MINISTRY OF EDUCATION AND TRAINING

­

­

**FPT UNIVERSITY**

Capstone Project Document

**Call-Center on Mobile for Clinics**

|  |  |
| --- | --- |
| **Group 1** | |
| **Group members** | Nguyễn Thế Phương – SE62087  Phan Thành Thuận - SE62063 Nguyễn Lương Tuấn Kiệt - SE61696  Nguyễn Cao Duy - SE61032 |
| **Supervisor** | Kiều Trọng Khánh |
| **Ext. Supervisor** | N/A |
| **Capstone Project code** |  |

-Ho Chi Minh City, ***18/05/2018*-**

# Table of Contents

Contents

[MINISTRY OF EDUCATION AND TRAINING 1](#_Toc514858049)

[Table of Contents 2](#_Toc514858050)

[List of Tables 4](#_Toc514858051)

[List of Figures 4](#_Toc514858052)

[Definitions, Acronyms, and Abbreviations 4](#_Toc514858053)

[A. Introduction 5](#_Toc514858054)

[1. Project Information 5](#_Toc514858055)

[2. Introduction 5](#_Toc514858056)

[3. Current Situation 5](#_Toc514858057)

[4. Problem Definition 5](#_Toc514858058)

[5. Proposed Solution 6](#_Toc514858059)

[5.1 Feature functions 6](#_Toc514858060)

[5.2 Values and Challenges 6](#_Toc514858061)

[6. Functional Requirements 6](#_Toc514858062)

[7. Role and Responsibility 6](#_Toc514858063)

[B. Software Project Management Plan 7](#_Toc514858064)

[1. Problem Definition 7](#_Toc514858065)

[1.1 Name of this Capstone Project 7](#_Toc514858066)

[1.2 Problem Abstract 7](#_Toc514858067)

[1.3 Project Overview 7](#_Toc514858068)

[1.3.1 Current Situation 7](#_Toc514858069)

[1.3.2 The Proposed System 8](#_Toc514858070)

[The system will have four sub-systems: 8](#_Toc514858071)

[1.3.2.1 API application 8](#_Toc514858072)

[1.3.2.2 Mobile application 8](#_Toc514858073)

[1.3.2.3 Hotline server 8](#_Toc514858074)

[1.3.2.4 Web application 8](#_Toc514858075)

[1.3.3 Boundaries of the System 8](#_Toc514858076)

[1.3.4 Future Plans 8](#_Toc514858077)

[1.3.5 Development Environment 9](#_Toc514858078)

[1.3.5.1 Hardware requirements 9](#_Toc514858079)

[1.3.5.2 Software requirements 9](#_Toc514858080)

[2. Project organization 9](#_Toc514858081)

[2.1 Software Process Model 9](#_Toc514858082)

[2.2 Roles and responsibilities 10](#_Toc514858083)

[2.3 Tools and Techniques 12](#_Toc514858084)

[3. Project Management Plan 12](#_Toc514858085)

[3.1 Product Backlog 12](#_Toc514858086)

[3.2 Sprint Backlog 13](#_Toc514858087)

[3.2.1 Sprint 1 (18.05.2018 – 25.05.2018): Project initiation 13](#_Toc514858088)

[3.2.1.1: Goal 13](#_Toc514858089)

[1.1 Project Information 13](#_Toc514858090)

[1.2 Introduction 13](#_Toc514858091)

[1.3 Current Situation 13](#_Toc514858092)

[1.4 Problem Definition 13](#_Toc514858093)

[1.5 Proposed Solution 13](#_Toc514858094)

[1.6 Role and Responsibility 13](#_Toc514858095)

[1.7 Functional Requirements 13](#_Toc514858096)

[2.1 Create Product Backlog 13](#_Toc514858097)

[3.1 Problem Definition 13](#_Toc514858098)

[3.2 Project Organization 13](#_Toc514858099)

[3.3 Project management plan 13](#_Toc514858100)

[3.4 Coding Convention 13](#_Toc514858101)

[3.2.1.2: Development 13](#_Toc514858102)

[3.3 All Meeting Minutes 13](#_Toc514858103)

[4. Coding Convention 13](#_Toc514858104)

[C. Report No. 3 Software Requirement Specification 14](#_Toc514858105)

[1. User Requirement Specification 14](#_Toc514858106)

# List of Tables

# List of Figures

Definitions, Acronyms, and Abbreviations

|  |  |
| --- | --- |
| **Name** | **Definition** |
| PO | Product owner |

A. Introduction

## 1. Project Information

* Project name: **Call-Center on Mobile for Clinic**
* Project Code: **CallClinic**
* Product Type: **Mobile Application**
* Start Date: **May 18th, 2018**
* End Date: **August 31th, 2018**

## 2. Introduction

In this document, we introduce an automatically Call-Center system for clinics. At the present, the clinic usually uses traditional ways to receive the call, that is hiring switchboard operator. But, that solution has a few problems such as missed call or receive wrong information. So, the use of switchboard operator to received call do not high efficiency.

