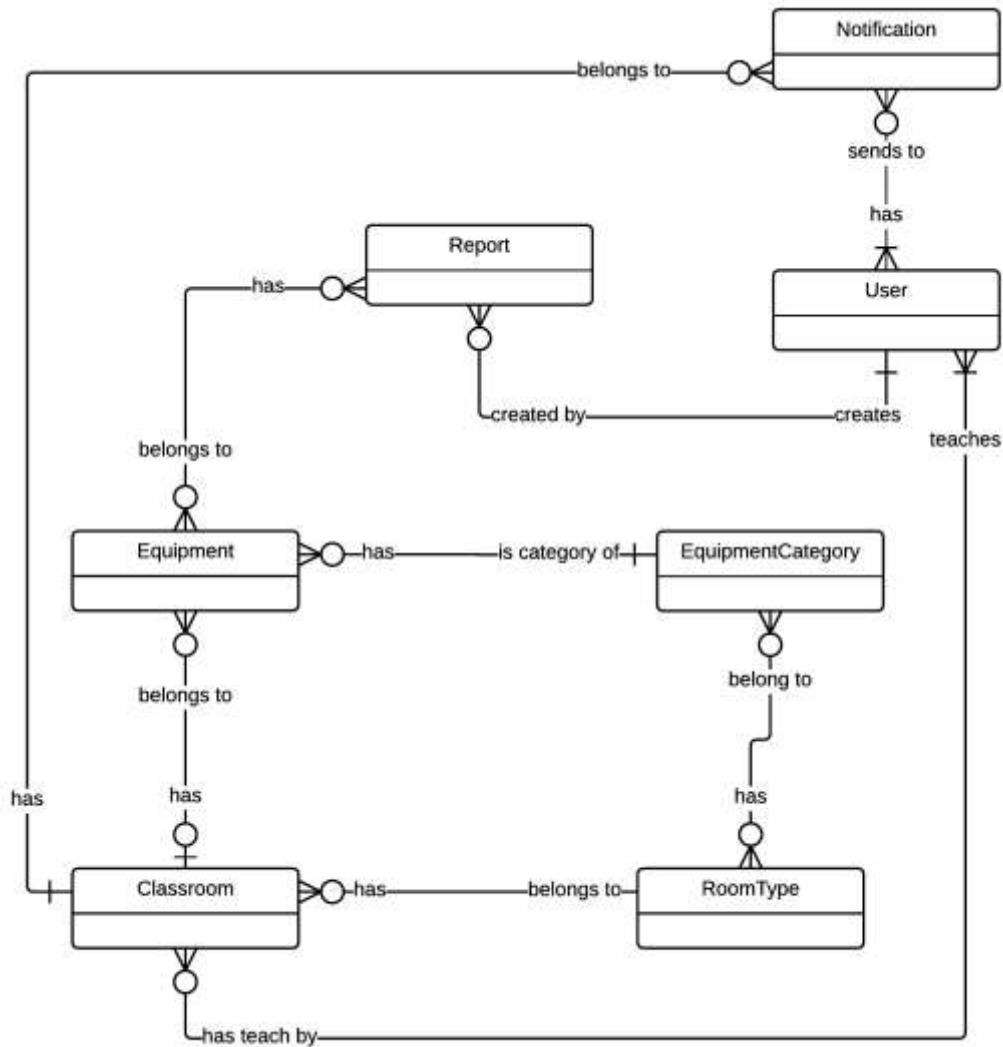


Figure 40: Conceptual Diagram

Data dictionary	
Entity Name	Description
User	Entity describes a user in system
Equipement	Contain the equipment information.
Classroom	Contain the classroom information.
EquipmentCategory	Contain the equipment category information.
Roomtype	Contain the room type information.
Report	Contain the report information
Notification	Contain the notification information

Table 48: Conceptual Diagram - Data Dictionary

D. Software Design Description

1. Design Overview

- This document describes the technical and user interface design of ECRM system. It includes the architectural design, the detailed design of common functions, the business functions and the design of database model.
- The architectural design describes the overall architecture of the system and the architecture of each main component and subsystem.
- The detailed design describes static and dynamic structure for each component and functions. It includes class diagrams, class explanations and sequence diagrams for each use cases.
- The database design describes the relationships between entities and details of each entity.
- Document overview:
 - Section 2: gives an overall description of the system architecture design.
 - Section 3: gives component diagrams that describe the connection and integration of the system.
 - Section 4: gives the detail design description, which includes class diagram, class explanation, and sequence diagram to details the application functions.
 - Section 5: describe a fully attributed Entity Relationship Diagram

2. System Architecture Design

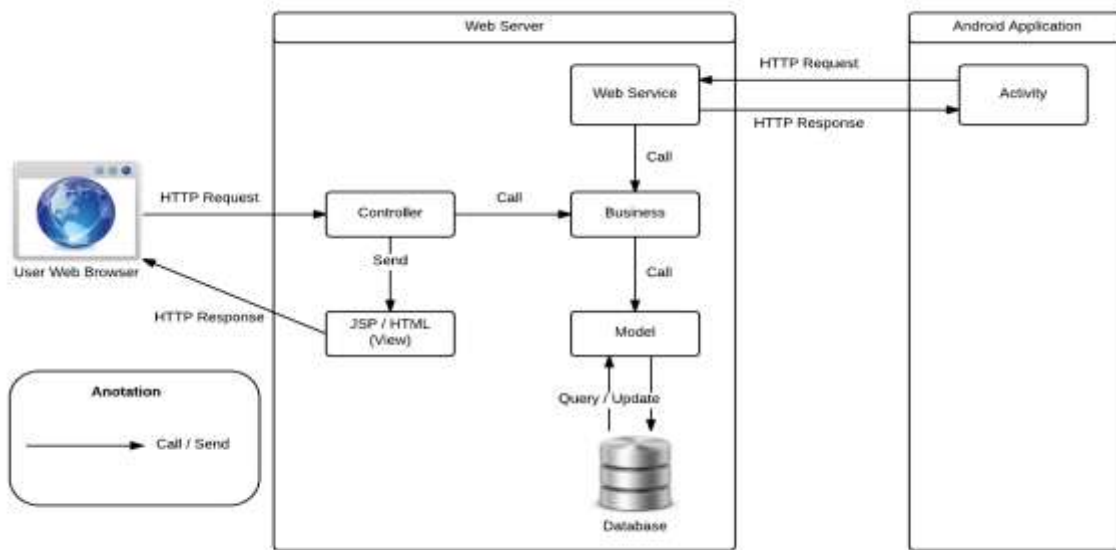


Figure 41: System Architecture Design

2.1. Web Application architecture description

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In Web Application, the system is developed under Spring MVC architecture style. We choose this architecture for Web application because of following advantages:

- Web application contains a Web service (public API for mobile app) with MVC architecture we can separate business code with Controller and View so we can use the business code in web service without repeat the code.
- In scope of 3-member team this, MVC architecture makes it easier to split the big project into small modules and make it easier to assign each module for members in our team.

This project follows MVC architecture with following components:

- **Web Service:** is the part of the application that acts like event handler for web and mobile communication via REST method.
- **Controller:** is the part of the application that acts like event handler to handles user interaction. Typically controller read data from a request and calls appropriate Business’s method then selects view to return to user.
- **JSP/HTML (View):** is the part of the application that handles the display of the data. The selection of View is under control of Controller.
- **Business:** is the part of the application that does business processing to solve domain problems.
- **Model:** is the part of the application that acts like a data transfer object between the system and database.

2.2. Mobile Application architecture description

The application is developed as an Android native application. In general, the application architecture conforms to Android architecture.

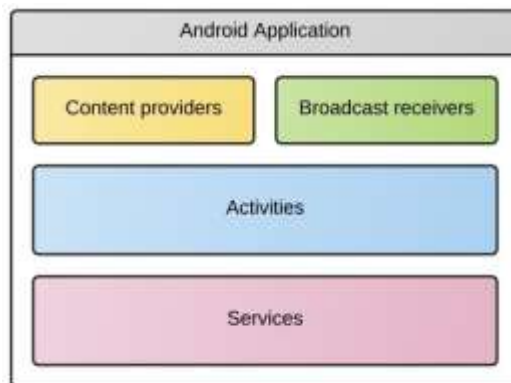


Figure 42: Android Application Architecture

Reference: [Android Developer Guide - Application Fundamentals](#)

This project follows Android application architecture with following components:

ECRM – Equipment’s Classroom Management

- **Activity** is the basic core of an android application that handles user input, create thread to run asynchronous tasks, send request and receive data from server via web services ...

3. Component Diagram

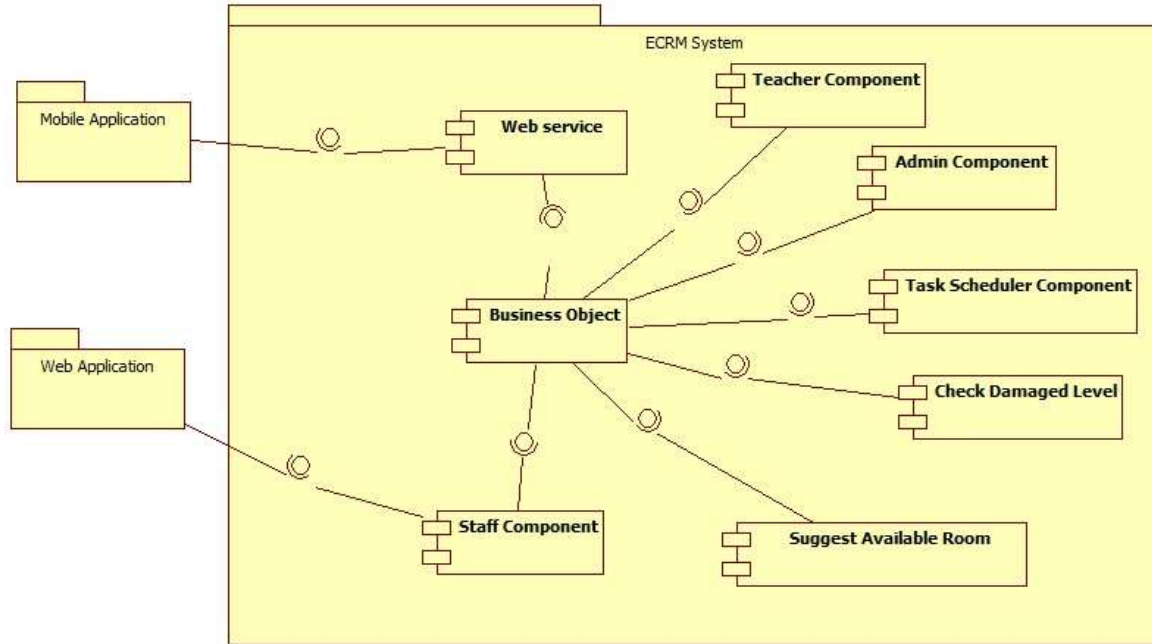


Figure 43: Component Diagram

Component Dictionary: Describes components	
Web Application	Web application package: View, Controller.
Mobile Application	Mobile application package.
Web Service	Include all web API controllers of the system.
Staff Component	Component to handle staff activities in the system.
Teacher Component	Component to handle teacher activities in the system.
Admin Component	Component to handle administrator activities in the system
Business Objects	Handle business operations for every component.
Suggest Available Room	Business logic for suggest room processing.
Check Damaged Level	Business logic for checking damaged level processing.
Task Scheduler Component	Component to handle task scheduler activities in the system.

Table 49: Component Dictionary

4. Detail Description

4.1. Class Diagram

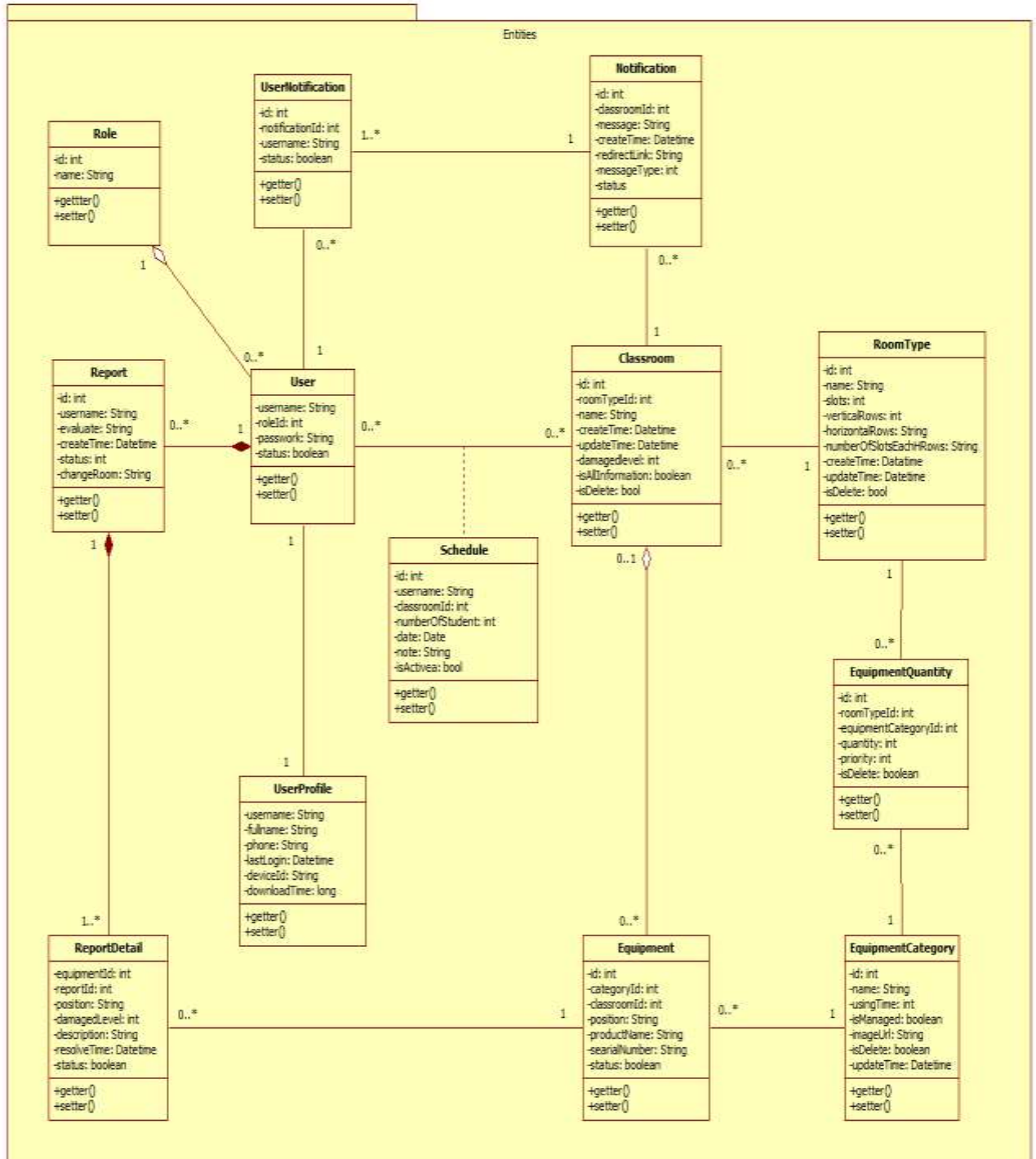


Figure 44: Class Diagram

Class dictionary: describe Class		
Class Name	Mapping column with Conceptual diagram	Description
User	User	Contain the user information.
Report	Report	Contain the report information.
Classroom	Classroom	Contain the classroom information
Equipment	Equipment	Contain the equipment information
EquipmentCategory	EquipmentCategory	Contain the equipment category information
RoomType	Roomtype	Contain the room type information
Notification	Notification	Contain the notification information
Role	N/A	Not exist in conceptual diagram. But needed in class diagram to contain the role of user
UserProfile	N/A	Not exist in conceptual diagram. But needed in class diagram to contain user detail information
ReportDetail	N/A	Not exist in conceptual diagram. But needed in class diagram to contain report detail information
EquipmentQuantity	N/A	Not exist in conceptual diagram. But needed in class diagram to contain quantity of equipment in each room type.
Schedule	N/A	Not exist in conceptual diagram. But needed in class diagram to contain the schedule information.
UserNotification	N/A	Not exist in conceptual diagram. But needed in class diagram to contain the notification of user information

Table 50: Class Dictionary

4.2. Class Diagram Explanation

4.2.1. User

Attribute	Type	Visibility	Description
username	String	Private	Unique identifier of account
password	String	Private	The user’s password
status	boolean	Private	The user’s status
role	Role	Private	The user’s role

Method	Return Type	Visibility	Description
Getter	Attribute type	Public	Get attribute value.
Setter	Void	Public	Set value of

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			attribute.
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4.2.2. Role

Attribute	Type	Visibility	Description
id	Integer	Private	Id of role in system
name	String	Private	Name of role in system

Method	Return Type	Visibility	Description
Getter	Attribute type	Public	Get attribute value.
Setter	Void	Public	Set value of attribute.

4.2.3. UserProfile

Attribute	Type	Visibility	Description
username	String	Private	Unique identifier of profile
fullname	String	Private	The full name’s account
email	String	Private	The user’s email
phone	String	Private	The user’s phone
lastLogin	String	Private	User login to system in last time
deviceId	String	Private	Smart phone’s id
downloadTime	Long	Private	Update equipment category version

Method	Return Type	Visibility	Description
Getter	Attribute type	Public	Get attribute value.
Setter	Void	Public	Set value of attribute.

4.2.4. Schedule

Attribute	Type	Visibility	Description
id	int	Private	Unique identifier of schedule
username	String	Private	The teacher’s username
classroomId	int	Private	The classroom’s id
numberOfStudent	int	Private	The number of student in room
date	Date	Private	The date is schedule active
note	String	Private	The schedule’s note
isActive	boolean	Private	The schedule’s status

Method	Return Type	Visibility	Description
Getter	Attribute type	Public	Get attribute value.
Setter	Void	Public	Set value of

			attribute.
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4.2.5. Classroom

Attribute	Type	Visibility	Description
id	int	Private	Unique identifier of classroom
roomTypeId	int	Private	The roomtype’s id
name	String	Private	The classroom’s name
createTime	Datetime	Private	The room was created in this date
updateTime	Datetime	Private	The room was updated in this date
isAllInformation	boolean	Private	Check complete room’s information
isDelete	boolean	Private	Check active or deactivate room

Method	Return Type	Visibility	Description
Getter	Attribute type	Public	Get attribute value.
Setter	Void	Public	Set value of attribute.

4.2.6. RoomType

Attribute	Type	Visibility	Description
id	int	Private	Unique identifier of room type
name	String	Private	The teacher’s username
slots	int	Private	Number of slots of room type
verticalRows	int	Private	The number of row in the room type
horizontalRows	String	Private	The number of horizontal row in vertical row
numberOfSlotsEachHRows	String	Private	The number of chair in horizontal row
createTime	Datetime	Private	The room type was created in this date
updateTime	Datetime	Private	The room type was created in this date
isDelete	bool	Private	Check active or deactivate room type

Method	Return Type	Visibility	Description
Getter	Attribute type	Public	Get attribute value.
Setter	Void	Public	Set value of attribute.

4.2.7. EquipmentQuantity

Attribute	Type	Visibility	Description
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id	int	Private	Unique identifier of equipment quantity
roomTypeId	int	Private	The roomtype’s id
equipmentCategoryId	int	Private	The category equipment’s id
quantity	Int	Private	The number of equipment in roomtype
priority	int	Private	The equipment’s priority in roomtype
isDelete	Boolean	Private	The equipment quantity’s delete status

Method	Return Type	Visibility	Description
Getter	Attribute type	Public	Get attribute value.
Setter	Void	Public	Set value of attribute.

4.2.8. EquipmentCategory

Attribute	Type	Visibility	Description
id	int	Private	Unique identifier of category
name	String	Private	The category equipment’s name
usingTime	int	Private	The number of hour equipment can use
isManaged	boolean	Private	The equipment is managed quantity
imageUrl	String	Private	The equipment’s image
isDelete	Boolean	Private	The category’s delete status
updateTime	Datetime	Private	The last update category

Method	Return Type	Visibility	Description
Getter	Attribute type	Public	Get attribute value.
Setter	Void	Public	Set value of attribute.

4.2.9. Equipment

Attribute	Type	Visibility	Description
id	int	Private	Unique identifier of equipment
categoryId	int	Private	The category’s id
classroomId	int	Private	The classroom’s id
position	String	Private	The equipment’s position in room
productName	String	Private	The equipment’s product name
serialNumber	String	Private	The equipment’s serial number
Status	boolean	Private	The equipment’s status

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Method	Return Type	Visibility	Description
Getter	Attribute type	Public	Get attribute value.
Setter	Void	Public	Set value of attribute.

4.2.10. ReportDetail

Attribute	Type	Visibility	Description
equipmentId	int	Private	The damaged equipment’s id
reportId	int	Private	The report’s id
position	String	Private	The position of equipment in room
damagedLevel	int	Private	The equipment’s evaluate
description	String	Private	The damaged equipment’s description
resolveTime	Datetime	Private	The time of resolve equipment
Status	boolean	Private	The report detail’s status

Method	Return Type	Visibility	Description
Getter	Attribute type	Public	Get attribute value.
Setter	Void	Public	Set value of attribute.

4.2.11. Report

Attribute	Type	Visibility	Description
id	String	Private	Unique identifier of account
username	String	Private	The username who create report
evaluate	String	Private	The user’s evaluate about room
createTime	Datetime	Private	The date create reporting
status	int	Private	The report’s status
changeRoom	String	Private	The room are changed

Method	Return Type	Visibility	Description
Getter	Attribute type	Public	Get attribute value.
Setter	Void	Public	Set value of attribute.

4.2.12. Message

Attribute	Type	Visibility	Description
Id	Integer	Private	Id of message in system
Username	String	Private	Username of user send message
Body	String	Private	Body of message
IsRead	Boolean	Private	Check status of

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			message is read or not
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Method	Return Type	Visibility	Description
Getter	Attribute type	Public	Get attribute value.
Setter	Void	Public	Set value of attribute.

4.2.13. Notification

Attribute	Type	Visibility	Description
id	int	Private	Unique identifier of notification
classroomId	int	Private	The room’s id
message	String	Private	Content message of notify
createTime	Datetime	Private	The date create notify
redirectLink	String	Private	The link are redirected
messageType	int	Private	The message’s type of notify
status	boolean	Private	The notification’s status

Method	Return Type	Visibility	Description
Getter	Attribute type	Public	Get attribute value.
Setter	Void	Public	Set value of attribute.

4.2.14. UserNotification

Attribute	Type	Visibility	Description
id	int	Private	Unique identifier of user notification
notificationId	int	Private	The notification’ id
username	String	Private	User was received notification
status	boolean	Private	The user notification’s status

Method	Return Type	Visibility	Description
Getter	Attribute type	Public	Get attribute value.
Setter	Void	Public	Set value of attribute.

4.3. Interactive Diagram

4.3.1. Web Application

4.3.1.1. Staff

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4.3.1.1.1. <Staff> Create Room Type

Summary: This diagram shows how to create new room type in web application.

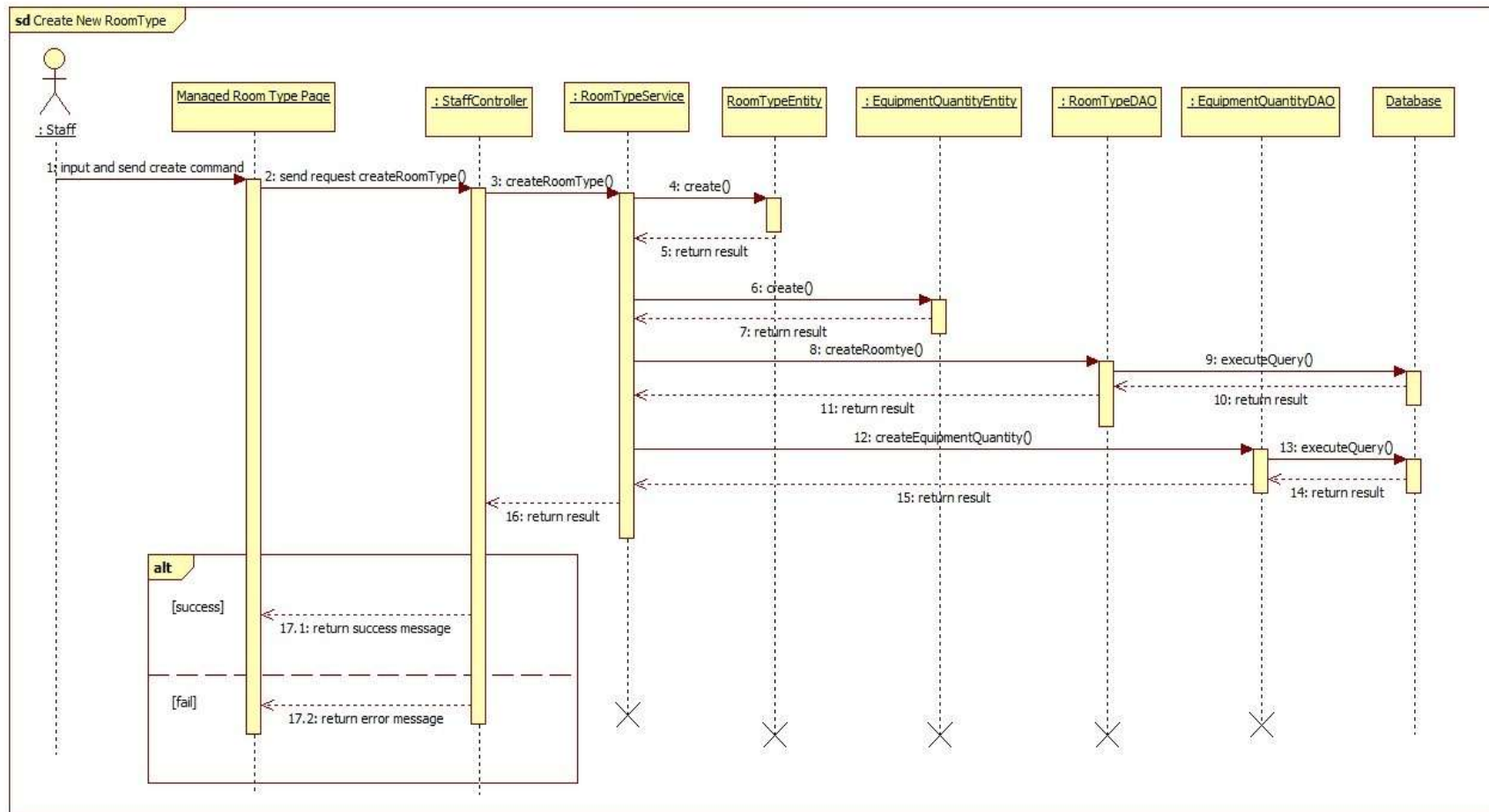


Figure 45: <Staff> Create Room Type - Interactive Diagram

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4.3.1.1.2. <Staff> Change Room

Summary: This diagram shows how to change room in web application.

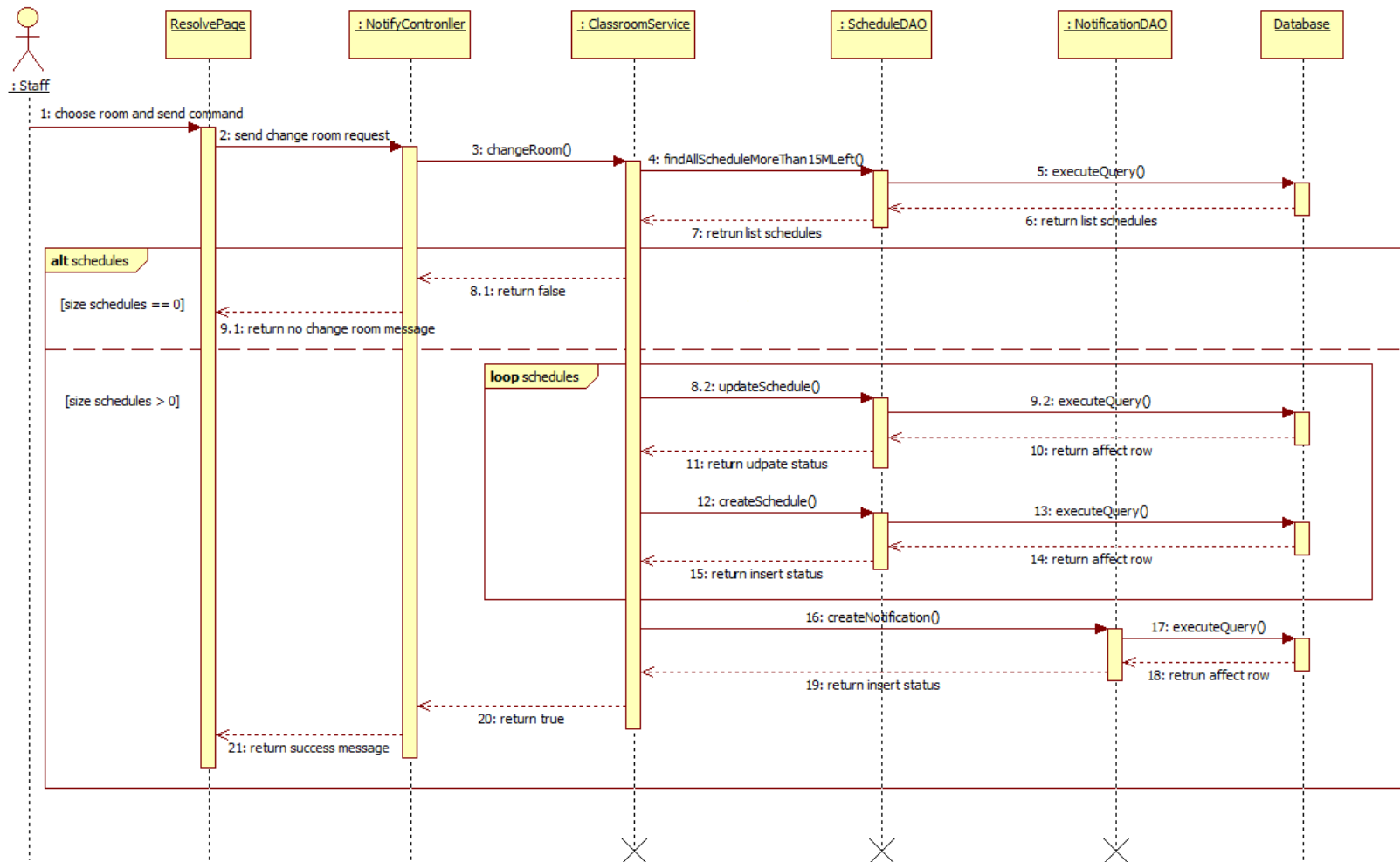


Figure 46: <Staff> Change Room – Interactive Diagram

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4.3.1.1.3. <Staff> Resolve Report

Summary: This diagram show how to resolve report at web application

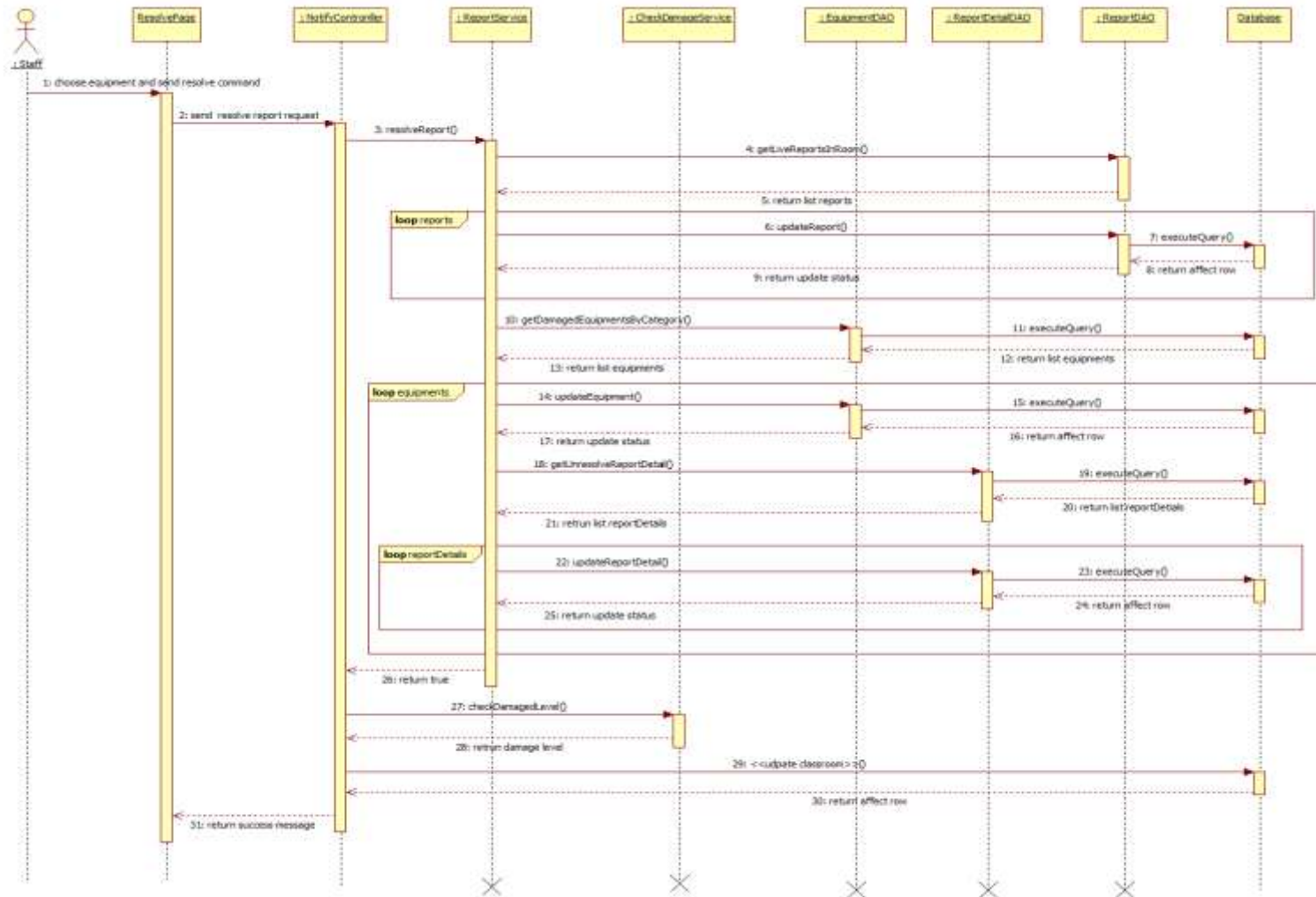


Figure 47: <Staff> Resolve Report – Interactive Diagram

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4.3.1.1.4. <Staff> Create Classroom

Summary: This diagram shows how to create new classroom in web application.

