TB DIAGNOSIS LABORATORY INFORMATION SYSTEM – Surveillance & Tracking

BY

LAW JIA WEI

A REPORT

SUBMITTED TO

Universiti Tunku Abdul Rahman

in partial fulfillment of the requirements

for the degree of

BACHELOR OF INFORMATION SYSTEMS (HONS)

INFORMATION SYSTEMS ENGINEERING

Faculty of Information and Communication Technology

(Kampar Campus)

JAN 2020

UNIVERSITI TUNKU ABDUL RAHMAN

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 Surveillance & Tracking

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Date: 23 April 2020

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JAN 2020

BIS (Hons) Information Systems Engineering

DECLARATION OF ORIGINALITY

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Signature	:	and the second second

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Date : 23 April 2020

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ABSTRACT

This project is a TB Diagnosis Laboratory information project. This project will provide laboratory users with the coordination of multiple laboratory, accuracy and easy to understand data. This project is designed for the Universiti Tunku Abdul Rahman's new specialist training hospital (operational by 2021). From the design point of view, emphasis is laid on the better detection and prevention of the TB (Tuberculosis) disease. As we know, TB (Tuberculosis) is of the disease frequently affects the human's lung and it can easily spread through the air. TB is extremely dangerous if we do not do any relevant action on it. Hence, this TB Diagnosis Laboratory information project is focus on resolve TB problem by allowing the relevant users to coordinate from different laboratory and enhance the data accuracy. This project is also trying to resolve the traditional paperwork of the medical staff since all the task will be done through the electronic system. The major motivation of the TB Diagnosis Laboratory Information project is to reduce the TB disease cases occurrence gradually. This project is expected to act as a useful tool for the TB medical domain in helping to resolve the TB disease problem

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LIST OF ABBREVIATIONS

DR TB	Drug-Resistant Tuberculosis
DST	Drug Susceptibility Testing
MDR	Multi-drug-resistant tuberculosis
SDLC	System Development Life Cycle
TB	Tuberculosis
WHO	World Health Organization
XDR	Extensively drug-resistant

Chapter 1: Introduction

Project title: TB Diagnosis Laboratory Information System (Back-End)

1.1 Problem Statement and Motivation

World Health Organization (WHO) which represent the specialized agency of the United Nation that was concerned with global public health, has published an international 2018 edition TB report which indicated about 1.7 billion people (23% population of world), were estimated to have a latent TB infection, and these people are having the risk of developing active TB disease during their lifetime. TB disease has now become an extreme serious problem that people cannot choose to ignore it.

The shortage of early detection and prevention of TB disease has become the critical problem currently. As we know "*prevention is better than cure*", it is better to prevent disease rather than to try to find the better cure for the new disease after they occur. Before the evil issues appear happened unexpectedly and become even worst, we need to make early prevention and detection plan for this kind of issues.

Besides, the problem of coordination of different laboratory occur in some existing system such as e-Chasqui Laboratory Information and Web Based MIS for Drug Resistance Tuberculosis and Laboratory Information System which will be further discuss in Chapter 2 below. Some of the lab test will be conducted in different laboratory, it might take some extra time and cost in order to carry out the sequentially testing from one lab to another lab. In some worst case, the related data or result might occur some error in the intermediary process.

Last but not least, the researches and investigation of the TB medical works are inefficient without a proper electronic computer system, especially for the hospital's staff or physician who want to acquire the results of drug susceptibility test and multidrug resistant bacteria on admission and hospitalization, without a proper hospital/lab management system, these important data may not be fully carried out it's information to the doctor and relevant investigator.

1.2 Project Scope

This system is design for the Universiti Tunku Abdul Rahman's new specialist training hospital (operational by 2021). This system will be instrumented to the UTAR hospital's Tuberculosis Laboratory after the infrastructure of the hospital is fully completed. This system will only concentrate on the Kampar, Perak area.

The fundamentally function such as account maintenance, registration, integrated report generalization will be included to the TB Diagnosis Laboratory Information System. Besides, this system able to analyze on the TB disease related data, a graph or a hotspot map will have carried out for early detection and outbreak prevention activities. For example, the address and district of the TB disease carrier will be stored into database of the designed system, after the analyzing on these healthcare data, we can know that which specific area or district might become the potential area of TB disease occurrence.

In this designed system, it allows user to complete workflows and manage clinical communications on one single platform. Multiple care teams from different labs can collaborate to improve care coordination. This system also provides the most effective way for the patient to directly find the information on their respectively health conditions and give them a better guidance to treat conditions.

1.3 Project Objectives

The objective of this project is to develop a system that can perform the work of early detection and prevention of TB disease and lead to a decrement cases of TB disease. Besides, multiple care teams from different labs can perform the better care coordination by using this proposed system which allow relevant user to complete workflows and manage clinical (laboratory) communications. Finally, the aim of this system is to provide the efficiency and effective relevant data that help to improve the treatment/therapy decision.

1.4 Impact, significance, and contribution

The biggest impact of this project is expected to the **reduce the TB infection rate** of the public through the way of collecting all the relevant TB data and generate the specific information that will provided to user to perform some further safeguard action since the TB disease has now become the global worries day by day. Despite this is not an easy work, but this is all about the survival of the human being and our next generation.

Besides, this project will eventually act as a **useful tool for the physician or relevant medical care personnel to analyze the TB data** and make a nearest hundred percent of correct decision for the treatment or therapy to the specific patients all the time. This will directly enhance the decision quality during the therapy making process.

Last but not least, this project system will **decrease the workloads for the staff** (paperwork) since it can automate the manual steps within the process of identifying, notifying and tracking with infectious disease. This project is contributed to help the specific hospital or laboratory staff to save their time, resources and energy since the traditional paperwork is eliminated. A proper **Graphical Representation** like formal **Dashboard** that include different chart (Line Chart, Bar Chart), table and Maps (Google Maps) in this project will help the user to visualize the TB data easier effective and efficiency.

1.5 Background information

Tuberculosis (TB) is a type of disease caused by *Mycobacterium tuberculosis* (*MTB*) which frequently affects the lung of the human. TB can be spread through the air when the people who have active TB in their lungs spit, cough, sneeze, or speak. The spreading method of the TB disease make it become a significant worldwide illness. TB can be categorized with two main types which are **Latent TB infection and Active TB disease**. TB bacteria can survive in human body without making people feel sick. This is called latent TB infection. Latent TB infection carrier do not have any symptoms and cannot spread TB bacteria to others. However, Active TB disease is contrary to Latent TB infection, people who have Active TB disease usually getting symptoms and cause the symptoms such as a bad cough (3 weeks) or longer, pain in the chest (abnormal chest x-ray), coughing up blood or sputum. A lot of people fall sick with TB every year. If a single person who resulted in having latent TB infection after the relevant testing, he or she should take medicine to keep from developing Active TB Disease.



Figure 1.1: Tuberculosis's sketch.

Typically, a doctor or a medical staff who want to inspect a patient whether he or she is contracted by the TB disease, the very first step taken by them is to check the medical history and have a physical exam, the next step is to do a **chest x-ray** in order to let health worker to examine the lung of the particular person with suspected TB. However, this specific person might need further test to prove he or she is suffered with the TB disease by the *sputum and culture test*.

CHAPTER 1 : Introduction



Figure 1.2: Tuberculosis's Chest X-Ray Sample.

Sputum test is often the first TB disease test to be used in many countries, especially for the countries with high TB infection rate. The sample of the sputum is often collected by the person coughing. In order to test for the TB several, at least 3 samples of sputum will normally be collected with the same person. It is because the results of the sputum are available within hours, the sensitivity though is only 50-60%.

Culture test involves studying TB bacteria by growing the bacteria on different substance. The substances are solid substances on culture plates or bottles of liquid. These substances are chosen to make higher chances growing of the bacteria. Culture test can also provide *Drug-susceptibility testing (DST)*. DST is to find out if a person has got drug resistant TB. DST can perform rapid discovering of a person who has the drug resistant TB in order to let this person can be provided with effective TB treatment.

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CHAPTER 1 : Introduction

Besides, *TB skin test* and *TB blood test* are the two types of test for the TB infection which are TB Skin Test and TB blood test. However, it is not recommended that to test a same person with both TB skin test and Tb Blood test. TB skin test has two result which is positive skin test and negative skin test, these two results depend on the size of the raised, hard area or swelling. Positive skin test means the person's body was infected with TB bacteria; negative skin test means person did not react to the test. The TB skin test can be repeated on the same person, but the additional test should be placed in different body's location. For the TB blood test, the result is exactly same as the skin test which also having positive and negative blood test.

TB disease related data such as basic information of the TB patient (age, gender, religion, living area etc.), results of the respectively TB test, rates of infection by multidrug resistant bacteria on admission and during hospitalization, patient admission and discharge diagnosis, and etc. are so important to the hospital management because these data can be further analyzing for the early detection and prevention of TB disease and decrement cases of TB disease. Hence, This TB Diagnosis Lab management system is design to partially automated the collection, analysis, and utilization of hospital data. Besides, this system will able to ease inter-facility communication among clinical, laboratory and public health activities, leading to faster disease reporting, outbreak detection and intervention.

1.6 Report Organization

The details of this research are shown in the following chapters. In Chapter 2, some related background and similar system are reviewed. In Chapter 3, describes the system overview, the design of the system, the flow chart of the system, the system flow diagram of every module, the entity-relationship diagram, the data dictionary, and the SQL of the database. Then, the design specification of the system includes the methodology involved in this system, the project phases, the tools for the developer and the requirements in this system such as hardware, software and user requirement are presented in Chapter 4. And then, Chapter 5 describes the system implementation included how to download and install XAMPP. Furthermore, Chapter 6 reports the system testing. Lastly, the conclusion of the whole project and the future work of the system are described in Chapter 7.

Chapter 2 Literature Review

2.1 Review on Similar System

2.1.1 e-Chasqui laboratory information system

e-Chasqui laboratory information system in reducing reporting errors compared to the paper system. **e-Chasqui** laboratory information system tends to communicate TB results to clinicians and public health administrators. This system implements to improve the quality of laboratory data in Lima, Peru such as patient's full bacteriological history and full result details of the selected sample.

Apart from the quality control, reports on tests performed, warnings about delayed reporting of results. This system also intends to protect patient confidentiality by incorporating extensive encryption, web security feature for the relevant medical record and logging of pages viewed. Besides, users required to sign a confidentiality agreement before being given access. As a result, medical users confirmed that the e-Chasqui laboratory information system provided them with the results not available



through the paper system.

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Figure 2.1.1.2 e-Chasqui main patient page. This page shows the patient's full bacteriological history on the left sidebar and with bolded sample date for the sample whose results were being displayed on main part of page.

The key feature of this system is using one patient information page which contain all the historical test of the patient which be placed at the left-hand side (sidebar). Every of the results are displayed in this patient information page in order to obtain a full historical sample of the patients. Besides, this system also provides a flexible search engine which allow related user to key in the patient's name or key in of the sample's IC number to improve the searching time of the system.

By using this information page, user can select specific tests to print the official report format paper come out. Besides, each HC can print the report quickly after the lab verification. Because of the high load of the TB patient, the HC personnel requested the ability to view their latest results on a single page and track the status of all sample being process.

Report	Informed	Purpose	Type of Access
Frequency of e-Chasqui access by HC personnel	Regional laboratory and TB director	Encourage frequent utilization of IS to access real-time laboratory data	Monthly report prepared by data administrator
Number of laboratory results entered at regional laboratory	Regional laboratory and TB director	Identify delays in data entry	Monthly report prepared by data administrator
Number of laboratory results verified and released to providers	Regional laboratory and TB director	Identify delays in verification	Monthly report prepared by data administrator
DST results for any specified period grouped by every variable in request form	Regional and INS laboratory director	Report and identify trends in laboratory performance	Constant access**

Figure 2.1.1.3 Sample reports generated by e-Chasqui

Strength e-Chasqui laboratory information system

Chasqui laboratory information system also aims to protect patient confidentiality by incorporating extensive encryption, web security feature for the relevant medical record and logging of pages viewed. The system uses a flexible searching algorithm by enter the patient's name or any of the sample's identification numbers. This algorithm can speed up the searching time of acquires a particular data.

Weakness and Resolvent with the e-Chasqui laboratory information system

The balance between appropriate entry of results and electronic verification with high data quality remains to be a major problem. The average number of days between a DST result being read, its entry, and verification is 5.8. Hence, the additional step of result verification is needed to ensure the data is remain its quality.

Besides, system addresses the actual end user needs or to have user appropriation may occur some error sometimes, Hence, medical related people must be involved from the beginning to the end make sure the probabilities of the mistakes (error) will be minimized.

2.1.2 Web Based MIS for Drug Resistance Tuberculosis and Laboratory Information System

First of all, Web Based MIS for Drug Resistance Tuberculosis and Laboratory Information System is a system that design by the DHIS2, DHIS2 is an open source software platform established by the Health Information Systems Program (HISP) and supported by the University of Oslo's Department of Informatics. This software a modular web-based software package built with free and open source Java framework; tool for collection, validation, and presentation of aggregate and patient based statistical data.

The Web Based Management Information System is design for the purpose of effective management and monitoring Drug-Resistant TB for the Multi-Drug Resistance Tuberculosis patient. This system is proposed to automate the patient tracking and some analytical and report generation tasks in Drug-Resistance TB management program. Besides, this system is also intent on storing vital patients' information as long as other related data, tracking of Drug-Resistant TB also being one of the important tasks for this system.

Core Functionality of the Web Based MIS for Drug Resistance Tuberculosis and Laboratory Information System as below:

- Capability report, analysis, and dissemination via dashboards of data for Drug-resistant (DR) TB management
- ii) Ability to track DR TB patients and show real-time data about their treatment stage, progress, and status.
- iii) Role based access to the users of the system

CHAPTER 2 : Literature Review

Registration	Date	Due date	Due date		
Previous	2017-08-21	yyyy-MM-dd			
Treatments					
Treatment	Date of Previous Treatment	уууу-MM-dd			
Phase	Duration of previous treatment				
DST	(month)				
Monthly	Initial smear	Select or search from the list	v		
Monitoring	Treatment regimen (use drug				
	abbreviations)				
Outcome	Treatment centre	[Please select]	Ð		
Patient					
Transfer	Smear status at end of treatment Select or search from the list		*		
	Culture status at end of treatment	Select or search from the list	*		
	Condition at end of treatment	Select or search from the list	¥		
	Complete	Delete	form		

Figure 2.1.2.1 Sample Interface of the Web Based MIS for Drug Resistance Tuberculosis and Laboratory Information System

Form this figure (left panel of the interface), user can perform the task like registration, previous treatments, Drug-susceptible Test, Monthly Monitoring, Outcome and Patient transfer.

Registration stage is accomplished during the period of registration. In this stage, user can insert the record such as patient name, age, ethnicity, district, contact number etc. This is repeatable stage. It consists of 3 treatment stages of patient, Intensive phase I, Intensive phase II and Continuation Phase. For Intensive Phase I, it should be completed at the time of registration. Once the Intensive phase is completed, system automatically scheduled for next update. The next stage is previous treatment, user can record down the date of previous treatment, duration of previous treatment, what type of the drugs have been received by a patient previously, and etc.