Another way to solve this problem for the clinic is Call-Center, the clinic will rent Call-Center to receive the call from patients. In this method, Call-Center will provide more professional service for the clinic, but the cost is quite expensive and it is hard to exchange appointment information for the clinic.

That is the reason why we decided to build an automatically Call-Center system to save time and cost for the clinic. When there is a call from the patient, the system will pick up the call automatically, receive information and schedule appointment for the patient. And then, the system will send SMS for the patient when the appointment is due. The clinic just accesses the system to view all schedule appointment.

## 3. Current Situation

Currently, Clinic using two ways for make appointment:

* **Switchboard operator**

- When patients want to book an appointment in the afternoon, they must call the clinic that morning. An employee at the clinic will record this information, based on that information, the employee will give the patient a specific time. The patient will go to the clinic at the time given and have the examination. All this process must be done manually, this is time consuming and sometime, some information is missing or mistaken because employees usually do many things at the same time.

* **Call Center**

- Call center acts as a middleman between clinic and patients. At first, the clinic contacts to a call center and sign up for a service there. When patients want to make an appointment, they call to call center's number, the staff at the call center will receive information from patients and transfer back to the clinic.

## 4. Problem Definition

**Clinic using Call-Center:**

**Advantages**:

* Provide professional service to take care patient

**Disadvantages**:

* Expensive cost that’s why small clinics do not have funds to hire Call-Center

**Switchboard operator:**

**Advantages**:

* Reduce costs and suitable for small clinics

**Disadvantages**:

* Clinics need a staff for wait a call from patient.
* Staff has difficulties to get information from patient for the appointment.
* Clinics are managing patient information, schedule appointment manually, that way makes them time-consuming and inconvenient.

## 5. Proposed Solution

### 5.1 Feature functions

Our solution is build an automatically Call-Center system for clinics to provide appointment booking service.

When there is a call from the patient, the system will pick up the call automatically, receive information and schedules the appointment for patient. Appointments will automatically schedule base on doctor's hours and patient's free time. The end result is that the doctor will only need follow those schedule, and the patient will receive the correct date and time without the need to pick up or wait for the appointment. Clinics free times will be optimized and no more overload.

### 5.2 Values and Challenges

**Values:**

* Save the time and the money for clinic.
* Provide better information management system for the clinic.

**Challenges:**

* Make clinic’s phone (the device that we put in the clinic) auto pick up an incoming call.
* Get patient voice and analyze that.
* Push reply (by voice) back to patient.
* Receive and analyze SMS from patient.

## 6. Functional Requirements

Functional requirements of the system are listed as below:

* **Doctor component**
* View list appointment
* **Service component**
* Hotline call service for patient make appointment
* SMS service for patient make appointment
* Make schedule
* Generate list appointment
* Notification to doctor
* Notification to patient when the appointment is due
* **Administrator component**
* Manage Clinic account

## 7. Role and Responsibility

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Full Name** | **Role** | **Position** | **Contact** |
| 1 | Kiều Trọng Khánh | Project Manager | Supervisor | khanhkt@fpt.edu.vn |
| 2 | Nguyễn Thế Phương | Developer | Leader | Phuongntse62087@fpt.edu.vn |
| 3 | Phan Thành thuận | Developer | Member | Thuanptse62063@fpt.edu.vn |
| 4 | Nguyễn Cao Duy | Developer | Member | duyncse61032@fpt.edu.vn |
| 5 | Nguyễn Lương Tuấn Kiệt | Developer | Member | kietnltse61696@fpt.edu.vn |

Table 1 Roles and Responsibilities

B. Software Project Management Plan

## 1. Problem Definition

### 1.1 Name of this Capstone Project

* **Official name:**  Call-Center on Mobile for Clinic
* **Vietnamese name:** Hệ thống nhân cuôc gọi tại phòng mạch tư nhân
* **Abbreviation:** CallClinic

### 1.2 Problem Abstract

This project is our exertion to help the clinic reduce costs, the patients save time and simplify the user experience. However, when we start to identify problems and find the way to resolve them, we found many difficult things. We decide to use smartphone as a switchboard to receive and answer call. We try on both Android and IOS but as we know that, take the privilege of system phone is really hard things. We try to root Android system and jailbreak IOS to take that privilege but it still not worked correctly. And event after many hours research we find the way to done the first step is auto pickup phone call (only working on Samsung’s device). We instantly face with another problem, we cannot send voice answer when we are receiving the call. So, we fail on that way.