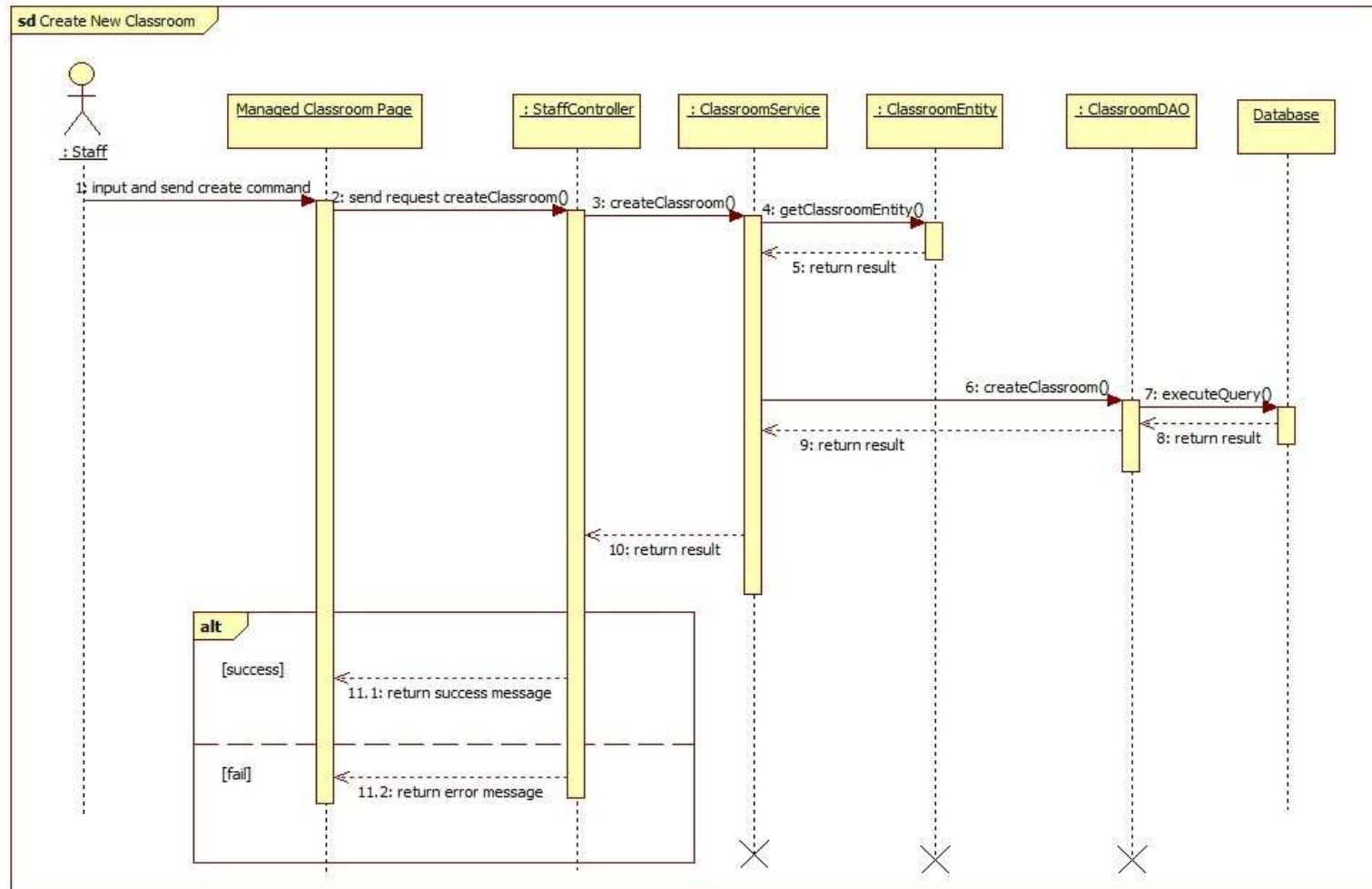


Figure 48: <Staff> Create Classroom - Interactive Diagram

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4.3.1.1.5. <Staff> Create Equipment

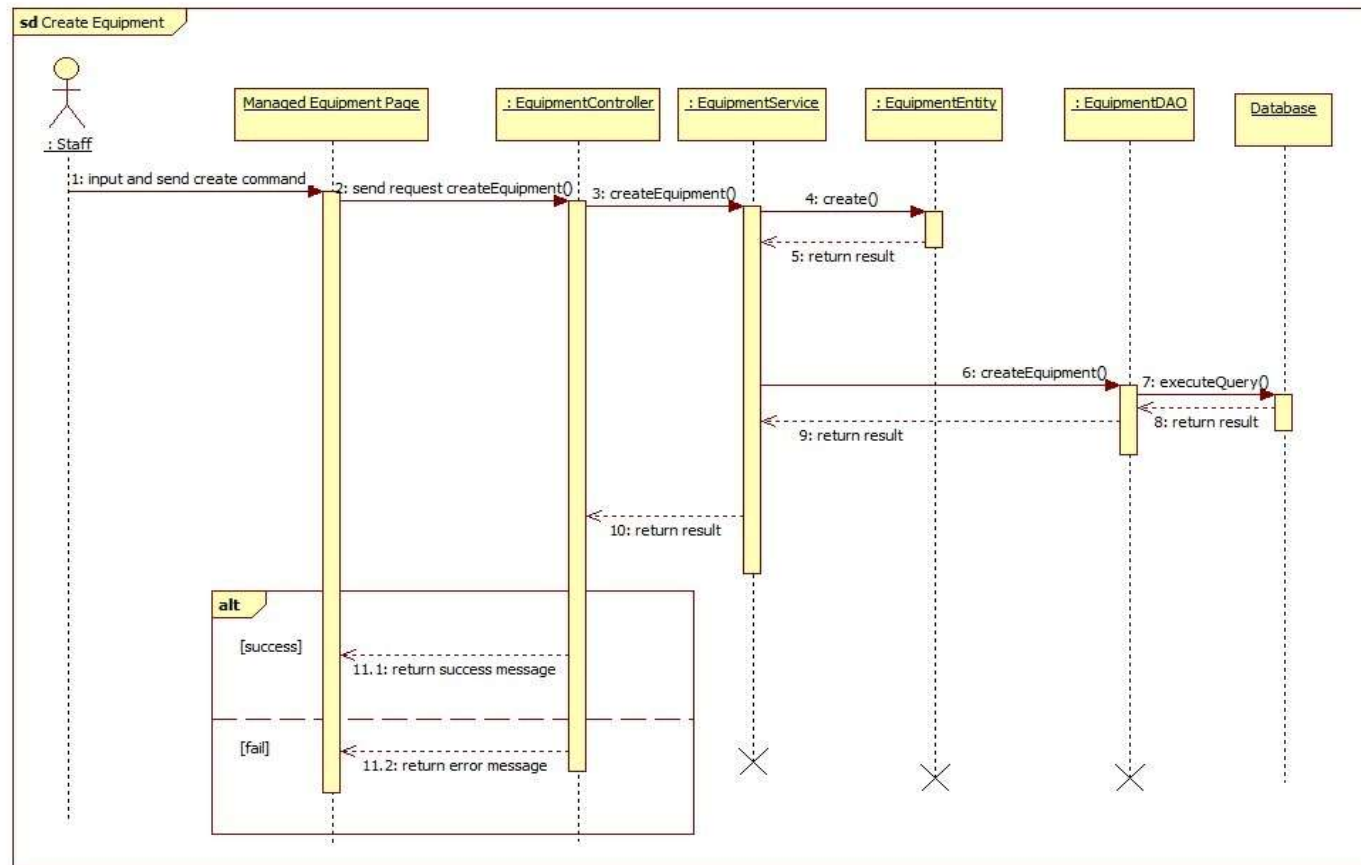


Figure 49: <Staff> Create Equipment - Interactive Diagram

4.3.1.2. Teacher

4.3.1.2.1. <Teacher> Create Report

Summary: This diagram shown how to create report in web application

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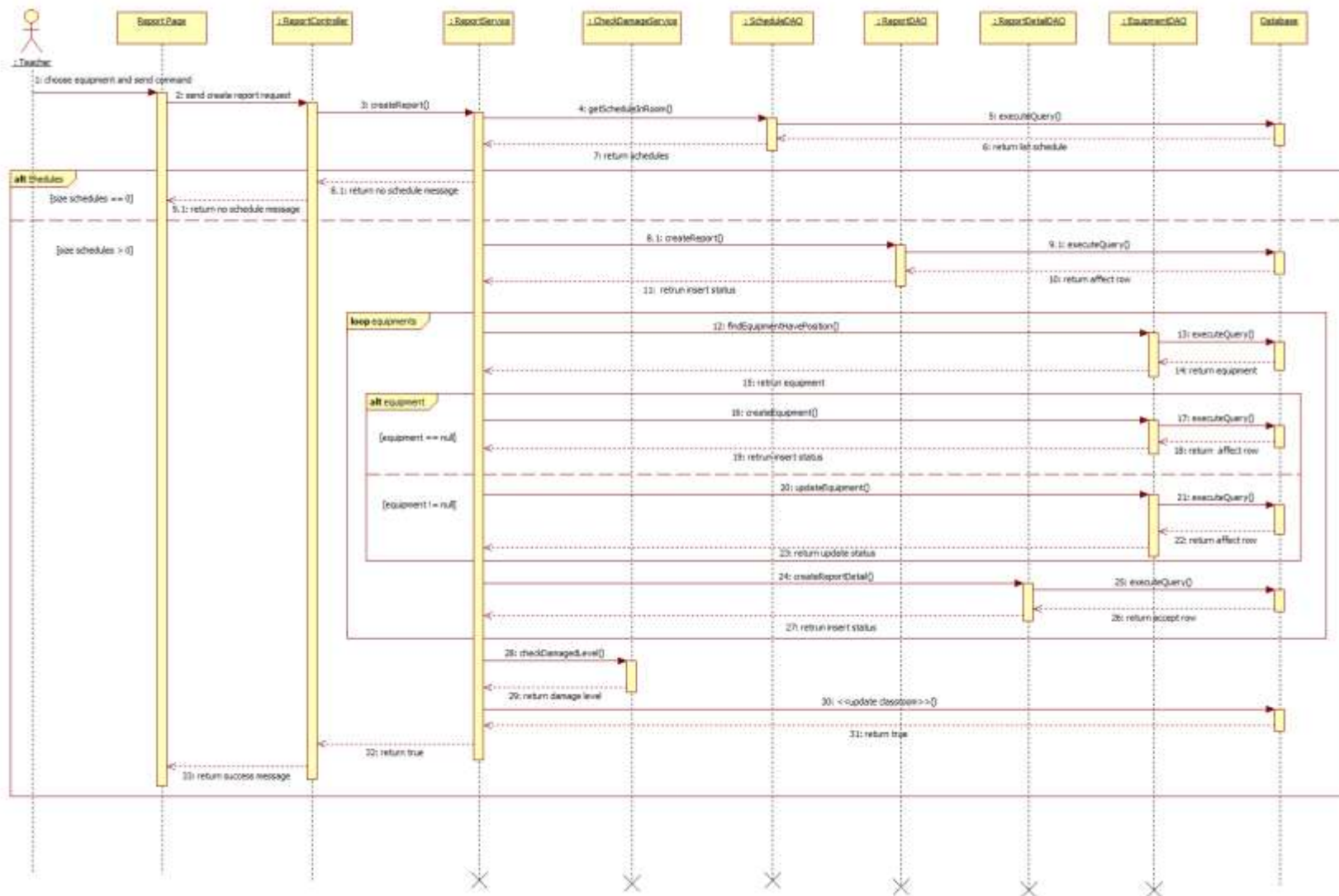


Figure 50: <Teacher> Create Report – Interactive Diagram

4.3.2. Mobile Application

4.3.2.1. ECRM Staff

4.3.2.1.1. <Staff> Change Room

Summary: This diagram shows how to change room in mobile application.

There are two ways for staff to change room in mobile application:

- Change room for report:

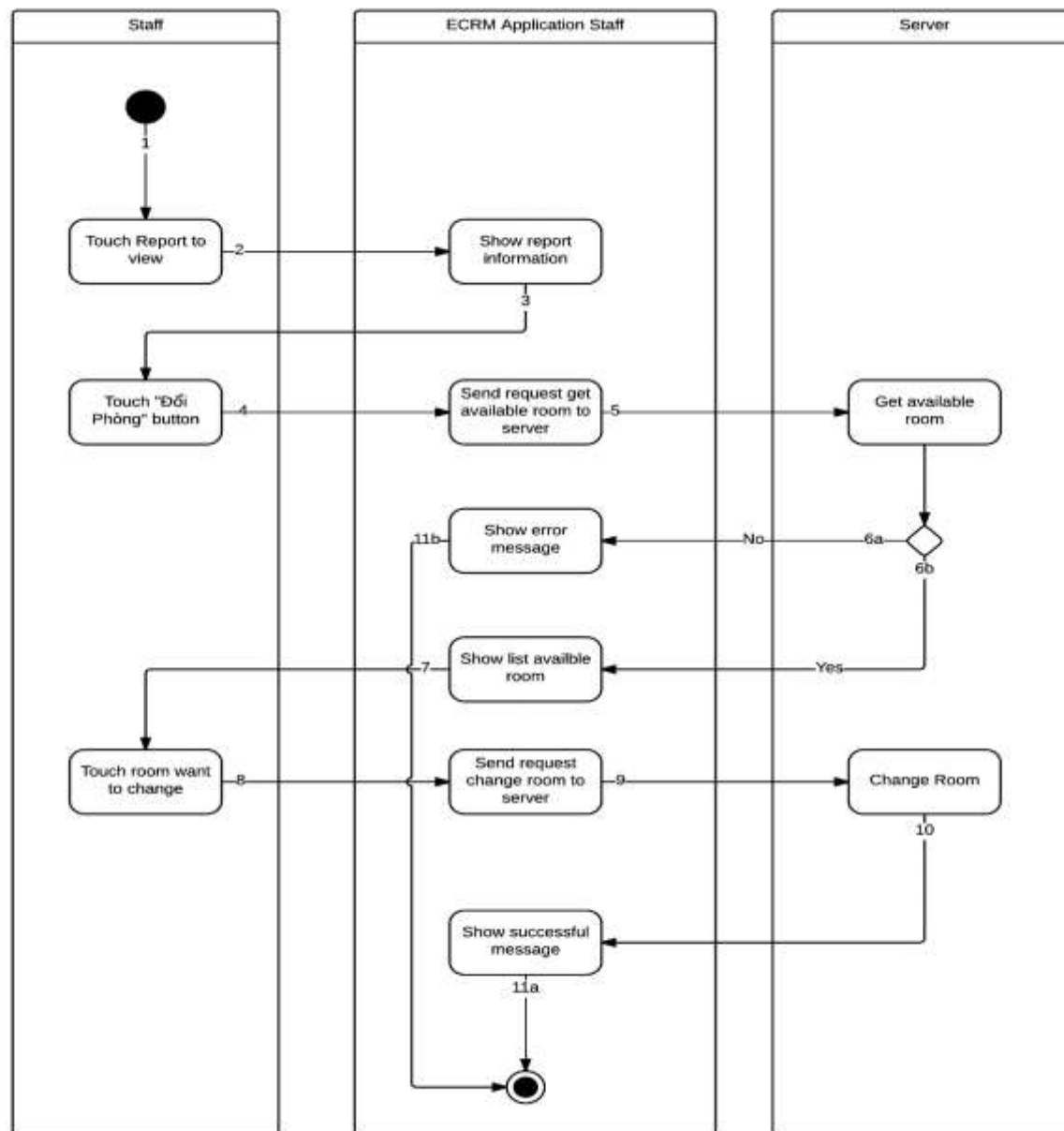


Figure 51: <Staff> Change Room for Report - Interactive Diagram

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1. Start	2. Choose Report	3. Show report
4. Choose “Đổi phòng”	5. Get available room from server	6a. No available room, show error message
6b. Show list available room	7. Touch room want to change	8. Send request change room
9. Change room	10. Change room success, show successful message.	11a. Finish
11b. Finish.		

- Change room manual:

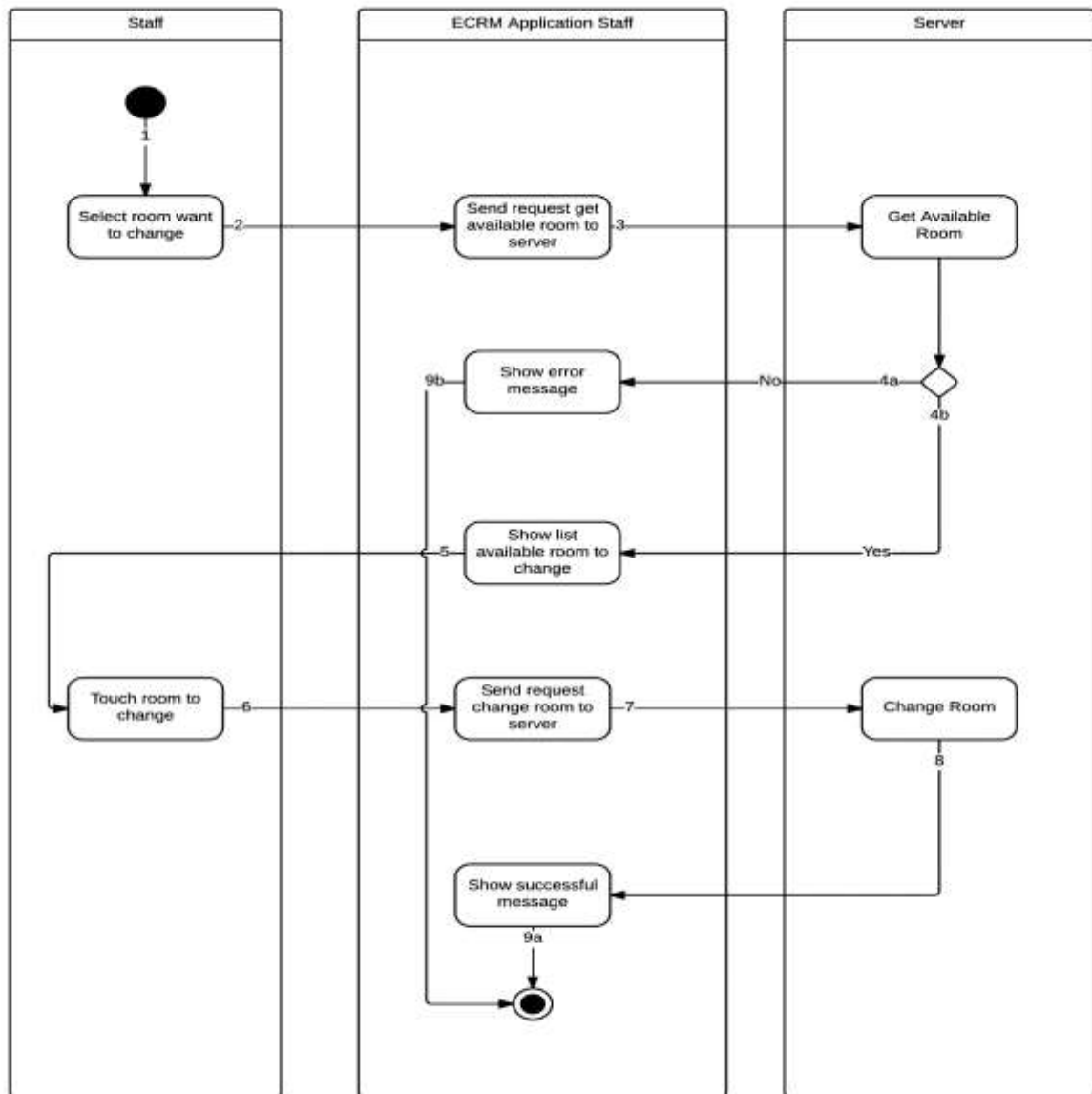


Figure 52: <Staff> Change Room Manual - Interactive Diagram

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1. Start	2. Touch room to change	3. Send request get available room.
4a. No available room, show error message.	4b. Show list available room	5. Touch room change tom
6. Send request change room	7. Change room	8. Show success message.
9a. Finish	9b. Finish.	

4.3.2.1.2. <Staff> View Report Information

Summary: This diagram shows how to view detail report in mobile application

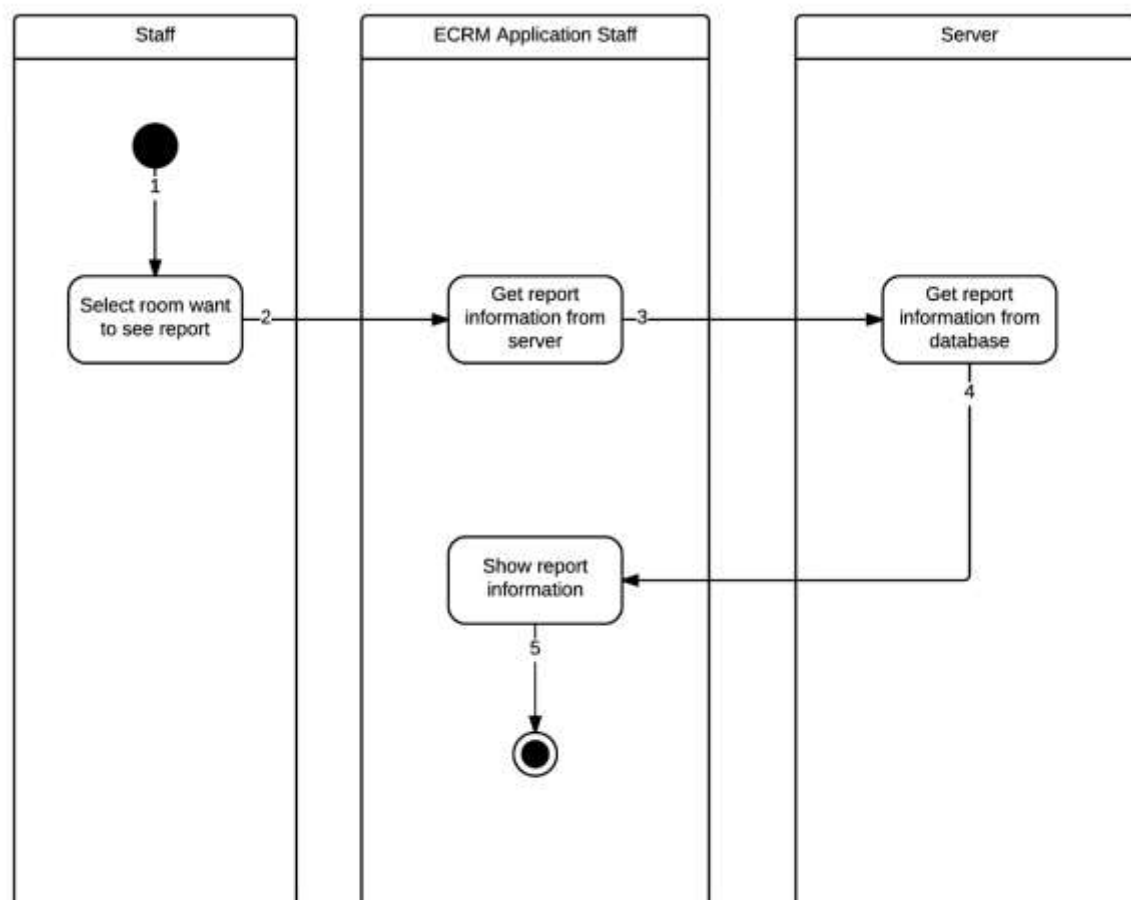


Figure 53: <Staff> View Report - Interactive Diagram

1. Start	2. Select room to view report	3. Send request get report to server
4. Show report detail	5. Finish.	

4.3.2.1.3. <Staff> Resolve Report

Summary: This diagram shows how to resolve report in mobile application

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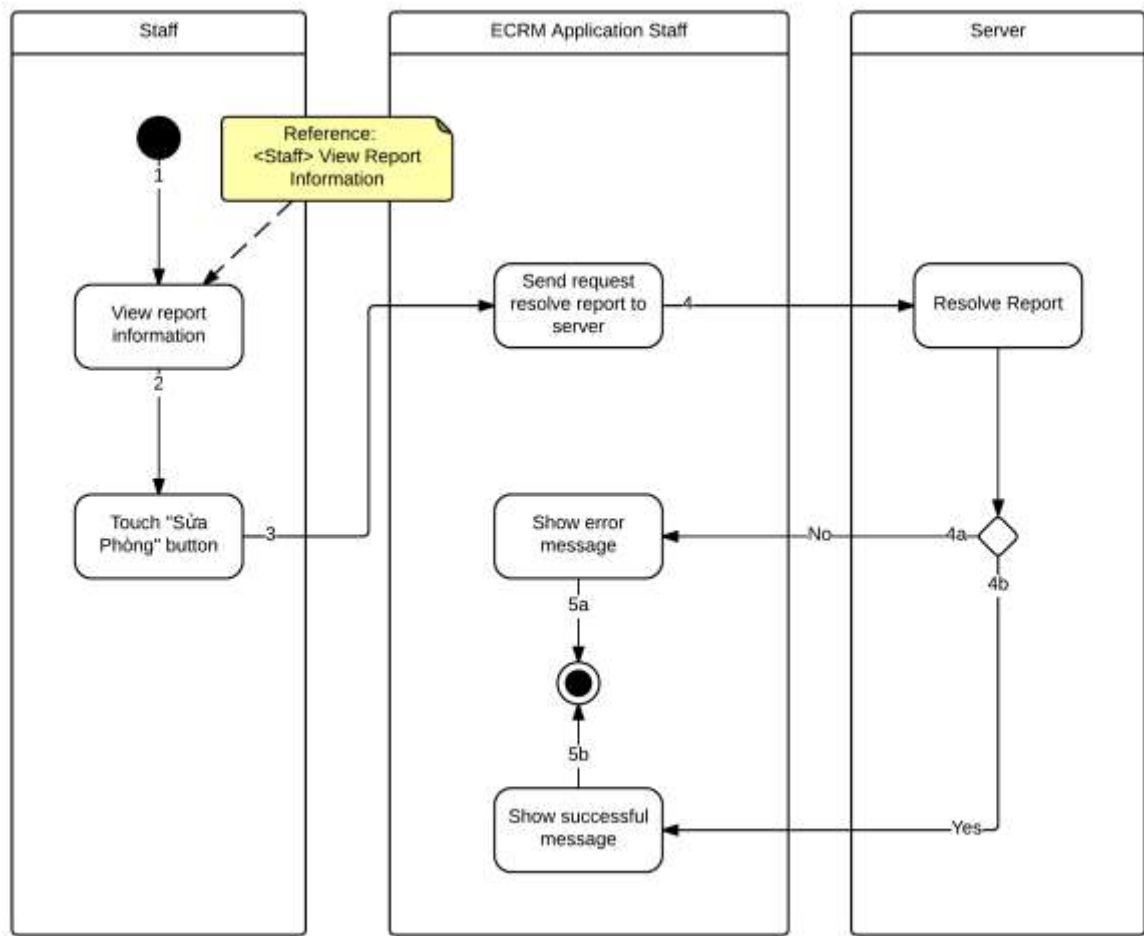


Figure 54: <Staff> Resolve Report - Interactive Diagram

1. Start	2. Touch “Sửa Phòng” button	3. Send request resolve report
4a. Resolve success, show success message	4b. Resolve failed, show error message.	5a. Finish
5b. Finish		

4.3.2.1.4. <Staff> Remove Report

Summary: This diagram shows how to remove report in mobile application.

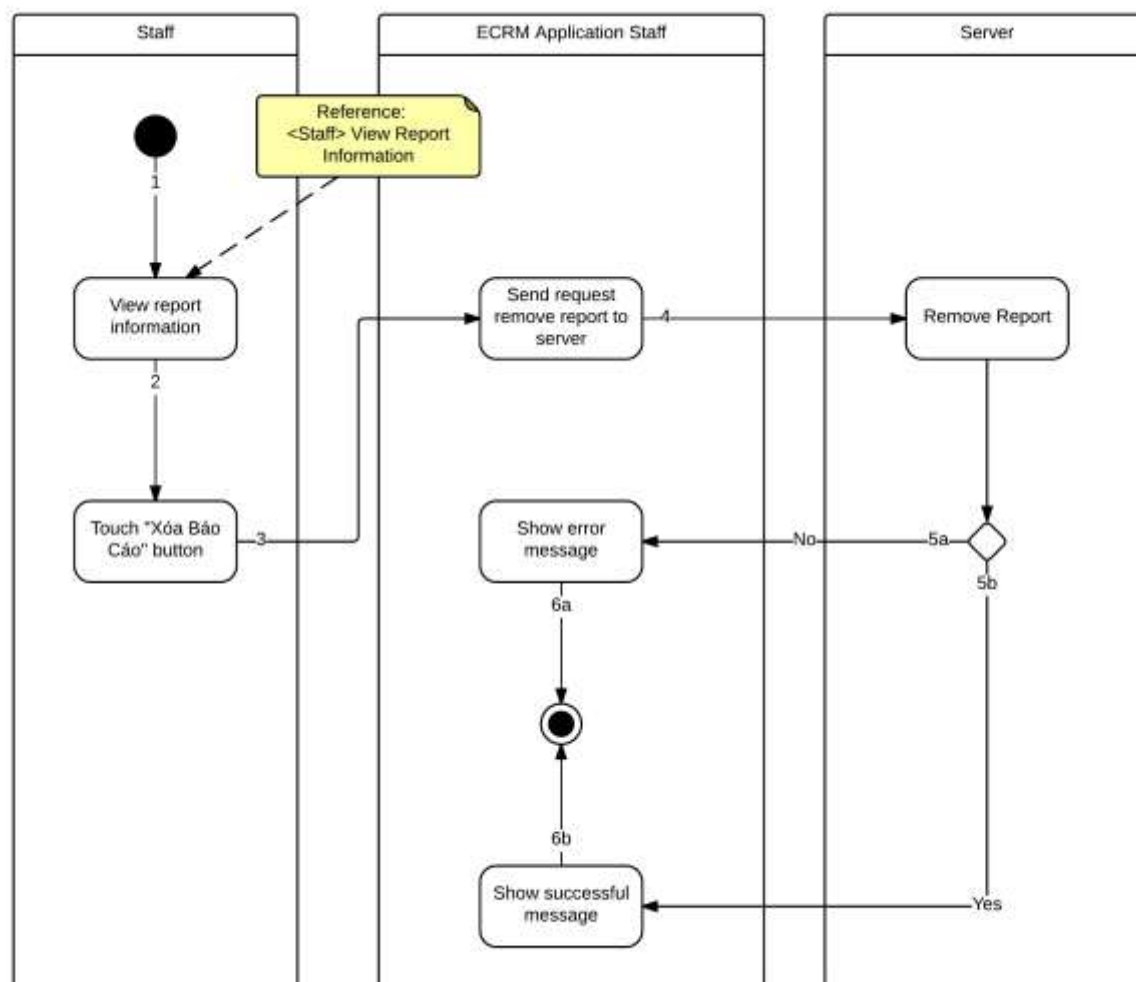


Figure 55: <Staff> Remove Report - Interactive Diagram

1. Start	2. View report	3. Touch “Xóa Báo Cáo” button
4. Send request remove to server	5a. Remove failed, show error message	5b. Remove success, show success message.
6a. Finish	6b. Finish.	

