**MINISTRY OF EDUCATION AND TRAINING**

**FPT UNIVERSITY**

Capstone Project Report 2

**The Laboratory Test Management System**

|  |  |
| --- | --- |
| **Group 6** | |
| **Group members** | Bạch Minh Đức – SE61791  Châu Minh Ý– SE61419  Trần Tuấn Dũng – SE61982  Nguyễn Hữu Lâm – SE61234 |
| **Supervisor** | Hồ Hoàn Kiếm |
| **Ext. Supervisor** | N/A |
| **Capstone Project Code** | eLTMS |

# Table of Contents

[Table of Contents 2](#_Toc532261998)

[List of Tables 3](#_Toc532261999)

[List of Figures 3](#_Toc532262000)

[**Software Project Management Plan** 4](#_Toc532262001)

[1. Problem Definition 4](#_Toc532262002)

[1.1. Name of this Capstone Project 4](#_Toc532262003)

[1.2. Problem Abstract 4](#_Toc532262004)

[1.3. Project Overview 4](#_Toc532262005)

[1.3.1. Current Situation 4](#_Toc532262006)

[1.3.2. The Proposed System 5](#_Toc532262007)

[1.3.2.1. Website and mobile application for user 5](#_Toc532262008)

[1.3.2.2. Website for administrator 5](#_Toc532262009)

[1.3.2.3. Web Services 6](#_Toc532262010)

[1.3.3. Boundaries of the System 6](#_Toc532262011)

[1.3.4. Future plans 7](#_Toc532262012)

[1.3.5. Development Environment 7](#_Toc532262013)

[1.3.5.1. Hardware requirement 7](#_Toc532262014)

[1.3.5.2. Software requirement 8](#_Toc532262015)

[2. Project organization 8](#_Toc532262016)

[2.1. Software Process Model 8](#_Toc532262017)

[2.2. Roles and responsibilities 9](#_Toc532262018)

[2.3. Tools and Techniques 10](#_Toc532262019)

[3. Project Management Plan 11](#_Toc532262020)

[3.1. Software development life cycle 11](#_Toc532262021)

[3.2. Phase Detail 12](#_Toc532262022)

[3.2.1. Phase 1: Requirements Definition 12](#_Toc532262023)

[3.2.2. Phase 2: System and Software Design 12](#_Toc532262024)

[3.2.3. Phase 3: Implementation and Unit Testing 13](#_Toc532262025)

[3.2.4. Phase 4: Integration and System Testing 14](#_Toc532262026)

[3.2.5. Phase 5: Operation and Maintenance 14](#_Toc532262027)

[3.3. Task sheet 15](#_Toc532262028)

[3.4. All Meeting Minutes 15](#_Toc532262029)

[4. Coding Convention 15](#_Toc532262030)

[4.1. Naming 15](#_Toc532262031)

[4.2. Comment 15](#_Toc532262032)

[4.3. Indentation 15](#_Toc532262033)

[4.4. Declaration 15](#_Toc532262034)

# List of Tables

[Table 1 - Hardware requirement for server 8](#_Toc531549971)

[Table 2 - Hardware requirement for web development 8](#_Toc531549972)

[Table 3 - Hardware requirement for mobile development 8](#_Toc531549973)

[Table 4 - Software requirement 8](#_Toc531549974)

[Table 5 - Roles and Responsibilities Details 10](#_Toc531549975)

[Table 6 - Tools and Techniques 10](#_Toc531549976)

[Table 7 - Software development life cycle 11](#_Toc531549977)

[Table 8 - Phase 1: Requirements Definition 12](#_Toc531549978)

[Table 9 - Phase 2: System and Software Design 12](#_Toc531549979)

[Table 10 - Phase 3: Implementation and Unit Testing 13](#_Toc531549980)

[Table 11 - Phase 4: Integration and System Testing 13](#_Toc531549981)

[Table 12 - Phase 5: Operation and Maintenance 13](#_Toc531549982)

# List of Figures

[Figure 1 - Scrum Model 9](#_Toc531549986)

# **Software Project Management Plan**

## Problem Definition

### Name of this Capstone Project

* Official name: **The Laboratory Management System**
* Vietnamese name: **Hệ thống quản lý phòng xét nghiệm**
* Abbreviation: **eLTMS**

### Problem Abstract

Hospital is the essential part of our lives providing best medical facilities for people to suffer from various ailments, which may be due to change in climatic conditions, increased work-load, emotional trauma stress etc. It is necessary for the hospitals to keep track of its day-to-day activities & records of its patients, doctors, nurses, ward boys and other staff personals that keep the hospital running smoothly & successfully.