After that, we research about third-party framework provides programmable voice (like Twilio, Nexmo), but the cost of doing research and demonstration voice-answering is quite expensive.

Moreover, we research more about VoIP technical (WebRTC) for the call over internet protocol and about a third-party framework to receive SMS from the patient. Finally, we find out solutions to remind patients when their appointment is due.

### 1.3 Project Overview

1.3.1 Current Situation

Below are the problems encountered in this project:

* Difficulty to get permission the privilege of system phone call for both IOS and Android.
* Limit in human resources and time: Team has only 4 members and time for all project is about 13 weeks for writing the document, implementing the products and testing
* New techniques: Some team members are new to the techniques used in the project. The team needs an amount of time to get familiar with those techniques.
* The cost for research and demonstration with third-party framework programmable voice is quite expensive.
* Lack of knowledge about manage the clinics.
* Lack of the amount of the necessary data: doctors, nurses, patients, …

1.3.2 The Proposed System

The system will have four sub-systems:

* An API application for handling data and response data for the mobile application.
* Mobile application for the doctor to view schedule appointment.
* Web application for clinic manage patient, schedule appointment.
* Hotline server handle incoming SMS and patient call.

1.3.2.1 API application

* The server system takes responsibility to respond all the requests and also manages and processes data
* Provide APIs for Mobile Application

1.3.2.2 Mobile application

* Sign in
* View list schedule appointment.

1.3.2.3 Hotline server

* Send SMS for mobile phone
* Receive incoming SMS for make appointment
* Receive incoming Call from patient

1.3.2.4 Web application

* Base component
  + - Sign in
    - Sign out
* Clinic component
  + - View list schedule appointment
    - Manipulate patient

1.3.3 Boundaries of the System

Our system supports:

* Provide appointment booking service
  + Patient can send SMS or call Clinic Hotline to make appointment.
  + Hotline with legacy call (call without internet) using Hotline server with Twilio
  + Hotline with VoIP call (call via internet protocol)
  + When appointment has been booked successfully, Send SMS or send notification to patient

Our system hasn’t supports:

* + Adjust appointment
  + Clinic phone auto pick up incoming call
  + Interactive with patient
    1. Future Plans

The current system is focused on solve core problem, that is cost saving and time for the clinic. So, some support features are limited. These features will be expanded in the future.

* Develop Clinic phone without using third-party framework programmable voice.
* Survey for service quality of clinic

1.3.5 Development Environment

1.3.5.1 Hardware requirements

**For server**

|  |  |  |
| --- | --- | --- |
| **Hardware** | **Minimum Requirements** | **Recommended** |
| Internet Connection | Cable, Wi-Fi (7 Mbps) | Cable, Wi-Fi (20 Mbps) |
| Computer Processor | Intel® Core ® i7 2.4GHz | Intel® Core ® i7 2.4GHz |
| Computer Memory | 1GB RAM | 1GB RAM or more |

Table 2:

Table 2: Hardware Requirement for Server

**For smartphone**

|  |  |  |
| --- | --- | --- |
| **Hardware** | **Minimum Requirements** | **Recommended** |
| Internet Connection | Wi-Fi (7 Mbps) | Wi-Fi (14 Mbps) |
| Operating System | Android 5 | Android 5 |
| Memory | 2GB RAM | 4GB RAM or more |

Table 3: Hardware Requirement for Client

1.3.5.2 Software requirements

|  |  |  |
| --- | --- | --- |
| **Software** | **Name / Version** | **Description** |
| Environment | Node JS  Android | Specification for developing Hotline Server application  Specification for developing mobile application |
| Modeling tool | Star UML | Used to design diagram |
| IDE | Visual Studio Code 1.23.1  Android Studio 3.1.2 | Programming tools |
| DBMS | MySQL 5.6.30 | Used to create & manage the database for system |
| Source control | SourceTree 2.7.3 | Used for source control |
| Web browser | Chrome 42 or later | Testing browser |
| Mobile OS | Android 5 or later | Testing mobile application |

Table 4: Software requirements

## 2. Project organization

### 2.1 Software Process Model

This project is developed using Scrum model – part of an agile framework for Software development project. Our team choose Scrum model because of the following reasons:

* Our team only has 4 members, and tasks are assigned vertically, do all steps from design, coding, testing and implementation. Scrum is the most suitable model for small and medium project.
* In the project there are many new technologies that need to be learned. With the Scrum model, the team can learn and develop in parallel to meet deadline.
* Product owner can change requirement or extend scope. The team will adapt to change better.