4.3.2.2. ECRM Teacher

4.3.2.2.1. <Teacher> Create Report

Summary: This diagram shows how to create report in mobile application

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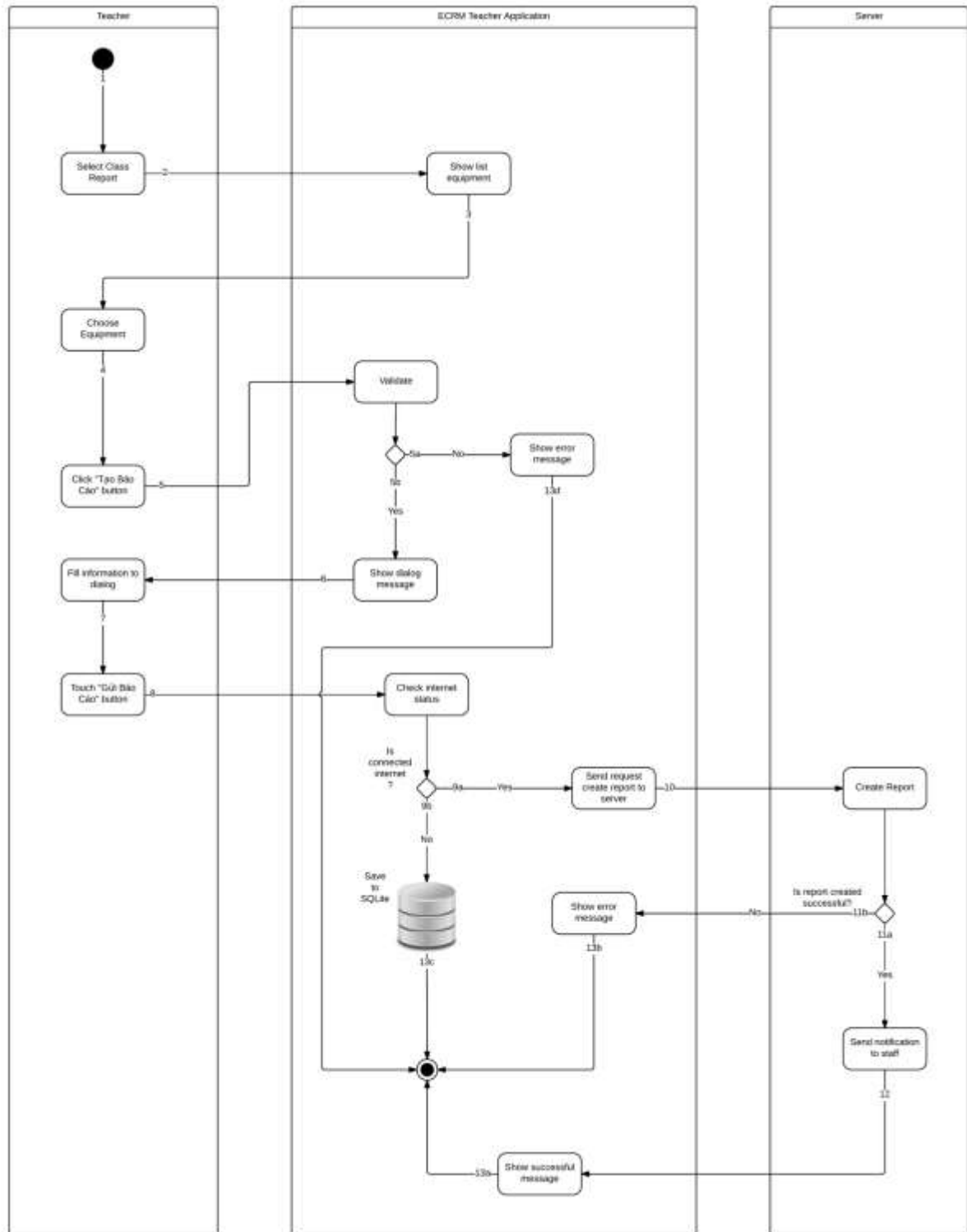


Figure 56: <Teacher> Create Report - Interactive Diagram

1. Start	2. Select Class	3. Show equipment of class
4. Choose equipment	5. Touch “Tạo Báo Cáo”	6a. Validate failed, show

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	button	error message.
6b. Validate success, show dialog	7. Choose evaluate	8. Touch “Gửi Báo Cáo” button
9a. Connect internet, send request to server	9b. Disconnect internet, save to local database.	10. Create report
11a. Create success, send notification to staff	11b. Create failed, show error message.	12. Show success message
13a. Finish	13b. Finish	13c. Finish
13d. Finish.		

4.3.2.2.2. <Teacher> View Report

Summary: This diagram shows how to view report in mobile application

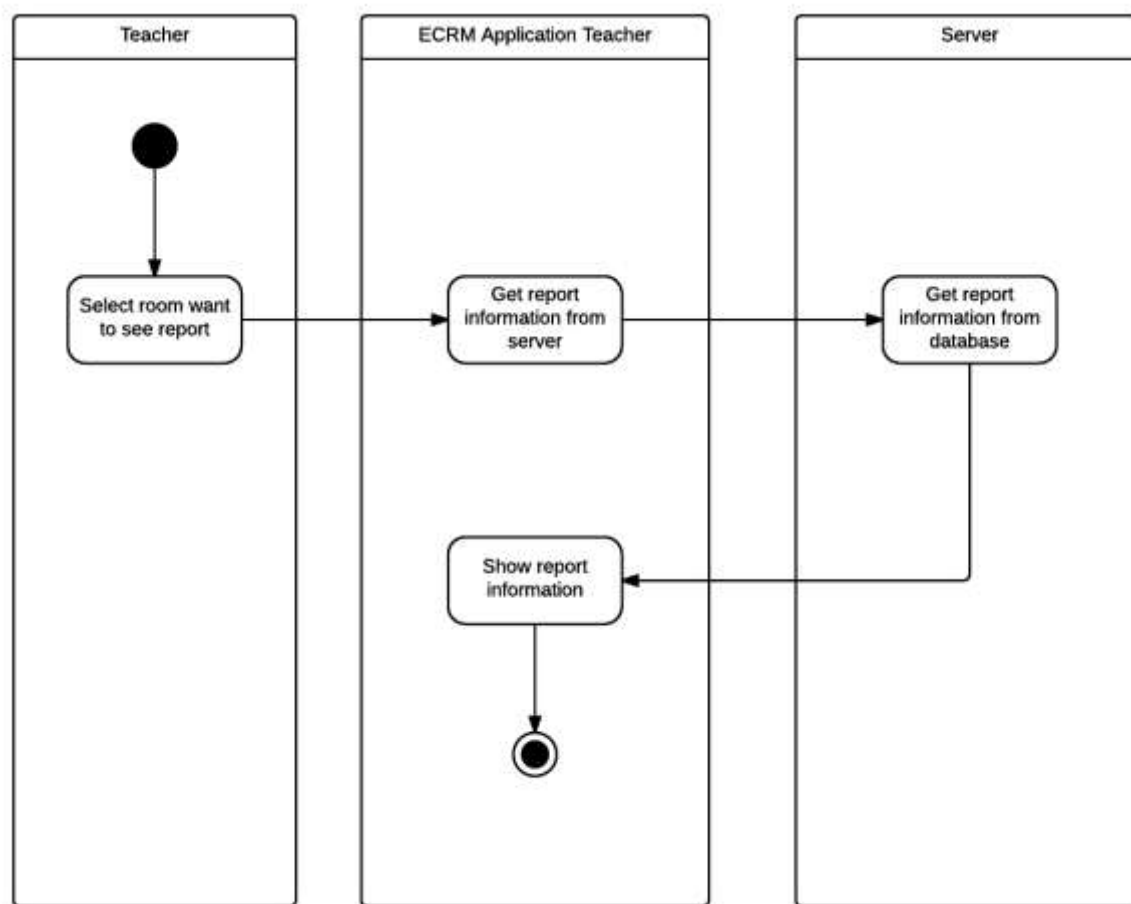


Figure 57: <Teacher> View Report - Interactive Diagram

1. Start	2. Select room	3. Send request to get report
4. Show report	5. Finish	

4.3.2.2.3. <Teacher> Edit Report

Summary: This diagram show how to edit exist report in mobile application

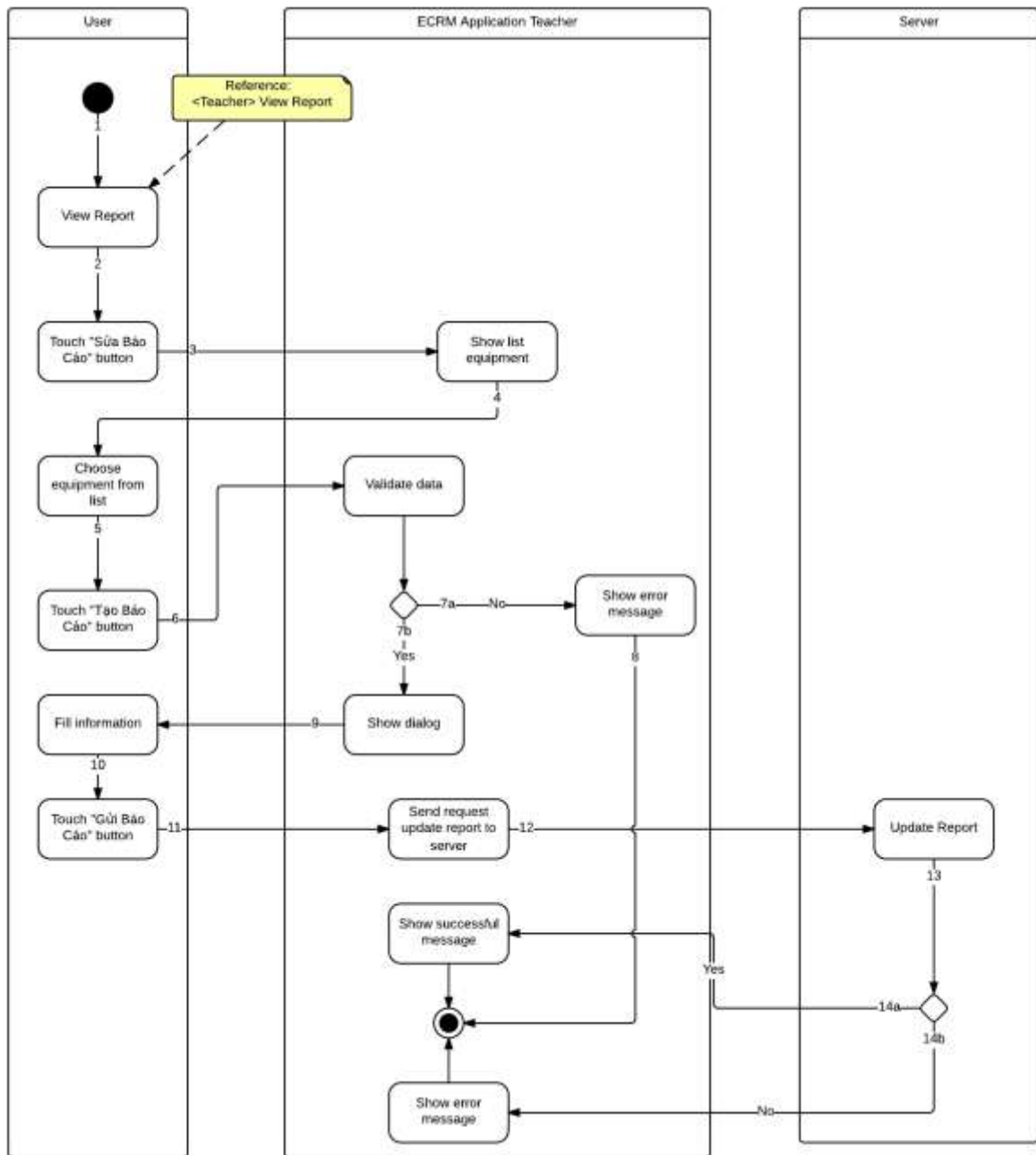


Figure 58: <Teacher> Update Report - Interactive Diagram

1. Start	2. View report detail	3. Touch "Sửa Báo Cáo" button
4. Choose equipment	5. Touch "Tạo Báo Cáo"	6. Validate data
7a. Validated failed, show	7b. Validated success, show	8. Finish

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error message	dialog confirm	
9. Choose evaluate	10. Touch “Gửi Báo Cáo” button	11. Update report
12. Send request to update report	13a. Update success, show success message	13b. Update failed, show error message.
14a. Finish	14b. Finish	

4.3.2.2.4. <Teacher> Remove Report

Summary: This diagram show remove exist report in mobile application

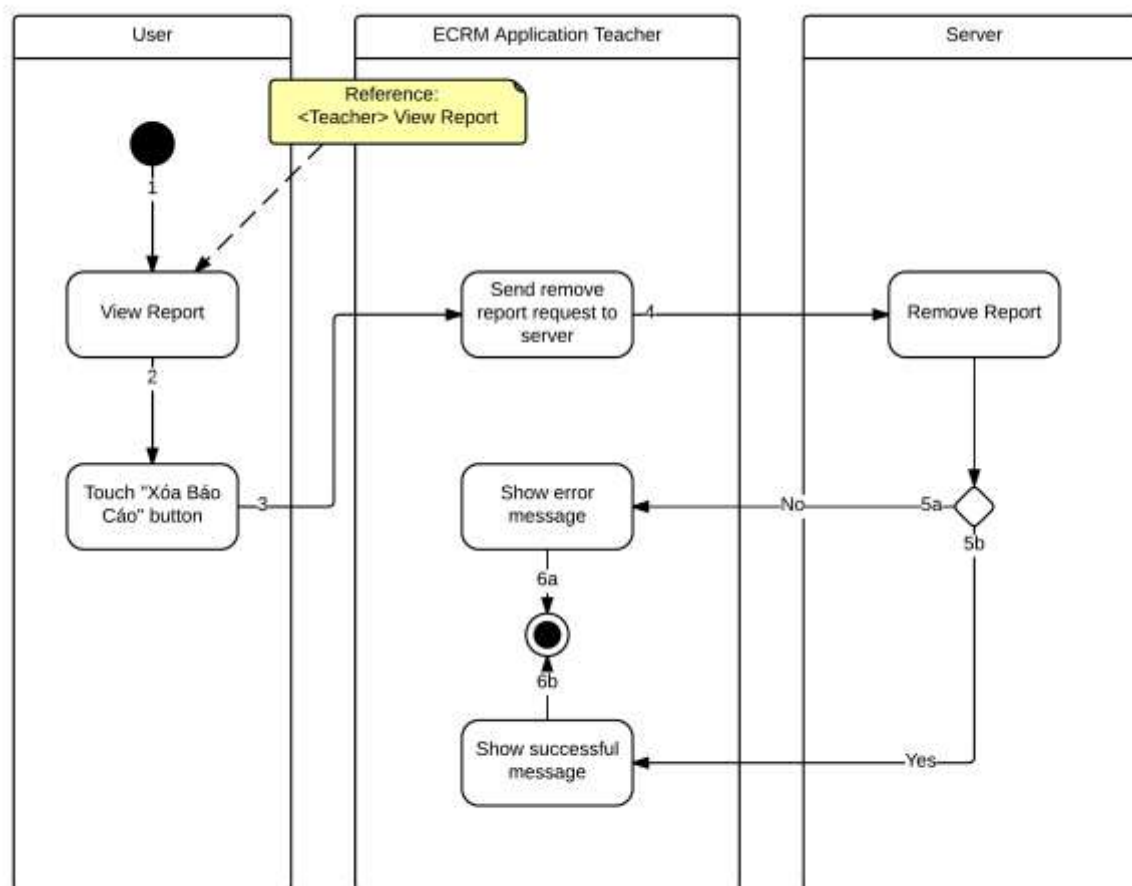


Figure 59: <Teacher> Remove Report - Interactive Diagram

1. Start	2. View report detail	3. Touch “Xóa Báo Cáo” button
4. Send request to remove report	5a. Remove failed, show error message	5b. Remove success, show success message.
6a. Finish	6b. Finish	

5. Interface

5.1. Component Interface

5.1.1. Web Service Interface

Signature	Description	Input	Output	Output Format	Exception
public ResultDTO checkConnection()	Check server status	N/A	Json Boolean the status of server	Boolean	JsonProcessingException
public AccountDTO Login(String username, String password)	Login to system with username and password	Request contains: Username: String Password: String	Json AccountEntity object	AccountEntity	JsonProcessingException NoResultException
public List<CategoryDTO> getCategory(String username)	Get all equipment category in system	Request contains: Username: String	Json String List of CategoryDTO	List CategoryEntity	JsonProcessingException NoResultException
public List<ScheduleDTO> getSchedule(String username)	Get schedule in day of account	Request contains: Username: String	Json String List of ScheduleDTO	List ScheduleEntity	JsonProcessingException NoResultException
public List<EquipmentClassDTO> getEquipment(Integer classId)	Get equipment of classroom	Request contains: classId: Integer	Json String List of EquipmentClassDTO	List EquipmentEntity	JsonProcessingException NoResultException
public ResultDTO createReport(Report r)	Create report from mobile	Request object contains: Username: String classId: Integer	Json String ResultDTO	ResultEntity	JsonProcessingException NoResultException

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		listDamaged: String listPosition: String listDescription: String evaluate: String listEvaluate: String createTime: String			
public List<ReportDTO> getReportByUsername(String username, Integer offset, Integer limit)	Get limit report of user has username from offset	Request contains: Username: String Offset: Integer Limit: Integer	Json String List ReportDTO	List ReportEntity	JsonProcessingException NoResultException
public List<ReportClassDTO> getReportStaff(String status, Integer limit, Integer offset)	Get limi report of staff with status from offset	Request contains: Status: String Limit: Integer Offset: Integer	Json String List ReportDTO	List ReportClassEntity	JsonProcessingException NoResultException
public List<String> getAvailableRoom(Integer classId)	Get available room with same options with current room.	Request contains: classId: Integer	Json String List Classroom	List String Classroom	JsonProcessingException NoResultException
public ResultDTO changeRoom(Integer from, Integer to)	Change schedule of user from current room to new room	Request contains: from: Integer to: Integer	Json String ResultDTO	ResultEntity	JsonProcessingException.
public ClassDTO getClassroom(Integer classId)	Get properties of classroom to	Request contains: classId: Integer	Json String ClassDTO	ClassEntity	JsonProcessingException

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r classId)	save local				NoResultException
public List<ScheduleDTO> getAllSchedule(String username)	Get all schedule in week of user	Request contains: Username: String	Json String List ScheduleDTO	Schedule Entity	JsonProcessingException NoResultException
public ResultDTO remove(String username, Integer reportId)	Remove report	Request contains: Username: String reportId: Integer	Json String ResultDTO	ResultEntity	JsonProcessingException NoResultException
public ResultDTO editReport	Edit report	Request contains: reportId: String Username: String classId: Integer listDamaged: String listPosition: String listDescription: String evaluate: String listEvaluate: String createTime: String	Json String ResultDTO	ResultEntity	JsonProcessingException NoResultException
public ResultDTO sendNotification (String message, String ListUser)	Send message to listUser by GCM notification	Request contains: Message: String ListUser: String	Json String ResultDTO	ResultEntity	JsonProcessingException NoResultException
public ResultDTO sendSMS (String message, String listUser)	Send message to listUser by SMS	Request contains: Message: String ListUser: String	Json String ResultDTO	ResultEntity	JsonProcessingException NoResultException
public boolean checkSchedule(Integer classId)	Check class has schedule after current time or	Request contains: classId: Integer	Json Boolean	Boolean	JsonProcessingException NoResultException

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	not				
public ResultDTO resolveReport (String listRoom)	Resolve report by room	Request contains: listRoom: String	Json String ResultDTO	ResultEnt ity	JsonProcessingExcepti on NoResultException
public int getFloor()	Get number of floor in school	N/A	Json String Integer	Integer	NoResultException
public List<List<ClassDTO> > getRoomInFloor()	Get all classrooms in school.	N/A	Json String List of List ClassDTO	ClassEntit y	JsonProcessingExcepti on NoResultException

Table 51: Web Service Interface

Entity

Entity	Description
ResultEntity	Integer error_code String error
AccountEntity	String username String password String fullname String phone String role String lastLogin String status
CategoryEntity	String id String name String imageUrl
ScheduleEntity	Integer classId String className String timeFrom String timeTo String date

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ReportEntity	Integer reportId String username String fullname Integer classId String className String createTime String evaluate Boolean status Integer damageLevel String changedRoom List<ReportDetailEntity> listEquipments
EquipmentEntity	String equipmentName String timeRemain String company Boolean isDamaged
ReportDetailEntity	String equipmentName String description String damaged Boolean status String solution Timestamp resolveTime
ReportClassEntity	Integer roomId String roomName String timeReport Integer damageLevel String evaluate String userReport Integer systemEvaluate String changeRoom List<EquipmentReportEntity> listEquipments
EquipmentReportEntity	Integer reportId

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	Integer equipmentId String equipmentName Integer quantity Boolean status String evaluate String damage
ClassEntity	Integer classId String className Integer damageLevel

Table 52: Web Service Interface - Entity

Exceptions

Exception	Description
JsonProcessingException	encountered when processing (parsing, generating) JSON content that are not pure I/O problems
NoResultException	Thrown by the persistence provider when getSingleResult() is executed on a query and there is no result to return

Table 53: Web Service Interface - Exceptions

5.2. Web Application Design

5.2.1. User Interface Design

5.2.1.1. Home Page Screen

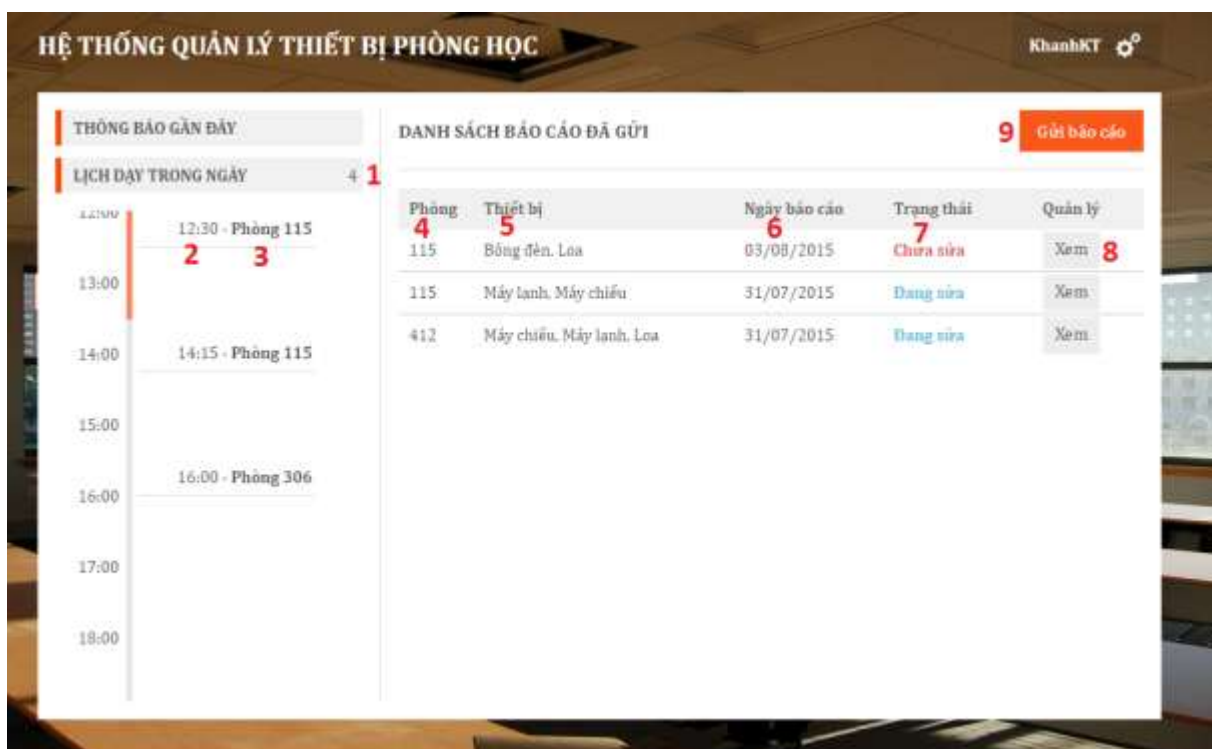


Figure 60: Home Page Screen

Fields

No	Field Name	Description	Read only	Mandatory	Control Type	Data Type	Length
1	lblTotal	Total schedule of teacher in day	Yes	Yes	Label	String	0 – 10
2	lblTimeStart	Time start of each schedule	Yes	Yes	Label	String	0 – 10
3	lblScheRoom	Room name of schedule	Yes	Yes	Label	String	0 - 30
4	lblRoom	Room name	Yes	Yes	Label	String	0 – 30

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		of report					
5	lblEquipment	List of equipment has reported	Yes	Yes	Label	String	0 – 30
6	lblTimeReport	Time user create report	Yes	Yes	Label	String	0 – 30
7	lblStatus	Current status of report	Yes	Yes	Label	String	0 – 30

Table 54: Home Page Screen – Fields

Buttons

No	Function	Description	Validation	Outcome
8	btnView	View detail report	No	Show form include all information about report
9	btnCreate	Create new report	No	Navigate to create report screen.

Table 55: Home Page Screen - Buttons

5.2.1.2. Create Report Screen

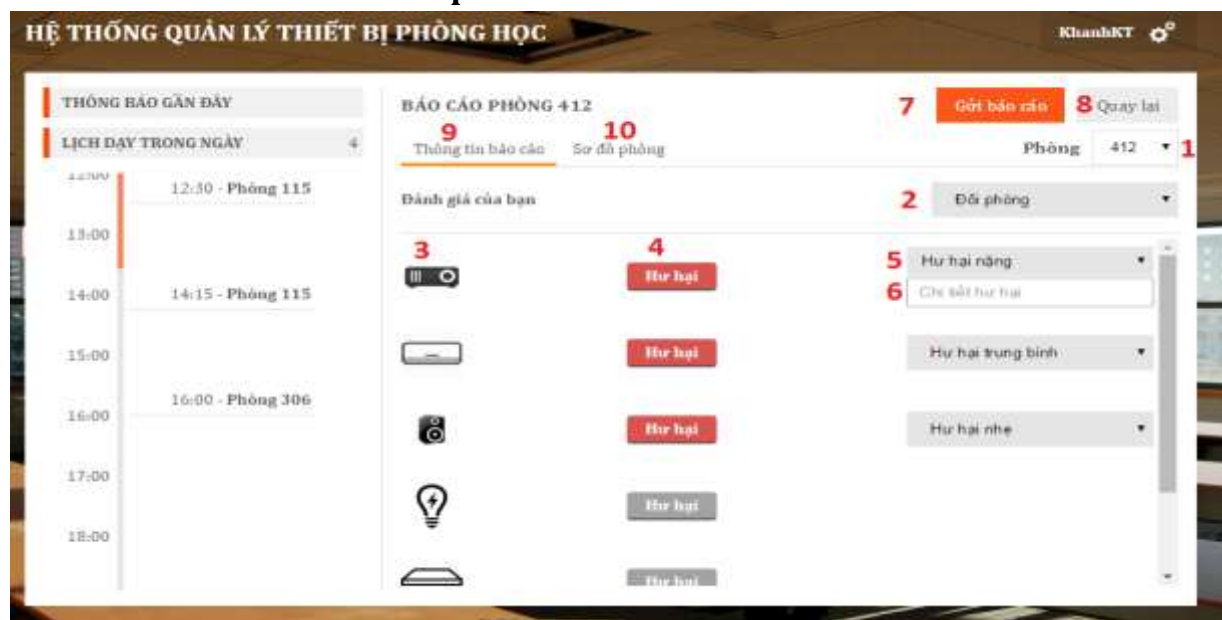


Figure 61: Create Report Screen

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Fields

No	Field Name	Description	Read only	Mandatory	Control Type	Data Type	Length
1	ddlRoom	Room user want report	No	Yes	Dropdown list	String	0 – 10
2	ddlEvaluate	Evaluate of user about room	No	Yes	Dropdown list	String	0 – 50
3	imgEquipment	Equipment image	Yes	Yes	Image	Image	N/A
5	ddlDamage	Damage of equipment	No	Yes	Dropdown list	String	0 – 50
6	txtDetail	Detail damage of equipment	No	No	String	String	0 – 50

Table 56: Create Report Screen – Fields

Buttons

No	Function	Description	Validation	Outcome
4	btnDamage	Check equipment has damaged	No	Show view for user to fill information about damaged
7	btnCreate	Create new report	No	Create report base on information has filled
8	btnBack	Back to previous page	No	Back to previous page
9	tabDetail	Show tab detail	No	Navigate to tab detail
10	tabMap	Show tab map	No	Navigate to tab map classroom.