DST is typically completed when the DST result is available. Monthly monitoring is normally completed each month during intensive phase and bimonthly during continuation phase. A detail for 0 month is completed at the time of registration. After that, the system automatically schedules the following update. Besides, the

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outcome stage is completed after the treatment of the patient is completed or the patient is switched to other treatments. System asks you to accomplish the enrolment when you complete the outcome stage, do agree and click on the complete enrolment. Patient transfer stage is completed when the patient is required to transferred out or in.

Strength of Web Based MIS for Drug Resistance Tuberculosis and Laboratory Information System

The strength of this system is having the ability to report, analysis and dissemination through dashboards of data for DR TB management. This system is able to track DR TB patients and show real-time data about their treatment stage, progress and status, directly help users to gain an efficiency way of patient tracking (stage, status) management.

Weakness Web Based MIS for Drug Resistance Tuberculosis and Laboratory Information System

This system is still lacking with routine surveillance and outbreak prevention activities. Although this system can keep track the real-time data of the patient, but these data never be used for further analysis to come out with the early detection and prevention on the TB disease.

Chapter 3: System Design

3.1 System Design (Block Diagram)

In this project, it consists of 7 modules, login module act as an 'common first layer module' that restrict the access rule for each user. Besides, there are 6 major module which are maintenance module, reception module, skin/blood test module, chest X-ray module, smear/culture/DST module and treatment/analysis & reporting module.



Figure 3.1: Modules of the project.

First of all, since this project will be the team based (2 person) project. Hence, me and my teammate **- Tan Sin Ping,** both of us will handle different part modules. The Login module and **Maintenance module** will be handled by me, the **Tests module** (skin-test, blood test, smear & culture test and etc.) will be handled by **Sin Ping.**

1. Login Module

The login module is important for the TB Diagnosis Laboratory Information System because this module act as the first line interface for every user to perform the login process in order to directed themselves to their main page and access to other module based on their position. The design of the login interface is remaining consistent for every user, each user will be required to key in their unique credentials (Username and Password) during the login process. The user position will generally be divided into admin, doctor, nurse, lab scientist and radiologist. When the credential is mismatch, the system will ask for the credential from user again, until the user key in with the correct username and password.

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2. Maintenance Module

This module is typically performed by the **admin**. The module will have 4 majors functionalistic, which are **create/edit user position's**, **create/edit user information based on their position, review the historical user** (inactive user) and **activate the inactive user**.

This maintenance module will handle the tasks like creation of the user, edition of the user (username, password and etc.), and keep track all the existing users within the TB Diagnosis Laboratory Information System.

3. Reception Module

This reception module is generally performed by the **nurse** who handle the patient reception task. Each of new patient will be registered through this module, all the important information will be record down, for example likes personal information, currently address, country or state travelling (latest) before, and emergency contact of the patient. Each of the record will stored into the database once the registration work is done. Besides, user who handle patient reception will be able to search through the specific patient record by using patient's IC number or passport number (foreign patient) in order to access patient's info profile. Moreover, each of the new patient record will be updated to other different test module in order to perform the further needed medical test.

4. Skin/Blood Test Module

This skin/blood test module is basically performed by the **nurse** who handle the skin or blood test process. Each of the new patient specific's record will be updated to this module once the patient's reception process has been done properly, which will be showing in the dashboard. Nurse will confirm a test (skin test or blood test) based on the patient willingness at first. After that, Nurse can search through the specific patients by using their IC number or passport number then insert the skin or blood test information and result once the test's result is come out. Each of the skin or blood test

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result information will be updated to the specific patient record and stored into the database in order to do further relevant decision and analysis.

6. Chest X-Ray Test Module

The functionalities of the chest X-Ray test module are basically same as the **skin/blood test module**. The different is that this module is perform by the **radiologist**, and the test result will be the chest X-Ray picture of the patient and other relevant chest x-ray result information.

7. Smear/Culture/ DST (Drug susceptibility Test) Test Module

Again, the functionalities of this Smear/Culture/DST test module are typically same as the **skin/blood test module.** However, this module is performed by the **lab scientist**, a few sample (sputum) will be collected from the particular patients and this sample will be further analyze by the lab scientist. Once the result is come out, all the smear and culture test result information will be updated to the specific patients record and stored into the database.

Besides, **DST** test can be performed concurrently along with the **Smear and Culture** test. A few sample (sputum) is needed from the patient in order to perform the DST test. Once the test result is come out, all the test information and result will be updated to the specific patient record and stored into the database.

8. Treatment/Analysis and Reporting Module

This module is performed by the **doctor** which he or she can handle several tasks in this module. Firstly, the dashboard of this module will contain all the patient information who have been gone through the relevant test. The patient number, IC number and each of the test's result will be showed up in the dashboard. The priority sequence of the showing patient list will be based on the test result which indicated positive (High chances of getting TB). Hence, doctor can quickly click on this patient record and insert all the relevant data like treatment, drug, comment and etc. Besides,

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the 'history record' functionality will be provided in this module in order to let doctor to keep track all the patient record previously which contain all the important result of all the individual patient.

Besides, this module is the most important part of the **TB Diagnosis Laboratory Information System.** This module includes all the related analysis part based on the database's data which collect from all the module mention previously and display on the "Dashboard" pages.

Analysis

- No. of Overall Local and Foreign TB cases (TB tester).
- No. of TB diagnosed (positive) cases, TB suspected cases, and nondiagnosed. (negative) cases.
- TB Tester and TB Diagnosed Demographic Analysis (Age, Gender, Race).
- No. of TB (TB Tester) cases per day, per month and per year.
- No. of TB (TB Diagnosed) cases per day, per month and per year.
- No. of Multiple Drug Resistance (MDR) Cases.
- No. of Extensively Drug-Resistant TB (XDR TB) Cases.
- DST's drugs Analysis (susceptible/resistance and contaminated cases).

All the **data** from the database will be transformed to **useful information** for the medical personnel through this analysis and reporting module. Last but not least, all the information can be presented via report format which generated by this module.

3.2 System Flow Diagram

3.2.1 General Flow Diagram (non-system flow chart)

The general flow diagram (as below) describes the procedures of people going through the TB test process.



Figure 3.2.1 General Flow Chart of Diagnosis Laboratory Information System.

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3.2.2 System Flow Diagram (Maintenance Module)



Figure 3.2.2.1 System Flow Diagram of Diagnosis Laboratory Information System (Maintenance Module).

3.2.3 System Flow Diagram (Reception Module)



Figure 3.2.3.1 System Flow Diagram of Diagnosis Laboratory Information System (Reception Module).

3.2.4 System Flow Diagram (Skin/Blood Test Module)



Figure 3.2.4.1 Flow Diagram of Diagnosis Laboratory Information System (Skin/Blood Module).

3.2.5 System Flow Diagram (Chest X-Ray Test Module)



Figure 3.2.5.1 Flow Diagram of Diagnosis Laboratory Information System (Chest X-Ray Test Module).

3.2.6 System Flow Diagram (Smear/Culture/ DST Test Module)



Figure 3.2.6.1 Flow Diagram of Diagnosis Laboratory Information System (Smear/Culture/ DST Test Module).

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3.2.7 System Flow Diagram (Treatment/Analysis and Reporting Module)



Figure 3.2.7.1 Flow Diagram of Diagnosis Laboratory Information System (Treatment/Analysis and Reporting Module).

3.3 ERD Diagram



Figure 3.3.1 ERD Diagram of the TB Laboratory Management System.



Figure 3.3.2 ERD Diagram of the TB Laboratory Management System (Cont.).

3.4 Data Dictionary

Table 3-4-1: Admin table

TABLE: admin						
Column Name	Key	Data type	Size Default	Nul	Description	Sample Data
idusers	PK	int	10	NN	Unique ID for user	1
admin_name		tinytext		NN	Name of administer	jiawei
pwdAdmin		varchar	50	NN	Password of administer	lawji awei0829
updationDate		timestamp	current_timestamp()	Ν	Date store administer's info	3/31/2020 19:31

Table 3-4-2: Admission table

TABLE: admission							
Column Name	Кеу	Data type	Size	Default	Nul	Description	Sample Data
admin_id	PK	int	15		NN	Unique ID for admission	1
p_id	FK	int	15		NN	Unique ID for patient	1
uid	FK	int	11		NN	Unique ID of user key in patient info	2
admin_uid	FK	int	15	Null	Ν	Unique ID of user key in admission result	1
adm_remark		varchar	##	Null	Ν	Doctor's remark	Null
adm_result		varchar	##	Null	Ν	Final TB test result	Positive
adm_status		varchar	15	Null	Ν	Status of admission	Complete
adm_saveDate		timestamp		current_timestamp()	Ν	Save date of admission	3/31/2020 19:31
adm_resultDate		timestamp		Null	Ν	Result date of admission	4/3/2020 8:53
adm_updationDate		timestamp		Null ON UPDATE current	t N	Updation date of admission	4/3/2020 8:53
p_street		longtext		Null	Ν	street of patient	222, Jalan Jarak
p_city		longtext		Null	Ν	city of patient	Taiping
p_state		longtext		Null	Ν	state of patient	Perak
p_postcode		longtext		Null	Ν	postcode of patient	34000
p_HIVstatus		varchar	50	Null	Ν	HIV status of patient	Yes
p_referring		varchar	##	Null	Ν	Referring hospital of patient	Pantai Hospital
p_reasonExam		longtext		Null	Ν	Reason exam of patient	Diagnosis
country1		varchar	##	Null	Ν	1st country's patient travel before	Australia
country2		varchar	##	Null	Ν	2nd country's patient travel before	Singapore
state1		varchar	50	Null	Ν	1st state's patient travel before	Johor
state2		varchar	50	Null	Ν	2nd state's patient travel before	Kelantan

Table 3-4-3: Blood test table

TABLE: bloodtest							
Column Name	Key	Data type	Size	e Default	Nul	Description	Sample Data
bt_id	PK	int	15		NN	Unique ID for blood test	1
adm_id	FK	int	15		NN	Unique ID for admission	4
uid	FK	int	11		NN	Unique ID for user	3
bt_type		varchar	30	Null	Ν	Type of blood test	QFT
bt_result		varchar	15	Null	Ν	Result of blood test	Negative
bt_saveDate		timestamp		NULL ON UPDATE curren	Ν	Save date of blood test	4/3/2020 8:54
bt_status		varchar	15	Null	Ν	Status of blood test	Complete

Table 3-4-4: Chest X-Ray table

TABLE: chestxray							
Column Name	Key	Data type	Size	e Default	Nul	Description	Sample Data
c_id	PK	int	15		NN	Unique ID for chest x-ray	1
adm_id	FK	int	15		NN	Unique ID for admission	1
uid	FK	int	11	Null	Ν	Unique ID for user	5
r_image		blob			NN	Image of chest x-ray	[file image location]
r_appearance		varchar	50	Null	Ν	appearance of chest x-ray	Unclear
r_result		varchar	15	Null	Ν	result of chest x-ray	Positive
r_saveDate		timestamp		NULL ON UPDATE curren	N	save date of chest x-ray result	4/3/2020 8:57
r_creationDate		timestamp		Null	Ν	creation date of chest x-ray test	4/3/2020 8:57
r_status		varchar	15	Null	Ν	status of chest x-ray test	Complete

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Table 3-4-5: Collect sample table

TABLE: collectsample							
Column Name	Кеу	Data type	Size	Default	Nul	Description	Sample Data
cs_id	PK	int	15		NN	Unique ID for sputum sample	1
adm_id	FK	int	15		NN	Unique ID for admission	1
uid	FK	int	11	Null	Ν	Unique ID for user	4
cs_status		varchar	15	Null	Ν	status of collect sample	Complete
sc_serialNo		varchar	50		NN	Sputum sample of serial No	S001
cs_dateReceived		timestamp		NULL ON UPDATE curre	r N	Receive date of sputum sample	4/3/2020 9:00
cs_type		varchar	50	Null	Ν	Type of sputum sample	Extrapulmonary
cs_quality		varchar	30	Null	Ν	Quality of sputum sample	Unsatisfactory
cs_volume		varchar	40	Null	Ν	Volume of sputum sample	More Than 3 ml
cs_referringHP		varchar	40	Null	Ν	Referring hospital of patient's sputum	Pantai Hospital
cs_dateCollected		timestamp		Null	Ν	Date collected of sputum sample	4/3/2020 9:00
cs_test_Status		varchar	15	Null	Ν	Status of collect sputum sample	Complete
cs_test_Date		timestamp		Null	Ν	Date of complete sputum collected	4/3/2020 9:00
cs_dst_Status		varchar	15	Null	Ν	Status of DST test	Complete
cs dst Date		timestamp		Null	Ν	Date of DST	4/3/2020 9:00

Table 3-4-6: Temporary collect sample table

TABLE: collectsample_temp						
Column Name	Key	Data type	Size Default	Nul	Description	Sample Data
cs_temp_id	PK	int	11	NN	Unique ID for temporary collect sample	1
adm_id	FK	int	11 Null	Ν	Unique ID for admission	12
cs_status		varchar	## Null	Ν	status of collect sample	Complete

Table 3-4-7: Country travelled before table

TABLE: country_traveled						
Column Name	Key	Data type	Size Default	Nul	Description	Sample Data
ct_id	PK	int	11	NN	Unique ID for country traveled before	12
ct_name		varchar	## Null	Ν	Name of the country traveled before	Hong Kong

Table 3-4-8: DST test table

TABLE: dst							
Column Name	Key	Data type	Size	e Default	Null	Description	Sample Data
dst_id	PK	int	15		NN	Unique ID for DST test	1
dst_LspecimenNo	PK	int	5		NN	Laboratory specimen no of DST test	1
uid	FK	int	11	Null	Ν	Unique ID for user	4
cs_id	FK	int	5	Null	Ν	Unique ID for sputum sample	3
dst_status		varchar	15	Null	Ν	Status of DST test	Complete
dst_S		varchar	50	Null	Ν	Value of Streptomycin	Resistance
dst_H		varchar	50	Null	Ν	Value of Isoniazid	Resistance
dst_R		varchar	50	Null	Ν	Value of Rifampin	Resistance
dst_E		varchar	50	Null	Ν	Value of Ethambutol	Resistance
dst_Z		varchar	50	Null	Ν	Value of Pyrazinamide	Resistance
dst_Km		varchar	50	Null	Ν	Value of Kanamycin	Resistance
dst_Am		varchar	50	Null	Ν	Value of Amikacin	Resistance
dst_Cm		varchar	50	Null	Ν	Value of Cpreomycin	Resistance
dst_Ofx		varchar	50	Null	Ν	Value of Ofloxacin	Resistance
dst_other		varchar	50	Null	Ν	Other remark	Remark
dst_saveDate		timestamp		Null	Ν	Save date of DST test	4/3/2020 9:42

Table 3-4-9: Blood test editing log table

TABLE: editing_log_blood						
Column Name	Key	Data type	Size Default	Nul	l Description	Sample Data
EL_id	PK	int	11	NN	Unique ID for blood test log table	1
EL_bt_id	FK	int	15	NN	Unique ID for blood test	6
el_editor	FK	int	11	NN	Unique ID for user	6
bt_type_before		varchar	10 Null	Ν	Type of blood test edit before	QFT
bt_type_after		varchar	10 Null	Ν	Type of blood test e after edit	QFT
editionDate		timestamp	current_timestamp()	Ν	Edition date of blood test	4/3/2020 8:54

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Table 3-4-10: Doctor module editing log table