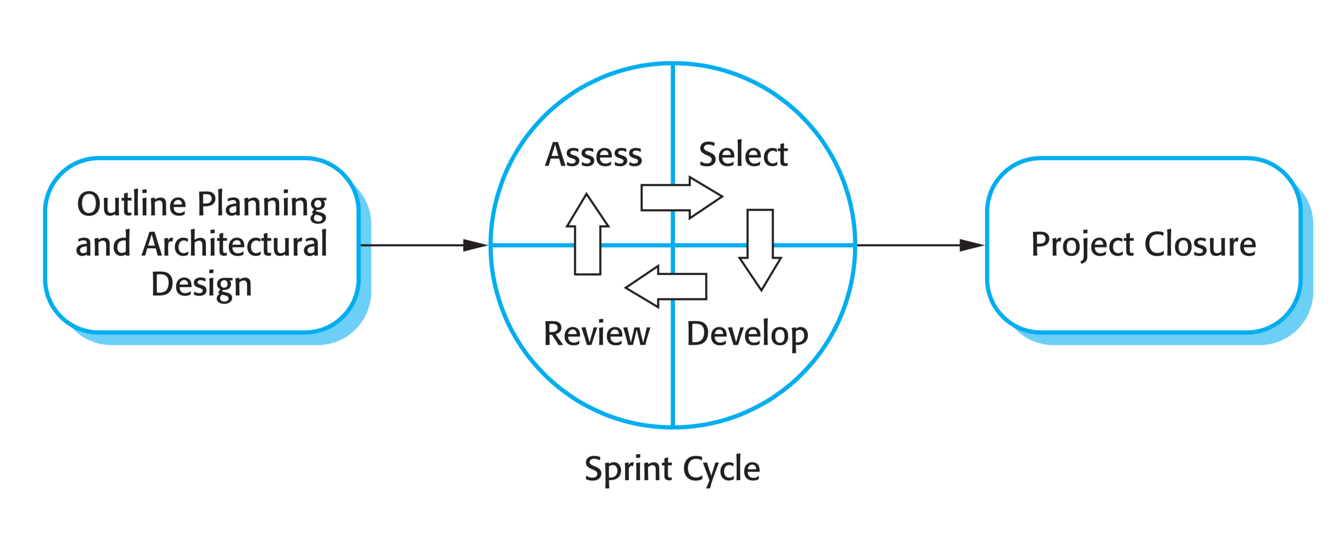


Figure 1 The Scrum Process

Reference: *Software Engineering 9th by Somerville, page 73*

### 2.2 Roles and responsibilities

|  |  |  |  |
| --- | --- | --- | --- |
| **No** | **Full name** | **Role in group** | **Responsibilities** |
| 1 | Kiều Trọng Khánh | Project Owner | ·         Specify scope and user requirement  ·         Give out technique and business analysis support  ·          Control the development process |
| 2 | Nguyễn Thế Phương | Scrum master | ·         Create Sprint Backlog and Product  Backlog  ·         Make sure the Scrum teams understand and follow the process.  ·         Help the team master scrum artifacts such as: Sprint Backlog, Product Backlog, ...  ·         Writing report  ·         Always be present to answer questions and give advice when product owner or scrum member needs. |
| 3 | Nguyễn Thế Phương  Phan Thành Thuận  Nguyễn Cao Duy  Nguyễn Lương Tuấn Kiệt | Scrum team members | ·         Clarifying requirements  ·         Prepare documents  ·         Designing database  ·         GUI Design  ·         Coding  ·         Testing |

Table 5: Roles and Responsibilities Details

### 2.3 Tools and Techniques

|  |  |
| --- | --- |
| **Tool/Technique** | **Name and version** |
| Back-end | Node JS |
| IDE | Android Studio 3.1.2, Visual Studio Code 1.23.1 |
| Database | MySQL |
| Modelling Tool | Star UML |