But keeping track of all the activities and their records on paper is very cumbersome and error prone. It also is very inefficient and a time-consuming process Observing the continuous increase in population and number of people visiting the hospital. Recording and maintaining all these records are highly unreliable, inefficient and error-prone. It is also not economically & technically feasible to maintain these records on paper.

Thus, keeping the working of the manual system as the basis of our project. We have developed “The Laboratory Tests Management System”.

The main objective of this project is to analyze the concept and process of laboratory tests in the hospital from it building up the website to manage all patient information of laboratory tests and helping doctor, users, and laboratory technician easily to control their job. It also aims to provide low-cost reliable automation of the existing systems. Not only does the system provides excellent security of data at every level of user-system interaction, but also it provides robust & reliable storage and backup facilities.

### Project Overview

#### Current Situation

Nowadays, In Vietnam, Except for the large hospitals on the up-line has laboratory system, which helps doctor conjecture and treat patients in the best way. Other hospitals or clinics on the downline do not have this system, If doctor want to conjecture and treat patients in the best way, they must require patients go to hospital on up-line and check their health on the laboratory systems, after that, patient will come back and listen the diagnosis.

But all of hospitals on up-line is over-load now. If patients want to check their health, they must waste time to change hospital and wait because large numbers overload of patients. Not only time but also money, they must spend money for this moving and laboratory system.

With our laboratory management system, we will help patients and doctor with life easier.

Below are disadvantages of current situation:

* Patients spend too much time, effort to get the health result
* Doctor do not have the best support tools for offering the best treatment options
* Hospitals, clinics have difficulty in managing records, reviews

#### The Proposed System

Our solution is to build systems capable of placing and managing time (Calendar Manager) to resolve the current situations, we also design the system to be scalable, so we can deploy this system to a multiple insurance services company in future.

##### Website and mobile application for user

* **User component (Patient):**
* Register
* Login
* Book an appointment
* View booked appointment
* Edit-Cancel appointment
* View testing result
* View suggestion, note
* Edit, Update profile account
* Feedback about service

##### Website for administrator

* **Hospital Receptionist component:**
* View details of appointment
* View list patient who has appointment by date
* Change status of appointment
* View patient’ information
* **Department Receptionist component:**
* Create new appointment for user (Patient)
* View list appointments by date
* Change status of appointment
* View patient’ information
* **Nurse component:**
* View details of appointment
* Change status of appointment
* Change status of lab testing
* View patient’s information
* **Laboratory Technician component:**
* Manage sample group
* Manage sample
* **Doctor component:**
* Check for the disease
* Write note (advice to patient) and conclusion
* Request re-testing
* View patient’ information
* **Manager component:**
* Manage service of system
* Manage staff’s account
* View patient’ information
* View testing result
* View Feedback

##### Web Services

* Provide RESTful APIs for web and mobile application
* Handle request, process data and send response to client site

#### Boundaries of the System

* Allow user to book appointment for testing, view result history of testing, view or edit contact information
* Allow admin to manage patients, appointments, staffs
* The language of this system is Vietnamese
* User’s devices (computer, smartphone) must connect to the Internet
* The complete product includes:
  + Website & mobile application for users (patient)
  + Website for administrators
  + Web services

#### Future plans

Current system is concentrated on core business flow. Therefore, some supporting features are restricted for the development team. These features may be expanded in the future:

* Support more categories
* Develop stronger security to reduce the risk for the system and users
* Develop getting detailed statistics for testing by month, year
* Develop system on mobile for admin