Table 57: Create Report Screen - Buttons

5.2.2. Staff Interface Design

5.2.2.1. Manage Report Screen

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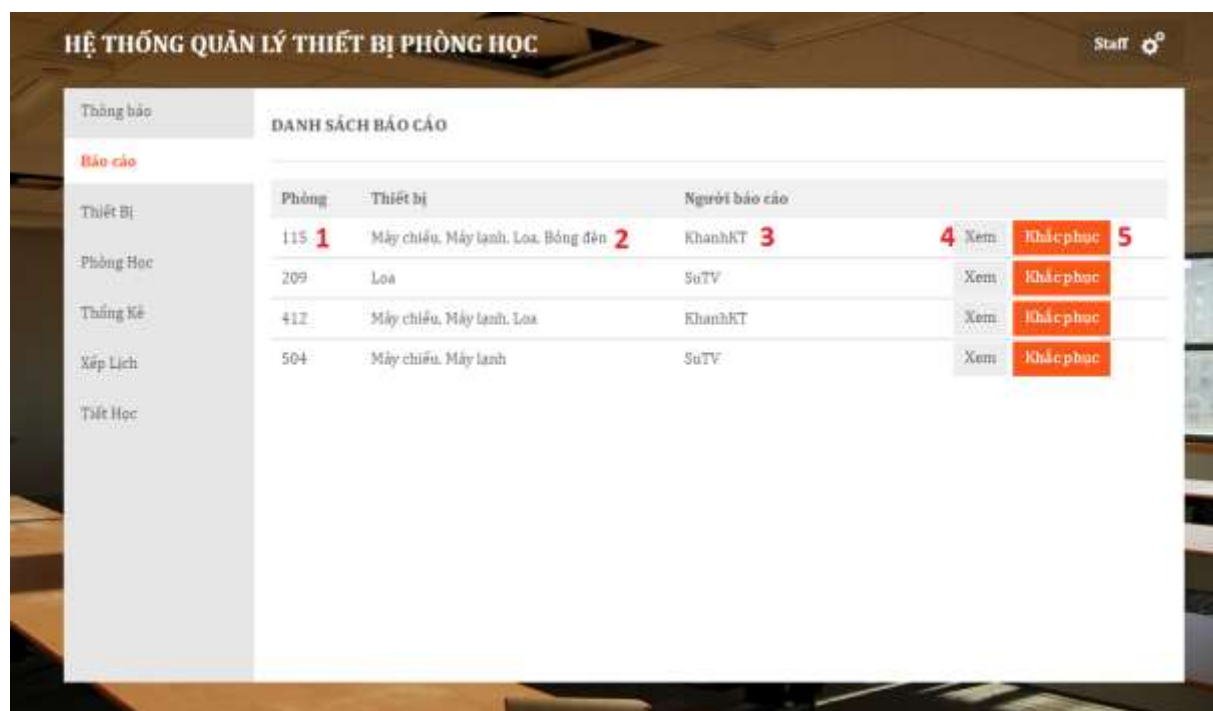


Figure 62: Manage Report Screen

Fields

No	Field Name	Description	Read only	Mandatory	Control Type	Data Type	Length
1	lblRoomName	Name of classroom	Yes	Yes	Label	String	0 – 10
2	lblEquipment	List equipment has reported in classroom	Yes	Yes	Label	String	0 – 80
3	lblUser	User create report	Yes	Yes	Label	String	0 - 30

Table 58: Manage Report Screen – Fields

Buttons

No	Function	Description	Validation	Outcome
4	btnView	View detail report	No	Show form include all information about report

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5	btnResolve	Resolve report	No	Change status of report to resolve.
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Table 59: Manage Report Screen - Buttons

5.2.2.2. Manage Classroom Screen

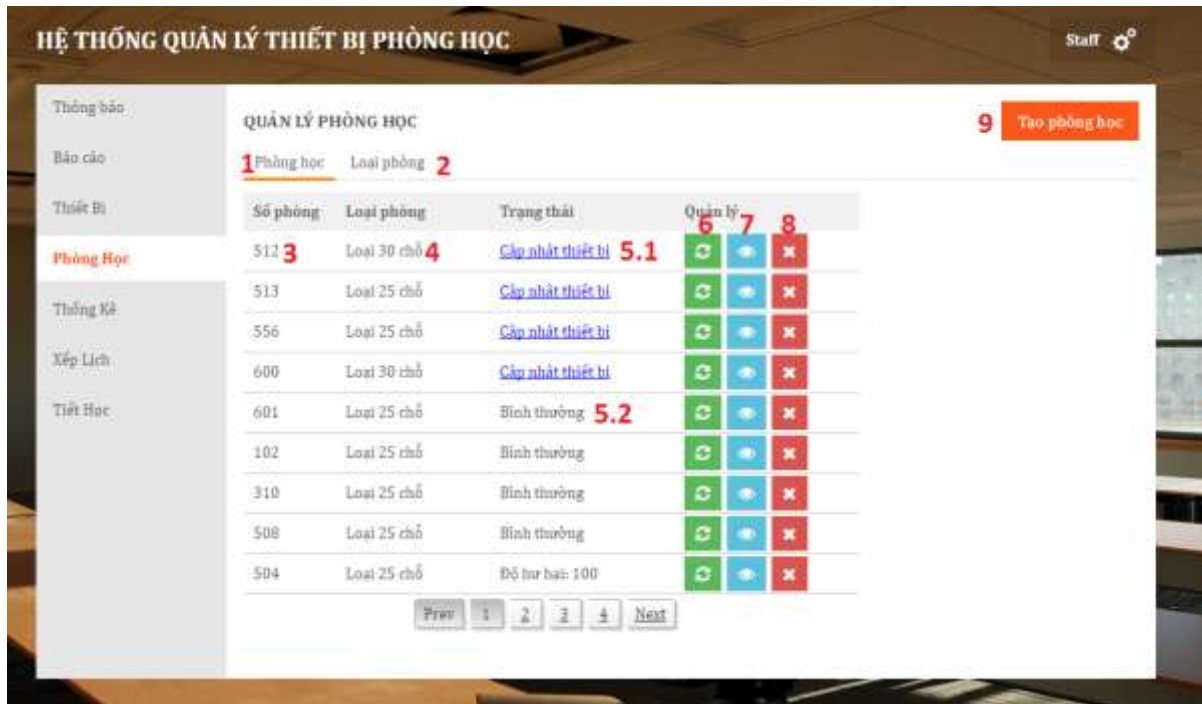


Figure 63: Manage Classroom Screen

Fields

No	Field Name	Description	Read only	Mandatory	Control Type	Data Type	Length
3	lblRoomName	Name of classroom	Yes	Yes	Label	String	0 – 10
4	lblType	Type of classroom	Yes	Yes	Label	String	0 – 80
5.1	lblStatus	Status of classroom	No	Yes	Link	String	0 - 50
5.2	lblStatus	Status of classroom	Yes	Yes	Label	String	0 – 50

Table 60: Manage Classroom Screen - Fields

Buttons

ECRM – Equipment’s Classroom Management

No	Function	Description	Validation	Outcome
1	tabClassroom	View tab classroom	No	Change view to tab classroom
2	tabRoomType	View tab room type	No	Change view to tab room type
6	btnChange	Change room	No	Change from current room to new room
7	btnView	View detail of room	No	View detail of room
8	btnRemove	Remove room	No	Remove room from system
9	btnCreate	Create new room	No	Create new room to system

Table 61: Manage Classroom Screen – Buttons

5.2.2.3. Manage Equipment Screen

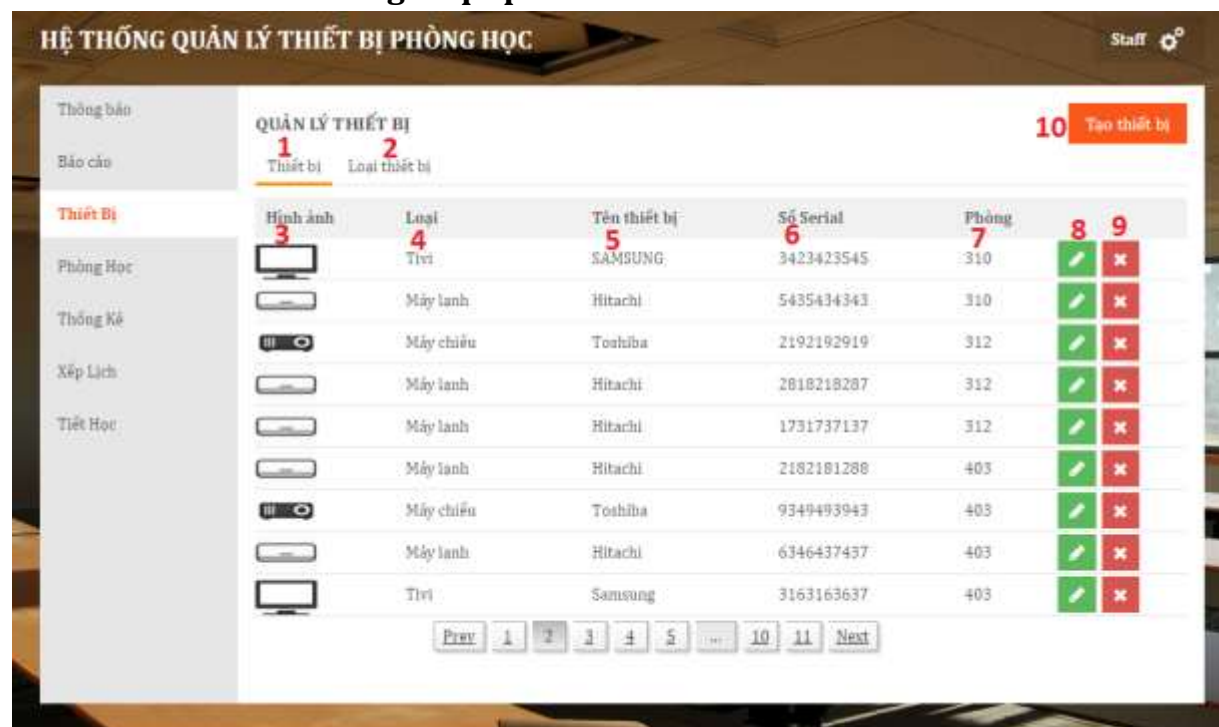


Figure 64: Manage Equipment Screen

Fields

ECRM – Equipment’s Classroom Management

No	Field Name	Description	Read only	Mandatory	Control Type	Data Type	Length
3	imgCategory	Image of equipment category	Yes	Yes	Image	Image	N/A
4	lblCategory	Category of equipment	Yes	Yes	Label	String	0 – 80
5	lblName	Name of equipment	Yes	Yes	Label	String	0 – 80
6	lblSerial	Serial number of equipment	Yes	Yes	Label	String	0 – 50
7	lblRoom	Room of equipment	Yes	Yes	Label	String	0 – 10

Table 62: Manage Equipment Screen – Fields

Buttons

No	Function	Description	Validation	Outcome
1	tabEquipment	View tab equipment	No	Change view to tab equipment
2	tabCategory	View tab category	No	Change view to tab category
8	btnUpdate	Update equipment	No	Update information of equipment
9	btnRemove	Remove equipment	No	Remove equipment from system
10	btnCreate	Create equipment	No	Create new equipment to system

Table 63: Manage Equipment Screen - Buttons

5.2.2.4. Schedule Screen

ECRM – Equipment’s Classroom Management

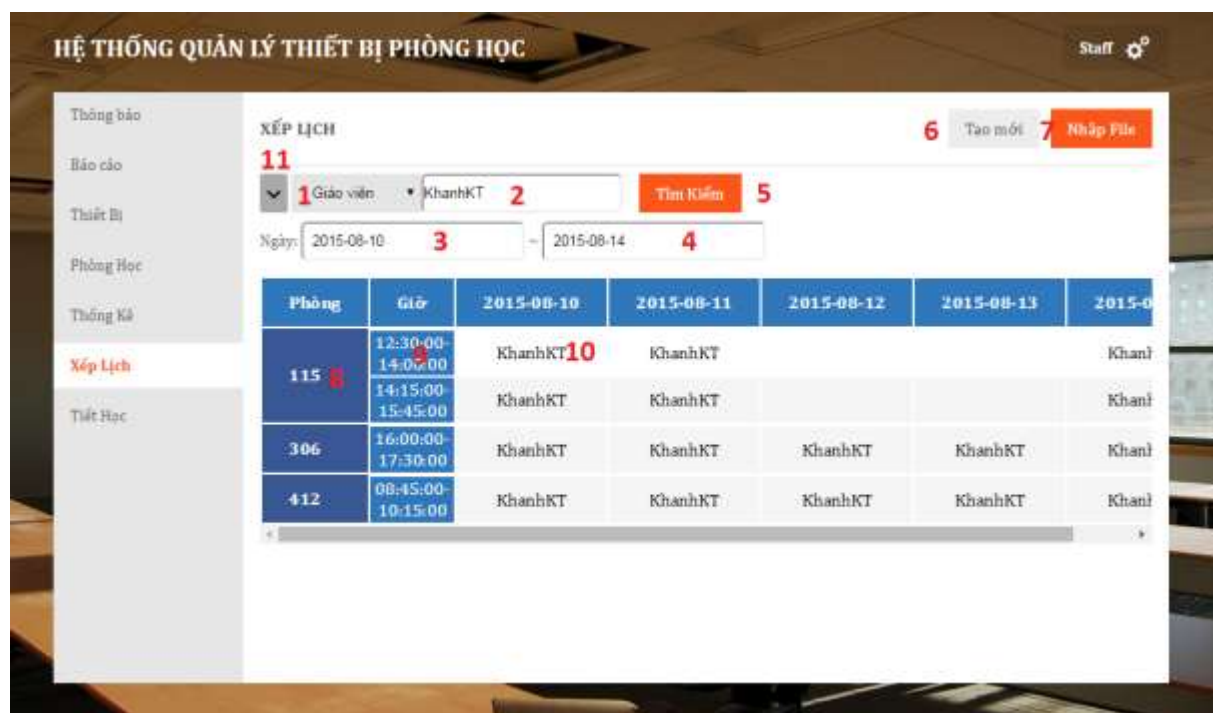


Figure 65: Schedule Screen

Fields

No	Field Name	Description	Read only	Mandatory	Control Type	Data Type	Length
1	ddlType	Type to search schedule	Yes	No	Dropdown list	String	0 – 30
2	txtKeyword	Keyword to search schedule	No	Yes	String	String	0 – 20
3	txtTimeFrom	Time start of schedule	No	No	DateTime	DateTime	0 - 20
3	txtTimeTo	Time end of schedule	No	No	DateTime	DateTime	0 – 20
8	txtRoom	Room name of schedule	Yes	Yes	String	String	0 – 10
9	txtTime	Time of schedule	Yes	Yes	String	String	0 – 10

ECRM – Equipment’s Classroom Management

10	txtUser	User schedule	of Yes	Yes	String	String	0 – 10
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Table 64: Schedule Screen – Fields

Buttons

No	Function	Description	Validation	Outcome
5	btnSearch	Search schedule from keyword, time from and time to	No	Search from system schedule base on keyword, time from, time to, and show in list bellow.
6	btnManual	Manual import schedule	No	Manual import schedule for user
7	btnFile	Import file schedule	No	Import schedule file to system with template create by system.
11	btnAdvanced	Advanced search schedule	No	Show text box TimeFrom and TimeTo to search detail.

Table 65: Schedule Screen - Buttons

5.2.2.5. Manual Import Schedule Screen

ECRM – Equipment’s Classroom Management

The screenshot shows a web application interface for manual schedule import. The main window is titled 'Nhập Lịch Bảng Tay' (Manual Import Schedule). It contains several input fields and checkboxes. Red numbers 1 through 11 are placed over the form to identify specific fields for data entry or validation. The fields include: Username (1), Start time (2), Number of slots (3), Number of students (4), Start date (5), End date (6), Find empty room checkbox (7), Room number (8), Send message checkbox (9), Create button (10), and Cancel button (11).

Figure 66: Manual Import Schedule Screen

Fields

No	Field Name	Description	Read only	Mandatory	Control Type	Data Type	Length
1	txtUsername	Username of account for schedule	No	Yes	String	String	0 – 50
2	ddlTimeStart	Time start of schedule	No	Yes	Dropdown list	String	0 – 80
3	ddlNoSlots	Number of slot of schedule	No	Yes	Dropdown list	String	0 – 30
4	txtNoStudents	Number of student in schedule	No	Yes	String	String	0 – 5
5	txtTimeFrom	Date start schedule	No	Yes	DateTime	DateTime	0 – 30
6	txtTimeEnd	Date end schedule	No	Yes	DateTime	DateTime	0 – 30

ECRM – Equipment’s Classroom Management

8	txtRoom	Name of room for schedule	No	Yes	String	String	0 – 10
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Table 66: Manual Import Schedule Screen – Fields

Buttons

No	Function	Description	Validation	Outcome
7	ckFindRoom	Find available room	No	Show list room available from input schedule
9	ckSendSMS	Send SMS	No	Send SMS message to username.
10	btnCreate	Create schedule	No	Create new schedule from input to database
11	btnBack	Back to previous page	No	Close form

Table 67: Manual Import Schedule Screen - Buttons

5.2.3. Admin Interface Design

5.2.3.1. Manage Account Screen

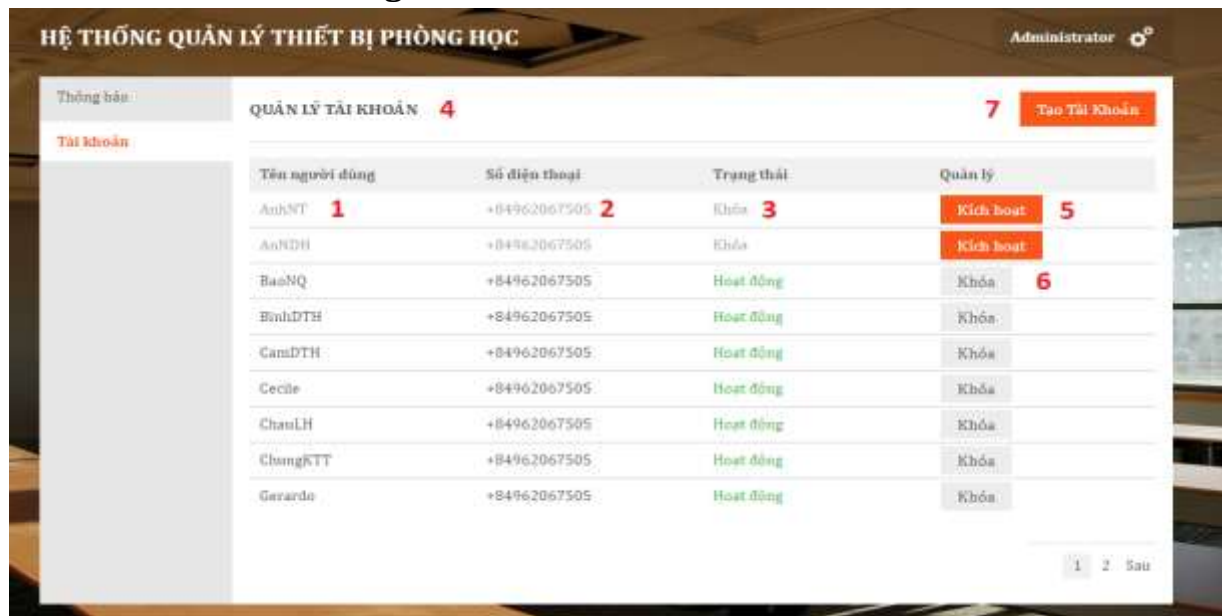


Figure 67: Manage Account Screen

Fields

No	Field Name	Description	Read only	Mandatory	Control Type	Data Type	Length
1	lblUsername	Username of account in system	Yes	Yes	String	String	0 - 55
2	lblPhone	Phone of account in system	Yes	Yes	Label	String	0 - 15
3	lblStatus	Status of account in system	Yes	Yes	Label	String	0 - 30
4	lblName	Page name	Yes	Yes	Label	String	0 – 50

Table 68: Manage Account Screen – Fields

Buttons

No	Function	Description	Validation	Outcome
5	btnActive	Activate account in system	No	Change user status to activate
6	btnDeActivate	Deactive account in system	No	Change user status to deactivate
7	btnCreate	Create new account in system	No	Show form to create new account

Table 69: Manage Account Screen - Buttons

5.2.3.2. Create Account Screen

ECRM – Equipment’s Classroom Management

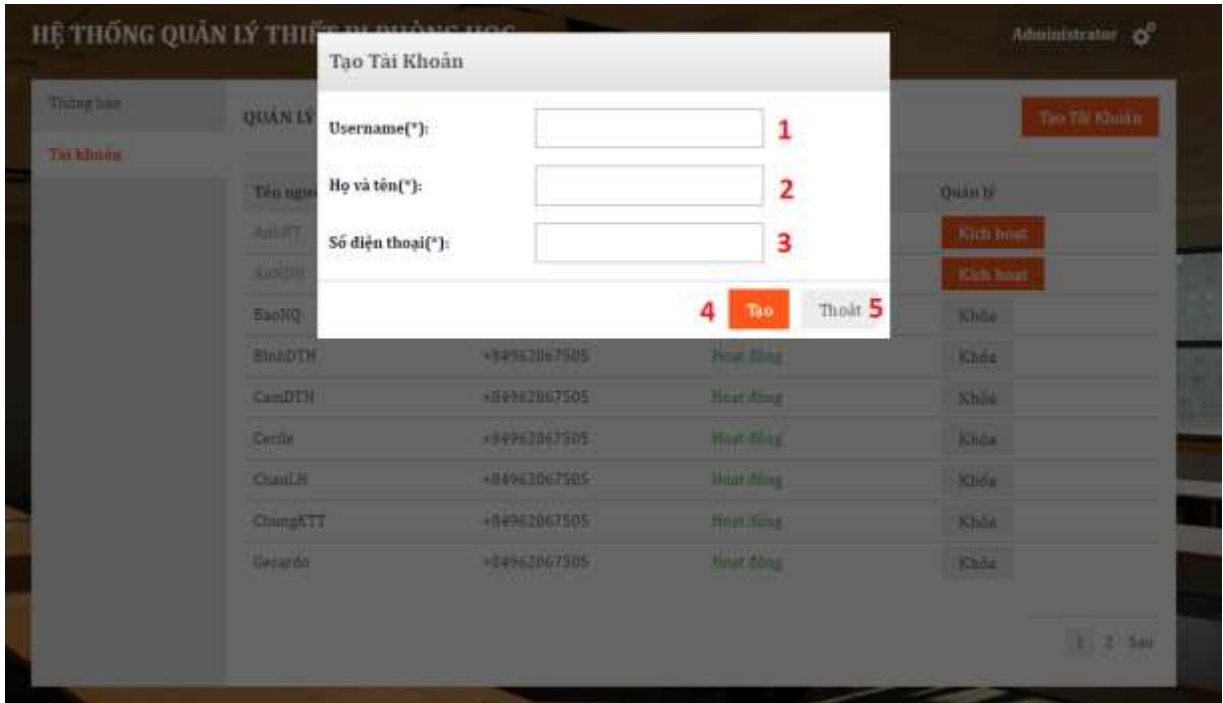


Figure 68: Create Account Screen

No	Field Name	Description	Read only	Mandatory	Control Type	Data Type	Length
1	txtUsername	Username of account in system	Yes	Yes	String	String	0 - 30
2	txtFullname	Fullname of user in system	Yes	Yes	String	String	0 - 50
3	txtPhone	Phone of user in system	Yes	Yes	String	String	0 - 15

Table 70: Create Account Screen – Fields

No	Function	Description	Validation	Outcome
4	btnCreate	Create new account in system	Yes	Insert new account to system
5	btnBack	Back to previous page	No	Close form

Table 71: Create Account Screen - Buttons

5.3. ECRM Staff Design

5.3.1. List Report Newest Screen



Figure 69: List Report Newest Screen

Fields

No	Field Name	Description	Read only	Mandatory	Control Type	Data Type	Length
1	txtKeyword	Keyword to search report	No	Yes	Textbox	String	0 - 35
3	lblRoomName	Name of classroom	Yes	Yes	Label	String	0 - 35
4	lblUser	User create	Yes	Yes	Label	String	0 - 30

ECRM – Equipment’s Classroom Management

		report					
5	lblDamageLevel	Damage Level analyze by system	Yes	Yes	Label	String	0 – 10
6	lblUserSuggest	Suggest of user when create report	Yes	Yes	Label	String	0 - 50

Table 72: List Report Newest Screen – Fields

Buttons

No	Function	Description	Validation	Outcome
2	btnSearch	Search report by keyword	No	Show list report search by keyword
7	lstReport	Click to view report detail	No	Navigate to report detail screen

Table 73: List Report Newest Screen - Buttons

5.3.2. Report Detail Screen

Phòng học: 312 **1**
 Thời gian: 2015-08-06... **2**
 Độ hư hại: 100 **3**
 Đề xuất của GV: Vẫn dạy được **4**
 Người báo cáo: SuTV, KhanhKT **5**
 Đề xuất hệ thống: Đổi phòng **6**
 Danh sách thiết bị được báo cáo:

11 
8 Loa - Số lượng: 1 **7**
 Mức độ hư hại: Nặng **9**
 Không sử dụng được **10**


 Máy lạnh - Số lượng: 1
 Mức độ hư hại: Nặng
 Không sử dụng được


 Máy chiếu - Số lượng: 1
 Mức độ hư hại: Nặng
 Không sử dụng được


 Ghế - Số lượng: 1
 Mức độ hư hại: Nặng

Đổi phòng học **12** Khắc phục **13**

Figure 70: Report Detail Screen

Fields

No	Field Name	Description	Read only	Mandatory	Control Type	Data Type	Length
1	lblRoomName	Name of classroom	Yes	Yes	Label	String	0 - 35
2	lblTimeReport	Time create report	Yes	Yes	Label	String	0 - 35

ECRM – Equipment’s Classroom Management

3	lblDamageLevel	Damage level analyze by system	Yes	Yes	Label	String	0 - 35
4	lblUserSuggest	Suggest of teacher	Yes	Yes	Label	String	0 – 35
5	lblUserReport	Username of user create report	Yes	Yes	Label	String	0 – 35
6	lblSystemSuggest	Recommend of system	Yes	Yes	Label	String	0 – 35
7	lblQuantity	Quantity of equipment category	Yes	Yes	Label	String	0 – 10
8	lblEquipmentName	Name of damage equipment	Yes	Yes	Label	String	0 – 50
9	lblDamage	Damage of equipment	Yes	Yes	Label	String	0 – 50
10	lblEvaluate	Evaluate equipment	Yes	Yes	Label	String	0 – 50
11	imgEquipment	Image of equipment	Yes	Yes	Image	Bitmap	N/A

Table 74: Report Detail Screen – Fields

Buttons

No	Function	Description	Validation	Outcome
12	btnChangeRoom	Click to change from current room to new room	No	Show dialog for staff to choose new room for changing
13	btnResolve	Click to check report has	No	Change status of report to

		resolved		resolved
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Table 75: Report Detail Screen - Buttons

5.3.3. Room Manage Screen

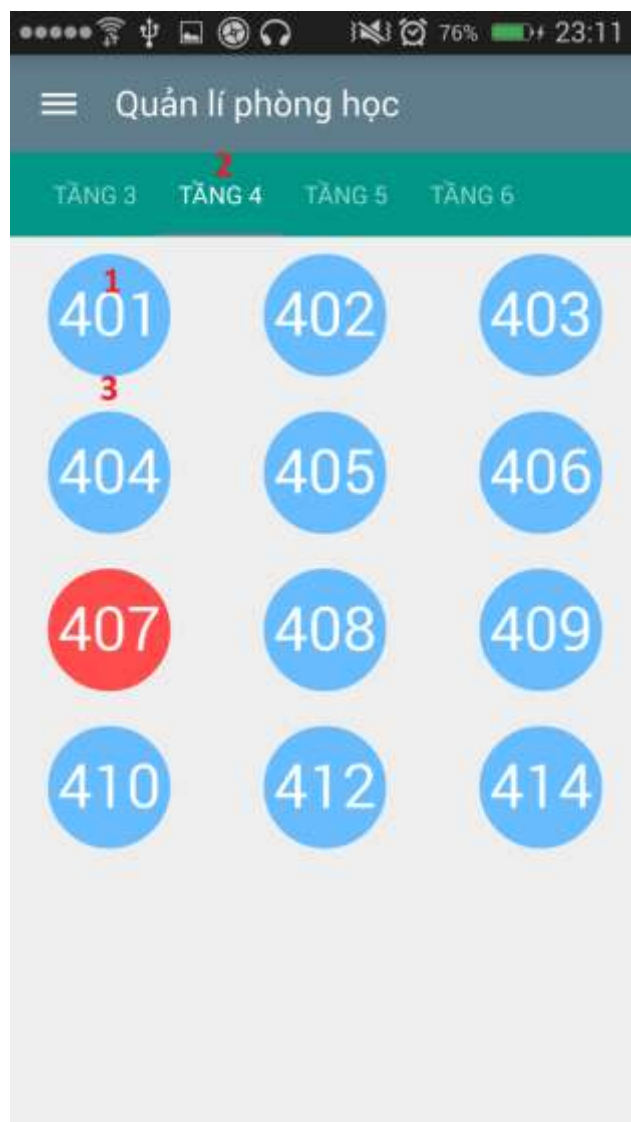


Figure 71: Room Manage Screen

Fields:

No	Field Name	Description	Read only	Mandatory	Control Type	Data Type	Length
1	lblRoomName	Name of classroom	No	Yes	Label	String	0 - 35

Table 76: Room Manage Screen - Fields

ECRM – Equipment’s Classroom Management

Buttons

No	Function	Description	Validation	Outcome
2	tabFloor	Click to view class room in each floor	No	System navigate to floor user choose
3	lstRoom	Click to change room	No	Show dialog change room

Table 77: Room Manage Screen - Buttons

5.4. ECRM Teacher Design

5.4.1. Schedule Screen

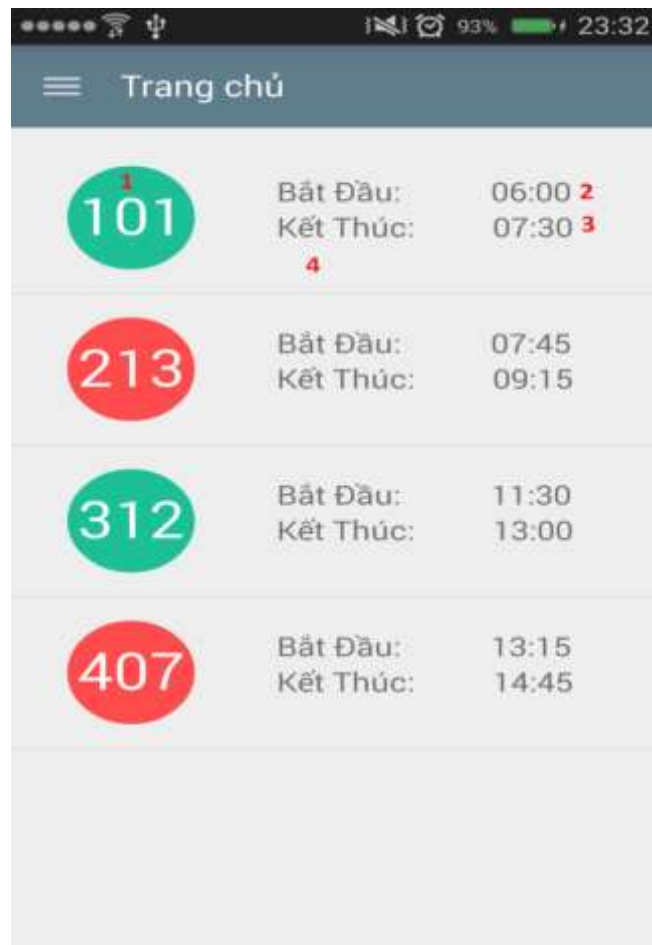


Figure 72: Schedule Screen

Fields

ECRM – Equipment’s Classroom Management

No	Field Name	Description	Read only	Mandatory	Control Type	Data Type	Length
1	lblRoomName	Name of classroom	Yes	Yes	Label	String	0 - 35
2	lblTimeFrom	Time start of schedule	Yes	Yes	Label	String	0 - 35
3	lblTimeTo	Time end of schedule	Yes	Yes	Label	String	0 - 35

Table 78: Schedule Screen - Fields

Buttons

No	Function	Description	Validation	Outcome
4	lstSchedule	Click to a row from list to create report in this classroom	N/A	Navigate to create report screen

Table 79: Schedule Screen - Buttons

5.4.2. Report Detail Screen

Phòng học: 312 **1**
 Thời gian: 21:49 - 06/08 **2**
 Độ hư hại: 100 **3**
 Đề xuất của GV: Vẫn dạy được **4**
 Người báo cáo: SuTV **5**
 Đề xuất hệ thống: Đổi phòng **6**
 Danh sách thiết bị được báo cáo:

11 **7** Loa - Số lượng: 1 **8**
 Mức độ hư hỏng: Nặng **9**
 Không sử dụng được **10**

Máy lạnh - Số lượng: 1
 Mức độ hư hỏng: Nặng
 Không sử dụng được

Máy chiếu - Số lượng: 1
 Mức độ hư hỏng: Nặng
 Không sử dụng được

Xóa báo cáo **12** Sửa báo cáo **13**

Figure 73: Report Detail Screen

Fields

No	Field Name	Description	Read only	Mandatory	Control Type	Data Type	Length
1	lblRoomName	Name of classroom	Yes	Yes	Label	String	0 - 35
2	lblTimeReport	Time create report	Yes	Yes	Label	String	0 - 35

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3	lblDamageLevel	Damage level analyze by system	Yes	Yes	Label	String	0 - 35
4	lblUserSuggest	Suggest of teacher	Yes	Yes	Label	String	0 – 35
5	lblUserReport	Username of user create report	Yes	Yes	Label	String	0 – 35
6	lblSystemSuggest	Recommend of system	Yes	Yes	Label	String	0 – 35
7	lblEquipmentName	Name of damage equipment	Yes	Yes	Label	String	0 – 50
8	lblQuantity	Quantity of euquipment category	Yes	Yes	Label	String	0 – 10
9	lblDamage	Damage of equipment	Yes	Yes	Label	String	0 – 50
10	lblEvaluate	Evaluate equipment	Yes	Yes	Label	String	0 – 50
11	imgEquipment	Image of equipment	Yes	Yes	Image	Bitmap	N/A