TABLE: editing_log_doc							
Column Name	Key	Data type	Size	Default	Nul	Description	Sample Data
EL_id	PK	int	11		NN	Unique ID for doctor log table	1
EL_admin_id	FK	int	15		NN	Unique ID for admission	6
el_editor	FK	int	11		NN	Unique ID for user	6
remark_before		varchar	40	Null	Ν	Doctor's remark edit before	Null
result_before		varchar	10	Null	Ν	Final TB test result edit before	Positive
remark_after		varchar	##	Null	Ν	Doctor's remark after edit	Null
result_after		varchar	10	Null	Ν	Final TB test result after edit	Negative
editionDate		timestamp		current_timestamp()	Ν	Edition date of doctor module	4/3/2020 8:54

Table 3-4-11: Skin test editing log table

TABLE: editing_log_skin							
Column Name	Кеу	Data type	Size	e Default	Nul	Description	Sample Data
EL_id	PK	int	11		NN	Unique ID for tests log table	1
EL_st_id	FK	int	15		NN	Unique ID for skin test	6
el_editor	FK	int	11		NN	Unique ID for user	6
el_arm_before		varchar	10	Null	Ν	Injection on which arm of patient edit before	Right
el_induration_diameter_before		int	10	Null	Ν	Induration diameter of patient edit before	15
el_arm_after		varchar	10	Null	Ν	Injection on which arm of patient after edit	Left
el_induration_diameter_after		int	10	Null	Ν	Induration diameter of patient after edit	13
editionDate		timestamp		current_timestamp()	Ν	Edition date of skin test	4/3/2020 9:00

Table 3-4-12: DST test editing log table

TABLE: editing_log_dst							
Column Name	Key	Data type 🛛 🤄	Size	Default	Null	Description	Sample Data
EL_id	PK	int	11		NN	Unique ID for dst test log table	1
EL_dst_id	FK	int	50	Null	Ν	Unique ID for DST test	6
el_editor	FK	int	50	Null	Ν	Unique ID for user	6
dst_S_before		varchar	50	Null	Ν	Value of Streptomycin edit before	Resistance
dst_H_before		varchar	50	Null	Ν	Value of Isoniazid edit before	Resistance
dst_R_before		varchar	50	Null	Ν	Value of Rifampin edit before	Resistance
dst_E_before		varchar	50	Null	Ν	Value of Ethambutol edit before	Resistance
dst_Z_before		varchar	50	Null	Ν	Value of Pyrazinamide edit before	Resistance
dst_Km_before		varchar	50	Null	Ν	Value of Kanamycin edit before	Resistance
dst_Am_before		varchar	50	Null	Ν	Value of Amikacin edit before	Resistance
dst_Cm_before		varchar	50	Null	Ν	Value of Cpreomycin edit before	Resistance
dst_Ofx_before		varchar	50	Null	Ν	Value of Ofloxacin edit before	Resistance
dst_other_before		varchar	50	Null	Ν	Other remark edit before	Remark
dst_S_after		varchar	50	Null	Ν	Value of Streptomycin after edit	Resistance
dst_H_after		varchar	50	Null	Ν	Value of Isoniazid after edit	Resistance
dst_R_after		varchar	50	Null	Ν	Value of Rifampin after edit	Resistance
dst_E_after		varchar	50	Null	Ν	Value of Ethambutol after adit	Resistance
dst_Z_after		varchar	50	Null	Ν	Value of Pyrazinamide after edit	Resistance
dst_Km_after		varchar	50	Null	Ν	Value of Kanamycin after edit	Resistance
dst_Am_after		varchar	50	Null	Ν	Value of Amikacin after edit	Resistance
dst_Cm_after		varchar	50	Null	Ν	Value of Cpreomycin after edit	Resistance
dst_Ofx_after		varchar	50	Null	Ν	Value of Ofloxacin after edit	Resistance
dst_other_after		varchar	50	Null	Ν	Other remark after edit	Remarks
editionDate		timestamp		current_timestamp()	Ν	Edition date of dst test	4/3/2020 8:54

Table 3-4-13: Collection sputum sample editing log table

TABLE: editing_log_sample							
Column Name	Key	Data type	Size	Default	Nul	Description	Sample Data
EL_id	PK	int	11		NN	Unique ID for collect sputum sample log table	1
EL_cs_id	FK	int	15		NN	Unique ID for sputum sample	6
el_editor	FK	int	11		NN	Unique ID for user	6
serialNo_before		varchar	50	Null	Ν	Sputum sample of serial No edit before	S001
type_before		varchar	50	Null	Ν	Type of sputum sample edit before	Extrapulmonary
quality_before		varchar	30	Null	Ν	Quality of sputum sample edit before	Unsatisfactory
volume_before		varchar	40	Null	Ν	Volume of sputum sample edit before	More Than 3 ml
referringHP_before		varchar	40	Null	Ν	Referring hospital of patient's sputum edit before	Pantai Hospital
serialNo_after		varchar	50	Null	Ν	Sputum sample of serial No after edit	4/3/2020 9:00
type_after		varchar	50	Null	Ν	Type of sputum sample after edit	Extrapulmonary
quality_after		varchar	30	Null	Ν	Quality of sputum sample after edit	Unsatisfactory
volume_after		varchar	40	Null	Ν	Volume of sputum sample after edit	More Than 3 ml
referringHP_after		varchar	40	Null	Ν	Referring hospital of patient's sputum after edit	Pantai Hospital
editionDate		timestamp		current_timestamp()	Ν	Edition date of collect sputum sample	4/3/2020 9:00

Table 3-4-14: Smear and culture test editing log table

TABLE: editing_log_sc							
Column Name	Key	Data type	Size	Default	Nul	Description	Sample Data
EL_id	PK	int	11		NN	Unique ID for tests log table	1
EL_test_id	FK	int	15		NN	Unique ID for tests	6
el_editor	FK	int	11		NN	Unique ID for user	6
appearance_before		varchar	40	Null	Ν	Appearance of tests edit before	Blood-Stained
contaminated_before		varchar	10	Null	Ν	Contaminated of test edit before	Yes
contamination_before		varchar	##	Null	Ν	Contamination of test edit before	Bacteria
result_before		varchar	10	Null	Ν	Result of test edit before	Positive
appearance_after		varchar	40	Null	Ν	Appearance of tests after edit	Blood-Stained
contaminated_after		varchar	10	Null	Ν	Contaminated of test after edit	Yes
contamination_after		varchar	##	Null	Ν	Contamination of test after edit	Bacteria
result_after		varchar	10	Null	Ν	Result of test after edit	Positive
editionDate		timestamp		current_timestamp()	Ν	Edition date of tests	4/3/2020 9:00

Table 3-4-15: Chest x-ray test editing log table

TABLE: editing_log_xray							
Column Name	Key	Data type	Size	Default	Nul	Description	Sample Data
EL_id	PK	int	11		NN	Unique ID for chest x-ray test log table	1
EL_c_id	FK	int	15		NN	Unique ID for chest x-ray	6
el_editor	FK	int	11		NN	Unique ID for user	6
image_before		blob		Null	Ν	Image of chest x-ray edit before	[file image location]
appearance_before		varchar	50	Null	Ν	appearance of chest x-ray edit before	Unclear
result_before		varchar	15	Null	Ν	result of chest x-ray edit before	Positive
image_after		blob		Null	Ν	Image of chest x-ray after edit	[file image location1]
appearance_after		varchar	50	Null	Ν	appearance of chest x-ray after edit	Unclear
result_after		varchar	15	Null	Ν	result of chest x-ray after edit	Negative
editionDate		timestamp		current_timestamp()	Ν	Edition date of chest x-ray test	4/3/2020 8:57

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Table 3-4-16: Patient table

TABLE: patient							
Column Name	Key	Data type	Size	Default	Null	Description	Sample Data
p_id	PK	int	15		NN	Unique ID for patient	1
patientfName		varchar	##	Null	Ν	First name of patient	Vince
patientlName		varchar	##	Null	Ν	Last name of patient	Tan
p_ic	U	varchar	15	Null	Ν	Malaysian Identity Card No. of patient	980307018932
p_passportnum	U	date	20	Null	Ν	Passportnumber of foreign patient	A123456
p_dob		varchar		Null	Ν	Date of birth of patient	3/7/1998
p_gender		varchar	15		NN	Gender of patient	Male
p_race		varchar	25	Null	Ν	Race of patient	Malay
p_nationality		varchar	55	Null	Ν	Nationality of patient	Malaysian
p_contactno		varchar	15	Null	Ν	Contact No of patient	012345678
p_street		longtext		Null	Ν	Street of patient	219,Jalan Perdana 14
p_city		longtext		Null	Ν	City of patient	Kampar
p_state		longtext		Null	Ν	State of patient	Perak
p_postcode		int	10	Null	Ν	Postcode of patient	31900
p_creationDate		timestamp		current_timestamp()	Ν	Creation date of patient info	3/30/2020 16:35
p_updationDate		timestamp		NULL ON UPDATE curren	Ν	Updation date of patient info	4/5/2020 16:35
p_ec_fname		varchar	##	Null	Ν	First name of emergency contact person	Johnson
p_ec_Iname		varchar	##	Null	Ν	Last name of emergency contact person	Tan
p_ec_relation		varchar	55	Null	Ν	Relation between patient & EC person	Father
p_ec_contactno		varchar	15	Null	Ν	Contact No. of emergency contact person	01232728472
p_status		varchar	55	Null	Ν	Status of patient	NULL
p_HIVstatus		varchar	55	Null	Ν	HIV status of patient	No
p_referring		varchar	##	Null	Ν	Referring hospital of patient	Pantai Hospital
p_reasonExam		longtext		Null	Ν	Reason exam of patient	Diagnosis

Table 3-4-17: Patient maps table

TABLE: patient_maps						
Column Name	Кеу	Data type	Size Default	Nul	Description	Sample Data
map_id	PK	int	11	NN	Unique ID for map	1
map_name		varchar	## Null	Ν	Patient name on map	Yi Lim
map_address		varchar	## Null	Ν	Address of patient on map	4,Jln ABC,78100,Perak
map_type		varchar	20 Null	Ν	Type of map	Null
lat		float	10,€ Null	Ν	The latitude on map	2.434784
Ing		float	10,6 Null	Ν	The longitude on map	102.10611

Table 3-4-18: State travelled before table

TABLE: state_traveled						
Column Name	Кеу	Data type	Size Default	Nu	l Description	Sample Data
st_id	PK	int	11	NN	Unique ID for State traveled before	1
st_name		varchar	## Null	Ν	Name of the state travelled before	Johor

Table 3-4-19: Skin test table

TABLE: skintest							
Column Name	Key	Data type	Size	Default	Nul	Description	Sample Data
st_id	PK	int	15		NN	Unique ID for skin test	1
adm_id	FK	int	15		NN	Unique ID for admission	5
uid	FK	int	11		NN	Unique ID for user	3
st_arm		varchar	10	Null	Ν	Injection on which arm of patient	Right
st_induration_diameter		int	10	Null	Ν	Induration diameter of patient	15
st_result		varchar	15	Null	Ν	Skin test result of patient	Positive
st_saveDate		timestamp		NULL ON UPDATE currer	Ν	Save date of skin test	4/3/2020 8:55
st_ExpirationDate		timestamp		Null	Ν	Expiration Date of skin test	4/6/2020 2:44
st_status		varchar	15	Null	Ν	Status of skin test	Complete

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CHAPTER 3 : System Design

Table 3-4-20: Tests table

TABLE: tests							
Column Name	Кеу	Data type	Size	Default	Null	Description	Sample Data
test_id	PK	int	15		NN	Unique ID for tests	1
test_LspecimenNo	PK	int	5		NN	Laboratory specimen no of tests	2
test_type	PK	varchar	30		NN	Type of test	Smear
cs_id	FK	int	5	Null	Ν	Unique ID for sputum sample	3
uid	FK	int	11	Null	Ν	Unique ID for user	4
t_savedate		timestamp		Null	Ν	Save date of tests	4/3/2020 9:03
t_appearance		varchar	40	Null	Ν	Appearance of tests	Blood-Stained
t_contaminated		varchar	10	Null	Ν	Contaminated of test	Yes
t_contamination		varchar	##	Null	Ν	Contamination of test	Bacteria
t_result		varchar	10	Null	Ν	Result of test	medium
t_Status		varchar	10	Null	Ν	Status of test	Complete

Table 3-4-21: User position table

TABLE: userposition							
Column Name	Кеу	Data type	Size	Default	Null	Description	Sample Data
u_position_id	PK	int	11		NN	Unique ID for user position	1
u_position_name		varchar	##	Null	Ν	Name of user position	Doctor
creationDate		timestamp		current_timestamp()	Ν	Creation date of user position	8/8/2019 9:23
updationDate		timestamp		NULL ON UPDATE curren	r N	Updation date of user position	1/8/2020 13:36

Table 3-4-22: Users table

TABLE: users							
Column Name	Кеу	Data type	Size	e Default	Nul	Description	Sample Data
uid	PK	int	11		NN	Unique ID for user	1
ufName		varchar	##	Null	Ν	First name of user	Ru Sian
ulName		varchar	##	Null	Ν	Last name of user	Теу
username	U	varchar	##	Null	Ν	Username of user	teyrusian
u_gender		varchar	6		NN	Gender of user	Male
u_position_id		int	11	Null	Ν	Unique ID for user position	1
uic	U	varchar	50		NN	Malaysian Identity Card No. of user	97123456782
u_contactno		Varchar	11	Null	Ν	Contact No. for user	0123456999
u_address		longtext		Null	Ν	Address of user	123,Jalan ABC
u_email		varchar	##	Null	Ν	Email of user	teyrusian@gmail.com
u_password		varchar	##	Null	Ν	Password of user	123456
u_status		varchar	10	'Active'	Ν	Status of user	Active
u_creationDate		timestamp		current_timestamp()	Ν	Creation date of user	3/30/2020 12:31
u_updationDate		timestamp		NULL ON UPDATE curren	N	Updation date of user	3/30/2020 12:31

Chapter 4: Design Specification

4.1 Methodologies

4..1.1 Prototyping Methodology

Methodology is a set of general principles that guide a people to choose a specific method suited to a project. A methodology is formalized approach and is a list of steps and deliverables to implementing the SDLC.

For the proposed system, the prototyping method will be involved as the system development approach. Prototyping is one of the categories of the methodology, A prototyping -based methodology performs the analysis, design, and implementation phase concurrently, and all three phases are performed repeatedly in a cycle until the system is fully completed. Prototyping methodology can reassure user working on system and quickly refine all the related requirement of the system. Quicker user feedbacks always lead to better solutions as missing functionality or errors can be detected much earlier.



Figure 4.1.1 Flow diagram of the Prototyping Methodology.

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4.1.2 Project Phase

1. Planning Phase

This is the very first step (phase) of the prototyping, the approach is to have a basic understanding on the system and user requirement. Starting by an interview with the user (interviewee). Selecting the relevant interviewee (laboratory staff or administrator, hospital manager) to interview to acquire the important information or requirement. All the requirement and information should be record down for the next phase.

Outcome for this project: Cantt Chart for the FYP2

2. Analysis Phase

The second phase is analysis phase, having a well-known about the existing system is necessary for this phase. Perform the action of investigation and definition for the requirements for new development and enhancement.

Outcomes for this project: User requirements

3. Design Phase

This third phase is sign phase, this phase provides a comprehensive approach to the design of the system, ensuring the design meet all user and system requirement. The outcome will be the physical design, interface design, database, and file design and etc.