Table 6: Tools

## 3. Project Management Plan

### 3.1 Product Backlog

|  |  |  |  |
| --- | --- | --- | --- |
| **Story ID** | **Story** | **Task ID** | **Task** |
| 1 | Product Owner (PO) wants to have introduction document | 1.1 | Project Information |
|  |  | 1.2 | Introduction |
|  |  | 1.3 | Current Situation |
|  |  | 1.4 | Problem Definition |
|  |  | 1.5 | Proposed Solution |
|  |  | 1.6 | Role and Responsibility |
|  |  | 1.7 | Functional Requirements |
| 2 | Scrum master wants to have Product Backlog | 2.1 | Create Product Backlog |
| 3 | PO wants to have project management plan | 3.1 | Problem Definition |
|  |  | 3.2 | Project Organization |
|  |  | 3.3 | Project management plan |
|  |  | 3.4 | Coding Convention |

Table 8: Sprint Backlog

### 3.2 Sprint Backlog

3.2.1 Sprint 1 (18.05.2018 – 25.05.2018): Project initiation

3.2.1.1: Goal x

- Sprint 1 must complete the following tasks:

1.1 Project Information

1.2 Introduction

1.3 Current Situation

1.4 Problem Definition

1.5 Proposed Solution

1.6 Role and Responsibility

1.7 Functional Requirements

2.1 Create Product Backlog

3.1 Problem Definition

3.2 Project Organization

3.3 Project management plan

3.4 Coding Convention

3.2.1.2: Development

|  |  |  |  |
| --- | --- | --- | --- |
| **Task ID** | **Task** | **Responsible** | **Review** |
| 1.1 | Project Information | PhuongNT | DuyNC |
| 1.2 | Introduction | DuyNC | ThuanPT, KietNLT |
| 1.3 | Current Situation | KietNLT | ThuanPT |
| 1.4 | Problem Definition | DuyNC | KietNLT |
| 1.5 | Proposed Solution | KietNLT | PhuongNT, KietNLT |
| 1.6 | Role and Responsibility | DuyNC | ThuanPT |
| 1.7 | Functional Requirements | ThuanPT | PhuongNT |
| 2.1 | Create Product Backlog | PhuongNT | DuyNC, ThuanPT |
| 3.1 | Problem Definition | PhuongNT | KietNLT |
| 3.2 | Project Organization | ThuanPT | KietNLT |
| 3.3 | Project management plan | PhuongNT | DuyNC, ThuanPT |
| 3.4 | Coding Convention | ThuanPT | PhuongNT |

### 3.3 All Meeting Minutes

All meeting minutes are saved at: [here](not%20provide%20yet)

## 4. Coding Convention

**NodeJS**

* **Naming convention:**

- Variables, properties and function names should use **lowerCamelCase**. They should also be descriptive. Single character variables and uncommon abbreviations should generally be avoided.

- Constants should be declared as regular variables or static class properties, using all uppercase letters.

* **Functions.**

- Feel free to give your closures a name. It shows that you care about them, and will produce better stack traces, heap and CPU profiles.

- Use closures, but don't nest them. Otherwise your code will become a mess.

- One method per line should be used if you want to chain methods. You should also indent these methods so it's easier to tell they are part of the same chain.

* **Comment:**

- Use slashes for both single line and multiline comments. Try to write comments that explain higher level mechanisms or clarify difficult segments of your code. Don't use comments to restate trivial things.

**Android**

* **Naming convention:**

- Class names are written in [**UpperCamelCase**](http://en.wikipedia.org/wiki/CamelCase). Ex: SignInActivity.

- Resources file names are written in **lowercase\_underscore**.

- Layout files should match the name of the Android components that they are intended for but moving the top level component name to the beginning.

- Resource files in the values folder should be **plural**

* **Functions.**

- Don’t ignore exception and don’t catch generic exception.

* **Comment:**

- Use TODO comments for code that is temporary, a short-term solution, or good-enough but not perfect. TODOs should include the string TODO in all caps.

* **Others:**

- Fully quality imports

Using Android coding convention from: <https://source.android.com/setup/contribute/code-style#dont-use-finalizers>

Using NodeJs coding convention from: https://google.github.io/styleguide/jsguide.html

# C. Software Requirement Specification

## 1. User Requirement Specification

Our system is designed to solve the problem of helping customers choose interior furniture that they don’t know the interior furniture items fit the size of their home or not. Customers can also contemplate products with 360 degree view through their smartphone. We also provide online marketplace that sellers can demonstrate, sell their products with lower costs than the traditional way. This software consists of four user roles that are Customer, Seller, Staff, Admin with Staff and Admin are our employees.