Table 80: Report Detail Screen - Fields

Buttons

No	Function	Description	Validation	Outcome
12	btnRemove	Click to remove report	N/A	Remove report from system
13	btnEdit	Click to edit report	N/A	Edit report and

			update to database
--	--	--	--------------------

Table 81: View Report History Screen - Buttons

5.4.3. Create Report Screen



Figure 74: Create Report Screen

Fields

No	Field Name	Description	Read only	Mandatory	Control Type	Data Type	Length
3	imgEquipemt	Image thumbnail of equipment	Yes	Yes	Image	Image	N/A
4	lblEquipmentName	Name of equipment	Yes	Yes	Label	String	0 - 35

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5	lblUserChoose	Check user has choose equipment	Yes	Yes	Label	String	0 – 50
6	lblTimeRemain	Time remain of equipment	Yes	Yes	Label	String	0 – 10
7	lblCompany	Company of equipment	Yes	Yes	Label	String	0 - 50

Table 82: Create Report Screen - Fields

Buttons

No	Function	Description	Validation	Outcome
1	tabEquipment	Click to view equipment tab	N/A	Navigation screen to equipment tab
2	tabMap	Click to view map classroom	N/A	Navigation screen to map classroom tab
8	lstEquipment	Click to choose equipment to report	N/A	<p>If user click show dialog to confirm damage, add equipment to report.</p> <p>If user long click, change screen to multi select equipment.</p>

Table 83: Create Report Screen - Buttons

5.4.4. View Report History Screen

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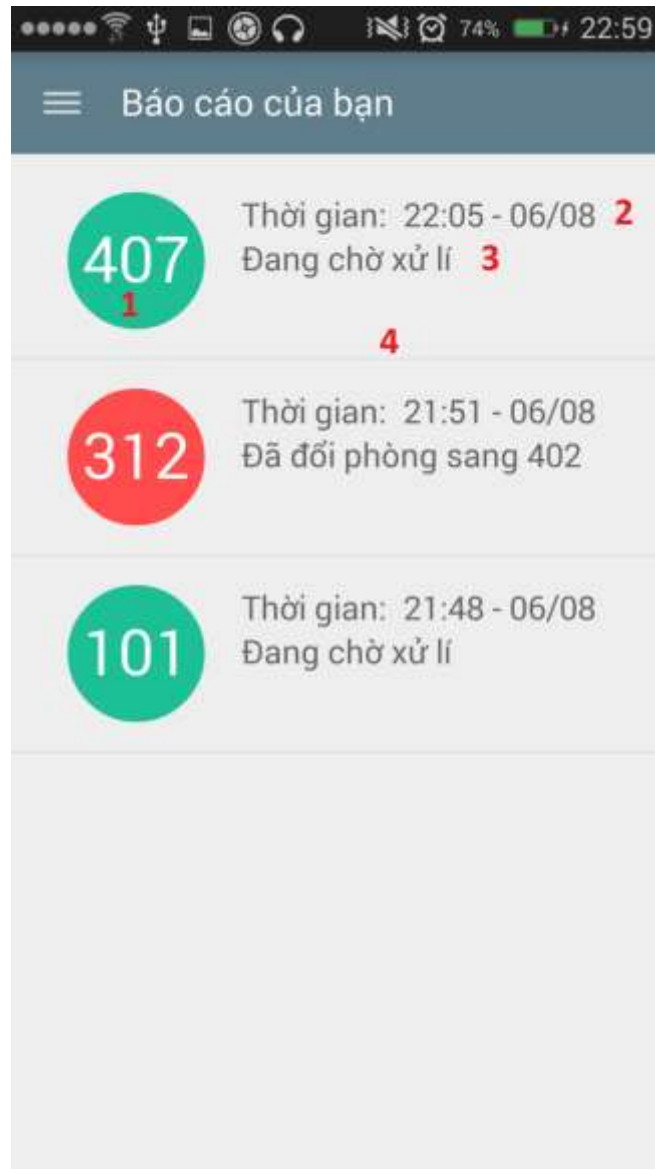


Figure 75: View Report History Screen

Fields

No	Field Name	Description	Read only	Mandatory	Control Type	Data Type	Length
1	lblRoomName	Classroom name	Yes	Yes	Label	Label	0 – 10
2	lblTimeReport	Time create report	Yes	Yes	Label	String	0 - 35
3	lblStatus	Status of	Yes	Yes	Label	String	0 – 50

		report					
--	--	--------	--	--	--	--	--

Table 84: View Report History Screen – Fields

No	Function	Description	Validation	Outcome
4	lstReport	Click to view report detail	N/A	Navigate screen to view report detail screen

Table 85: View Report History Screen - Buttons

6. Database Design

6.1. Entity Relationship Diagram

ECRM – Equipment’s Classroom Management

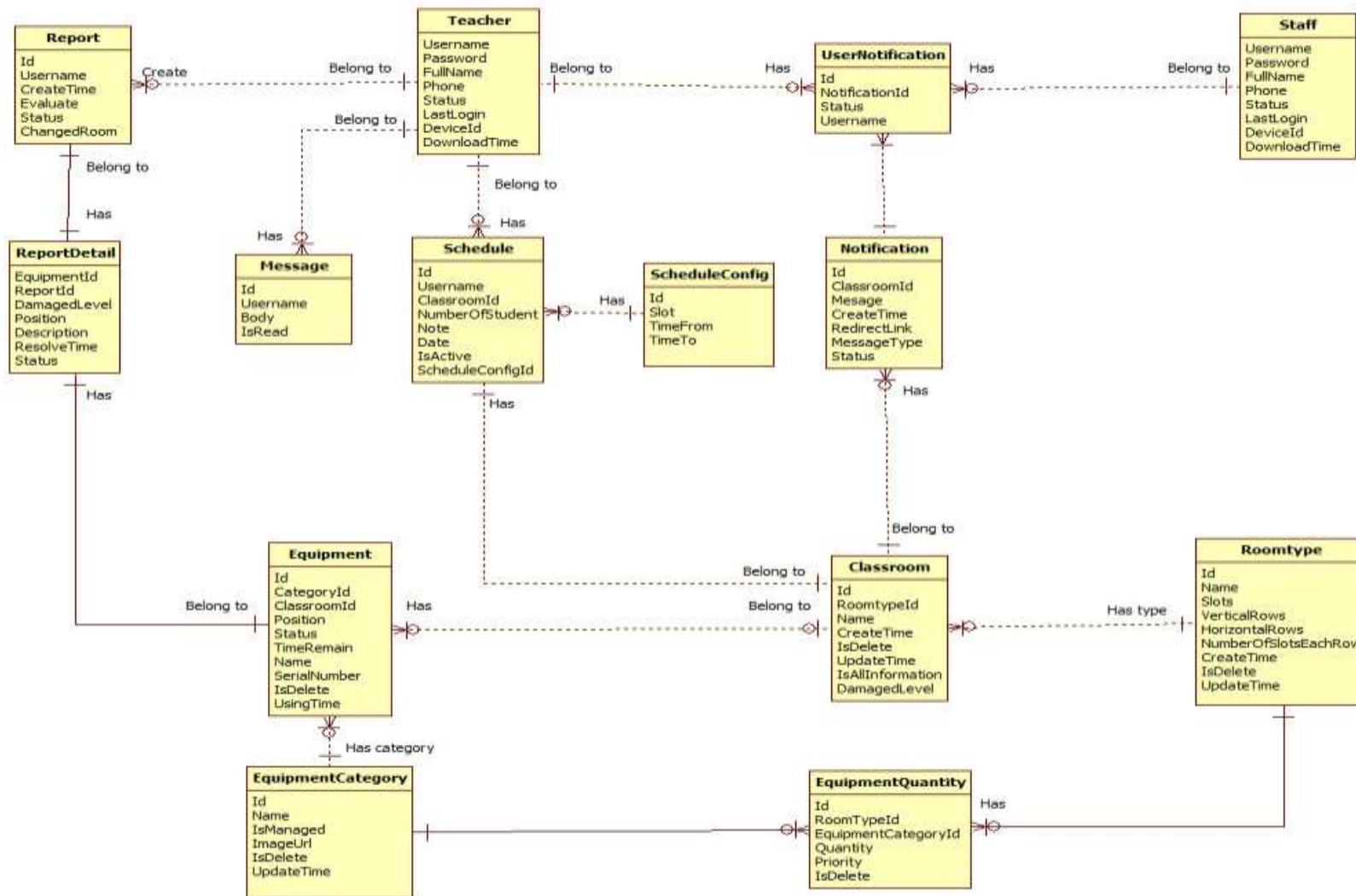


Figure 76: Entity Relationship Diagram

6.2. Entity Dictionary

Data Dictionary	
Entity name	Description
Teacher	Abstract entity describes a user with role teacher in system.
Staff	Abstract entity describes a user with role staff in system.
UserNotification	Represent a notification sent for user.
Notification	Contain the notification information.
Message	Represent a message sent by teacher.
Schedule	Contain the schedule information.
ScheduleConfig	Contain the schedule configuration information
Classroom	Contain the classroom information.
RoomType	Contain the room type information.
EquipmentQuantity	Contain the equipment quantity information.
EquipmentCategory	Contain the equipment category information.
Equipment	Contain the equipment information.
ReportDetail	Contain the report detail information.
Report	Contain the report information.

Table 86: Entity Dictionary

7. Algorithms

7.1. Notification

7.1.1. Definition

Notification is a feature of ECRM Application to notify teacher and staff when some important events occur.

7.1.2. Notification methods

- Show icon notification in web application
- Show notification using Google Cloud Message in mobile application
- Send SMS Message to user

7.1.3. Notification use cases

Type	Trigger	Receiver	Notify method	Close notify trigger
1	Teacher send report about damaged equipment	Staff	<ul style="list-style-type: none"> - Web - GCM - SMS (If damaged is critical) 	<ul style="list-style-type: none"> - Mark as read to notification - Touch to notification - Read SMS
2	System analyze room status and change room for teacher	All teacher in room	<ul style="list-style-type: none"> - Web - GCM - SMS 	<ul style="list-style-type: none"> - Mark as read to notification - Touch to notification - Read SMS
3	Staff change room manual	All teacher in room	<ul style="list-style-type: none"> - Web - GCM - SMS 	<ul style="list-style-type: none"> - Mark as read to notification - Touch to notification

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				- Read SMS
4	Teacher create report offline	Server	- SMS	- System run job check SMS unread, resolve and mark as read.
5	System analyze time remain of equipment and count schedule remain	Staff	- SMS - GCM - Web	- Mark as read - Touch to notification - Read SMS

Table 87: Notification Use Cases

7.2. System Scheduler Process

7.2.1. Definition

System scheduler is a main component of ECRM system. All the report will be checked by scheduler and give recommend for staff easy to make decision.

7.2.2. Define Problems

In web application:

- We need system schedule run every day at 06:30 and 12:15 to check status of room and change room if needed.
- We need system schedule run every day at 00:00 to check schedule in system.
- We need system schedule run every day at 06:00 to update equipment using time.
- We need system schedule run each 5 minutes to receive report from teacher and change room if needed.

7.2.3. Solution

We create schedule task by Spring Scheduler, it will run on the same server with web application and access to database server to check status, find available room to do change if need. It will run at specific time that administrator has defined.

7.2.3.1. Scheduler change room every day

The checking process is described as follow:

- 1) Get all classroom have damaged level is more than 50%
- 2) Get all schedule in each classroom
- 3) Get list of available classrooms for current classroom
- 4) Get classroom which current classroom had been changed to. If it has, check if this classroom is existed in list of available classrooms.
- 5) Check current day time and change room.

- 6) Notify and send SMS for teacher.

7.2.3.2. Scheduler get report

The checking process is describes as follow:

- 1) Get new report
- 2) Check damaged level of classroom
- 3) Get all schedule in each classroom
- 4) Get list of available classrooms for current classroom
- 5) Get classroom which current classroom had been changed to. If it has, check if this classroom is existed in list of available classrooms.
- 6) Check current day time and change room.
- 7) Update report.
- 8) Notify and send SMS for teacher.

7.2.3.3. Scheduler update equipment using time

The checking process is describes as follow:

- 1) Get all classroom
- 2) Get schedule for each classroom the last day.
- 3) Get all managed equipment in each classroom
- 4) Time remain of each equipment equals using time subtracts total teaching duration today. If time remain equals 0, set equipment is damaged, evaluate is “Không sử dụng được” and update classroom’s damaged level (**refer to ...**) which equipment is belong to.
- 5) Notify and send SMS for staff if equipment time equals 0 or smaller than “expiredTime” field in table “SystemConfiguration”.

7.2.3.4. Scheduler check schedule in system.

The checking process is describes as follow:

- 1) Get the nearest day of all schedule in database
- 2) Notify and send SMS for staff.

7.2.4. Flow Chart

7.2.4.1. Scheduler change room every day

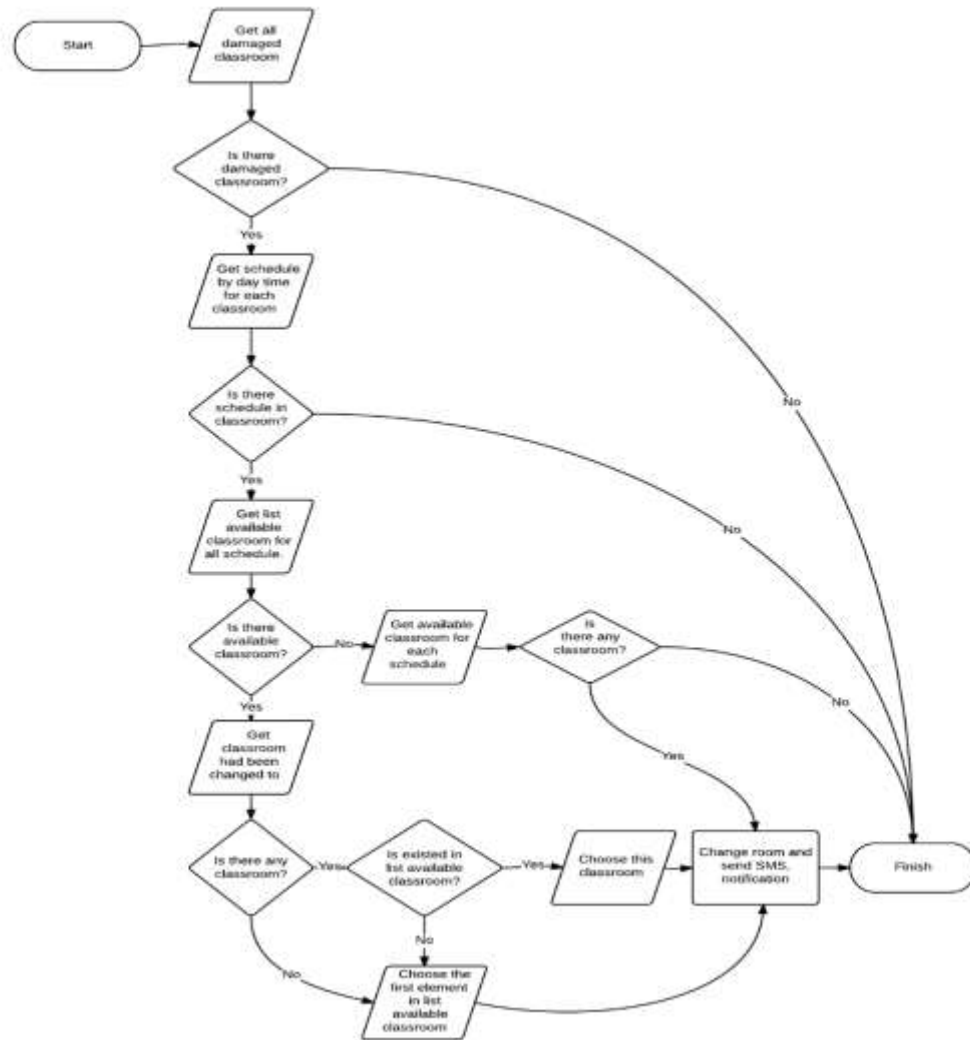


Figure 77: Scheduler Change Room Everyday

7.2.4.2. Scheduler get report

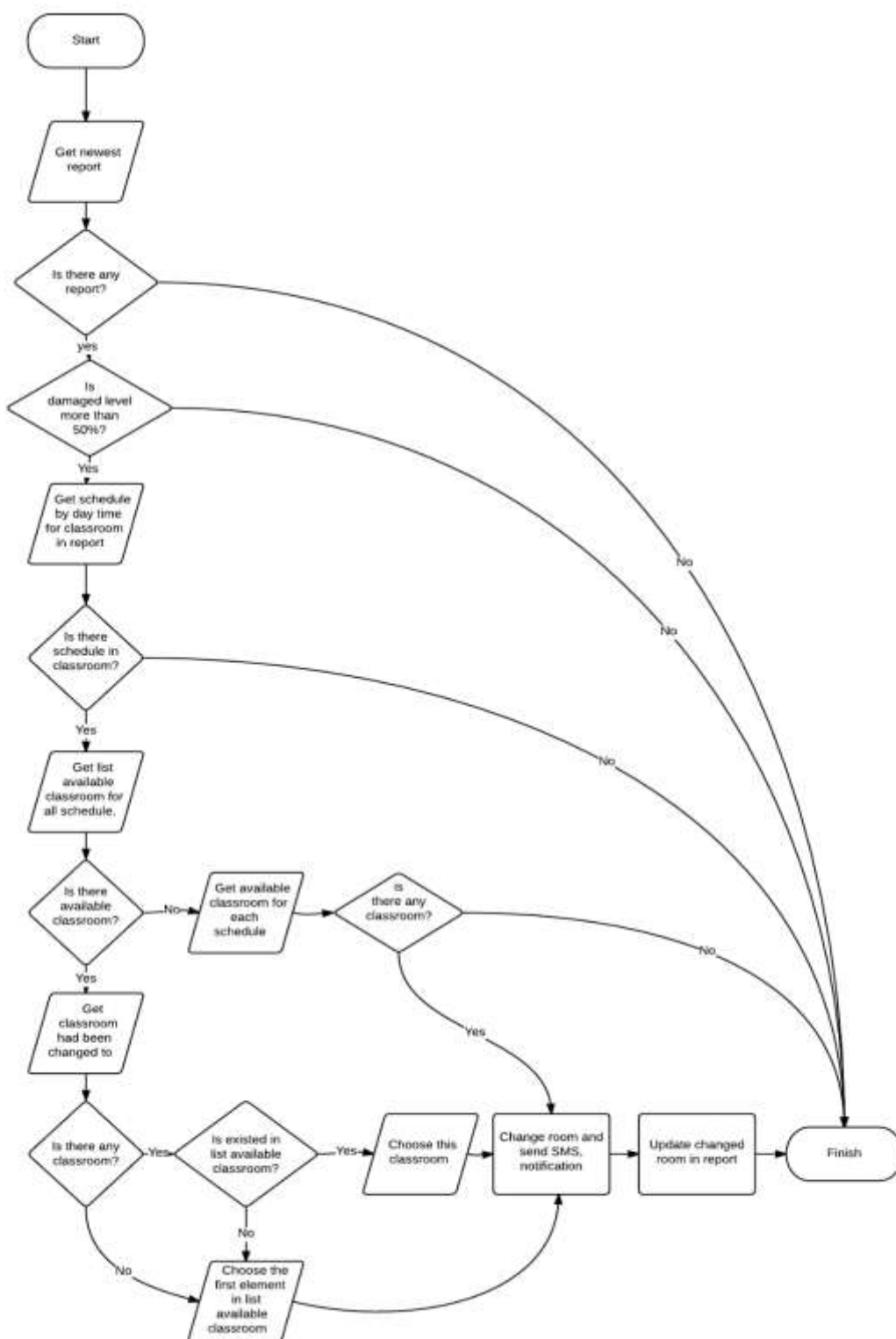


Figure 78: Scheduler Get Report

7.2.4.3. Scheduler update equipment using time

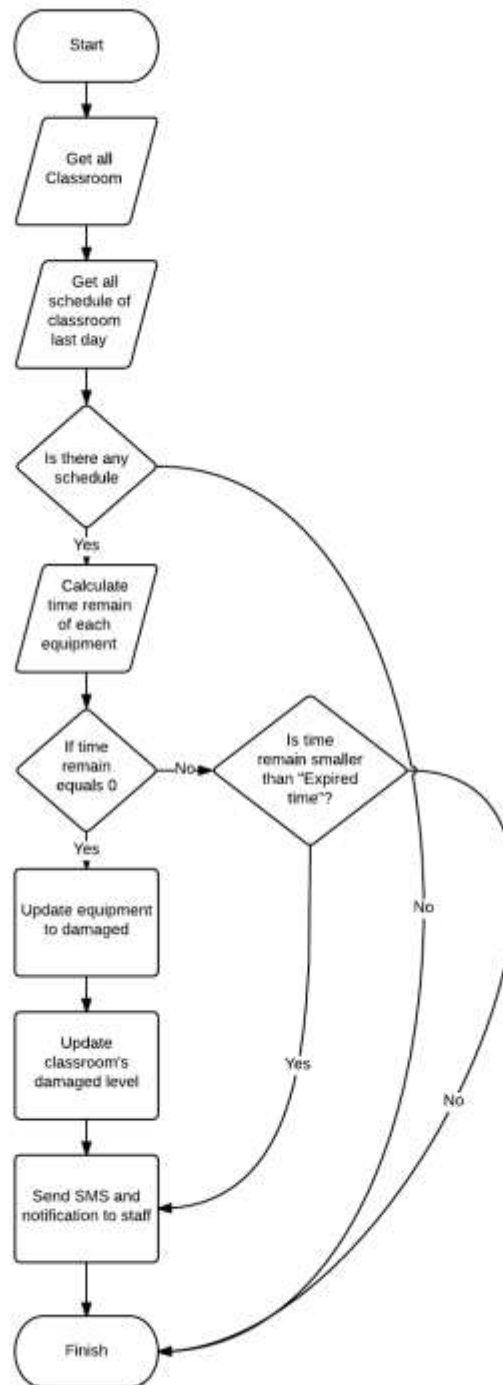


Figure 79: Scheduler Update Equipment Using Time

7.2.4.4. Scheduler check schedule in system



Figure 80: Scheduler check schedule

7.3. Suggest available classroom

7.3.1. Definition

Suggest available classroom is a function of web application and mobile application to give a list of available and similar classroom with current classroom.

7.3.2. Define problems

In web and mobile application, every time staff or system do change room, finding a classroom that meet criteria about availability, nearest with current classroom.

7.3.3. Solution

- 1) Get all undamaged classroom.
- 2) Get all schedules in current classroom.
- 3) Compare each schedule with all schedule in list undamaged classroom. If one classroom has one schedule has the same scheduleConfigId, we will ignore that classroom. The result is list of available classroom.

Table schedule configuration

ECRM – Equipment’s Classroom Management

Column Name	Datatype
Id	INT(11)
Slot	INT(11)
TimeFrom	TIME
TimeTo	TIME

- 4) We will get list of list available classroom and then compare them. The result we will get is list of common classroom.
- 5) We sort list of classroom by criteria nearest distance with current classroom. For example: we have list {202, 303, 201, 301, 402, 101, 503} and current classroom is 205, the result is: {202, 201, 301, 303, 101, 402, 503}.
- 6) Finally, we will sort the list by criteria similar with current room type of classroom. The most similar will appear firstly, the least similar will appear lastly.

7.4. Damaged statistic

7.4.1. Definition

Damaged statistic is a function of web application and mobile application to a number describes the damaged level of classroom.

7.4.2. Define Problems

In web and mobile application, every time teacher report classroom, staff has to check the damage of this classroom and do change room. We have to find solution to check damaged level automatically.

7.4.3. Solution

- 1) Get classroom.
- 2) Get list of damaged equipment.
- 3) Get room type of classroom.
- 4) Get equipment’s **evaluation** in report and equipment **priority** in room type.
- 5) Get damaged level in table “**SystemConfiguration**” in database based on **evaluation** and **priority** of each equipment. Example: **evaluation** of equipment is “**Không thể sử dụng được**” and priority is “**Cao**”, we will get field “**UserHigh_PriorityHigh**” with damaged level equal 50 in table “**SystemConfiguration**”.
- 6) Damaged level of classroom equals total equipment’s damaged level.

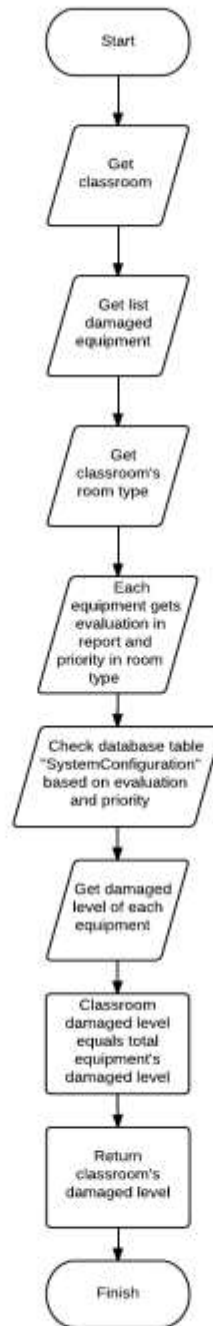
Example:

Teacher A reports classroom B with projector, air conditioning and two tables. Teacher A **evaluates** “**High**” for projector, “**High**” for air conditioning and “**High**” for table. Meanwhile, in classroom B, the **priority**

ECRM – Equipment’s Classroom Management

of projector is “**High**”, air conditioning is “**Medium**”. So the damaged level will be: (UserHigh-PriorityHigh) + (UserHigh-PriorityMedium) + (TableHigh)*2 = 50 + 30 + 5*2 = 90.

7.4.4. Flow chart



7.5. Report State

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The state chart bellow describes all the state of report.

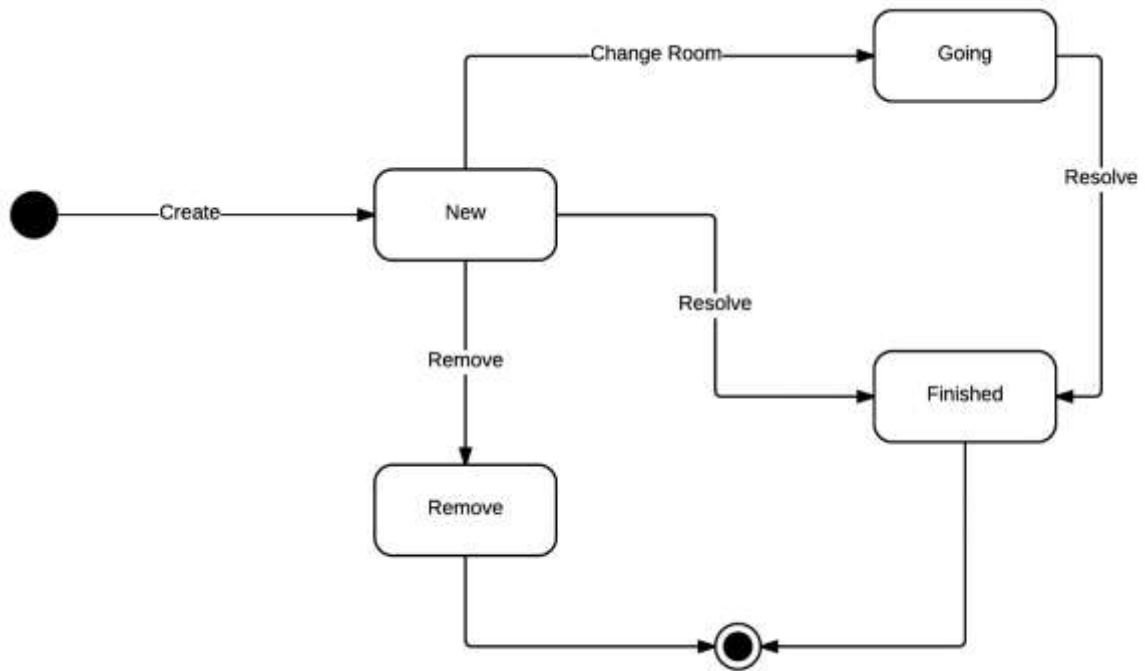


Figure 81: Report State

State	Description
New	The report has been created and do not have any change
Going	System or staff change room for this report
Remove	The report has removed by staff or teacher.
Finished	The report has resolved by staff

Table 88: Report State Dictionary

Stimulus	Description	State before	State after
Create	Teacher create new report about damage equipment	N/A	New
Resolve	Staff resolve report when room has been fixed	New, Going	Finished
Remove	Staff or teacher remove report	New	Remove
Change Room	Staff or system change room for this report	New	Going

Table 89: Report State Flow

E. System Implementation & Test

1. Introduction

1.1. Overview

This describes the approach and methodologies used by group to plan, organize and manage the testing of ECRM system. It provides in the detail all necessary information about the implementation and testing procedure of the system included test plans, test cases, test result, test environments, pass/fail criteria and risks estimations as well as a checklist to cover all possible cases.

1.2. Test Approach

- Goal: Test all features in the whole ECRM system based on the core flow.
- Method: black-box testing
- Technique: check list

The testing for this project will consists of Integration System test level. Testing the program which was integrated and as a complete system to ensure that the software requirements have been met.

- Integration testing would be performed by all member of team and approved by team leader.
- System testing is focused on assessing the system’s reliability. This process is concerned with finding errors that result from unanticipated interactions between components and component interface problems.