Outcomes for this project: Storyboard, ERD Diagram

4. System Prototype Phase

After the basic of the analysis and design are performed, and work immediately begins on the system prototype, a "quick-and-dirt" program that provides some features. After that, it will proceed to the next phase (implementation phase).

Outcomes for this project: Login Module, Maintenance Module and etc.

5. Implementation Phase

This phase comes after understanding of system requirement and specification, the construction process after having a complete and illustrate design for the requested system. The coding and testing are included within this phase. The outcome of this project might be the maintenance plan.

Analysis, design, and implementation phase, all these three phases are performed repeatedly in a cycle of the prototyping methodology. The basic of analysis and design are performed, and work rapidly begins on the system prototyping phase. The first prototype normally is the first part of system used by the user, If the first system results in some error or some shortage. The first system will be re-analyzing, re-design, re-implement to a second prototype until refinement of the system is occur.

4.2 Tools for Developer

4.2.1 Software/Technology

1. Programming Language

- I. JavaScript as the client-side scripting language to make the system interacts with the user dynamically and jQuery library to improve the structure of code as it simplifies the complex DOM manipulation to shorter and easier code.
- II. PHP for open-source server-side scripting language that able to create the dynamic websites as it can be embedded into HTML. It also works with MySQL to create, read, update, delete the data from/to the database. Other advantages included the widely available community support and is a user-friendly language.

2. Database

MySQL and MySQL Workbench to create our database for the system. MySQL is selected as it is a free and open-source database management system that manages databases and connects the database to the system. MySQL workbench is used to design, model and generate our entity-relationship diagram because it follows the MySQL-specific physical design standards, so no mistakes are made when building new ER diagrams.

3. Editor / IDE

Visual Studio Code as text editor because it supports all the languages for our system development. It also comes with syntax highlighting, bracket-matching, auto-indentation, and includes an interactive debugger to step through source code, inspect variables, view call stacks, and execute commands in the console.

4. Markup Language & Style Sheet Language

HTML5 and CSS3 as the front-end language to structure the elements of the system and at the same time styling all the elements to make the system more user-friendly.

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5. Framework

Bootstrap library to improve the design of the system and shorten the time for system designing without the need to create every style used in the system.

6. API

• Maps JavaScript API

The Maps JavaScript API allow clients to customize maps with their own content and descriptions for display on web pages and mobile devices. Maps JavaScript API will mainly be used on "Dashboard" of **Treatment/Analysis** and **Reporting Module.**

• Geocoding API

The Geocoding API is a package that supports geocoding and reverse geocoding of addresses. This API will be used to convert the diagnosed patient address into "Latitude" and "Longitude".

7. Other Technology (server)

XAMPP is a free and open-source cross-platform web server solution stack package that include the server application (Apache), database (MySQL) and scripting language (PHP) to run the system locally without the need to worry about the platform being used.

4.2.2 Hardware

The hardware used in this project are:

• Personal Computer/Laptop

The PC/Laptop will be primarily used to program the system. The processor and RAM of the PC/Laptop need to be in a standard performance since it may be several software opened simultaneously such as XMAPP, and Visual Studio Code. The Table 4-1 below shows the minimum requirement of the device. PC/Laptop can also test the basic function of the system and debug the error of the system.

Table 4-1:	Minimum	requirements	of the	PC/Laptop.
1 4010 1 11			01 111	- e, =uptop.

Components	Specification
OS	Window 7.0
RAM	4GB
Processor	Intel(R) Core (TM) i7-3537U CPU @ 2.00Ghz
	2.50Ghz

4.3 User Requirements

4.3.1 Connectivity Requirements

Table 4-2: Connectivity Requirements for Users

Connectivity	Requirement
WiFi/Data Connection	Recommended

As table 4-2 shown, WiFi/Data connection is recommended using the dashboard of the Diagnosed Patient Pin Maps (Google Maps) feature to improve the accuracy of the location information as it can help to convert the patients' locations address into longitude and latitude format data from Geolocation API. Besides, the WiFi/Data is needed to display the Diagnosed Patient Pin Maps (Google Maps) on the Dashboard.

4.3.2 Hardware Requirements

Hardware	Requirement
	1
Memory	4GB RAM or higher
	-
Storage	50GB or higher
Processor	Intel Core i3 or higher (RECOMMENDED Core
	i5/i7 Processor)
	,

Table 4-3: Minimum Hardware Requirements for Users.

Table 4-3 shows the minimum hardware requirements of a laptop in order to run the proposed system smoothly. 4GB RAM and Intel Core i3 (Minimum) of a device make sure that the system able to run. The proposed system size is expected to be within 150MB and the XAMPP size is about 700 MB, and thus, the device should have a minimum of 50GB storage size so that it can install the XMAPP and include the proposed project file to operate it.

4.3.3 Software Requirements

Table 4-4: Minimum Software Requirements for Users.

Software	Requirement
XMAPP	7.2.29 / PHP 7.2.29 newer version

For the software requirements, the laptop or PC has to be able to support the XMAPP that can be found in the <u>Download XAMPP</u> - Website (see Table 4-4).

4.4 User requirements

As an Administrator

- 1. Manage TB Diagnosis Laboratory Information System users record
 - I. Add user position
 - II. Add and edit user
 - III. Review historical user
 - IV. Activate historical user
- 2. System Maintenance

As a Nurse

- 1. Manage TB Diagnosis Laboratory Information System patient record.
 - I. Insert patient record
 - II. Edit patient record
 - III. Search patient record
- 2. Manage Skin Test and Blood Test.
 - I. Insert skin or blood test result
 - II. Review patient skin or blood test result
 - III. Edit skin or blood test result

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As a Lab Scientist

- 1. Collect test sample (sputum) from patient.
- 2. Manage smear and culture Test.
 - I. Upload smear and culture test result
 - II. Review patient smear and culture test result
 - III. Edit smear and culture test result
- 3. Manage DST (Drug Susceptibility Test).
 - I. Upload DST test result
 - II. Review patient DST test result
 - III. Edit DST test result

As a Radiologist

- 1. Manage Chest X-Ray Test.
 - I. Upload chest X-Ray test image
 - II. Upload chest X-Ray test result
 - III. Review chest X-Ray test result
 - IV. Edit chest X-Ray test result

As a Doctor

- **1.** Review all the patient record.
- **2.** Manage final result of the patient.
 - I. Examine patient
 - II. Insert comment or give remark to patient
- 3. Generate final diagnosis based on clinical, radiological and laboratory evidence.
- 4. Get the data about total number of the TB tester and patient.
- 5. Acquire the information about differences between suspected patient and actual (diagnosed) patient.
- **6.** Acquire the information about TB Multi-Drug cases and XDR (Extensively drug-resistant) cases.
- 7. Get the State and Country diagnosed patient traveled before.

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4.5 Timeline

10	A	Task	Task Name	Duration	Start	Finish	Predecessors		10	1	1.0			1	1 10	1	20	Februar	ry 2020
1		*	Review Project 1	2 days	Mon 13/1/2	2Tue 14/1/2	0	+-	10	20		-	24	20	40		39		
2		*	Meet with supervisor	1 day	Wed 15/1/20	Wed 15/1/20	1												
3		*	Prototype design Cont	9 days	Thu 16/1/20	Tue 28/1/20	2												
4		*	Prototype Implementation	8 days	Wed 29/1/20	Fri 7/2/20	3								-				
5		*	Testing and Evaluation on Prototype	6 days	Mon 10/2/20	Mon 17/2/20	4												
8		*	Submit Draft Report	1 day	Tue 18/2/2	Tue 18/2/2	5												
7	1	*	Review Prototype	3 days	Wed 19/2/2	2 Fri 21/2/20	5												
8		*	Full System Finalization	7 days	Mon 24/2/20	Tue 3/3/20	7												
9		*	Review and benchmarking of System Performance	5 days	Wed 4/3/20	Tue 10/3/20	В												
10	1	*	Finalize report	5 days	Wed 11/3/2	ZTUE 17/3/2	9												
11	1	*	Submit Full Report	1 day	Wed 18/3/2	2 Wed 18/3/2	210												
12		*	Presentation Preparation	2 days	Thu 19/3/20	Fri 20/3/20	11												
13		*	Oral Presentation	1 day	Mon 23/3/2	2 Mon 23/3/2	212												
14		*	Submit Project	1 day	Tue 24/3/2	Tue 24/3/2	013												

Figure 4.5.1 Gantt Chart of TB Laboratory Information System project 2 development

4.6 Implementation Issues and Challenges

A well understanding/researching on TB diagnosis information and TB diagnosis laboratory's workflow that required to build a TB Diagnosis Laboratory Information System is extremely. Without the specific knowledge or information related to the TB field, it is hard to develop a system accurately for the TB Diagnosis Laboratory's user.

The second implementation issues will be the "requirements gathering" as some of the data or information are hard to obtain it from the journal or online article, it requires a long time period to discover the information through online searching. In this project, a meeting or interviewing end-user is strongly required to have a clear requirement. Moreover, it is difficult to collect the sample data of form to develop accurate ERD because it may offend the personal data privacy policy. It is also important to clearly understanding the usage of each form and the importance of data or value need to collect from the form for further analysis.

The challenge in this project includes the implementation of Chest-X Ray in Tests Module because the function to store the Chest X-Ray is needed further study to integrate it in our proposed system. Another possible challenge could be the combination of all the module for a complete system which may raise some problem when come to the compound process, it may need a long-time duration to figure out the bugs and do action of fixing.

Finally, the TB data analysis is the more challenging part in this project. The process of figuring out the way for presenting the data to the user is essential and important to the project All the graphical representation of data such as bar chart, line chart, table, maps etc. need to be undergo through some research and eventually implement to the proposed system.

Chapter 5: System Implementation

5.1 Setup and Configuration

5.1.1 Download XAMPP Apache Server

For this project, the XAMPP version used is XAMPP Version 7.4.4. Please open the XAMPP Website to download XAMPP: <u>https://www.apachefriends.org/index.html</u>



Figure 5.1.1 Screenshot of XAMPP Hyperlink.

Click on the "XAMPP for Windows" a Grey button which at the bottom of the page. After that, this is depending on the browser used, some may ask user to choose the save location first or verify the download first.



Figure 5.1.2 Screenshot for interface of "XAMPP for windows" button.

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5.1.2 Install XAMPP Apache Server

Find and double-click on the downloaded file, basically user will find it at the "Downloads folder" or the desktop. The file name will be named likely as **xampp-windows-x64-7.2.26-0-VC15-installer.**



Figure 5.1.3 Screenshot for downloaded file in desktop.

Click on the "Yes" button when the figure 5.1.4 pop-up so that the XAMPP setup window will open.



Figure 5.1.4 Screenshot of XAMPP ask for permission make changes on device.

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Click the "Next" button which at the bottom of the setup window to continue the installation of XAMPP as shown at the figure 5.1.5 below.



Figure 5.1.5 Screenshot of the XAMPP setup window.

Thus, the figure 5.1.6 below will be shown after the setup window. User can review and select the list of XAMPP attributes on the left side of the window to install. For this project, users are suggested to select the aspects as default. By default, all attributes are included in the XAMPP installation.

Select Components	ເຮ
Select the components you want to install; dear the Next when you are ready to continue	he components you do not want to install. Click Llick on a component to get a detailed description
XAMPP Installer	< Back Next > Cancel

Figure 5.1.6 Screenshot Select components of XAMPP to install.

The figure 5.1.7 below will be shown after that, click on the folder icon to select an installation location. User should avoid installing XAMPP in hard drive's folder such as OS (C:) if the user had activated the UAC on computer. User can create a new folder on the desktop side as the installation destination.

🖾 Setup	_	
Installation folder		ខេ
Please, choose a folder to install XAMPP Select a folder C:\xampp		

Figure 5.1.7 Screenshot of select installation location for XAMPP.

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Click "OK" button after confirms the selected folder as the XAMPP installation location.



Figure 5.1.8 Screenshot of browse for folder in XAMPP.

The learn more about Bitnami for XAMPP checkbox is at the middle of the page. Uncheck the "Learn more about Bitnami" box, then click on the "Next" button to continue the installation of XAMPP.



Figure 5.1.9 Screenshot of Bitnami for XAMPP.

The window will be shown as the figure 5.1.10 below, user needs to click "Next" button at the bottom of the window so that XAMPP will start installing the files into the installation location/folder selected before.



Figure 5.1.10 Screenshot for Begin Installing XAMPP.

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Click on the "Finish" button when the window prompted out as shown as the figure 5.1.11 below. The "Next" button will be shown at the bottom of the XAMPP window. The window will be close after user click on the "Next" button.



Figure 5.1.11 Screenshot of the XAMPP installation window with "Finish" button.

XAMPP Control Panel is the way to access the server, click on the XAMPP Control Panel to open it. After open, the XAMPP Control Panel, the figure 5.1.12 will be shown as below to select the language for the Control Panel. For English language, check the box under the American flag else check the box under the German flag for German language. Click the "Save" button to confirm the selected language.

Language	×
۲	0
🗙 Abort	t 🛷 Save

Figure 5.1.12 Screenshot for select language in XAMPP.

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Open the XAMPP installed folder, click on the "xampp-control". If prompt out a window, clicking "Run as administrator" and clicking "Yes" for open the XAMPP Control Panel in the future.

	setup_xampp	3/30/2013 8:29 PM	Windows Batc
Videos	💿 test_php	12/9/2016 2:40 AM	Windows Batc
🟪 OS (C:)	🞯 uninstall	1/21/2020 6:23 PM	DAT - MPEG vi
DATA (D:)	🚳 uninstall	1/21/2020 6:23 PM	Application
A Network	xampp_shell	1/21/2020 6:19 PM	Windows Batc
- Hetwork	🔀 xampp_start	3/30/2013 8:29 PM	Application
	🔀 xampp_stop	3/30/2013 8:29 PM	Application
	🔀 xampp-control	6/5/2019 8:10 PM	Application
	🔊 xampp-control	4/15/2020 7:11 AM	Configuration
	xampp-control	4/15/2020 7:11 AM	Text Documen
52 items 1 item selected	3.21 MB		

Figure 5.1.13 Screenshot of xampp-control.

Click "Start" on Apache and MySQL to run the TB Lab System as shown as the figure 5.1.4 below.

ន	XAMPP Control Panel v3.2.4									
Modules Service	Module	PID(s)	Port(s)	Actions				🔘 Nets		
	Apache			Start	Admin	Config	Logs	🗾 Sh		
	MySQL			Start	Admin	Config	Logs	Expl		
	FileZilla			Start	Admin	Config	Logs	- 🛃 Serv		
	Mercury			Start	Admin	Config	Logs	😡 He		
	Tomcat			Start	Admin	Config	Logs	📃 Q.		
2:29:39 2:29:40	AM [Apache AM [mysol]] Status cha Attempting	ange detected: r a to start MvSQ	unning						
2:29:40	AM [mysql]	Status cha	ange detected: r	unning						
2:30:30	AM [Apache	e] Attempting	to stop Apach	e (PID: 610))					
2:30:30	AM [Apache] Attempting	to stop Apach	e (PID: 169	96)					
2:30:30	AM [Apache	J Status cha	ange detected: s	stopped						
12:30:31 12:30:31	AIVI [mysqi]	Attempting	to stop iviySQI	∟app						
2.30.31	An [mysqi]	Status cha	ange detected. s	stopped						

Figure 5.1.14 Screenshot of main XAMPP Control Panel Page.