#### Development Environment

##### Hardware requirement

* For server

|  |  |  |
| --- | --- | --- |
| Hardware | Minimum Requirements | Recommended |
| Internet Connection | Cable, Wi-Fi (6 Mbps) | Cable, Wi-Fi (16 Mbps) |
| Operating System | Window Server 2012 | Window Server 2012 |
| Computer Processor | Intel® Core i3-8100 (3.6Ghz/6MB martCache) | Intel® Core  i7-8850H (2.6Ghz/9MB martCache) |
| Computer Memory | 8GB RAM | 16GB RAM |

Table 1 - Hardware requirement for server

* For web development:

|  |  |  |
| --- | --- | --- |
| Hardware | Minimum Requirements | Recommended |
| Internet Connection | Cable, Wi-Fi (4 Mbps) | Cable, Wi-Fi (8 Mbps) |
| Operating System | Windows 7 or above | Windows 7 or above |
| Computer Processor | Intel® Core  i3-6300 (3.8Ghz/4MB martCache) | Intel® Core i5-6500 (3.6Ghz/6MB martCache) |
| Computer Memory | 4GB RAM | 8GB RAM |

Table 2 - Hardware requirement for web development

* For mobile development:

|  |  |  |
| --- | --- | --- |
| Hardware | Minimum Requirements | Recommended |
| Internet Connection | Wi-Fi (2 Mbps),3G-4G | Wi-Fi (4 Mbps), 3G-4G |
| Operating System | Android 4.4.2 | Android 6.0 |
| Memory | 4GB RAM | 8GB RAM |

Table 3 - Hardware requirement for mobile development

##### Software requirement

|  |  |
| --- | --- |
| Software | Name / Version |
| Operating system | Windows 7 or above |
| Environment | C#.NET, Spring framework, JQuery, Bootstrap |
| Modeling tool | Offline: WhiteStartUML  Online: draw.io |
| IDE | Visual Studio 2017, Android studio |
| DBMS | SQL Server 2014 |
| Source control | SourceTree, Git |
| Web browser | Chrome 42 or above |

Table 4 - Software requirement

## Project organization

### Software Process Model

In this project, we choose Scrum which is an agile framework that allows step by step to set up a plan successfully. We choose this model because of the following reasons:

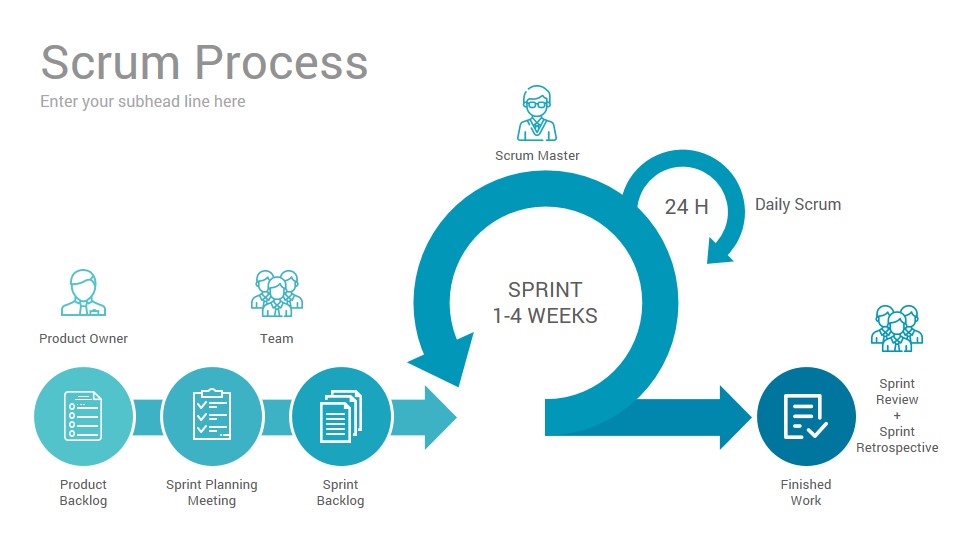
* Time-saving: daily meetings ensure that the process is at correct stage, as established at the beginning of the project
* Easy to use: suitable model for small and medium project
* Fast response to changes: product owner may change requirements or extend / reduce scope and we can adapt better
* Encourage teamwork: roles and tasks are divided and assigned efficiently