2. Database Relationship Diagram

2.1. Physical

Diagram

ECRM – Equipment’s Classroom Management

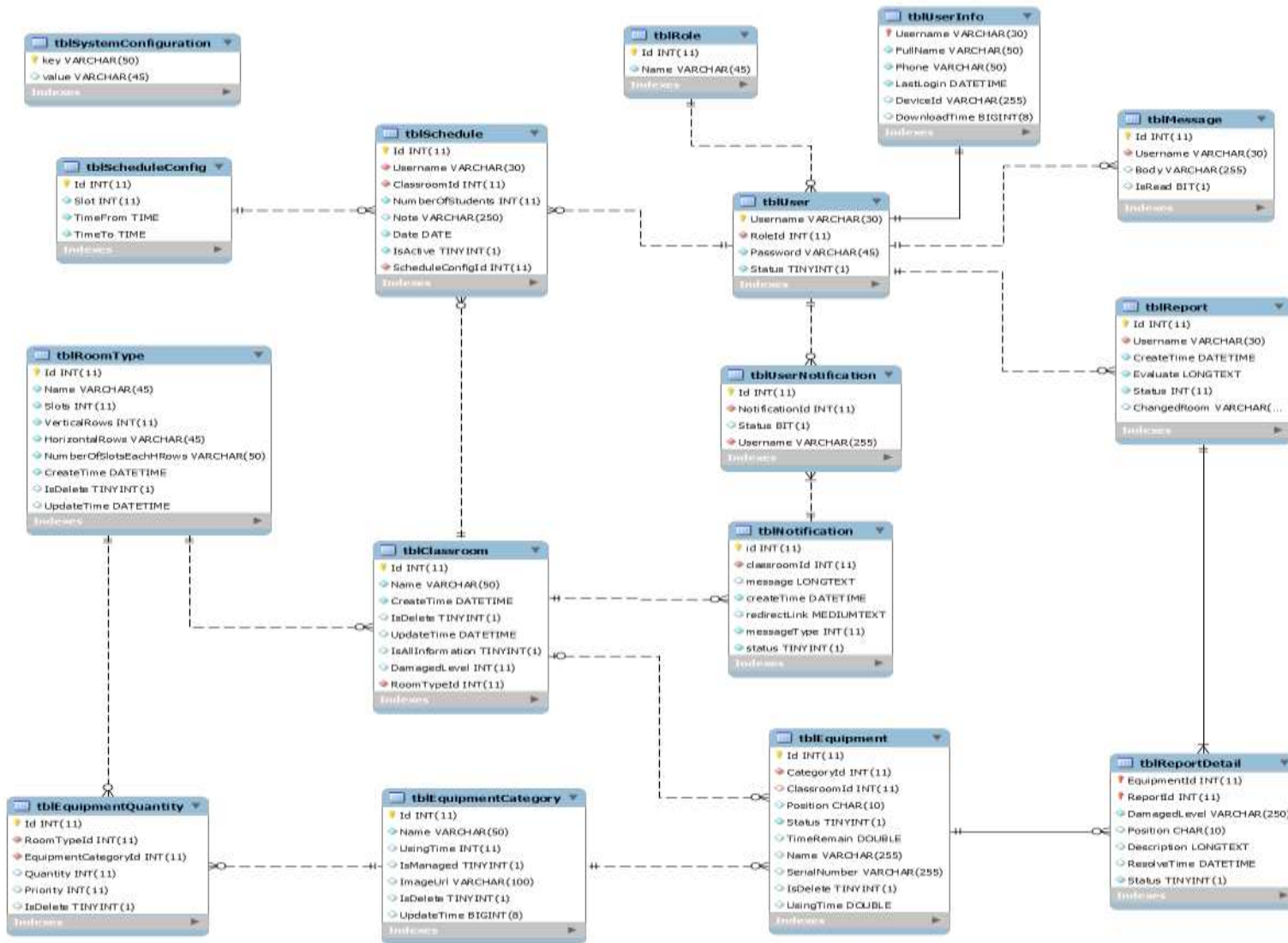


Figure 82: Physical Diagram

2.2. Data Dictionary

Table Name	Attributes	Description	Domain	Null
tblUser	Username	Username to login system	VARCHAR(30)	No
	Password	Password of account to login system	VARCHAR(45)	No
	Status	Status of account	TINYINT(1)	No
	RoleId	Role of account	INT(11)	No
tblRole	Id	Id of role	INT(11)	No
	Name	Name of role	VARCHAR(45)	No
tblUserInfo	Username	Username of account	VARCHAR(30)	No
	FullName	Fullname of account	VARCHAR(50)	No
	Phone	Phone number of account	VARCHAR(50)	No
	LastLogin	Last login of account to system	DATETIME	Yes
	DeviceId	Device ID of account when using mobile application	VARCHAR(255)	Yes
	DownloadTime	Last download time of user when using mobile application	BIGINT(8)	Yes
tblMessage	Id	Id of message	INT(11)	No
	Body	Content of message	VARCHAR(255)	No
	IsRead	Status of message	BIT(1)	No
	Username	Username of user send message	VARCHAR (30)	No
tblReport	Id	Id of report	INT(11)	No
	Username	Username of account create report	VARCHAR(30)	No
	CreateTime	Time report has created	DATETIME	No
	Evaluate	Evaluate of teacher about this report	LONGTEXT	No
	Status	Status of report	INT(11)	No
	ChangeRoom	Room number has changed	VARCHAR(45)	Yes
tblEquipmentCategory	Id	Id of equipment category	INT(11)	No
	Name	Name of equipment category	VARCHAR(50)	No
	UsingTime	Time using of	INT(11)	Yes

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		equipment category		
	IsManaged	Check equipment has managed quantity or not	TINYINT(1)	No
	ImageUrl	Link to image of equipment category	VARCHAR(100)	No
	IsDelete	Check equipment is deleted or not	TINYINT(1)	No
	UpdateTime	Time user update information of equipment category	BIGINT(8)	Yes
tblEquipment	Id	Id of equipment	INT(11)	No
	CategoryId	Id of equipment category	INT(11)	No
	ClassroomId	Id of classroom has equipment	INT(11)	No
	Position	Position of equipment in classroom	CHAR(10)	No
	Status	Status of equipment	TINYINT(1)	No
	TimeRemain	Time remain of equipment	DOUBLE	No
	Name	Name of equipment	VARCHAR(255)	No
	SerialNumber	Serial Number of equipment	VARCHAR(255)	No
	IsDelete	Check equipment has deleted or not	TINYINT(1)	No
	UsingTime	Time using of equipment	DOUBLE	No
tblReportDetail	EquipmentId	Id of equipment has reported	INT(11)	No
	ReportId	Id of report	INT(11)	No
	DamagedLevel	Damage level of equipment	VARCHAR(250)	No
	Position	Position of equipment in classroom	CHAR(10)	No
	Description	Description of equipment	LONGTEXT	Yes
	ResolveTime	Time resolve this equipment	DATETIME	Yes
	Status	Status of this report detail	TINYINT(1)	No
tblUserNotification	Id	Id of user notification	INT(11)	No

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	NotificationId	Id of notification	INT(11)	No
	Status	Status of notification	BIT(1)	No
	Username	Username of account received this notification	VARCHAR(30)	No
tblNotification	Id	Id of notification	INT(11)	No
	ClassroomId	Id of classroom	INT(11)	No
	Message	Content of notification	LONGTEXT	No
	CreateTime	Time notification has been created	DATETIME	No
	RedirectLink	Link will redirect after user click to notification	MEDIUMTEXT	No
	MessageType	Type of message	INT(11)	No
	Status	Status of notification	TINYINT(1)	No
tblClassroom	Id	Id of classroom	INT(11)	No
	RoomTypeId	Id of roomtype	INT(11)	No
	Name	Name of classroom	VARCHAR(50)	No
	CreateTime	Time create of classroom	DATETIME	No
	IsDelete	Check classroom has been deleted	TINYINT(1)	No
	UpdateTime	Time update classroom	DATETIME	No
	IsAllInformation	Check classroom has full equipment	TINYINT(1)	No
	DamageLevel	Damage level of classroom	INT(11)	No
tblSchedule	Id	Id of schedule	INT(11)	No
	Username	User of schedule	VARCHAR(30)	No
	ClassroomId	Classroom of schedule	INT(11)	No
	NumberOfStudents	Number of student of classroom	INT(11)	No
	Note	Note of schedule	VARCHAR(250)	Yes
	TimeFrom	Time start schedule	TIME	No
	Slots	Total slot of schedule	INT(11)	No
	Date	Date of schedule	DATE	No
	IsActive	Status of schedule	TINYINT(1)	No
	ScheduleConfigId	Config of schedule	INT(11)	No
tblScheduleConfig	Id	Id of schedule config	INT(11)	No
	Slot	Slot of schedule	INT(11)	No

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		config		
	TimeFrom	Time start of schedule config	TIME	No
	TimeTo	Time end of schedule config	TIME	No
tblRoomType	Id	Id of roomtype	INT(11)	No
	Name	Name of roomtype	VARCHAR(100)	No
	Slots	Number of slot of roomtype	INT(11)	No
	VerticalRows		INT(11)	No
	HorizontalRows		VARCHAR(50)	No
	NoSlotEachHRows		VARCHAR(50)	No
	CreateTime	Time create roomtype	DATETIME	No
	IsDelete	Check roomtype has deleted or not	TINYINT(1)	No
	UpdateTime	Time update roomtype	DATETIME	No
tblEquipmentQuantity	Id	Id of equipment quantity	INT(11)	No
	RoomTypeId	Room Type Id	INT(11)	No
	EquipmentCategoryId	Id of equipment category	INT(11)	No
	Quantity	Quantity of equipment category in roomtype	INT(11)	No
	Priority	Priority of equipment category	INT(11)	No
	IsDelete	Check equipment category is delete or not	TINYINT(11)	No
tblSystemConfig	Key	Key	VARCHAR(50)	No
	Value	Value of key	VARCHAR(50)	No

Table 90: Physical Diagram - Data Dictionary

3. Performance Measures

3.1. Web Application Page Load Speed

3.1.1. Definition

This section tests the general page load speed from all the page of the web application

3.1.2. Test environment

Server:

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- Operating System: Ubuntu 14.04 Server 32 bit
- RAM: 512MB
- Storage: 40GB
- Network: 1Mbps

3.1.3. Test cases

Using browser from client side and request each page of web application.
Record the page load time using Chrome Dev Tools at client side.

Test pages:

Public	Login Page
User	Dashboard
	Create Report
	View History Report
Staff	Dashboard
	Schedule Config <ul style="list-style-type: none">- Add new schedule config- Update schedule config- Remove schedule config
	Schedule <ul style="list-style-type: none">- Search schedule by user in default time.- Search schedule by classroom in default time.- Search between time with all user and classroom- Search between time with specific user and classroom- Search between times with specific user in all classrooms.- Search between times with specific classroom with all users.- Import schedule excel file in 1 week of school (about 15KB)- Import manually 1 schedule
	Statistic
	Classroom <ul style="list-style-type: none">- Create new classroom- Remove classroom- Edit classroom- List all classroom- Search classroom by class name
	Roomtype <ul style="list-style-type: none">- Create new roomtype- Remove roomtype- Edit roomtype

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	<ul style="list-style-type: none"> - List all roomtype - Search roomtype by name
	Equipment <ul style="list-style-type: none"> - List all equipment - Create new equipment - Remove equipment
	Report <ul style="list-style-type: none"> - List all report - View report - Resolve report - Remove report
Admin	Account <ul style="list-style-type: none"> - List all account - Activate/ Deactivate account - Create account - Edit account

Table 91: Web Application Page Load - Test Pages

3.1.4. Test result

The test is run 10 times, in each time we go through all the pages listed above and log down the average page load time.

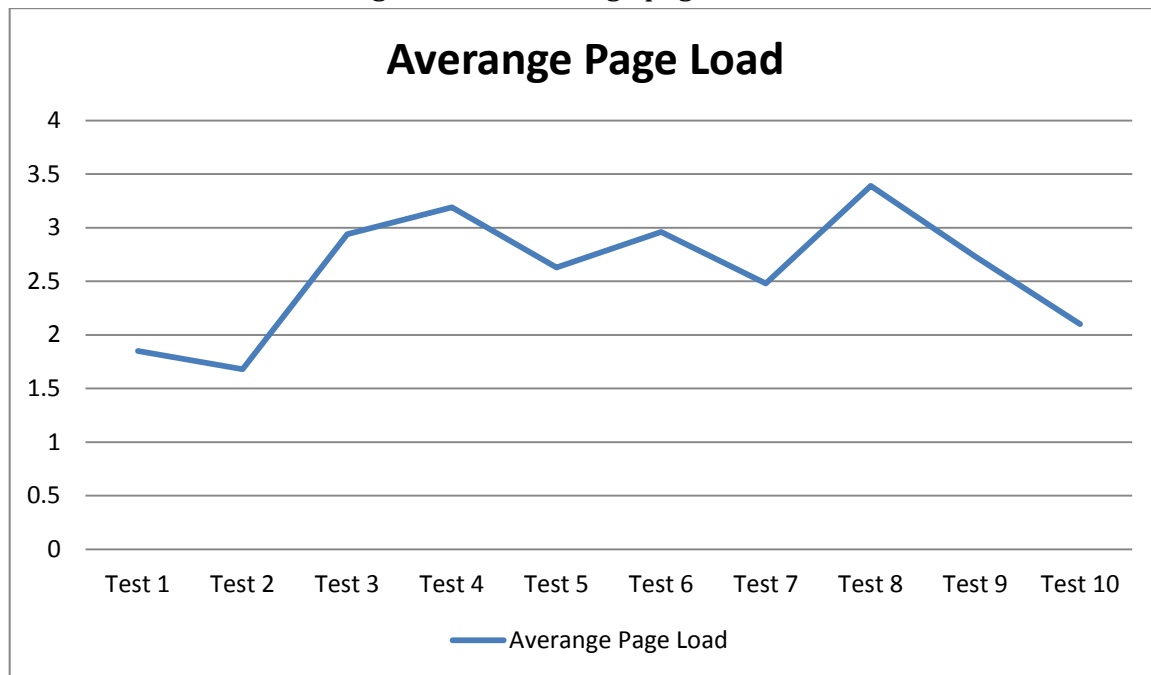


Figure 83: Web Application Page Load - Average Page Load

Test No.	Average page load time (second)	Execute date
----------	---------------------------------	--------------

1	1.85	25 July 2015
2	1.68	25 July 2015
3	2.94	25 July 2015
4	3.19	25 July 2015
5	2.63	25 July 2015
6	2.96	25 July 2015
7	2.48	25 July 2015
8	3.39	25 July 2015
9	2.73	25 July 2015
10	2.10	25 July 2015
Average: 2.59 (seconds)		

Table 92: Web Application Page Load - Average Page Load

3.2. Mobile Application API Load Speed

3.2.1. Definition

This section tests the load speed of mobile apps when connection to server through API

3.2.2. Test environment

Server:

- Operating System: Ubuntu 14.04 Server 32 bit
- RAM: 512MB
- Storage: 40GB
- Network: 1Mbps

Client:

Hardware Requirements	Minimum	Recommended
Internet Connection	512Kbps	Wi-Fi Connection 12MB
Operating System	Android 4.0	Android 4.0
Memory	128MB of RAM	1GB of RAM or more

3.2.3. Test case

Using mobile application to send the entire API request to web server.
List of APIs:

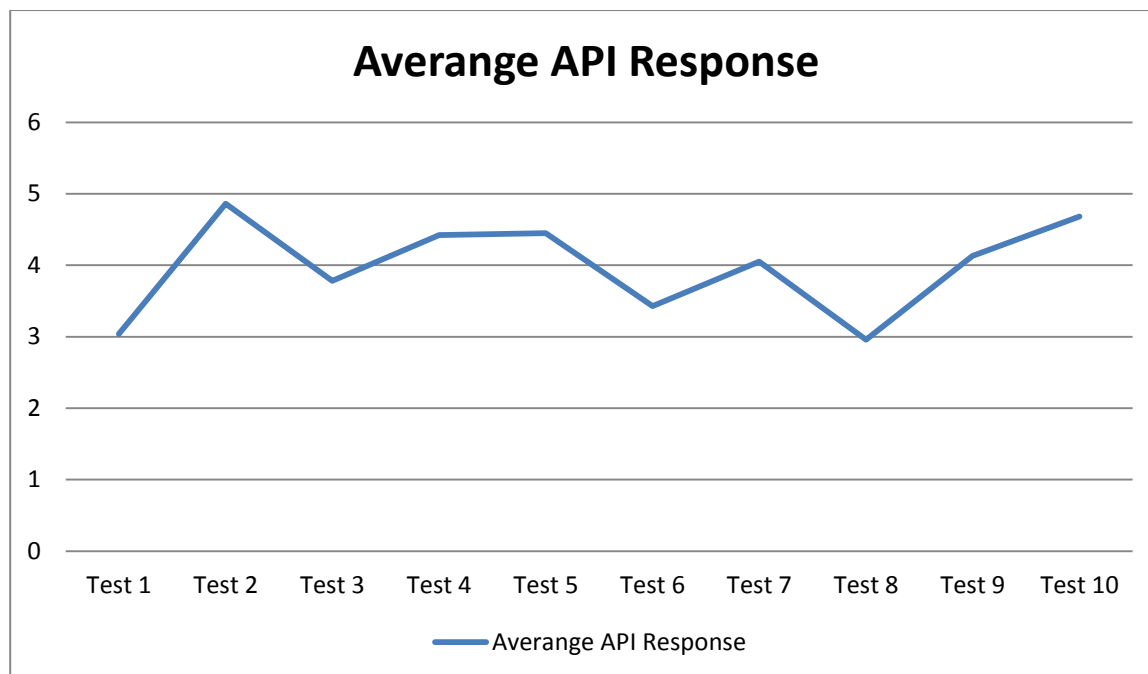
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No.	API	Description
1	checkConnection	Check connection to server
2	login	Login to application
3	schedule	Get schedule of user
4	getEquipments	Get equipment of each classroom
5	createReport	Create new report
6	getCurrentTime	Get current time of server
7	getReportByUsername	Get report of user
8	remove	Remove report
9	editReport	Edit report
10	getReportStaff	Get all report of staff
11	getAvailableRoom	Get available room for change room function
12	changeRoom	Do change room function when needed
13	sendNotification	Send notification to user
14	sendSMS	Send SMS to user
15	map	Get map of classroom
16	getAllReport	Get all report
17	resolve	Resolve report
18	checkSchedule	Check classroom has user teacher after that slot.
19	getAllSchedule	Get all schedule of user in week
20	getClassroom	Get current status of classroom
21	getClassroomInFloor	Get all classroom of school.
22	getQuantity	Get all equipment quantity of user in week

3.2.4. Test result

The test is run 10 times, each time we run all the test cases listed above and log down the average API response time.

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Test No.	Average page load time (second)	Execute date
1	3.04	25 July 2015
2	4.86	25 July 2015
3	3.78	25 July 2015
4	4.42	25 July 2015
5	4.45	25 July 2015
6	3.43	25 July 2015
7	4.05	25 July 2015
8	2.96	25 July 2015
9	4.13	25 July 2015
10	4.68	25 July 2015
Average: 3.98 (seconds)		

4. Test Plan

The overall purpose of testing is to ensure ECRM system meets its entire technical, functional and business requirement. The purpose of this document is to describe the overall test plan and strategy for testing the ECRM system. The approach described in this document provides the framework for all testing related to this application. Individual test cases will be written for each version of the application that is released. This document will also be updated as required for each release.

4.1. Feature to be tested

- Staff: View schedule, resolve report, remove report, change room, import file schedule, import schedule manual, create equipment ,create classroom, edit classroom, remove classroom, and create room type.
- User: Create report, edit report and remove report.
- Mobile Application: Create report, edit report, remove report, resolver report and change room.
- System: Automatically check damage and change room.

4.2. Feature no to be tested

- Admin: Create account, update account, active/deactivate account.
- Staff: Edit equipment, edit room type, and delete room type, configure schedule, statistic, search schedule.
- Login, logout, change profile
- View information: list room type, list classroom, list report.

5. System Testing Test Case

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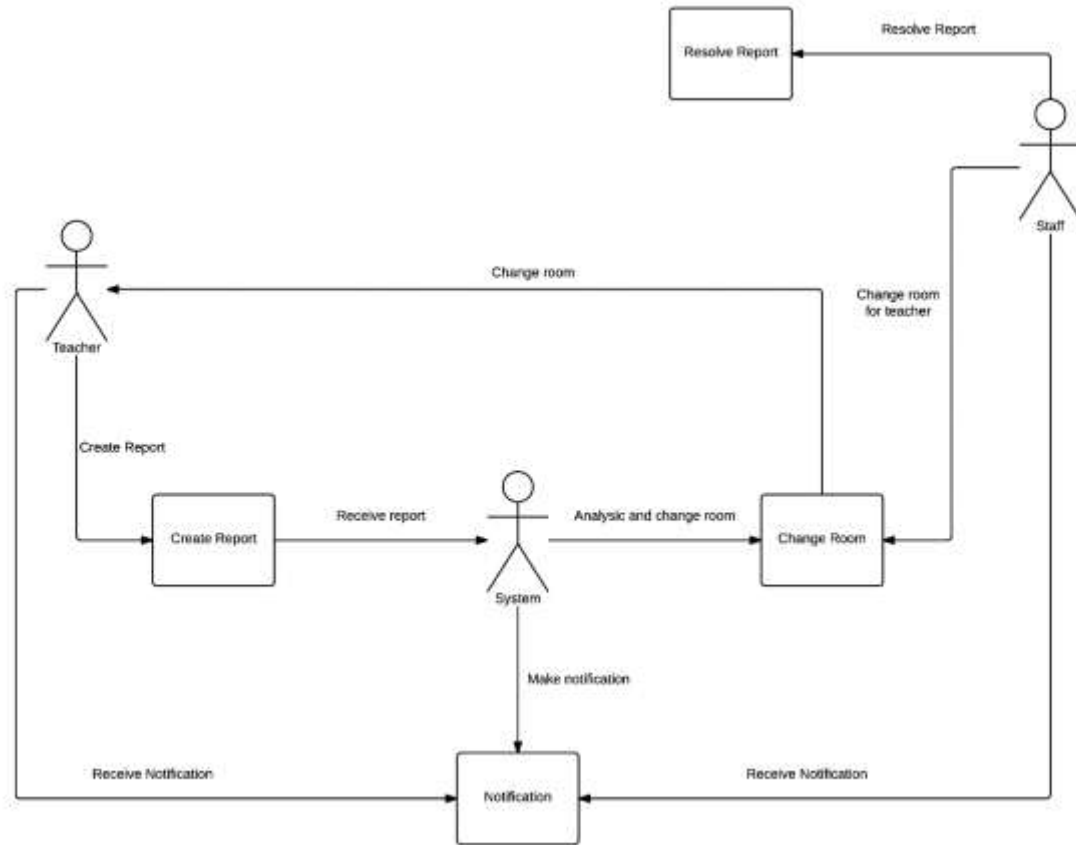


Figure 84: System Testing Testcase

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5.1. Create Report

5.1.1. Mobile Application

ID	Test Case Description	Test Case Procedure	Expected output	Inter-test Case Dependence	Result	Test Date	Note
CRM1	User with role is teacher report some damaged equipmet in the classroom that he have schedule in, at the time before his schedule start.	<ul style="list-style-type: none">○ User login with account “HoangNT” on date: “21/07/2015” at time: “07:45 am”.○ User choose classroom “113” with start time at “08:45 am”.	<ul style="list-style-type: none">○ After step 1, show list of classroom that user have schedule in.○ After step 2, show message:”Bạn không thể báo cáo phòng này”.	N/A	Passed	26/7/2015	
CRM2	User with role is teacher report some damaged equipmet in the classroom that he have schedule in, at the time that schedule has already started for 5 minutes.	<ul style="list-style-type: none">○ User logins with account “HoangNT” on date: “21/07/2015” at time: “08:50 am”.○ User chooses classroom “113” with start time at “08:45 am”.○ User chooses “Máy lạnh” and “Máy chiếu” and then chooses “Tiếp tục”.	<ul style="list-style-type: none">○ After step 1, show list of classroom that user have schedule in.○ After step 2, show list equipment of classroom “113”.○ After step 3, show evaluate damaged box.○ After step 4, show message “Đã báo cáo thành công”.	N/A	Passed	26/7/2015	

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		<ul style="list-style-type: none"> ○ User chooses “Phải đổi phòng” and then chooses “Gửi báo cáo”. 					
CRM3	User with role is teacher report classroom that he have schedule in, at the time that schedule has already started for 5 minutes. But there are no equipment is choosen.	<ul style="list-style-type: none"> ○ User logins with account “HoangNT” on date: “21/07/2015” at time: “08:50 am”. ○ User chooses classroom “113” with start time at “08:45 am”. ○ User chooses “Tiếp tục”. 	<ul style="list-style-type: none"> ○ After step 1, show list of classroom that user have schedule in. ○ After step 2, show list equipment of classroom “113”. ○ After step 3, show error message: “Bạn cần chọn 1 thiết bị trước khi báo cáo!” 	N/A	Passed	26/7/2015	
CRM4	User with role is teacher report some damaged equipmet in the classroom that he have schedule in, with no internet access.	<ul style="list-style-type: none"> ○ User logins with account “HoangNT” on date: “21/07/2015” at time: “08:50 am”. ○ User chooses classroom “113” with start time at “08:45 am”. ○ User chooses “Máy lạnh” and “Máy chiếu” and then chooses “Tiếp tục”. ○ User chooses “Phải đổi phòng” and then 	<ul style="list-style-type: none"> ○ After step 1, show list of classroom that user have schedule in. ○ After step 2, show list equipment of classroom “113”. ○ After step 3, show evaluate damaged box. ○ After step 4, System wil evaluate damaged level of classroom “113” , if it’s more than 50%, 	N/A	Passed	26/7/2015	

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		chooses “Gửi báo cáo”.	show confirm message box “Hệ thống đánh giá phòng hư hại nặng! Bạn có muốn gửi tin nhắn đến nhân viên? Việc này sẽ gây tốn phí!”. Otherwise, show message: “Gửi báo cáo thành công!”.				
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5.1.2. Web Application

ID	Test Case Description	Test Case Procedure	Expected output	Inter-test Case Dependence	Result	Test Date	Note
CRM1	User with role is teacher report some damaged equipmet in the classroom that he have schedule in, at the time before his schedule start.	<ol style="list-style-type: none"> 1. User login with account “HoangNT” on date: “21/07/2015” at time: “07:45 am”. 2. User clicks on button “Gửi báo cáo” 	<ol style="list-style-type: none"> 1. After step 2, show message: “Hiện tại bạn không có lịch dạy”. 	N/A	Passed	26/7/2015	
CRM2	User with role is teacher report some damaged equipmet in the classroom that he	<ol style="list-style-type: none"> 1. User logins with account “HoangNT” on date: “21/07/2015” at time: “08:50 am”. 	<ol style="list-style-type: none"> 1. After step 2, show list of classroom that user have schedule in. 2. After step 3, show 	N/A	Passed	26/7/2015	

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	have schedule in, at the time that schedule has already started for 5 minutes.	<ol style="list-style-type: none"> 2. User clicks on button “Gửi báo cáo” 3. User chooses classroom “113”. 4. User clicks on “Máy lạnh” and “Máy chiếu” and then clicks on “Gửi báo cáo”. 	<ol style="list-style-type: none"> list equipment of classroom “113”. 3. After step 4, show message: “Báo cáo đã gửi thành công!”. 				
CRM3	User with role is teacher report in the classroom that he have schedule in, at the time that schedule has already started for 5 minutes. But there are no equipment is choosen.	<ol style="list-style-type: none"> 1. User logins with account “HoangNT” on date: “21/07/2015” at time: “08:50 am”. 2. User clicks on button “Gửi báo cáo” 3. User chooses classroom “113”. 4. User clicks on “Gửi báo cáo”. 	<ol style="list-style-type: none"> 1. After step 2, show list of classroom that user have schedule in. 2. After step 3, show list equipment of classroom “113”. 3. After step 4, show message: “Bạn cần chọn 1 thiết bị trước khi báo cáo! ”. 	N/A	Passed	26/7/2015	

5.2. Resolve Report

5.2.1. Web Application

ID	Test Case Description	Test Case Procedure	Expected output	Inter-test Case Dependence	Result	Test Date	Note
RW1	User with role is staff resolve some damaged	1. User logins with account “Staff” on date: “10/08/2015”	1. After step 2, show report details and list of damaged equipment	N/A	Passed	10/8/2015	

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	equipmet in the classroom.	<ol style="list-style-type: none"> 2. User clicks on button “Xem” in classroom “213” 3. User choose “Máy lạnh” and “Ghế” 4. User clicks on “Khắc phục” button. 5. User clicks on “Khắc phục” button. 	<ol style="list-style-type: none"> category in classroom “101”. 2. After step 3, show list serial number of “Máy lạnh” 3. After step 4, show message: “Bạn muốn khắc phục hư hại phòng 101”. 4. After step 5, comeback list report page. 				
RW2	User with role is staff resolve all damaged equipmet in the classroom by “Khắc phục tất cả” button.	<ol style="list-style-type: none"> 1. User logins with account “Staff” on date: “10/08/2015” 2. User clicks on button “Xem” in classroom “213” 3. User clicks on “Khắc phục tất cả” button. 4. User clicks on “Khắc phục” button. 	<ol style="list-style-type: none"> 1. After step 2, show report details and list of damaged equipment category in classroom “213”. 2. After step 3, show message: “Bạn muốn khắc phục tất cả hư hại phòng 213”. 3. After step 4, comeback list report page. 	N/A	Passed	10/8/2015	
RW3	User with role is staff resolve all damaged equipmet in the classroom by choose all equipment.	<ol style="list-style-type: none"> 1. User logins with account “Staff” on date: “10/08/2015” 2. User clicks on button “Xem” in classroom “501”. 3. User chooses all equipment in list 	<ol style="list-style-type: none"> 1. After step 2, show report details and list of damaged equipment category in classroom “501”. 2. After step 4, show message: “Bạn muốn khắc phục tất cả hư hại 				

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		damaged. 4. User clicks on “Khắc phục” button. 5. User clicks on “Khắc phục” button.	phòng 501”. 3. After step 5, comeback list report page.				
RW4	User with role is staff resolve room. But there are no equipment is choosen.	1. User logins with account “Staff” on date: “10/08/2015” 2. User clicks on button “Xem” in classroom “101” 3. User clicks on “Khắc phục” button. 4. User clicks on “Khắc phục” button.	1. After step 2, show report details and list of damaged equipment category in classroom “101” 2. After step 3, show message: “Bạn muốn khắc phục hư hại phòng 101”. 3. After step 4, show message: “Bạn cần chọn ít nhất 1 thiết bị!”	N/A	Passed	10/8/2015	

5.2.2. Mobile Application

ID	Test Case Description	Test Case Procedure	Expected output	Inter-test Case Dependence	Result	Test Date	Note
RM	User login to ECRM Staff application and resolve	1. User logins with account “Staff” on date: “10/08/2015” 2. Staff touch to view report of room “401”	1. After step 1, show list report newest 2. After step 2, show report details with list of damaged equipment category in class	N/A	Passed	10/8/2015	

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		3. Staff touch “Sửa phòng”	“401” 3. After step 3, show dialog “Đang sửa phòng” and back to previous screen.				
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5.3. Change Room

5.3.1. Web Application

ID	Test Case Description	Test Case Procedure	Expected output	Inter-test Case Dependence	Result	Test Date	Note
CRW 1	User with role is staff, change room affect to other teacher have schedule in room.	1. User logins with account “Staff” on date: “10/08/2015” at time: “09:08 am”. 2. User clicks on button “Xem” in classroom “210” 3. User click on “Đổi phòng” button 4. User choose room “406” in list room. 5. User clicks on “Đổi phòng” button.	1. After step 2, show report details and list of damaged equipment category in classroom “210”. 2. After step 3, show change room form 3. After step 5, show message: “Đổi phòng thành công”, and account TaiNT receive SMS: “Bạn được đổi phòng sang 406 vào tiết: 10h30”.	N/A	Passed	10/8/2015	
CRW 2	User with role is staff, change room but room haven’t	1. User logins with account “Staff” on date: “10/08/2015”	1. After step 2, show report details and list of damaged equipment	N/A	Passed	10/8/2015	

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	schedule in day.	2. User clicks on button “Xem” in classroom “105”	category in classroom “105”. - “Đổi phòng” button is hidden - Message: “Phòng hiện đang trống”.				
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5.3.2. Mobile Application

ID	Test Case Description	Test Case Procedure	Expected output	Inter-test Case Dependence	Result	Test Date	Note
CM1	User with role is staff, change room when view report.	1. User login to ECRM Staff application 2. Touch to view report of class “308” 3. Touch “Đổi phòng” button 4. Touch to choose room “305” and touch “Đổi phòng”	1. After step 1, show list report newest 2. After step 2, show detail report of class “308” with equipment category 3. After step 3, show list available room for room “308” 4. After step 4, change room from “308” to “305”. Users teach in “308” receive notification from system. Application goes to previous page.	N/A	Passed	10/8/2015	
CM2	User with role is staff, change room	1. User login to ECRM Staff application	1. After step 1, show list report newest.	N/A	Passed	10/8/2015	

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	when have no report.	2. Touch menu and choose “Quản lí phòng học” menu 3. Touch to classroom “308” 4. Touch to choose room “305” and touch “Đổi phòng”	2. After step 2, show list classroom of school by floor. 3. After step 3, show list available room 4. After step 4, system change room from “308” to “305”. Users teach in class will receive notification from system.				
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F. Software User’s Manual

1. Installation Guide

1.1. Setting up environment at server side

The following software must be installed into the server machine:

1.1.1. Hardware requirement

Personal computers for developing with the minimum configuration:

- Processor: Minimum Core 2 Duo 2.0GHz
- Memory: Minimum 1GB RAM
- Available Disk Space: Minimum 30GB hard disk
- Internet: Minimum speed 10Mbps

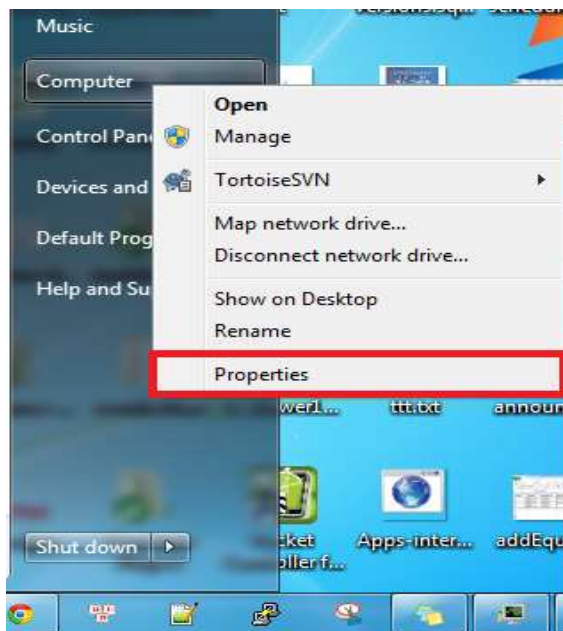
1.1.2. Software requirement

- Web Server: Apache Tomcat 7.0.55 with JRE 7
- OS: Microsoft Windows Server 2008
- MySQL Server 5.5

1.2. Deployment at server side

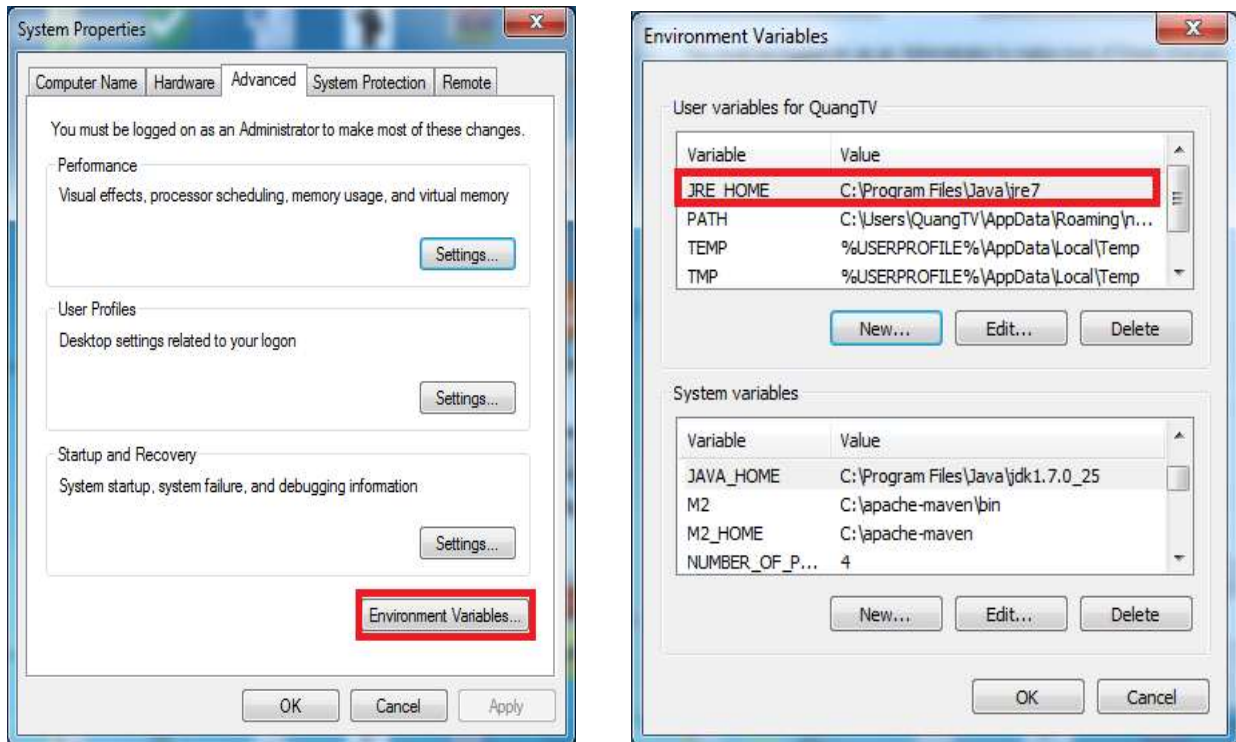
1.2.1. Setup environment variable

Please go following path: Click **Properties** of **Computer**, then click **Advanced System Setting**, in “**Advanced**” tab select **Environment variables**.