5.2 Login Module

The figure 5.2.1 showed the login interface which had been built in our system. In this system, user with different positions will have the different functionalists to access. Every user requires to login their account before accessing the functionality of system, user cannot create an account with their own, but they can require an account with the system administration. In the login page, the feature enables user to see the password by clicking the "eyes" icon, this allows user to check the password they have entered.

TB Laboratory
ACCOUNT LOGIN
USERNAME
PASSWORD
۲
Forget Password?
Login
_

Figure 5.2.1 Login page of TB Laboratory.

When user key in the valid username and valid password then clicks on the "login" button, system will prompt a message "Login successfully" as figure 5.2.2 below shown.



Figure 5.2.2 System prompt a message "Login Successfully".

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5.3 Administrator Module

After system administrator login into the system, the first interface is the dashboard interface as shown in the figure 5.3.1 below. In the administration module, administrator able to create a new user, manage the user's account, create a new user position, and manage the user position. The admin dashboard will show the total number of users in the system and total number of users for each position.

Tuberculosis	≡		TB Lab	Management System 🎩 🍏
MAIN TASK				Admin / Dashboard
Dashboard		ADMIN DASHBOARD SINPI	NG	
Luser Account	<			
Doctor	<			
🔺 Nurse	<	••	1	8
🛔 Lab Scientist	<		Managa Doctor	Managa Nurso
Radiologist	<	Total Users :6	Total Doctor: 1	Total Nurse: 2
Receptionist	<			
		Manage Lab Scientist Total Lab Scientist 1	Manage Radiologist	Manage Receptionist
		© 2020 TB. All rights reserved		^

Figure 5.3.1 Dashboard of Administrator.

Users are group by each user position, and this will easier for administrator to keep track the total number for each user position and easier to find a user. Administrator can click on the "Total number: 2" under "Manage Nurse", doing so it will bring administrator to the figure 5.3.2 as shown below.

Tuberculosis	≡		TB Lab Management System 💄 🛶
MAIN TASK Dashboard User Account	<	ADMIN MANAGE NURSE	Admin / Manage Nurse
Doctor Nurse Lab Scientist	<	Add More User	Historical User
 Radiologist Receptionist 	< <	Manage Nurse Show 10 entries # ^ Position	Search:
		Nurse 6 Jing Wen Tan 2. Nurse 9 Wei Xun Beh Showing 1 to 2 of 2 entries	tanjingwen 97123456788 Active 2020-04-16 23.12.33 ✓ ★ behwekun 960305060999 Active 2020-04-17 16.22.08 ✓ ★ Previous

Figure 5.3.2 Screenshot for Manage Nurse.

On the left-hand side, click on the "User Account" a drop-down list will be shown with create user, manage user, and manage/ create user position as figure 5.3.3 below.



Figure 5.3.3 User Account's drop-down list.

The figure 5.3.4 below showed the create user account interface, system will check the username and user Identity Card Number to avoid duplicate the account created. System will also check the availability of email key in. After created successfully, system will prompt a message "User Create Successfully".

ТВ	=			TB Lab Management System 🏖 🗸				
MAIN TASK		Create User						
Dashboard		User Position Dcotor TB						
Q Doctor		User First Name	User First Name					
A Nurse-Reception		Wong User Last Name						
Nurse-Skin Test		Kai XIn						
Lab Scientist		Username wongkaixintb	User Gender Male					
Dcotor TB		Username available for Registration	User Contact					
		970909085422 IC available for Registration	0169876543					
		User Address						
		7, <u>Kampar</u>		A				
		User Email wongkaixin@gmail.com						
		Email available for Registration						
		Password	Confirm Password					
		Create						

Figure 5.3.4 Create User Interface.

After successfully create the user account, the account will show in the manage user account table, administrator can modify and delete the account as shown in the figure 5.3.5 below. When the administrator wishes to delete/inactivate the account, the system will prompt a message to confirm with the action. The deleted account will remove from the manage user account table and prompt a message "User Inactive" at the top of the table.

	lhost/TBlab/	/admin/manage-user.php							९ 🖈 🥑 😩 :
ТВ	≡		local Are v	host says		TB La	ab Man	agement Sys	tem 🤽 🖑
MAIN TASK				OK Cancel					Admin / Manage Liser
Dashboard		ADMIN MAN	AGE USE						
Luser Account									
A Doctor									
A Nurse-Reception		Add More User Dashboa	ard						Historical User
A Nurse-Skin Test		Manage User							
Lab Scientist		# Position	ID User First Nam	e User Last Name	Username	User IC no	Status	Creation Date	Action
2 Radiologist		1. Doctor	1 Teh	Sha Bl	tehshabitb	970801081234	Active	2019-08-08 17:27:01	2 ×
2 Dcotor TB		2. Nurse-Reception	2 Teh	Sin Ping	tansinpingtb	970103085678	Active	2019-08-08 17:34:45	2 ×
		3. Nurse-Skin Test	3 Lau	Ка Ка	laukakatb	970103081234	Active	2019-08-09 21:24:57	/ ×
		4. Lab Scientist	4 Law	Ki Ki	lawkikitb	980202381234	Active	2019-08-09 21:27:25	/ ×
		5. Radiologist	5 Lim	So So	limsosotb	980101081234	Active	2019-08-12 23:30:21	/ ×
		6. Radiologist	6 Wang	Kao Kao	wangkaokaotb	960202081234	Active	2019-08-13 00:45:52	2 ×
		7. Dcotor TB	7 Wong	Kai XIn	wongkaixintb	970909085422	Active	2019-08-14 11:29:15	 ×

Figure 5.3.5 Manage user account interface.

The removed account will show in the historical user interface. System administrator can reactivate the account and the system will prompt a message to confirm the action as figure 5.3.6 below. The reactivate account will show in the user account table.

\leftarrow	C O localhost/TBlab/admin/historical-user.php Q C O										९ 🖈 🥝 😩 :		
TE	3	≡					localhost says	tivata this usar?		TB La	ab Mar	nagement Sy	rstem 🤽 🖓
MAIN	TASK		AD	MIN HIS	STO	RICAL	File you sure you main to ut	OK	Cancel				
6	Dashboard												
ዾ	User Account		Back	a									
ዾ	Doctor												
ዾ	Nurse-Reception		Hist	orical User									
ዾ	Nurse-Skin Test		#	Position	ID	User First N	lame User Last Na	ame Username	User I	Cino	Status	Inactive Date	Action
ደ	Lab Scientist		1.	Dcotor TB	7	Wong	Kai XIn	wongkaixintb	97090	9085422	Inactive	2019-08-14 11:31:07	1
ደ	Radiologist												
ይ	Dcotor TB												

Figure 5.3.6 Historical user interface.

The figure 5.3.7 below showed the interface for administrator to add user position, user also can modify the user position and remove the user position. System will also check the availability for new position to avoid the overlap of the user position in the system.

\leftarrow	\rightarrow C \bigcirc local	nost/TBlab	/admin/user-posi	ition.php			९ 🛧 🥝 😩 :
TE	3	=				TB Lab Manag	jement System 💄 🍏
MAIN	TASK		ADMIN	I ADD USER I	POSITION		
	Dashboard						
ደ	User Account						
ደ	Doctor		Add a Use	r Position			
ደ	Nurse-Reception		User Position	1			
ደ	Nurse-Skin Test		Dcotor TB				
ደ	Lab Scientist		Position avail	lable for Registration			
ደ	Radiologist		Submit				
				Destition			
			Manage User	Position			
			No.	Position	Creation Date	Modify Date	Action
			1.	Doctor	2019-08-08 17:23:13		/ ×
			2.	Nurse-Reception	2019-08-08 17:29:46		2 ×
			3.	Nurse-Skin Test	2019-08-08 17:59:33		2 ×
			4.	Lab Scientist	2019-08-08 17:59:54		2 ×
			5.	Radiologist	2019-08-12 22:18:58	2019-08-12 23:14:38	2 ×

Figure 5.3.7 Add User Position.

System will prompt out a message to inform user if the user position added successfully and the new added user position will show in the side bar and manage user position table as shown in the figure 5.3.8 below.

TE	3	≡					TB Lab Ma	anagement Sy	rstem 🎎 🖓
MAIN	TASK								
ඛ	Dashboard		Add a User	Position					
ዾ	User Account								
ደ	Doctor		User Position	added successfully II					
ደ	Nurse-Reception		Enter User F	Position					
ደ	Nurse-Skin Test		Submit						
ደ	Lab Scientist								
ዾ	Radiologist		Manage User	Position					
ደ	Dcotor TB		No.	Position	Cre	ation Date	Modify Date		Action
	4		1.	Doctor	201	9-08-08 17:23:13			2 ×
			2.	Nurse-Reception	201	9-08-08 17:29:46			2 ×
			3.	Nurse-Skin Test	201	9-08-08 17:59:33			2 ×
			4.	Lab Scientist	201	9-08-08 17:59:54			2 ×
			5.	Radiologist	201	9-08-12 22:18:58	2019-08-12 23:14:38		2 ×
			6.	Dcotor TB	201	9-08-14 11:23:34			2 ×
									·



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Besides that, system also allows user to change their password by clicking on the "change password" which shows in the drop-down list at the top of the right. From the drop-down list, user can also log out from the system as shown in figure 5.3.9.

					९ 🖈 🕑 😩 :
		TB Lab	Mana	gement Sys	tem 🚨 Admin
					Change Password
					Historical User
ne	Username	User IC no	Status	Creation Date	Action
	6.1.1.1.20	070004004004	A 11	0040 00 00 47 07 04	•

Figure 5.3.9 Drop down list with "Change Password" and "Log Out".

The figure 5.3.10 below showed the change password interface, user can modify the password by key in the correct current password and enter the new password for the account. If the user keys in the current password wrongly or the new password are not consistent with the confirm password, the request of change password will be rejected.

Tuberculosis	=	TB Lab Manage	ement System 🤱 🕬
MAIN TASK			Admin / Change Password
Dashboard		ADMIN CHANKITYI CHANGE PASSWORD	
& User Account	<		
A Doctor			
🔺 Nurse	<		
Lab Scientist		Change Password	
Radiologist	<	Current Password 🐵	
🐣 Receptionist	<	Enter Current Password	
		New Password 🛛 👁	
		New Password	
		Confirm Password 🐵	
		Confirm Password	
		Submit	

Figure 5.3.10 Change Password interface.

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When user submitted the change password request with key in the correct current password and new password is matching with confirm password, system will pop-up a message "Password changed Successfully !!" as shown in figure 5.3.11.

localhost/TBIab/admin/admin-ch	× 🔁 Patient Reception Search or Ad × 🕇 +			
admin/admin-change-password.ph	qr			Q
🕽 TB Login 🛛 🙀 localhost / 127.0.0	localhost says	ySQL Insert	Titas Assignment (F	1
	Password Changed Successfully !!			
	ОК			

Figure 5.3.11 System prompt a message "Password Changed Successfully".

5.4 Receptionist Module

After receptionist login into the system, the first interface is the Search or Add interface as shown in the figure 5.4.1 below. In the Receptionist module, Receptionist able to search patient, create a new patient account and manage patient account.

Tuberc	culosis	≡	TB Lab Management System 🚨 Patient Receptionist
MAIN TASK			Patient Reception / Search / Add Patient
Q Search o	or Add Patient		PATIENT RECEPTION SEARCH OR ADD PATIENT
A Patient L	_ist		
Create Pa Manage F	atient Account Patient		Search or Add patient
			Enter Patient IC Number / Passport Number (Foreign Patient)
			IC: 970808085411 Q. Search
			© 2020 TB. All rights reserved

Figure 5.4.1 Search or add patient interface in Receptionist module.

Receptionist will register every patient with their Malaysian Identity Card No. or Passport No. for foreign patient. Receptionist will key in their IC no. / Passport No. and press "Search" button to check whether the patient registered before or not. By doing so, if it is a new patient a create patient interface will be shown as figure 5.4.2 below. The patient IC no. keyed in at the search patient interface will automatically fill in the patient IC Number field.

Tuberculosis 🔳		TB Lab Manag	gement System	Patient Receptionist
MAIN TASK				Receptionist / Create Patient
Q Search or Add Patient	RECEPTIONIST CREATE PA	TIENT		
👤 Patient List <				
	Create Patient			
	Patient First Name	Patient Last Name		
	Enter Patient First Name	Enter Patient Last Name		
	Patient IC Number	Passport Nnumber (Foreign Patient)		
	980506980965	Enter Patient Passport Number		
	Patient Dob	Patient Gender		
	mm/dd/yyyy	Please Select a Gender		
	Patient Race	Patient Nationality		
	Please Select One	Please Select One		
	Patient Contact	HIV Status		
	Example: 0161234567	Please Select One Status		
	Address *Notice: Please fill in with Current Address Street			

Figure 5.4.2 Create patient interface.

After filled in all required entry field and patient necessary information, press "Create" button to create a new patient account in TB Lab Management system. The system will prompt a message "Patient created Successfully" as shown in figure 5.4.3 below, after submitted the created patient form.

eption/add-patient.php		
	localhost says Patient created Successfully	
	ОК	

Figure 5.4.3 A pop-up message display "Patient created successfully".

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When an existing IC No./ Passport No. (e.g. Connie's IC no.) has searched, the system will lead receptionist to the existing patient interface (e.g. Connie's Profile) shown as figure 5.4.4 below.

 Tuberculosis		TB Lab Manag	gement System	Patient Receptionist
AAIN TASK Q Search or Add Patient Patient List <	RECEPTIONIST EXISTING PA	ATIENT		Receptionist / Existing Patient
	Back Edit Patient Info Connie's Profile Profile Reg. Date: 2020-04-17 00/22:41			
	Patient First Name	Patient Last Name		
	Connie	Goh		
	Patient IC Number	Passport Nnumber (Foreign Patient)		
	950921018967			
	Patient Dob	Patient Gender		
	09/21/1995	Female		
	Patient Race	Patient Nationality		
	Chinese	Malaysian		
	Patient Contact	HIV Status		

Figure 5.4.4 Existing patient's profile interface.

Receptionist can recheck and update the latest patient information, especially for the other information section. Receptionist also can click on the "Re-examination" / "Follow-up examination" or fill in other necessary reason in the text box then press "Create New Admission Record" button to submit as shown in figure 5.4.5 below.

Tuberculosis				TB Lab Management System 💄 Patient Receptionist
MAIN TASK		Sister	0165623265	
Q Search or Add Patient				
Patient List	<	Other Information		
		The Latest 2 State (Malaysia) Travel:		
		State 1	State 2	
		Kelantan	Melaka	
		The Latest 2 Countries Travel:		
		Country 1	Country 1	
		Austria	Argentina	
		Others:		
		Referred Hospital		
		Reason for TB Exam		
		Re-Examination Follow-up examination		
		Re-Examination		
		Create New .	Admission Record	



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CHAPTER 5: System Implementation

The receptionist will submit successfully the create new admission record's request only if the patient previous admission status is completed or failed on the TB skin test. If receptionist successfully submits the new admission record request, the system will prompt the message "New Admission Record Inserted Successfully" as figure 5.4.6 below.

dit-existing-passport-pa	atient.php	
	localhost says New Admission Record Inserted Successfully	
	ок	

Figure 5.4.6 A pop-up message display "New Admission Record Inserted Successfully".

Manage patient interface will display all the patient list in the system, receptionist can search a specific patient by patient IC no./passport no. with the search function built in at the top of the patient list as figure 5.4.7 below.