Figure 1 - Scrum Model

### Roles and responsibilities

|  |  |  |  |
| --- | --- | --- | --- |
| No | Full name | Role in Group | Responsibilities |
| 1 | **Hồ Hoàn Kiếm** | Supervisor/Project Manager | * Specify user requirements * Control the development process * Support in technique and business logic. |
| 2 | **Bạch Minh Đức** | Team leader, scrum master, BA, Developer, Tester | * Clarify requirements * Design database * Design GUI * Code * Write document and report * Create test plan * Testing. |
| 3 | **Châu Minh Ý** | Scrum member, BA, Developer, Tester | * Clarify requirements * Design database * Design GUI * Code * Write document and report * Create test plan * Testing |
| 4 | **Trần Tuấn Dũng** | Scrum member, BA, Developer, Tester | * Clarify requirements * Design database * Design GUI * Code * Write document and report * Create test plan * Testing |
| 5 | **Nguyễn Hữu Lâm** | Scrum member, BA, Developer, Tester | * Clarify requirements * Design database * Design GUI * Code * Write document and report * Create test plan * Testing |

Table 5 - Roles and Responsibilities Details

### Tools and Techniques

|  |  |
| --- | --- |
| Tool / Technique | Name / version |
| Frontend | HTML,CSS, Javascript, Bootstrap |
| Mobile | Java |
| Backend | C#, .NET Framework |
| DBMS | SQL Server 2014 |
| Source control | SourceTree, Git |
| Modeling tool | Offline: WhiteStartUML  Online: draw.io |
| Web browser | Chrome 42 or above |

Table 6 - Tools and Techniques

## Project Management Plan

### Software development life cycle

Below are all the major tasks that need to be performed sequentially during the development of the system

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Phase | Description | Deliverables | Dependencies and Constrains | Risk |
| Requirements Definition | Collect requirements from customer  Identify and clarify requirements for the system in general | Introduce of proposed system  Software requirement specification  Project task plan  Report No.1 Software Project Management Plan | N/A | Missing requirement  Unclear scope of project  Lack of member share and understand |
| System and Software Design | Identify hardware and software requirements  Decide software architect and clarify software detail design  Design database | Report No.2 Software Project Management Plan.  Report No. 3 Software Requirement Specification | Depend on Requirements definition | Misunderstood or unclear system’s requirement  Lack of practical experience leading to unreasonable design |
| Implementation and Unit Testing | Code the project following the requirement  Fix bug of project  Testing | Web application  Mobile application  Report No. 4 Software Design Description | Base on Requirement analysis. | Lack of practical experience  Missing the deadlines  Get many bug  Delay task |
| Integration and System Testing | Perform integration test and system test | Report No. 5 System Implementation & Test | Implementation and Unit Testing are finished | Lack of testing experience leading to lack of test cases  Get many bug to fix |
| Operation and Maintenance | Deploy the system  Create the user’s manuals  Do routine maintenance activities | Report No.6 Software User’s Manual | Integration and System Testing are finished | User’s manual may be difficult for user to understand and confuse |

Table 7 - Software development life cycle

### Phase Detail

#### Phase 1: Requirements Definition

|  |  |  |
| --- | --- | --- |
| Task | Description | Author |
| Report 1 | Writing Report 1 | Nguyễn Hữu Lâm  Bạch Minh Đức |
| Collect requirements from MEDIC | Go to MEDIC, observe, asking for result papers and information book | Bạch Minh Đức  Trần Tuấn Dũn |
| Identify and clarify requirements for the system in general | Design booking algorithms for almost cases. Explain for the team Discuss together | Bạch Minh Đức  Trần Tuấn Dũng  Châu Minh Ý  Nguyên Hữu Lâm |