- Add variable **JRE_HOME**: Directory path of Java Runtime Environment.

ECRM – Equipment’s Classroom Management



1.2.2. Prepare deployment package

Copy the deployment package (**WAR** file) to a folder on the Tomcat server.

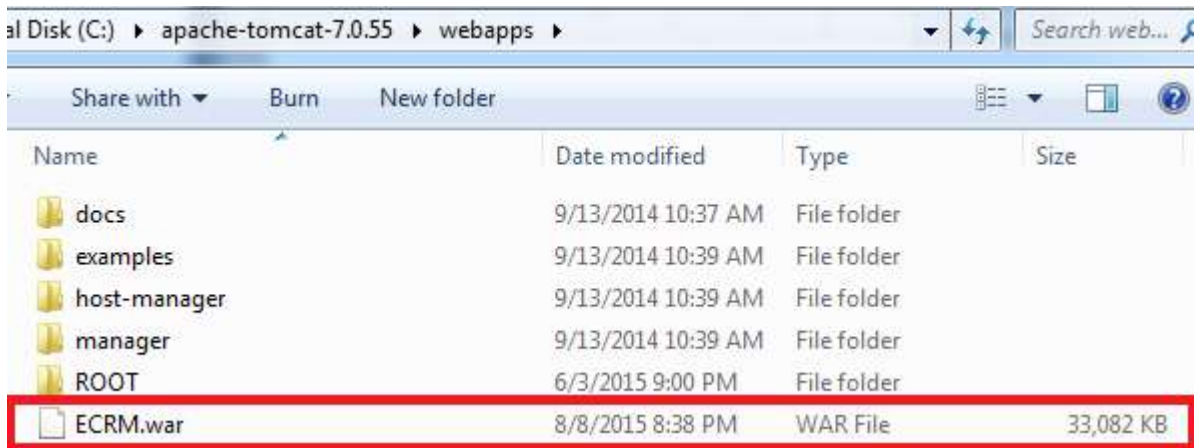


Figure 85: Copy file to Tomcat Server

1.2.3. Configure Server before deploy

- Open MySQL Workbench, connect to server
- Create new schema with name “ECRM”

ECRM – Equipment’s Classroom Management

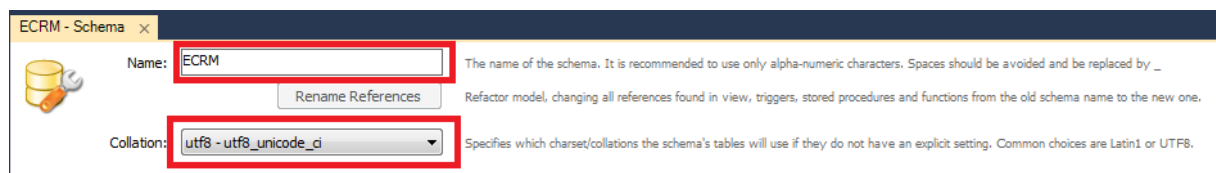
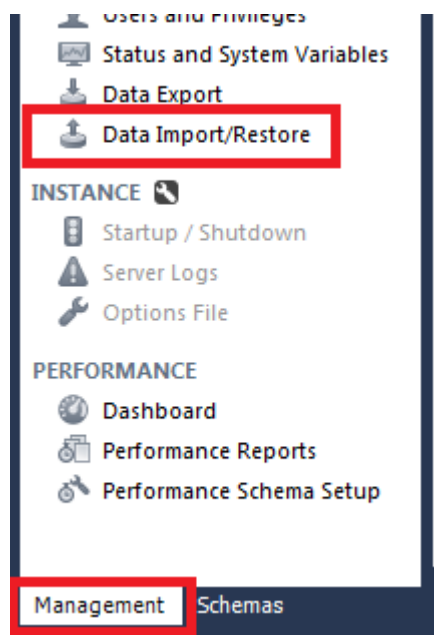
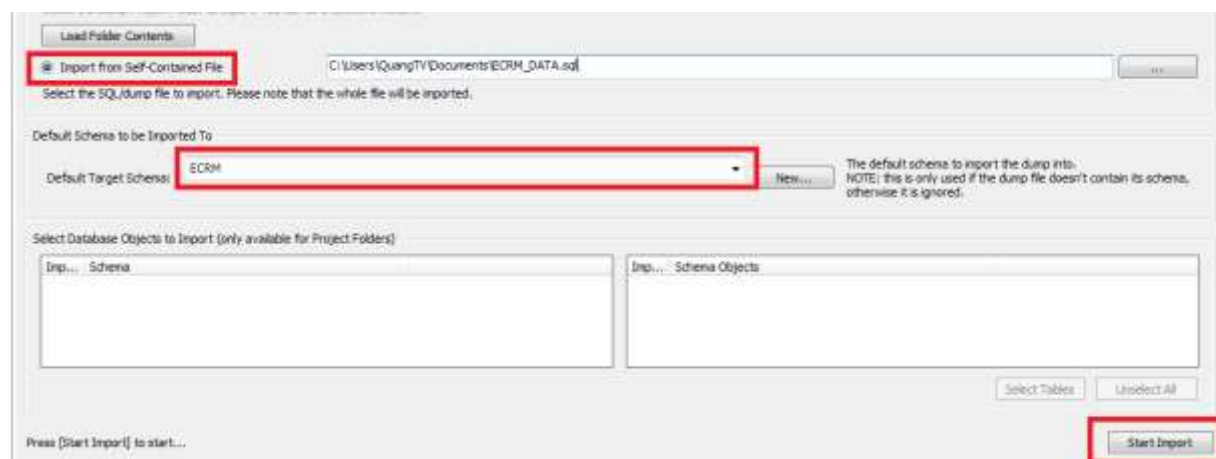


Figure 86: Create Schema

- Select **Management** tab and choose **Data Import/Restore**



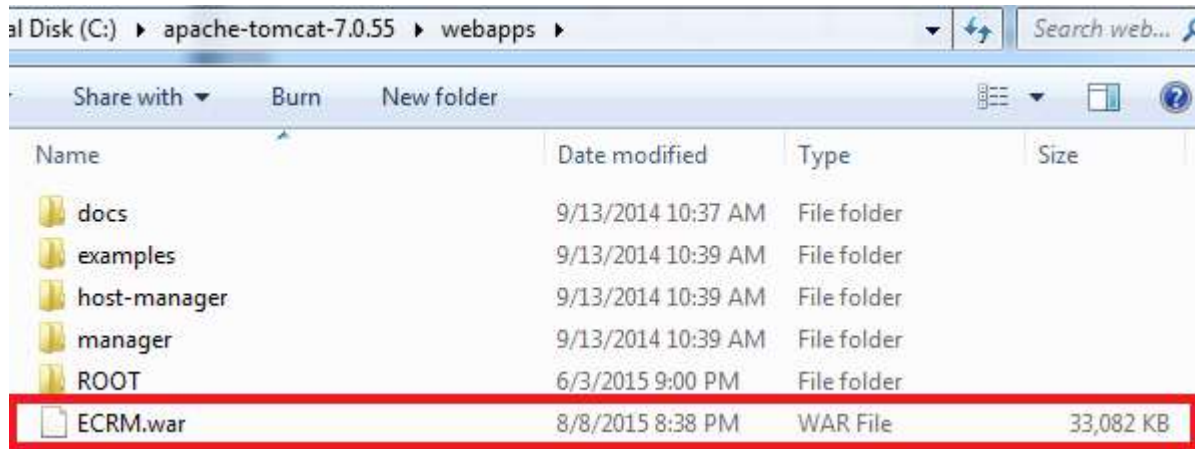
- Choose **Import From Self-Contained File** and enter path to “**ECRM_DATA.sql**”
- Choose **Default Target Schema** is **ECRM**
- Press **Start Import**



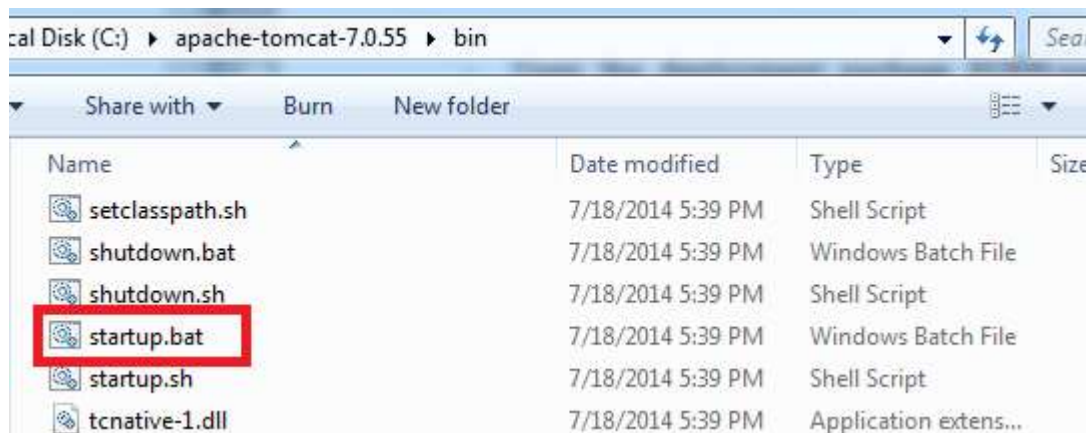
1.2.4. Deploy web application at server

ECRM – Equipment’s Classroom Management

- Copy the deployment package **ECRM.war** to a folder **webapps** in the directory of Tomcat server. Ex: C:\apache-tomcat-7.0.55\webapps



- Navigate to folder **bin** in the directory of Tomcat server. Then click **startup.bat** file to start the server and wait for server startup.



1.3. Setting up environment at client side

1.3.1. Setting up for computer

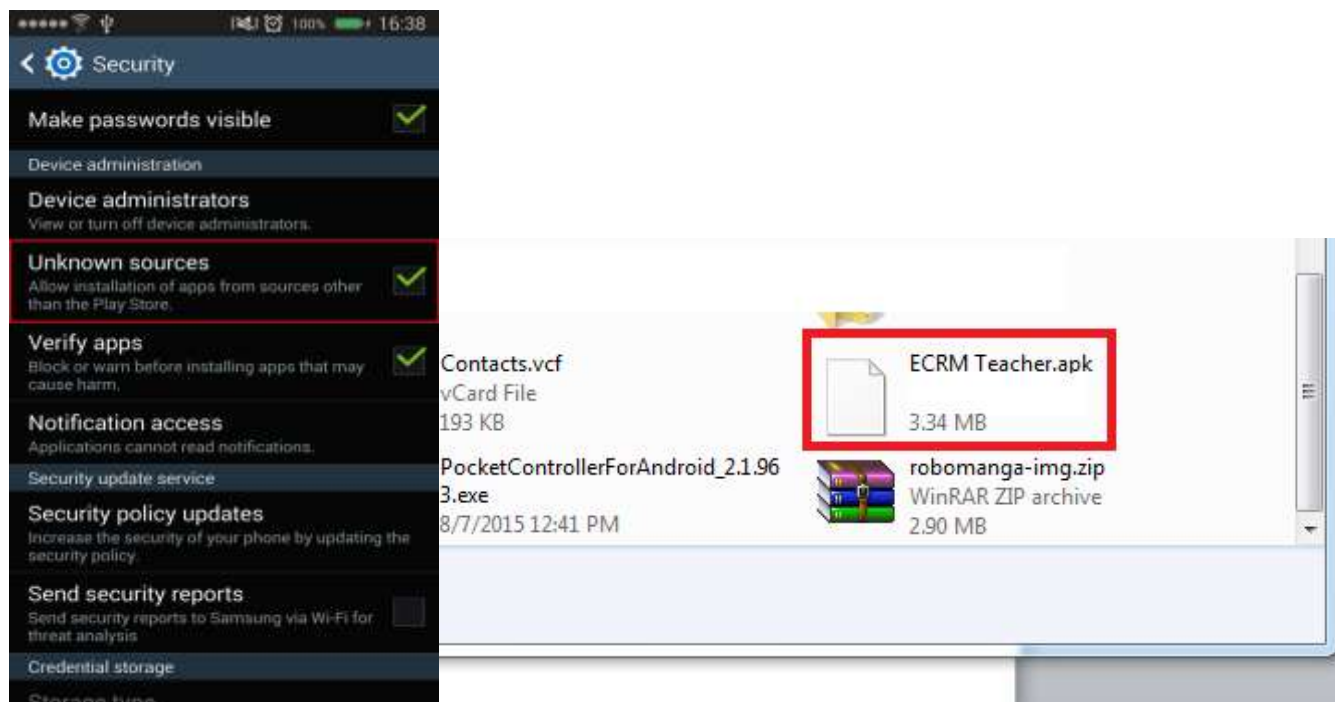
The client devices need to have one of the following browsers to access the website: Firefox (v30 or above), Google Chrome (v14 or above) browser... enables JavaScript.

1.3.2. Setting up for Android device

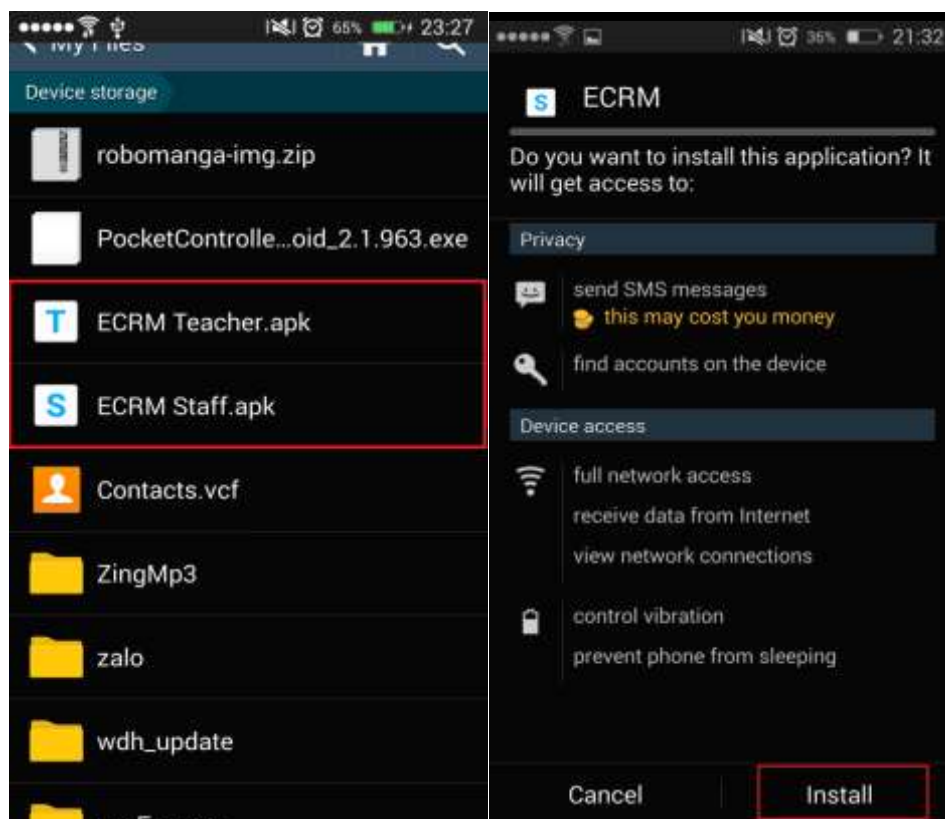
Change setting to install unknown source **apk files**. To do this, go to **Setting/Security**, tick check box **Unknown sources**.

Copy installation source into device external memory: **ECRM Teacher.apk** or **ECRM Staff.apk**

ECRM – Equipment’s Classroom Management



Open Android file explorer, navigate to external memory directory. Click on file to install.



2. User Guide

ECRM – Equipment’s Classroom Management

2.1. Teacher Guide

2.1.1. Mobile Application

2.1.1.1. Login



Step	Description
1	Fill in fields: “Tài khoản” “Mật khẩu”
2	Touch “Đăng nhập” button

2.1.1.2. View Schedule

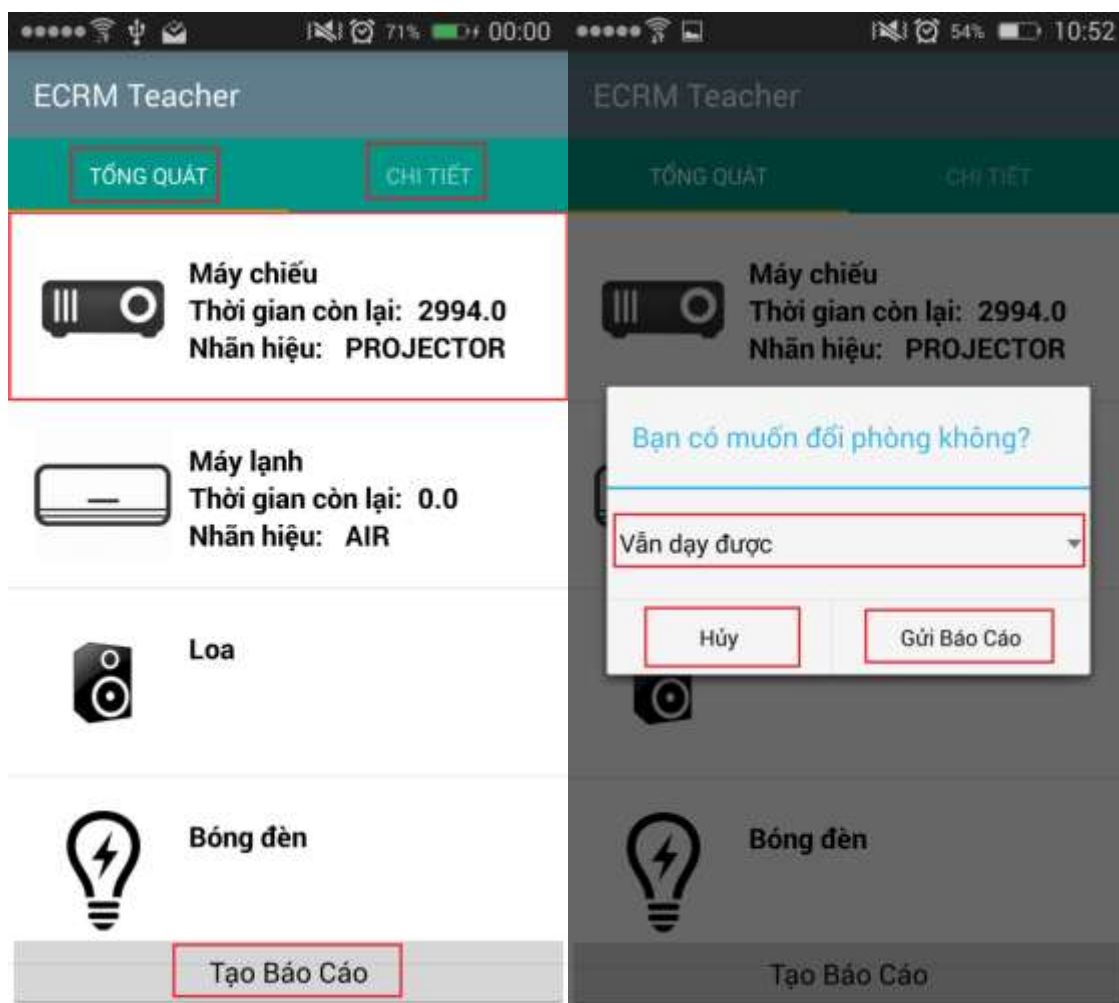
ECRM – Equipment’s Classroom Management



Step	Description
1	Thông tin lịch dạy
2	Touch to item to create report for this room.

2.1.1.3. Create Report

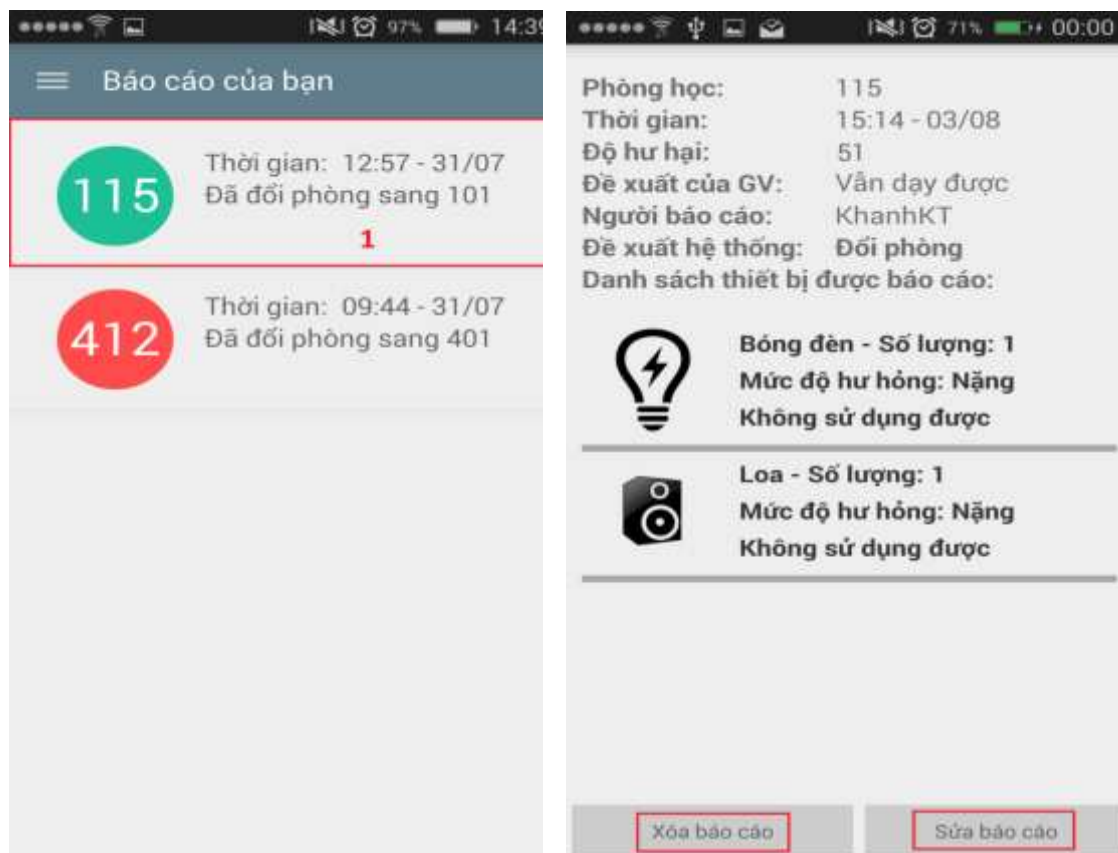
ECRM – Equipment’s Classroom Management



Step	Description
1	At View Schedule Screen, choose classroom to report
2	Touch “TỔNG QUÁT” to view list equipment category of classroom
3	Touch “CHI TIẾT” to view map of classroom
4	Choose equipmenet show in list to report
5	Touch “Tạo Báo Cáo” to create report
6	Evaluate report by choose from spinner value
7	Touch “Gửi Báo Cáo” to send report to staff

2.1.1.4. View Report History

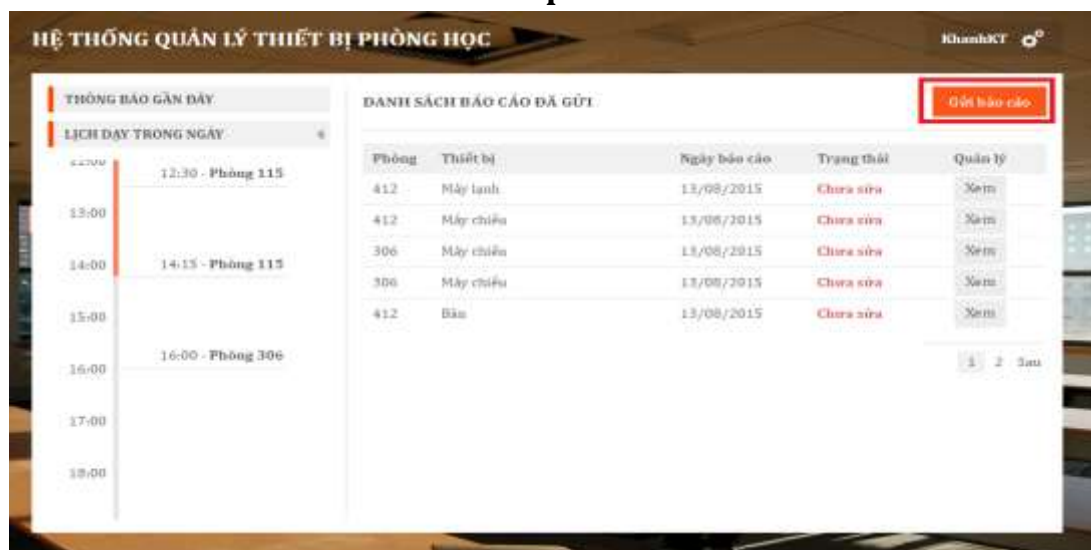
ECRM – Equipment’s Classroom Management



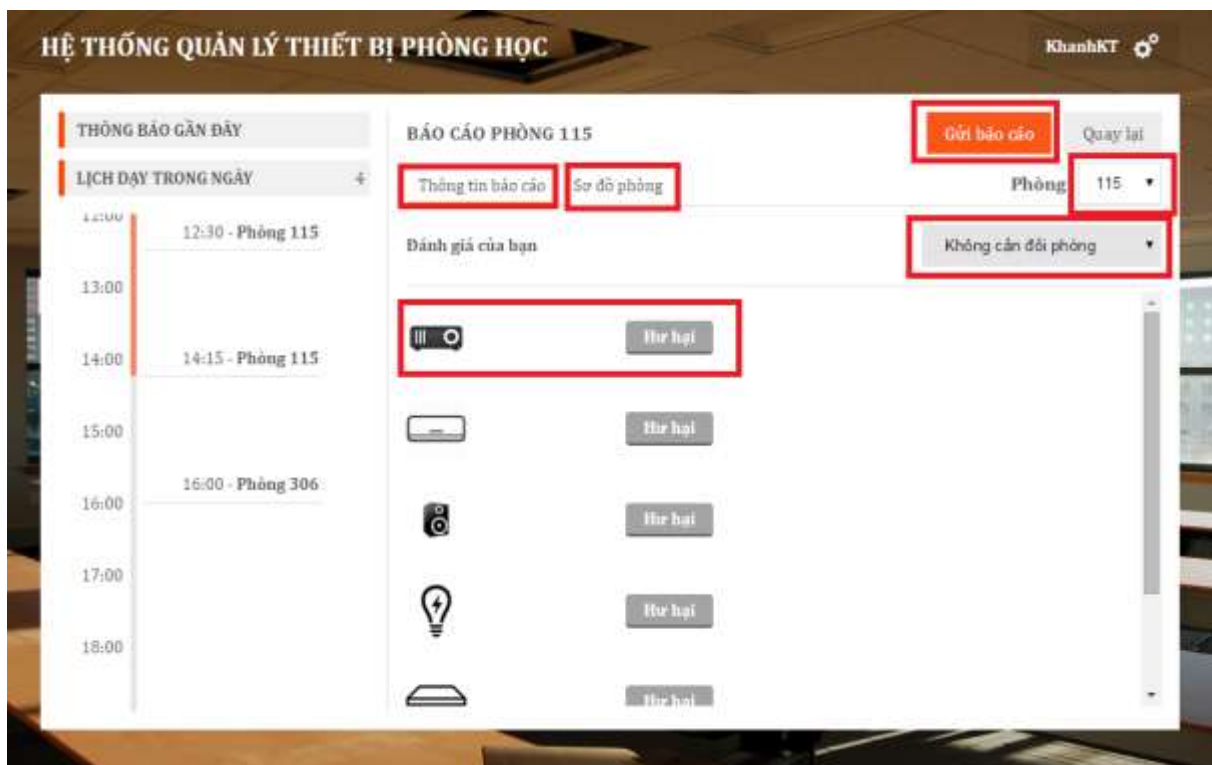
Step	Description
1	Touch to view detail report
2	Touch “Xóa báo cáo” to remove report
3	Touch “Sửa báo cáo” to edit report

2.1.2. Web Application

2.1.2.1. Create Report



ECRM – Equipment’s Classroom Management



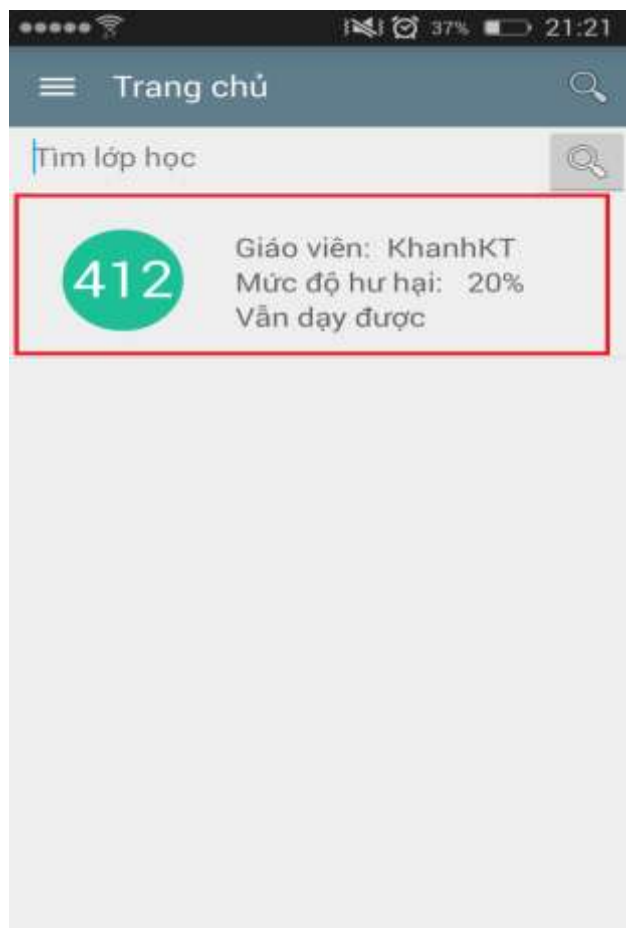
Step	Description
1	At home page, click “Gửi báo cáo”
2	Click “Thông tin báo cáo” to view list equipment category of classroom
3	Click “Sơ đồ phòng” to view map of classroom.
4	Choose “Phòng” to report specific classroom.
5	Choose equipmenet show in list to report.
6	Choose “Đánh giá của bạn” to send teacher’s evaluation about classroom.
7	Click “Gửi Báo Cáo” to send report.