					TB Lab Management System	Repeated Patient	Receptionist	Í
MAIN TASK Q Search or Add Patient Patient List <	RECEP	TIONIST MANAGE F	PATIENT			Receptionist /	Manage Patie	vt
	Add More Pat	Search:	*(Patient I/C or Passport.)			Search o	r Add Patient	
	# *	Patient Last Name	Patient First Name	Patient IC	Patient Passport Number	6 A	ction	
	1.	Liu	Kimi	980504018972			4	-
	2.	Yap	Poh Yee	890405018923			•	-
	3.	Oui	Siew Foong	780619015689			A (1)	_
	4.	Binti Auhman	Jayasuriya	001023015689			A (1)	-
	5.	bin Ali	Mazlah Baharum	760501018973			A (1)	-
	6.	Tan	Christine	890607018932			A (1)	_
	7.	Goh	Connie	950921018967			•	-
	8.	Wong	Dek Fong	051015018967			•	
	9.	Alias	Noorazlin Hidayu	750216098967			•	
	10.	Chan	Amy	680316017783			•	-
	Showing 1 to 10	of 15 entries			1	Previous 1	2 Next	_

Figure 5.4.7 Manage patient interface.

The receptionist can click on the icon at the "Action" column as shown in figure 5.4.8 below to view the selected patient's admission records and patient information.

∎ Tuberculosis		TB Lab Management System 와 Patient Receptionist
AANN TASK Q Search or Add Patient & Patient List <	RECEPTIONIST MANAGE PATIENT	Reception: / Manage Patient
	Add More Pittent Search: (A503229 'v Palent K or Paraport) Manage Patient	Search or Add Patient
	# * Patient Last Name Patient First Name ID Patient IC	Patient Passport Number Admission Date/Time Action
	1 Perry Katty 12	A903289 2020-04-17 01:00:12
	Showing 1 to 1 of 1 entries	Previous 1 Net

Figure 5.4.8 Manage patient interface (cont.).

The figure 5.4.9 below show the selected patient's admission records, receptionist can view the patient information by click on the "eye" icon at the "Action" column. Thus, receptionist also

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can edit/ modify the patient information by click on the "Pen" icon at the right of the "eye" icon. Receptionist can edit the patient information only if the patient account/admission record is created by them.

Tuberculosis		TB Lab Management System 🎎 Patient Receptionist
AAN TASK Q Search or Add Patient Patient List	RECEPTIONIST MANAGE PATIENT	Receptorist / Manage Patient
	Back Marage Patient # * Date/Time (Reception) 0 Result Date/Time 0 Result 0	Remark I Status Action
	1. 2020-04-17 01:00:12 2020-04-18 10:22:12 Positive	Remarks given by doctor Complete • /
	2. 2020-04-19 19:45:44	Incomplete 🔹 🖌
	Showing 1 to 2 of 2 entries	Previous 1 Next

Figure 5.4.9 Selected patient's admission records interface.

The figure 5.4.10 will be shown if the receptionist clicks the "Pen" icon.

Tuberculosis		TB La	ab Management System & Patent Recoptionist
AAN TASK Q Search or Add Patient Patient List	RECEPTIONIST EDIT PATIENT		Receptionist / Edit Patient
	Back		
	Edit Patient info Katty's Profile		
	Profile Reg. Date: 2020-04-17 01:00:12 Profile Last Updation Date: 2020-04-10 10:45:44		
	Patient First Name Katty	Patient Last Name Perry	
	Patient IC Number	Passport Nnumber (Foreign Patient) A903289	
	Patient Dob 03/04/1977	Patient Gender Female	
	Patient Race	Patient Nationality	
	Umer Patient Contact	HIV Status	

Figure 5.4.10 Edit Patient interface.

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After modifying the patient's information, receptionist can click "Update" button to submit the edit patient information request as shown in Figure 5.4.11 below.

New Zeeland	Australia	
New Zealand	Australia	
Others :		
Referred Hospital		
D		
Diagnosis Follow-up examination		
Re-Examination		

Figure 5.4.11 Edit Patient interface (cont.).

Besides that, system also allows receptionist to manage their personal account by clicking on the "Manage Account" which shows in the drop-down list at the top of the right. From the drop-down list, user can also log out from the system as shown in figure 5.4.12.

	TB Lab Management System 🚨 Patient Receptionist
	Patient R Log Out nt
atient	Q Search

Figure 5.4.12 Drop-down list with "Manage Account" and "Log Out".

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The figure 5.4.13 below showed the profile of current receptionist/user, the receptionist can edit their user account with make changes on their first name, last name username, contact no., address, email, and password. Receptionist requested to key in the correct current password in order to make changes successfully on their personal account. If the receptionist makes changes on username, system require user to re-login system with the new username.

Tuberculosis 🔳	TB Lab Management System 🚨 Patient Receptional				
MAIN TASK Q Search or Add Patient 2 Patient List	RECEPTIONIST EDIT USER ACCOUNT				
	Back				
	chankityi's Profile Profile Reg. Date: 2020-04-15 01:09:01 Profile Last Updation Date: 2020-04-15 02:42:49				
	User ID: 4 User First Name Re 10 Re				
	User Last rame Cha User anno: chankityi User Contact chasided n179456888				
	(Changes require user re-enter into the system with new username) User Address 123.julan uni				
	lisar Fmail				

Figure 5.4.13 Edit user account interface.

The figure 5.4.14 below showed the change password section for the receptionist personal account, receptionist can modify the password by key in the correct current password and enter the new password for the account. If the receptionist keys in the current password wrongly or the new password are not matching with the confirm password, the request of change password will be rejected.

User Email	
chankityi@gmail.com	
Current Password @	
Enter Current Password	
New Password 🔹	Confirm Password 👁
New Password	Confirm Password
	Update

Figure 5.4.14 Edit user account interface cont.

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5.5 Skin/Blood Test Module

After nurse login into the system, the first interface is the dashboard interface as shown in the figure 5.5.1 below. The skin/blood test's dashboard will show a patient waiting list (to do task), the patient is waiting for nurse to help them do injection for skin test or carry blood test.

Tuberculosis ■			TE	3 Lab Managem	ent System	Skin/Blood Test
MAIN TASK Dashboard Create Report	SKIN/BLO	OD TEST DASH	IBOARD		Ski	n/Blood Test / Dashboard
History Report	Date/Time (Today): Sun Apr 19 2020 21:55	30 GMT+0800 (Singapore Standa	rd Time)		
	Patient No. 🕴	Date Time 🕌	Patient IC No./Passport No. ≬	Patient Last Name ≬	Search: Patient First Name	e ∳ Status ∳
	12	2020-04-19 19:45:44	A903289	Perry	Katty	Incomplete
	15	2020-04-19 18:21:47	980506980965	Andrew Ong	Tan Hui	Incomplete
	Showing 1 to 2 of 2 entri	es			F	Previous 1 Next

Figure 5.5.1 Dashboard of skin/blood test.

The prompt window as figure 5.5.2 will be shown if the nurse clicks on the selected patient's row/record. Before carrying the test, the nurse needs to confirm the patient identity with checking their IC no./Passport no. is matching with the IC no./Passport no. given from the pop-up window thus choose the test type to carry and press the "Submit" button to submit it. After submitting the confirmation of TB skin/blood test, the selected patient record will be removed from the patient waiting list in the dashboard and can find in the History report.

=		ТР	Lab M	1anader	ment System	Skin/Blood Test
Tuberculosis		Confirmation of TB Skin/Blood Test	×			· · ·
MAIN TASK		Patient Information			Skir	/Blood Test / Dashboard
Dashboard	SKIN/BLOC	Patient No: 12				
Create Report		First Name: Katty				
History Report	Date/Time (Today) :	Last Name: Perry				
		NRIC/Passport: A903289				
		Contact No: 013278927398			Search:	
	Patient No. 🔶			t Name 🔅	Patient First Name	Status 👙
	12	Confirmation of TB Skin/Blood Test		1	Katty	Incomplete
	15	Choose Test Type: Choose Here		Ong	Tan Hui	Incomplete
	Showing 1 to 2 of 2 entries	Skin Test Blood Test			Ρ	revious 1 Next
		Close	Submit			

Figure 5.5.2 Confirmation of TB Skin/Blood Test interface.

After completing the test, the nurse needs to create a report for the patient. The nurse can click on the "Create Report" at the left side, the screen as figure 5.5.3 below will shown. The nurse needs to key in the patient IC no. / Passport number in order to the create report page. If the patient has not completed the test before, the nurse does not have the right to create a report for the patient and the IC no./Passport no. of the patient will not found while searching.

Tuberculosis ■	TB Lab Management System 🚨 Skinition Test
MAIN TASK Dashboard	SKIN/BLOOD TEST CREATE REPORT
Create Report History Report	Search Patient
	Enter Patient IC Number / Passport Number (Foreign Patient) A903289 A903289
	© 2020 TB. All rights reserved

Figure 5.5.3 Search patient interface in skin/blood test module.

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The figure 5.5.4 below will shown after the nurse click "Search" button and the test type chosen before is TB Skin Test. After filled in all field and test result, press the "Submit" button to submit the report.

Tuberculosis ■		TB Lab Management System 🚨 Skin/Blood Test
MAIN TASK Dashboard Create Report	SKIN TEST REPORT PATIENT'S NRIC/PASSPORT: A90328	Skin/Blood Test / Create Report
History Report	Dashboard Patient Information Skin Test Result	History Report
	Expiration Date: 2020-04-22 22:46:06 Arm of AD Please Select One Result	Induration Diameter (mm)
	Please Select One Back	Submit

Figure 5.5.4 Create TB skin test report interface.

After successfully created the report, the system will prompt a message "Patient Record Updated Successfully (Skin-Test)" as shown in figure 5.5.5 below.

t/CreateReport_Test.	php
	localhost says Patient Record Updated Successfully (Skin-Test)
	ок

Figure 5.5.5 Create TB skin test report interface cont.

The figure 5.5.6 below will shown after click "Search" button and the test type chosen before is TB Blood Test. After filled in all field and test result, press the "Submit" button to submit the report.

Tuberculosis ■		TB Lab Management System	M & Skin/Blood Test
MAIN TASK	BLOOD TEST REPORT PATIENT'S NRIC/PASSPORT: 980506	980965	Skin/Blood Test / Create Report
History Report	Deshboard Patient Information Blood Test Result		History Report
	Blood Test Type: Please Select One Back	Result Please Select One	Submit
			^

Figure 5.5.7 Create TB blood test report interface

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After successfully created the report, the system will prompt a message "Successfully Update Patient Record (Blood-Test)" as shown in figure 5.5.8 below.

d-Test/CreateReport_Test.	php
	localhost says Successfully Update Patient Record (Blood-Test)
	ок

Figure 5.5.8 Create TB blood test report interface cont.

History Report interface will display all the patient list with carried skin/blood test before or created report before in the system, the nurse can search a particular patient by patient IC no./passport no. with the search function built in at the top of the patient list as figure 5.5.9 below. The nurse also can click on the patient record/row to see the patient history report or patient information.

				TB Lab N	lanagement System 🤽 Skin/Blood Test 🕺
MAIN TASK					Skin/Blood Test / History Report
Dashboard	SKIN/BL	OOD TEST H	IISTORY REPORT		
Create Report					
History Report					
	#	Patient No.	Patient Last Name	Patient First Name	Search: Patient IC No./Passport No. 0
	1.	1	Liu	Kimi	980504018972
	2.	2	Yap	Poh Yee	890405018923
	3.	3	Oui	Siew Foong	780619015689
	4.	4	Binti Auhman	Jayasuriya	001023015689
	5.	5	bin Ali	Mazlah Baharum	760501018973
	6.	6	Tan	Christine	890607018932
	7.	7	Goh	Connie	950921018967
	8.	8	Wong	Dek Fong	051015018967
	9.	9	Alias	Noorazlin Hidayu	750216098967
	10.	10	Chan	Amy	680316017783
	Showing 1 to 10 of 15 entries				Previous 1 2 Next

Figure 5.5.9 History report of TB skin/blood test interface

The figure 5.5.10 will be shown after click on the patient record/row, the screen shows the selected patient information and skin/blood test result. User also can click "Edit" button on the right to edit the test information.

Tuberculosis		TB Lab Management System	Skin/Blood Test
MAIN TASK	SKIN TEST REDORT I DATIENT'S NDIC (DASSDORT: 680316017783		Skin/Blood Test / Report
Dashboard			
Create Report			
 History Report 	Back Dashboard Create Report		Edit
	Patient Information		2
	Skin Test Result		1
	Expiration Date: 2020-04-20 03:33:39		
	Arm of AD:	Induration Diameter(nm):	
	Left	13	
	Result:		
	Positive		
	Examined By:		
	Name:	Date/Time:	
	Jing Wen Tan	2020-04-17 04:18:34	
	Position:	Contact:	
	Nurse	0123456999	

Figure 5.5.10 History report of TB skin/blood test interface cont.

The figure 5.5.11 will be shown after the "Edit" button has been clicked, the nurse is allowed to edit the patient test information that created by them before. The nurse is not allowed to edit

patient's test information created by other user and the test result are also not allowed to make changes.

Tuberculosis		TB Lab Management System 🤱 SkinBlood Text
MAIN TASK	EDIT SKIN TEST REPORT TEST ID: 2	Skin/Blood Test / Edit Report
Create Report		
History Report	Back	
	Skin Test Result	
	Expiration Date: 2020-04-20 03:33:39	
	Arm of AD:	Induration Diameter(nm):
	Left	13
		Submit

Figure 5.5.11 Edit skin test report interface.

After the nurse click the "Submit" button, a window will be prompted as shown in figure 5.5.12 below. This will help the nurse to taking serious on the edit test information's action and not simply to modify the test. Press the "OK" button, system will display "Update Patient Record Successfully".

				TB Lab Management Sys
IN TEST REPORT TEST ID: 2	Edit Record Confirmation		×	
	Are you sure you want to edit this record?			
		ОК	CANCEL	
est Result				
ation Date: 2020-04-20 03:33:39				
of AD:			Induration D	liameter(nm):
			12.5	

Figure 5.5.12 Pop up window to confirm the edit skin test action.

The nurse also can keep track the edit history by clicks on the "Edited" button beside the tittle "Skin Test Result" as shown in Figure 5.5.13.

Tuberculosis 🔳		
MAIN TASK		
Dashboard	SKIN TEST REPORT PATIENT'S NRIC/PASSPORT: 680316017783	
Create Report		
History Report	Back Dashboard Create Report	
	Patient Information Skin Test Result Edited	
	Expiration Date: 2020-04-20 03:33:39	
	Arm of AD:	Indu
	Right	14
	Result:	
	Positive	
	Examined By:	

Figure 5.5.13 "Edited" button beside title "Skin Test Result".

After clicks on the "Edited" button, the test information edits before and after will be stored in the log table. The edition date is also an important information stored in the log table as shown in figure 5.5.14 below.