Table 8 - Phase 1: Requirements Definition

#### Phase 2: System and Software Design

|  |  |  |
| --- | --- | --- |
| Task | Description | Author |
| Identify hardware and software requirements. | Find out the approriate hardware and software for the system | Bạch Minh Đức  Trần Tuấn Dũng  Châu Minh Ý  Nguyên Hữu Lâm |
| Report 2 | Writing Report 2 | Châu Minh Ý  Nguyên Hữu Lâm |
| Database/Design | Draw database diagram.  Implement it with My SQL Server Insert data Write some queries and test | Bạch Minh Đức  Trần Tuấn Dũng  Châu Minh Ý  Nguyên Hữu Lâm |
| Diagrams Design | Entity Relationship  Class Diagram  Use-case Diagram Activity Diagram Sequence Diagram | Bạch Minh Đức  Trần Tuấn Dũng  Châu Minh Ý  Nguyên Hữu Lâm |
| Report 3 | Writing Report 3 | Bạch Minh Đức  Nguyên Hữu Lâm |

Table 9 - Phase 2: System and Software Design

#### Phase 3: Implementation and Unit Testing

|  |  |  |
| --- | --- | --- |
| Task | Description | Author |
| Implements all functions of system | Coding all the components | Bạch Minh Đức  Trần Tuấn Dũng  Châu Minh Ý  Nguyên Hữu Lâm |
| Create test plan | Planning for testing | Bạch Minh Đức  Trần Tuấn Dũng  Châu Minh Ý  Nguyên Hữu Lâm |
| Perform Unit testing | Write Unit test cases  Implement Unit tests | Bạch Minh Đức  Trần Tuấn Dũng  Châu Minh Ý  Nguyên Hữu Lâm |
| Unit Testing | Write test cases for APIs, Web, Mobile- Run test cases | Bạch Minh Đức  Trần Tuấn Dũng  Châu Minh Ý  Nguyên Hữu Lâm |
| Report 4 | Write Report 4 | Châu Minh Ý  Nguyên Hữu Lâm |

Table 10 - Phase 3: Implementation and Unit Testing

#### Phase 4: Integration and System Testing

|  |  |  |
| --- | --- | --- |
| Task | Description | Author |
| Perform integration test and system test | Write test cases and test the system | Bạch Minh Đức  Trần Tuấn Dũng  Châu Minh Ý  Nguyên Hữu Lâm |
| Report 5 | Write Report 5 | Bạch Minh Đức  Châu Minh Ý |

Table 11 - Phase 4: Integration and System Testing

#### Phase 5: Operation and Maintenance

|  |  |  |
| --- | --- | --- |
| Task | Description | Author |
| Deploy the system | Deploy the system | Bạch Minh Đức  Trần Tuấn Dũng  Châu Minh Ý  Nguyên Hữu Lâm |
| Create the user’s manual | Write user’s manual | Bạch Minh Đức  Trần Tuấn Dũng  Châu Minh Ý  Nguyên Hữu Lâm |
| Do routine maintenance activities | Do routine maintenance activities for client system | Bạch Minh Đức  Trần Tuấn Dũng  Châu Minh Ý  Nguyên Hữu Lâm |
| Report 6 | Write Report 6 | Châu Minh Ý |

Table 12 - Phase 5: Operation and Maintenance

### Task sheet

All Task sheet could be found here: https://goo.gl/QJn2AU

### All Meeting Minutes

N/A

### Naming

* + Using camel case for variables and methods
  + Using capitalized for classes and interfaces
  + Using uppercase words separated by underscores for constants
  + Variable, class and interface names should be nouns. Method names should be verbs

### Comment

* Using /\* \*/ for block comments
  + Using // for line comments

### Indentation

* 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)

### Declaration

* One declaration per line
* Do not put different types on the same line
* Put declarations only at the beginning of blocks
* Try to initialize local variables where they’re declared. The only reason not to initialize a variable where it’s declared is if the initial value depends on some computation occurring first
* No space between a method name and the parenthesis “(“starting its parameter list
* Open brace “{” appears at the end of the same line as the declaration statement
* Closing brace “}” starts a line by itself indented to match its corresponding opening statement, except when it is a null statement the “}” should appear immediately after the” {“
* Methods are separated by a blank line