2.2. Staff Guide

2.2.1. Mobile Application

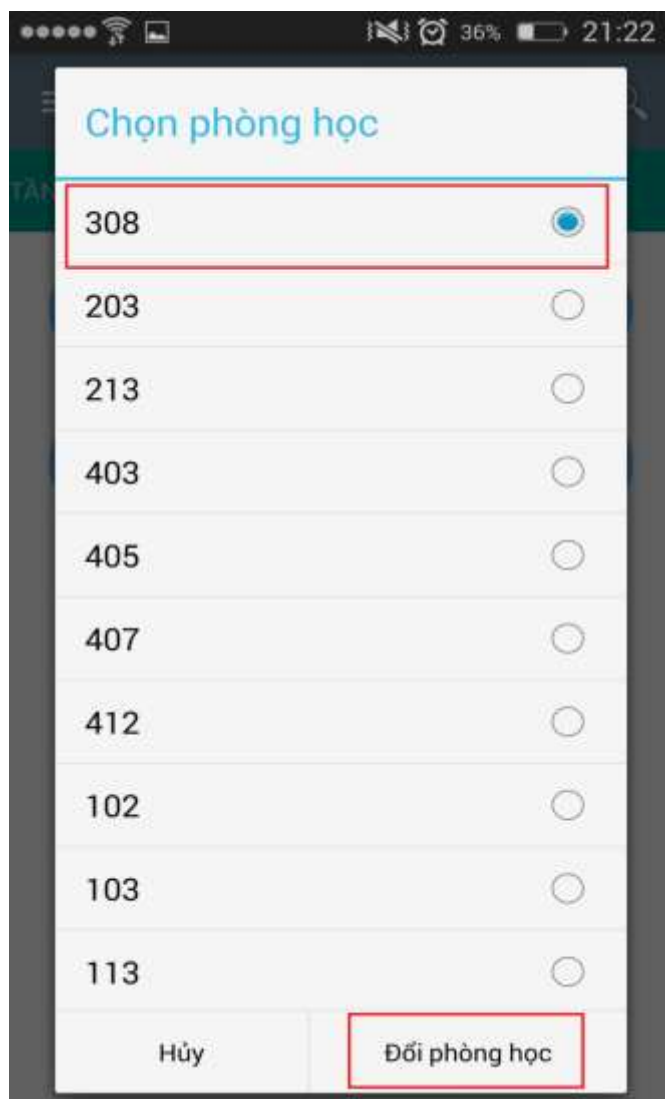
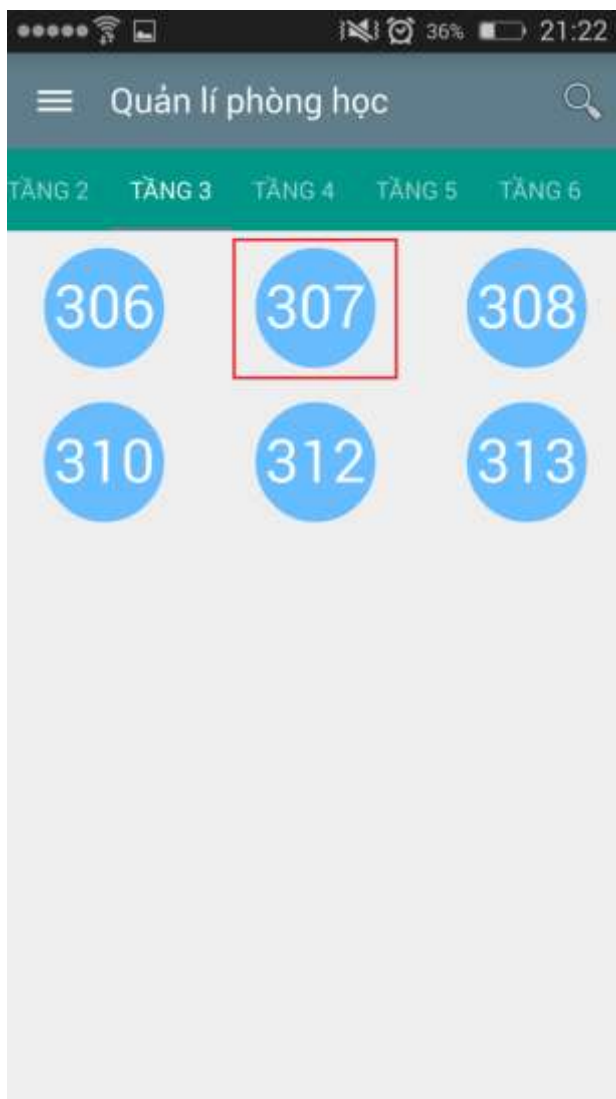
2.2.1.1. Resolve Report

ECRM – Equipment’s Classroom Management



Step	Description
1	Touch to view detail report
2	Touch “Khắc phục” to resolve report
3	Touch “Đổi phòng học” to change room

2.2.1.2. Change Room



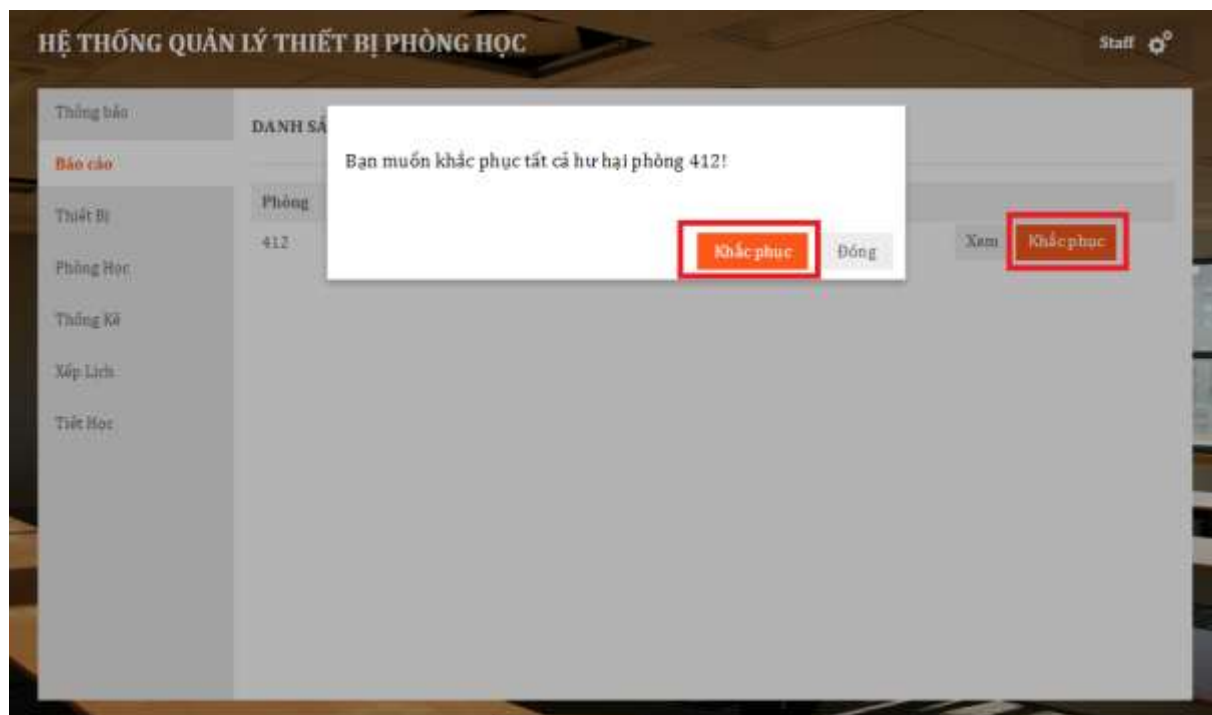
Step	Description
1	Touch to room name to find available room
2	Touch “Đổi phòng học” to change room

2.2.2. Web Application

2.2.2.1. Resolve Report

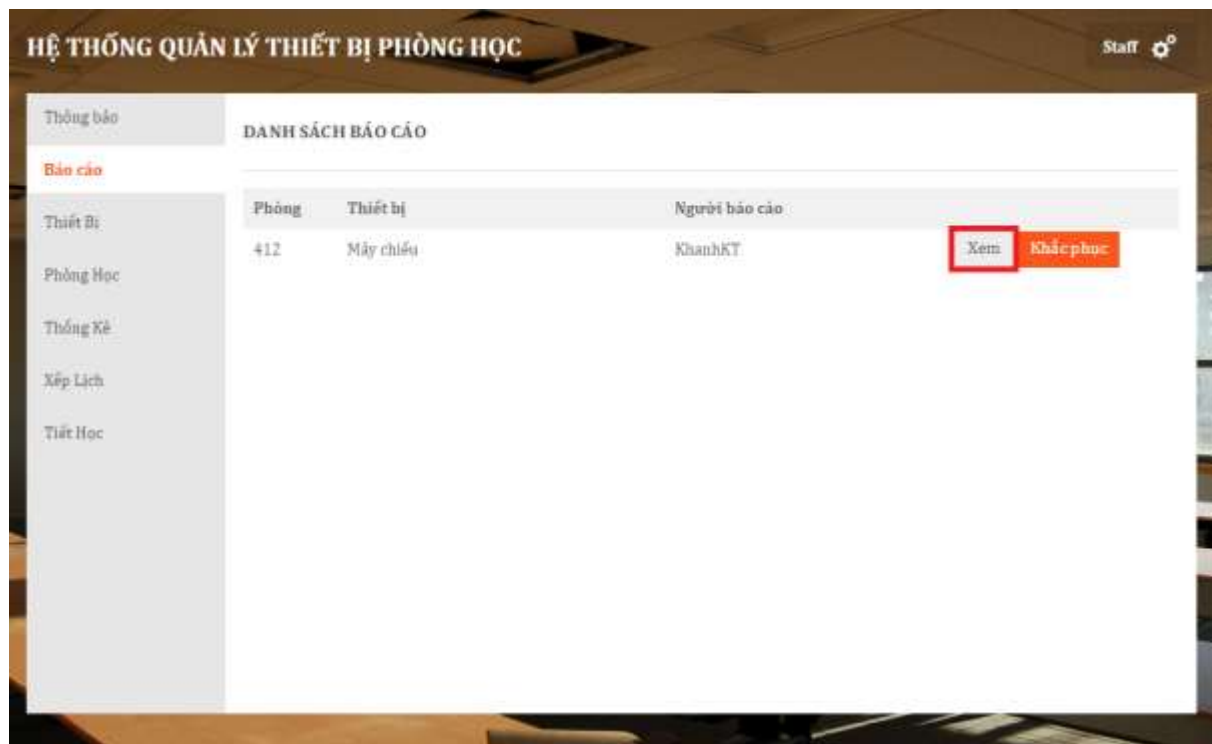
2.2.2.1.1. Resolve All

ECRM – Equipment’s Classroom Management



Step	Description
1	At “Báo cáo”, click “Khắc phục”
2	Click “Khắc phục” to resolve report.

2.2.2.1.2. Resolve Detail



ECRM – Equipment’s Classroom Management

HỆ THỐNG QUẢN LÝ THIẾT BỊ PHÒNG HỌC

Staff

Thông báo

Báo cáo

Thiết bị

Phòng Học

Thống kê

Xếp Lịch

Tiết Học

CHI TIẾT BÁO CÁO PHÒNG

Quay lại

Thông tin Sơ đồ

Danh sách hư hại

☒ Máy chiếu 7457667867

Khắc phục tất cả Khắc phục

Giảng viên đánh giá Văn dạy được

Đề xuất đổi phòng Phòng 403 Đổi phòng

Hư hại của phòng 20%

Step	Description
1	At “Báo cáo” page, click “Xem”
2	Check equipment and choose serial number.
3	Click “Khắc phục tất cả”

2.2.2.2. Import Schedule

HỆ THỐNG QUẢN LÝ THIẾT BỊ PHÒNG HỌC

Staff

Thông báo

Báo cáo

Thiết bị

Phòng Học

Thống kê

Xếp Lịch

Tiết Học

XẾP LỊCH

Tạo mới Nhập File

Giáo viên Tìm Kiếm

Nhập Lịch

Bấm vào để tải mẫu!

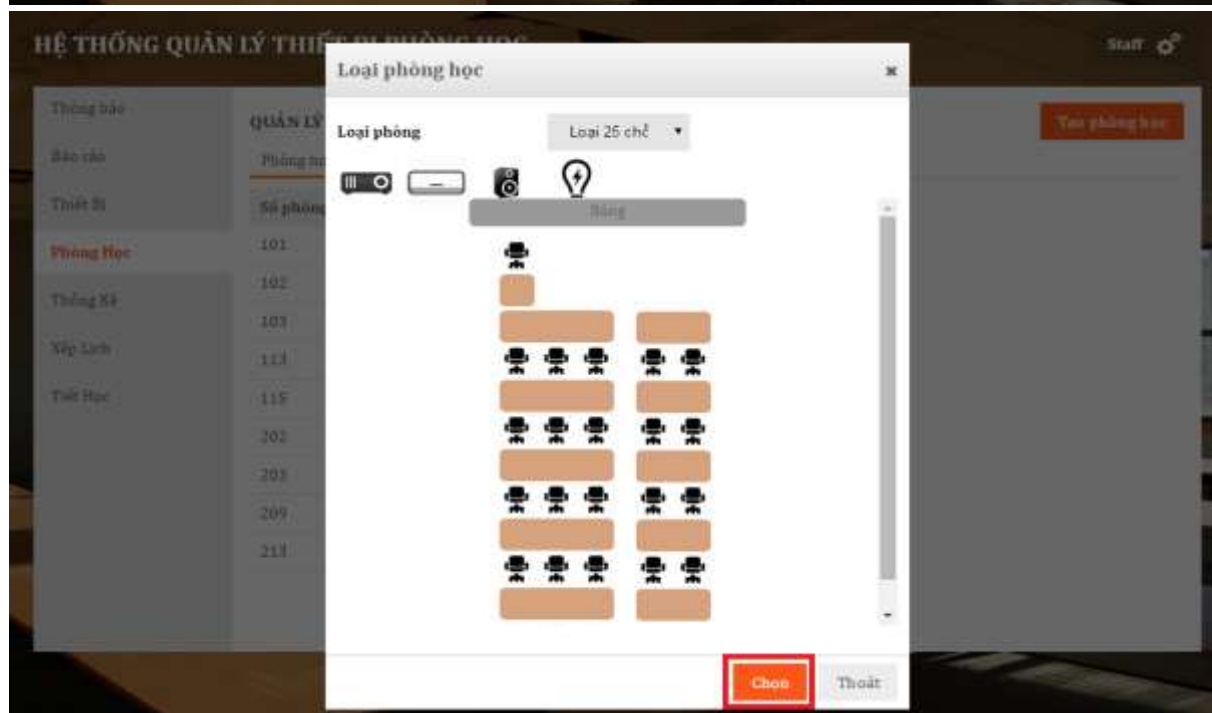
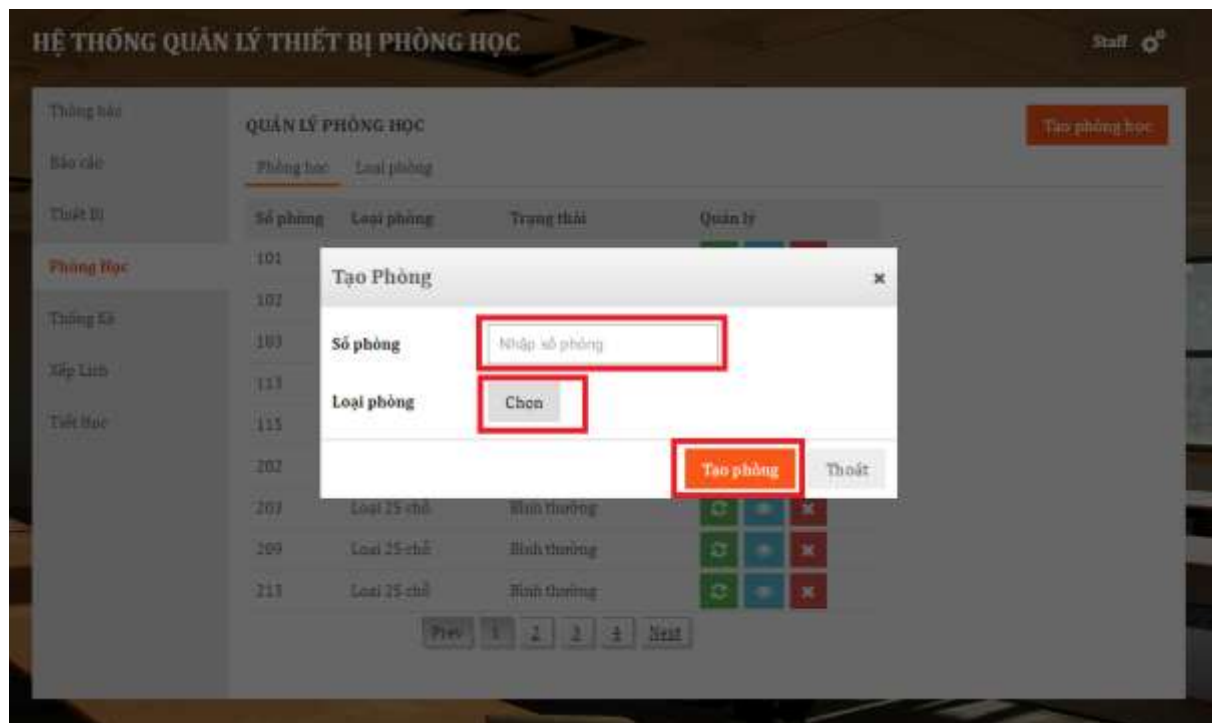
Chọn file excel: Chọn tệp Không có tệp nào được chọn

Nhập lịch Thoát

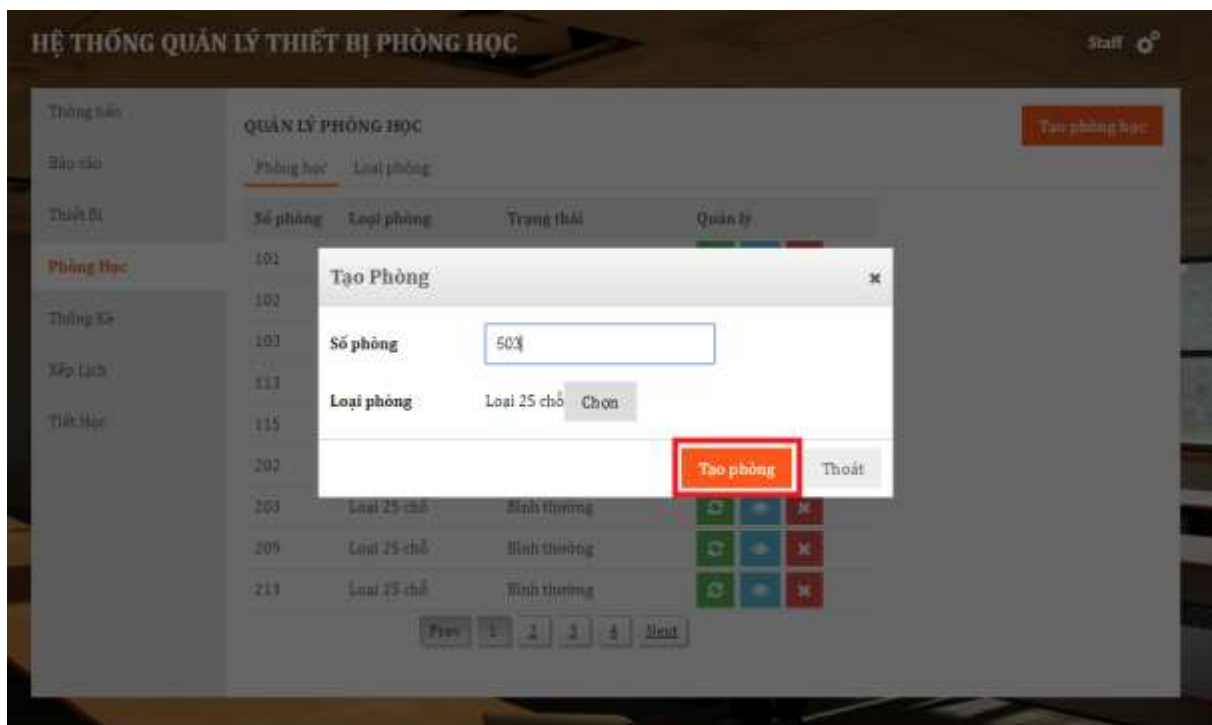
ECRM – Equipment’s Classroom Management

Step	Description
1	At “Xếp lịch” page, click “Nhập File”
2	Click “Bấm vào để tải mẫu” to download template
3	Click “Chọn tệp” to select file
4	Click “Nhập lịch” to import schedule.

2.2.2.3. Create Classroom

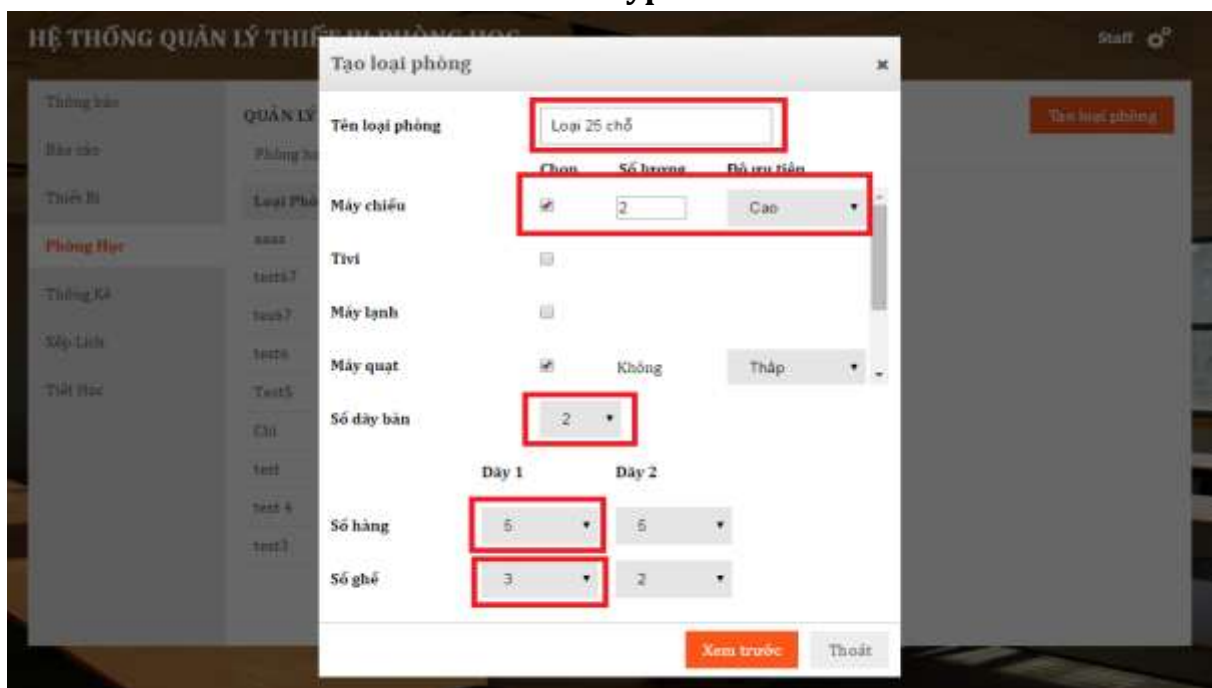


ECRM – Equipment’s Classroom Management

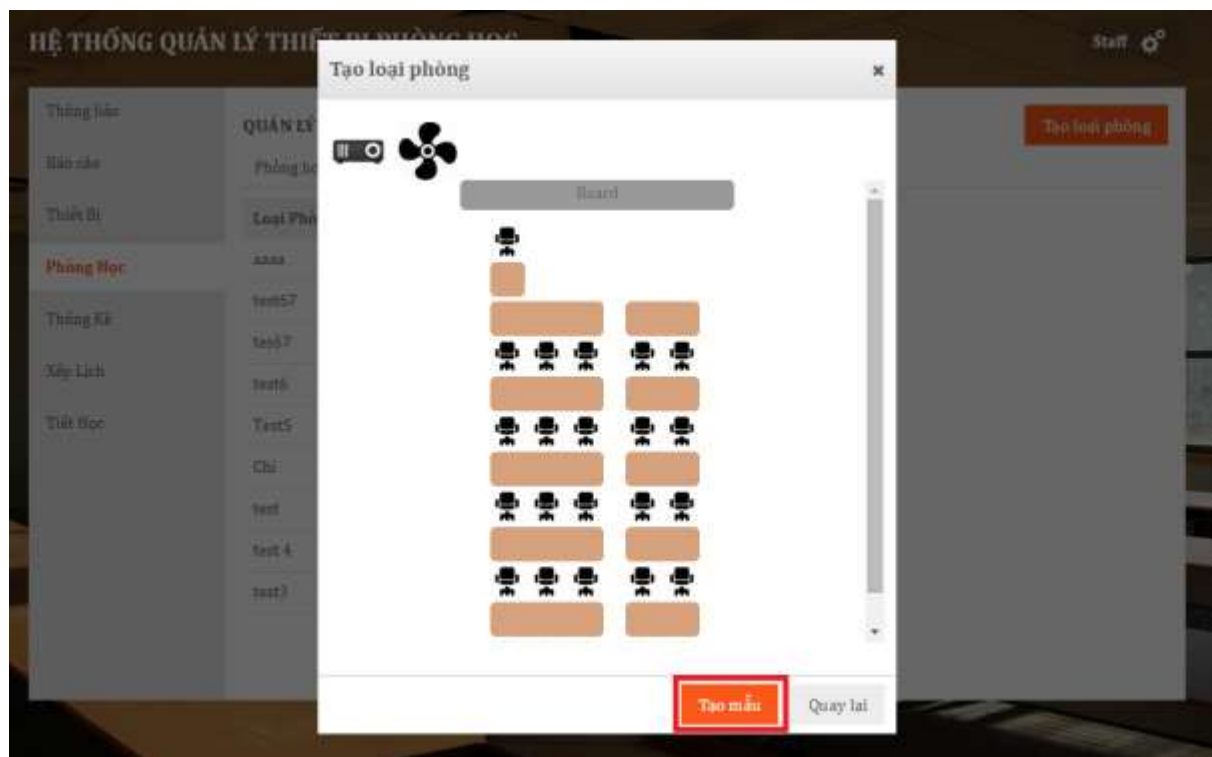


Step	Description
1	At “Phòng học” page, click “Tạo phòng học”
2	Input at “Số phòng” and click “Tạo phòng”
3	Choose “Loại phòng” and click “Chọn”
4	Click “Tạo phòng”

2.2.2.4. Create Room Type



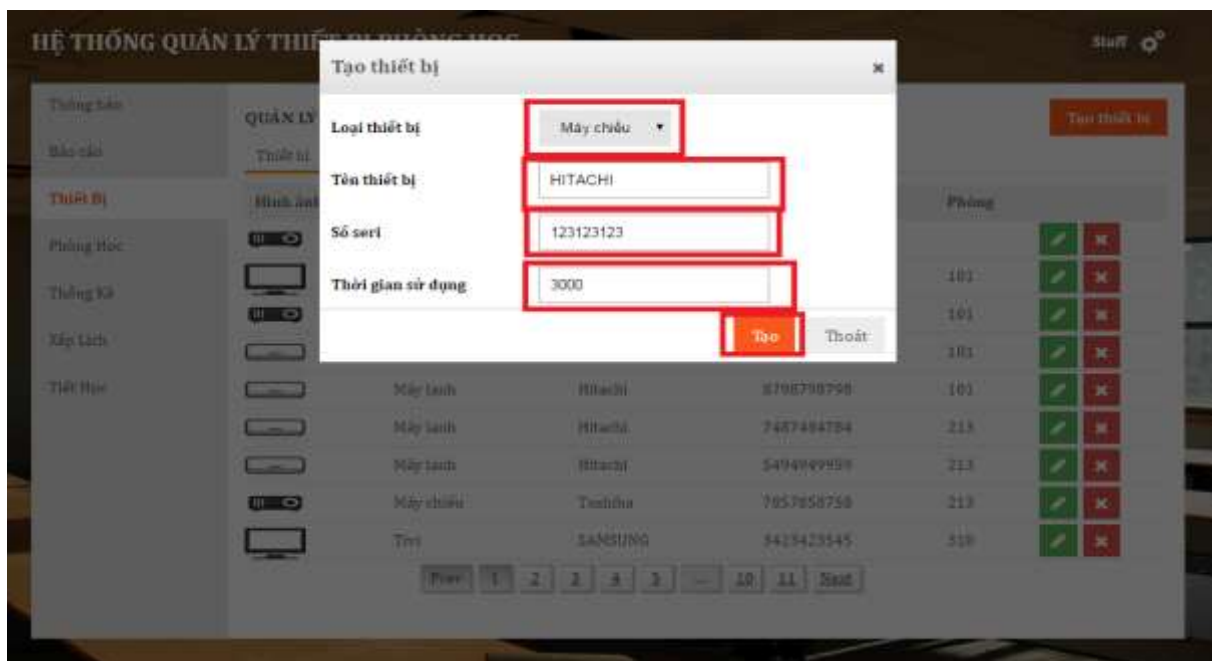
ECRM – Equipment’s Classroom Management



Step	Description
1	At “Phòng học” page, tab “Loại phòng”, click “Tạo loại phòng”
2	Input at “Tên loại phòng”
3	Check equipment, input “Số lượng” and choose “Ưu tiên”
4	Choose “Dãy bàn”, “Số hàng”, “Số ghế”
5	Click “Xem mẫu”
6	Click “Tạo mẫu”

2.2.2.5. Create Equipment

ECRM – Equipment’s Classroom Management



Step	Description
1	At “Thiết bị” page, tab “Thiết bị”, click “Tạo thiết bị”
2	Choose “Loại thiết bị”
3	Input at “Tên thiết bị”, “Số seri”, “Thời gian sử dụng”
6	Click “Tạo”

G. Appendix

1. SOFTWARE ENGINEERING 9th Edition, by Ian Sommerville.
2. Code Conventions for the Java TM Programming Language, by Sun Microsystems, rev April 20, 1999.
3. Android Developer Guide - Application Fundamentals
<http://developer.android.com/guide/components/fundamentals.html>
4. Send and receive SMS with Twilio Service
<http://kieutrongkhanh.net/index.php/advanced/118-gi-va-nhn-tin-nhn-sms-vi-twilio>