Tuberculosis 🔳				TB Lab Manage	ement System 🏖 Skin/Blood Test
MAIN TASK Dashboard Create Report	SKIN/BLOOD TEST EE	ITION LOG TAE	ILE TEST ID : 2		Skin Test / Edition Log Table
History Report	Back			Editor : Jing	Wen Tan Contact : 0123456999
	# A Edition Date 0	Arm of AD: (Before)	Arm of AD: (After)	Induration Diameter(nm) (Before)	Search: Induration Diameter(nm) (After)
	1. 2020-04-19 23:57:09 Showing 1 to 1 of 1 entries	Left	Right	13	13 Previous 1 Next



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Besides that, system also allows nurse to manage their personal account by clicking on the "Manage Account" shows in the drop-down list at the top of the right. The "Manage Account" function designed was same with the Receptionist module and the functionality has mentioned before in the receptionist module. From the drop-down list, user can also log out from the system as shown in figure 5.5.14.

Patient Last Name	Patient First Name 🔶 Status 🛊
	Search:
gapore Standard Time)	
	S Log Out
	Account
_ab Managemen	t System

Figure 5.5.15 Drop down list on the top right of skin/blood test.

5.6 Chest X-Ray Test Module

After radiologist login into the system, the first interface is the dashboard interface as shown in the figure 5.6.1 below. The chest x-ray test dashboard will show a patient waiting list (to do task), the patient is waiting for radiologist to help them to carry chest x-ray test.

Tuberculosis			٦	TB Lab Management	System 🎎 RADI	OLOGIST - CHEST X-RAY		
MAIN TABK Dashboard Create Report	RADIOLOGIST - CHEST X-RAY DASHBOARD							
History Report	Date/Time (Today) : M	on Apr 20 2020 01:11:20 G	MT+0800 (Singapore Standard Time)					
	Patient No. 🕴	Date Time 🗸	Patient IC No./Passport No.	Patient Last Name	Search: Patient First Name	¢ Status ¢		
	15	2020-04-19 23:40:20	980506980965	Andrew Ong	Tan Hui	Incomplete		
	12	2020-04-19 23:33:24	A903289	Perry	Katty	Incomplete		
	13	2020-04-18 09:16:31	930506018967	Liu	Nicholas	Incomplete		
	Showing 1 to 3 of 3 entries					Previous 1 Next		

Figure 5.6.1 Dashboard of Chest X-Ray test.

The pop-up window as figure 5.6.2 will be shown if the nurse clicks on the selected patient's row/record. Before carrying the test, the nurse needs to confirm the patient identity with checking their IC no./Passport no. is matching with the IC no./Passport no. given from the pop-up window thus press the "Submit" button to submit it or not. After submitting the confirmation of Chest X-Ray test, the selected patient record will be removed from the patient waiting list in the dashboard and user can find it in the history report.

Tuberculosis		Cor	firmation of C	hest X-Ray Radiology	TDISH X	4anagemen	t System 🚨 🛤	DIOLOGIST - CHEST X-RAY
		Patient Inf	ormation				Radiologis	t - Chest X-Ray / Dashboard
Dashboard	RADIOLOGIST	- CH	Patient No:	15				
Create Report			First Name:	Tan Hui				
History Report	Date/Time (Today) : Mo	n Apr 2(Last Name:	Andrew Ong				
		NF	RIC/Passport:	980506980965				
			Contact No:	016546562323			Search	
	Patient No. 🔅	Di				.ast Name 🔅	Patient First Name	• Status •
	15	2020-0			Close Submit	ew Ong	Tan Hui	Incomplete
	12	2020-0.,	_	1000200	_	erry	Katty	Incomplete
	13	2020-04-18 09:16:31		930506018967		Liu	Nicholas	Incomplete
	Showing 1 to 3 of 3 entries							Previous 1 Next

Figure 5.6.2 Confirmation of Chest X-Ray Test interface.

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After completing the test, the radiologist needs to create a report for the patient. The radiologist can click on the "Create Report" at the left side, the screen as figure 5.6.3 below will be shown. The radiologist needs to key in the patient IC no. / Passport number in order to the create report page. If the patient has not completed the test before (confirmation of chest x-ray test), the nurse does not have the right to create a report for the patient and the IC no./Passport no. of the patient will not found while searching.

	TB Lab Management System 🎄 RADIOLOGIST-CHEST X-RAY
MAIN TASK	Radiologist-OnestXRay / Create Repo
Dashboard	RADIOLOGIST - CHEST X-RAY CREATE REPORT
Create Report	
History Report	
	Search Patient
	Enter Patient IC Number / Passport Number (Foreign Patient)
	980506980965 Q. Search

Figure 5.6.3 Search patient interface in chest x-ray test module.

The figure 5.6.4 below will be shown after the radiologist click "Search" button and the IC no. is found. Radiologist can click on the "Choose file" to choose the chest x-ray test image from their desktop and upload it. After filled in all field and test result, press the "Submit" button to submit the report.

Tuberculosis	ТВ	Lab Management System	RADIOLOGIST - CHEST X-RAY
MAIN TASK Dashboard Create Report	CHEST X-RAY REPORT PATIENT'S NRIC/PASSPORT: 9805	06980965	Radiologist - Chest X-Ray / Create Report
History Report	Dashboard Patient Information X-Ray Result		History Report
	X.Ray Image Choose File No file chosen Result Please Select One Back	Appearance Please Select One	Submit
	© 2020 TB. All rights reserved		~



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After successfully created the report, the system will prompt a message "Patient Record Updated Successfully (Chest X-Ray)" as shown in figure 5.6.5 below.

/Update_	patient_Xray.php
	localhost says Patient Record Updated Successfully (Chest X-Ray)
	ОК

Figure 5.6.5 Create chest x-ray report interface cont.

History Report interface will display all the patient list with carried chest x-ray test before or created report before in the system, the radiologist can search a particular patient by patient IC no./passport no. with the search function built in at the top of the patient list as figure 5.5.9 below. The radiologist also can click on the patient record/row to see the patient history report or patient information.

Tuberculosis				TB Lab Manager	nent System 🏖 Radiologist - CHEST X-RAY	
MAIN TASK Dashboard Create Report	RADIOL	RADIOLOGIST - CHEST X-RAY HISTORY REPORT				
History Report						
					Search:	
	# ^	Patient No.	Patient Last Name	Patient First Name	Patient IC No./Passport No. +	
	1.	3	Oui	Siew Foong	780619015689	
	2.	4	Binti Auhman	Jayasuriya	001023015689	
	3.	5	bin Ali	Mazlah Baharum	760501018973	
	4.	6	Tan	Christine	890607018932	
	5.	7	Goh	Connie	950921018967	
	6.	8	Wong	Dek Fong	051015018967	
	7.	9	Alias	Noorazlin Hidayu	750216098967	
	8.	10	Chan	Amy	680316017783	
	9.	11	Gaga	Lady	A089231	
	10.	12	Perry	Katty	A903289	
	Showing 1 to 10	of 12 entries			Previous 1 2 Next	

Figure 5.6.6 History report of chest X-Ray screen.

The figure 5.6.7 will show after the patient record/row has been clicked, the screen shows the selected patient information, chest x-ray image and chest x-ray result. User also can click "Edit" button on the right to edit the test information.



Figure 5.6.7 History report of chest x-ray screen cont.

The figure 5.6.8 will be shown after the "Edit" button has been clicked, the radiologist can edit the patient test information that created by them before. The radiologist is not allowed to edit patient's test information created by another user.

 Tuberculosis		TB Lab Management System 🚨 RadicLogist - CHEST X-RAY
MAIN TASK	EDIT REPORT TEST ID: 9	Radologist - Chest X-Ray / Edit Report
History Report	Back Radiologist - Chest X-Ray	
	Appearance: Abnormal Chest X-Ray Chest X-Ray Image:	Result: Negative
	Choose Fie No file chosen	

Figure 5.6.8 Edit chest x-ray report interface.

After the radiologist click the "Submit" button, a window will be prompted as shown in figure 5.6.9 below. This will help the radiologist to taking serious on the edit test information's action and not simply to modify the test. After press the "OK" button, system will display "Update Patient Record Successfully".



Figure 5.6.9 Edit chest x-ray report interface cont.

The radiologist also can keep track the edit history by clicks on the "Edited" button beside the tittle "TB Chest X-Ray" as shown in Figure 5.6.10.



Figure 5.6.10 "Edited" button beside title "TB Chest X-Ray".

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After clicks on the "Edited" button, the test information edits before and after will be stored in the log table. The edition date is also an important information stored in the log table as shown in figure 5.6.11 below. The editor information will also display at the top of the right on the log table.

Tuberculosis	TB Lab Management System 🤽 RADIOLOGIST - CHEST X-RAY
MAIN TASK Dashboard Create Report History Report	RADIOLOGIST - CHEST X-RAY Edition Log Table Test ID : 11
	Back Editor : Mun Choong Lee Contact : 0186549656
	Search Search Result Result Result (Before) Appearance (After) Image (Before) Image (After) Result (Before) (After)
	1. 2020-04-20 03:09:35 Normal Chest X-Ray Abnormal Chest X-Ray Negative Positive
	Showing 1 to 1 of 1 entries Previous 1 Next

Figure 5.6.11 Edition log table of chest x-ray test.

Besides that, system also allows radiologist to manage their personal account by clicking on the "Manage Account" shows in the drop-down list at the top of the right. The "Manage Account" function designed was same with the Receptionist module and the functionality has mentioned before in the receptionist module. From the drop-down list, user can also log out from the system as shown in figure 5.6.11.



Figure 5.6.12 Drop down-list at the top of the right in chest x-ray module.

5.7 Lab Scientist Module

5.7.1 Collection Sample Sputum Test

After lab scientist login into the system, the first interface is the collect sputum sample's dashboard interface as shown in the figure 5.7.1.1 below. The dashboard will showed a patient waiting list(to do task), the lab scientist can click on the "View icon" to see more patient information or click on "Create Sample Report" to record and create a report for the patient after received the sputum sample.

Tuberculosis	≡	TB Lab Management System 🔐 LAB SCIENTIST							
MAIN TASK									
🔮 Sputum Sample	<	LAB SCIENTIST CC	Lab Scientis	Lab Scientist / Collection Sample(Sputum) Create Report					
🔮 Smear & Culture Test	<	SAMPLE(SPUTUM)							
V Drug-Susceptibility Test	<								
	Date/Time (Today) : Mon Apr 20 2020 16:26:02 GMT+0800 (Singapore Standard Time)								
		Show 10 entries				Search:			
		Patient IC No./Passport No. 🍦	Patient Last Name 🍦	Patient First Name	♦ Status ♦	Action \$			
		950921018967	Goh	Connie	Incomplete	Create Sample Report / View			
		A903289	Perry	Katty	Incomplete	Create Sample Report / View			
		930506018967	Liu	Nicholas	Incomplete	Create Sample Report / View			
		980506980965	Andrew Ong	Tan Hui	Incomplete	Create Sample Report / View			
		Showing 1 to 4 of 4 entries				Previous 1 Next			

Figure 5.7.1.1 Dashboard of collection sputum sample interface.

After lab scientist click on the "Create Sample Report", the figure 5.7.1.2 will be shown. Every sputum sample will have a unique serial number on the sputum sample bottle. The lab scientist should key in all the correct information and press the "Submit" button to submit the report.

Tuberculosis	≡			TB Lab Managem	nent System 🤽 LAB SCIENTIST	Í
MAIN TASK				Lab Scientist Collection Sample(Sputum) / Create Repo		
😍 Sputum Sample	<	SPUTUM COLLECTION REPORT PATIENT'S NRIC/PASSPO		- 1		
Smear & Culture Test	<					
Crug-Susceptibility Test	<	Back			History Repor	t
		Patient Information			2	
		Record Sputum Sample				
		Serial Number:		Specimen Quality		
				Please Select One		
		Volume:	1	Type & Classification:		
		Please Select One		Please Select One		
		Reffering (Specimen Collection) Place:				
		s	ubmi	it		
						11

Figure 5.7.1.2 Create sputum sample report interface.

The system will prompt a message "Patient Record Updated Successfully (Sputum Specimen Collection)" when the report submitted successfully as shown in figure 5.7.1.3. After submitting the report, the selected patient record/row will be removed from the dashboard and added in history report. The patient record/row will not disappear only if the sputum sample quality is not acceptable (unsatisfactory). The lab scientist will recollect sputum sample with patient and make a new report again.



Figure 5.7.1.3 Create sputum sample report interface cont.

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History Report of collection sample sputum interface will display all the patient list with created report before in the system, the lab scientist can search a particular patient by patient IC no./passport no. with the search function built in at the top of the patient list as figure 5.7.1.4 below. The lab scientist also can click on the patient record/row to see the patient history report or patient information.

Tuberculosis	≡				TB Lal	b Management System 🤱 🛤 SCIENTIST				
MAIN TASK		LAB SCIE REPORT	LAB SCIENTIST COLLECTION SAMPLE(SPUTUM) HISTORY							
History Report										
😌 Smear & Culture Test	<	Show 10 entries				Search:				
Orug-Susceptibility Test	<	# *	Patient No.	Patient Last Name	Patient First Name	Patient IC No./Passport No.				
		1.	10	Chan	Amy	680316017783				
		2.	9	Alias	Noorazlin Hidayu	750216098967				
		3.	8	Wong	Dek Fong	051015018967				
		4.	4	Binti Auhman	Jayasuriya	001023015689				
		5.	5	bin Ali	Mazlah Baharum	760501018973				
		6.	7	Goh	Connie	950921018967				
		7.	6	Tan	Christine	890607018932				
		8.	3	Oui	Siew Foong	780619015689				
		9.	12	Perry	Katty	A903289				
		10.	11	Gaga	Lady	A089231				
		Showing 1 to 10 of 1	0 entries			Previous 1 Next				

Figure 5.7.1.4 History report of collection sample sputum interface.

The figure 5.7.1.5 will shown after click on the patient record/row, the screen shows the selected patient information and sample Collection (Sputum) result. User also can click "Edit" button on the right to edit the test information.

Tuberculosis	≡		TB Lab Management Syste	em 🤽 LAB SCIENTIST
MAIN TASK				ist Collection Sample(Sputum) / Report
😌 Sputum Sample	<	LAB SCIENTIST COLLECTION SAMPLE(SPOTC	JM) PATIENT S INRIC/PASSPORT. Ag0328g	
😵 Smear & Culture Test	<			
Drug-Susceptibility Test	<	Back Dashboard Create Report		Edit
		Patient Information		2
		Sample Collection (Sputum) Result		2
		Serial Number:	Specimen (Sputum Sample) Record Date :	
		S005	2020-04-17 21:07:30	
		Specimen Quality:	Type & Classification:	
		Satisfactory	Extrapulmonary	
		Volume:	Reffered (Specimen Collection) Place:	
		More Than 3ml		
		Examined By:		
		Name:	Date/Time:	
		Yu Hong Quek	2020-04-17 21:07:30	
		Position:	Contact:	
		Lab Scientist	0156894365	-

Figure 5.7.1.5 History report of collection sample sputum interface.

The figure 5.7.1.6 will be shown after the "Edit" button has been clicked, the lab scientist is allowed to edit the patient test information that created by them before. The lab scientist is not allowed to edit patient's test information created by another user.

Tuberculosis	≡		TB Lab Management System 🏖 LAB SCIENTIST
MAIN TASK			Lab Scientist Collection Sample(Sputum) / Edit Report
😲 Sputum Sample	<	EDIT REPORT TEST ID: 11	
😲 Smear & Culture Test	<		
Crug-Susceptibility Test	<	Back	
		Lab Scientist Collection Sample(Sputum) Record	
		Serial Number: \$005	Specimen Quality
		Re-enter with new Serial No	Satisfactory
		Volume:	Type & Classification:
		More Than 3ml	Extrapulmonary
		Reffering (Specimen Collection) Place:	
		Su	bmit
		© 2020 TB. All rights reserved	^

Figure 5.7.1.6 Edit report of collection sputum sample test interface

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After the lab scientist click the "Submit" button, a window will be prompted as shown in figure 5.7.1.7 below. This will help the lab scientist to taking serious on the edit test information's action and not simply to modify the test. After press the "OK" button, system will display "Update Patient Record Successfully".