1.1 Customer Requirement

Customer is a person who doesn’t have access to the system. Customer can only use shopping function and chooses and places virtual real-world objects to real world on mobile. For payment, customer must login. These are some functions customer can use*:*

* Register
* Login
* Upgrade role to Seller
* Search product
* Add product to cart
* Get cart
* Execute payment
* Place virtual real-world objects to real world on mobile.
* Contemplate products via 3D models.

1.2 Seller Requirement

Seller is a person who doesn’t have access to the system. Seller is a role that upgrade from Customer to have more features. There are some functions, Seller can use besiding Customer’s function:

* Login
* Search product
* Add product to cart
* Get cart
* Execute payment
* Place virtual real-world objects to real world on mobile.
* Contemplate products via 3D models.
* Request to sell product
* Manipulate products

1.3 Staff Requirement

Staff is an employee in the system who has responsible for technical work such as approving requests from customer to upgrade role to seller, 3D model generating, editing 3D model result. Staff can do the following functions:

* Approve Customer’s information to upgrade role from Customer to Seller
* Manipulate customer and seller
* Approve Seller’s product
* Update model’s quality
* Manipulate product

1.4 Administrator Requirement

Administrator is a person who has all functions of Staff and can also manipulate staffs’ account.

1.5 Authorized User Requirement

Authorized user is a person who already logined success into system. Authorized user can do the following task:

* Logout
* Edit profile.

1.5 Scheduler Requirement

Scheduler can run some functions in backend. Scheduler user can do the following task:

* Generate 3D model
* Send notifications

## 2. System Requirement Specification

### 2.1 External Interface Requirement

2.1.1 User Interface

The user interface uses language is English for all web application and mobile application.

* + 1. Hardware Interface
* **Server:**
* Ram: 2GB
* CPU: Intel Core i7-7700K CPU 4,20 GHz
* Disk storage:
* Database: 9322960 bytes ~ 9 MB
* Operational system: 20GB
* Environment: 128MB
* Total: ~21GB
* **Mobile smartphone:**
* Chipset: at least dual cores with 1.85 GHz
* Disk storage: at least 16 GB
* RAM: at least 2 GB
* Wifi connection: 802.11ac Wi‑Fi with MIMO
* LTE band: LTE (Bands 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 18, 19, 20, 25, 26, 27, 28, 29)

2.1.3 Software Interface

* Service 3rd party:
  + AWS S3
  + Autodesk Forge Reality Capture v1
* Driver library:
  + Mssql Jdbc (v4.0)

2.1.4 Communication Protocol

* Use HTTP protocol 1.1 for communication between:
* Web application and web server
* Mobile application and web server

### 2.2 System Overview Usecase

### 2.3 List of Usecase

**2.3.1 < Administrator > Overview Usecase**

## 3. Software System Attribute

### 3.1 Usability

* UI website is fit for each browser in each device
* Font style: Helvetica, Arial, Helvetica Neue, Roboto, Arial, Droid Sans, sans-serif
* Font size: 12px -26px
* Color: green, black, red, white, blue, Light Slate Grey, Fuego, Honeysuckle…
* Background: White, Catalina Blue, Whisper…
* Theme: Gentelela
* UI mobile application mobile is scalable with each monitor of smart phone:
* Font size: 13-30pt
* Font style: San Francisco.
* Color: Black, Light Gray, Orange, Blue…
* Background: White, Light Grey…

### 3.2 Reliability

* View AR on mobile successfully with at light level from 35 lux to brighter.
* 3D model generated by system has acceptable quality with accuracy is 80%.

### 3.3 Availability

* System replies in maximum 2 seconds.

### 3.4 Security

* Each role of user has a specific permission to interact with the system.
* System always checks for authorization and authentication before doing anything.
* Input data is validated before saving to database.

### 3.5 Maintainability

* The system is divided into separated modules for easy maintain.

### 3.6 Portability

* User can use the mobile application on devices running on iPhone 6S or later with iOS 11.3 or later.
* Web application can be run on Chrome browser version 42 or later.

### 3.7 Performance

* Camera can detect surface under 5 seconds on almost surfaces with light level upper 35 lux.
* User can view maxium with 10 products in AR view.

## 4. Conceptual Diagram