Tuberculosis	≡				TB Lab M	lanagement System 💄 🔤 SCIENTIST	
MAIN TASK			Edit Record Confirmation		×	Lab Scientist Collection Sample(Sputum) / Edit Report	
😲 Sputum Sample		EDIT REPORT TEST ID:	Are you give you want to add this record?				
Smear & Culture Test			Are you sure you want to eait this record?				
Drug-Susceptibility Test				ок	CANCEL		
		Dack					
		Lab Scientist Collection San	nple(Sputum) Record				
		Serial Number: \$005			Specimen Quality		
					Satisfactory Type & Classification:		
		Volume:					
		Less Than 3ml			Extrapulmonary		
		Reffering (Specimen Collection) F	Place:				
				Sub	mit		
		© 2020 TB. All rights reserved				^	

Figure 5.7.1.7 Edit report of collection sputum sample test interface.

The lab scientist also can keep track the edit history by clicks on the "Edited" button beside the tittle "Sample Collection (Sputum) Result" as shown in Figure 5.7.1.8.

Tuberculosis	=			TB Lab Management Sy	vstem 🛓 LAB SCIENTIST
MAIN TASK Sputum Sample Smear & Culture Test	<	LAB SCIENTIST COLLECTIO NRIC/PASSPORT: A903289	DN SAMPLE(SPUTUM) PATIENT	^{روي} S	Scientist Collection Sample(Sputum) / Report
Orug-Susceptibility Test	<	Back Dashboard Create Report			Edit
		Patient Information Sample Collection (Sputum) Result	Edited		2
		Serial Number: S005		Specimen (Sputum Sample) Record Da 2020-04-17 21:07:30	ate :
		Specimen Quality: Satisfactory		Type & Classification: Extrapulmonary	
		Volume: Less Than 3ml		Reffered (Specimen Collection) Place:	
		Examined By:			

Figure 5.7.71.8 "Edited" button beside the tittle "Sample Collection (Sputum) Result".

After clicks on the "Edited" button, the test information edits before and after will be stored in the log table. The edition date is also an important information stored in the log table as shown in figure 5.7.1.9 below.

Tuberculosis	=							TE	3 Lab M	anagem	ent Syst	tem 💄	LAB SCIENTIST
MAIN TASK													
😲 Sputum Sample	<	Labs	Scientist	L Collect	ion Sar	nnle(Sputu	m) Edition	l og Tabl	e Test IF).	Collect	ion Sample(Sputum	/ Edition Log Table
😲 Smear & Culture Test	<	11	Lab Scientist Collection Sample(Sputum) Edition Log Table Test ID : 11										
Urug-Susceptibility Test	<												
		Back	Edition Date	Serial No (Before)	Serial No (After)	Sample Type (Before)	Sample Type (After)	Sample Quality (Before)	Edito Sample Quality (After)	r : Yu Hong Volume Quality (Before)	Volume Quality (After)	Referred Place (Before)	Referred Place (After)
		1.	2020-04- 20 17:22:14	S005	S005	Extrapulmonary	Extrapulmonary	Satisfactory	Satisfactory	More Than 3ml	Less Than 3ml		

Figure 5.7.1.9 Edition Log Table of Collection Sample (Sputum).

5.7.2 Smear & Culture Test

After the collection of sputum sample, the patient record/row will be added in the dashboard of Smear & Culture test and DST test. Click on the "Smear & Culture Test" a drop-down list will be shown with "Create Report" and "History Report" then click on the "Create Report". The patient record/row shown in the report creation dashboard are waiting for carry Smear & Culture test as shown in figure 5.7.2.1.

Tuberculosis	TB Lab	Management S	System 🛓 LAB SCIENTIST						
MAIN TASK	LAB SCIENTIST SMEAR & CULTURE TEST REPORT CREATION Lab Scientist Smear & Culture Test / Report Gradien Dashboard DASHBOARD								
History Report	Date/Time (Today) : Mon Apr 20 2020 18:05:37 GMT+0800 (Singapore Standard Time)								
🗞 Drug-Susceptibility Test 🗧	Show 10 entries		Search:						
	Date/Time (Specimen (Sputumn Sample) Record Date)	Serial No.	Action \$						
	2020-04-20 16:42:33	S012	Create Test / View						
	2020-04-17 21:08:47	S009	Create Test / View						
	2020-04-17 21:08:17	S008	Create Test / View						
	2020-04-17 21:07:45	S006	Create Test / View						
	2020-04-17 21:05:34	S004	Create Test / View						
	2020-04-17 21:05:20	S003	Create Test / View						
	2020-04-17 17:00:17	S001	Create Test / View						
	Showing 1 to 7 of 7 entries		Previous 1 Next						

Figure 5.7.2.1 Dashboard of Smear & Culture test.

The figure 5.7.2.2 will be shown after lab scientist click on the "Create Test" button. The lab scientist can choose the test type and filled in all the test information then submit it by press on the "Submit" button.

Tuberculosis		TB Lab Management System 🏖 🕰 CONSTRUCT
WAIN TASK Vr Sputum Sample Vr Smear & Culture Test	Patient Information Specimen (Sputum) Sample Collection Information	
Drug-Susceptibility Test	Serial Number: S012	Specimen (Sputum Sample) Record Date : 2020-04-20 16:42:33
	Specimen Quality: Satisfactory	Volume: Less Than 3ml
	Type & CLassification: Pulmonary	Reffered (Specimen Collection) Place:
	Smear & Culture Test	
	est type: Please Select One Please Select One Street Test Culture Test	
		^

Figure 5.7.2.2 Create report of Smear & Culture test interface.

After the test record submitted successfully, the system will prompt a message "Record Import Successfully" if the record submitted successfully in the system as shown in figure 5.7.2.3 below.

Controller/Smear_Culture/Update_SmearCulture_Record.php							
	localhost says Record Import Successfully						
	ок						

Figure 5.7.2.3 Create report of Smear & Culture test interface cont.

Click on the "History Report", The history report of Smear & Culture test interface will display all the patient list with created Smear & Culture test record before in the system. The lab

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scientist can search a particular patient by patient IC no./passport no., Serial No., or date time with the search function built in at the top of the patient list as figure 5.7.2.4 below. The lab scientist can set the number of record show in a page. The lab scientist also can click on the patient record/row to see the patient history report or patient information.

Tuberculosis	≡					TB La	ab Management System 🤱 LAB SCIENTIST
MAIN TASK						DEDODT	Lab Scientist Smear & Culture Test / History Report
🕅 Sputum Sample	<	LAB SCIE	NIISTISMEAR	& CUL	TURE TEST HISTORY	REPORT	
😌 Smear & Culture Test							
Create Report							
History Report		Show 10 entries					Search:
Orug-Susceptibility Test	<	# 🔺	Serial No. (Specimen)	÷	Patient IC No./Passport No.	¢	Date/Time (Complete Smear & Culture Test)
		1.	S011		680316017783		2020-04-18 18:24:06
		2.	S006		750216098967		
		3.	S001		051015018967		
		4.	S004		001023015689		
		5.	S009		760501018973		
		6.	S012		950921018967		
		7.	S010		890607018932		2020-04-18 08:22:50
		8.	S003		780619015689		
		9.	S005		A903289		2020-04-18 09:05:23
		10.	S008		A089231		
		Showing 1 to 10 of 10	entries				Previous 1 Next

Figure 5.7.2.4 History report of smear & culture test interface.

The figure 5.7.2.5 will be shown after click on the patient record/row, the screen shows the selected patient information, sample Collection (Sputum) information and the Smear & Culture test records. User also can use the built-in search function to sort the test record or search for the specific test record. User can sort/search the test records with the date/time, test type, result, appearance, contaminated or contamination. The lab scientist also can press "view" button to see more information of the selected patient row's test record. Moreover, the lab scientist also can clicks "Edit" button on selected patient row/record to edit the test information/result.

Tuberculosis						TB Lab Mar	nagement Syste	m 🤽 LAB SCIENTIST
MAIN TASK	SMEAR & CULTURE TE	ST PATIENT'S ID: 7					Lab Scientist	Smear & Culture Test / Create Report
Sputum Sample <								
🔮 Smear & Culture Test								
V Drug-Susceptibility Test	Back							Create Report
	Patient Information							1
	Specimen (Sputum) Sample	Collection Information						1
	Smear & Culture Test							1
	Specimen No	Date (Test Done)	Test Type	Result 0	Appearance	Contaminated Contamination	Searc	iew 🕴 Edit 🌵
	2	2020-04-20 18:02:23	Culture	low		No		• 2
	Showing 1 to 2 of 2 entries							Previous 1 Next
	Smear Test					Culture Test		
	No. AFB	0 (Negative)				No growth reported	0 (Negative)	
	1-9 AFB per 100 HPF	Scanty (and rep	ort number of AFB)			Fewer than 10 colonies	Report number of colonies (Scanty)	
	10 - 99 AFB per 100 HPF	+ (Low)				10 - 100 colories	+ (Low)	
	1-10 AFB per HPF	++ (Medium)				More than 100 colonies	++ (Medium)	
	>10 AFB per HPF	+++ (High)				Innumerable or confluent growth	+++ (High)	
					Comple	te Test		

Figure 5.7.2.5 Selected patient's history report of smear & culture test interface.

The figure 5.7.2.6 will be shown the "Edit" button has been clicked, the lab scientist is allowed to edit the patient test information that created by them before. The lab scientist is not allowed to edit patient's test information created by another user.

Tuberculosis	=		TB Lab Management System 🤱 🛤 SCIENTIST
MAIN TASK			Lab Scientist Smear & Culture Test / Edit Report
Sputum Sample Smear & Culture Test	< <		
Drug-Susceptibility Test		Back	
		Smear & Culture Test Record	
		Culture Test Contaminated:	Contamination:
		Yes Result:	bacteria
		+ (Low)	
		Su	Submit
		© 2020 TB. All rights reserved	^

Figure 5.7.2.6 Edit Culture Report interface.

After the lab scientist click the "Submit" button, a window will be prompted as shown in figure 5.7.2.7 below. After press on the "OK" button, system will display "Patient Record Updated

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Successfully". If the lab scientist clicks on the "Cancel" button, the edit request will not submit to system and edit action will seems as failed.

				TB Lab M
T TEST ID: 10	Edit Record Confirmation		×	
	Are you sure you want to edit this record?			
		ок	CANCEL	
rd				
			Contamination	
			bacteria	

Figure 5.7.2.7 Edit Culture Report interface cont.

The lab scientist also can keep track the edit history of every test record by clicks on the "Edited" button as shown in Figure 5.7.2.8

Tuberculosis	=					TB Lab Managen	nent System	
Tuberculosis		Position:				Contact:		
MAIN TASK		Lab Scientist				0156894365		
😍 Sputum Sample	<							
😍 Smear & Culture Test	<	Smear & Culture Test						2
Urug-Susceptibility Test	<							
		Specimen No 🗍 Date (Test	Done) Test Type 🖨	Result App	earance	Contaminated Contaminated	ion Record Edited	t ≑ View ≑ Edit ≑
		1 2020-04-20 1	8:00:00 Smear	low 5	aliva			۰ ۲
		2 2020-04-20 1	8:02:23 Culture	low		Yes bacteria	Edited	• 2
		Showing 1 to 2 of 2 entries					1	Previous 1 Next
		Smear Test				Culture Test		
		No. AFB	0 (Negative)			No growth reported	0 (Negative)	
		1-9 AFB per 100 HPF	Scanty (and report numbe	r of AFB)		Fewer than 10 colonies	Report number of coloni	ies (Scanty)
		10 - 99 AFB per 100 HPF	* (Low)			10 - 100 colories	+ (Low)	
		1-10 AFB per HPF	++ (Medium)			More than 100 colonies	++ (Medium)	
		>10 AFB per HPF	++++ (High)			Innumerable or confluent growth	+++ (High)	
				ſ	Comple	te Test		
				l]		

Figure 5.7.2.8 "Edited" button on the selected patient's history report interface

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After clicks on the "Edited" button, the test information edits before and after will be stored in the log table. The edition date is also an important information stored in the log table as shown in figure 5.7.2.9 below. The editor information will also display at the top of the right on the log table.

Tuberculosis	=		-	TB Lab M	anageme	ent Systen	n 🎎 LAB	
WARN TASK Sputum Sample Smear & Culture Test Drug-Susceptibility Test	< < <	Lab Scientist Smear & Culture Test Ec	dition Log Table 1	Test ID : 10		Smear &	.Culture Test / E	Edition Log Table
		Back		Edito	r : Yu Hong	Quek Cont	act : 0156	6894365
		# Edition Date Appearance Aappearance 1. 2020-04-20 18 55 57 Showing 1 to 1 of 1 entries	rrance Contaminated (Before)	Contaminated (After)	Contamination (Before)	Contamination (After)	Result (Before) low Previous	Result (After) low 1 Next

Figure 5.7.2.9 Edition log table of Smear & Culture test interface

Every patient will carry difference times of smear tests and culture tests, the lab scientist can click the "Complete test" button as a close test or completion of create report for the specific patient as shown in figure 5.7.2.10 below. Before click on the "Complete Test" button, the lab scientist needs to confirm all the test result recorded are correct. The lab scientist is not allowed to add more test result for the patient after clicks the button.

Tuberculosis	≡						TB Lab Ma	anageme	ent System	n 🤽 lab s	
		Position:					Contact:				
MAIN TASK		Lab Scientist					0156894365				
😲 Sputum Sample	<										
😲 Smear & Culture Test	<	Smear & Culture Test									10
😲 Drug-Susceptibility Test	<										
									Search:		
		Specimen No 🕴 Date	Test Done)	Test Type ≬	Result 🕴	Appearance	Contaminated	Contamination	n Record Edited	I 🕴 View 🕴	Edit 🕴
		1 2020-04	-20 18:00:00	Smear	low	Saliva				۲	2
		2 2020-04	-20 18:02:23	Culture	low		Yes	bacteria	Edited	۲	8
		Showing 1 to 2 of 2 entries								Previous 1	Next
		Smear Test					Culture Test				
		No. AFB	0 (Nega	five)			No growth reported		0 (Negative)		
		1-9 AFB per 100 HPF	Scanty	and report numbe	er of AFB)		Fewer than 10 colonies		Report number of coloni	es (Scanty)	
		10 - 99 AFB per 100 HPF	+ (Low)				10 - 100 colories		+ (Low)		
		1-10 AFB per HPF	++ (Mei	lium)			More than 100 colonies		++ (Medium)		
		>10 AFB per HPF	+++ (Hi	gh)			Innumerable or confluent g	rowth	+++ (High)		
						Complet	to Test				
						Compier	te lest				

Figure 5.7.2.10 "Complete Test" button on the selected patient's history report interface

The figure 5.7.2.11 will be shown after click on the "Complete Test" button to ensure that the lab scientist confirms to complete the Smear & Culture test and will not add any test result for the selected patient later.

_Patient_Histor	y_Selected_F	eport.php				
				TB La	ib Ma	anage
Juiture rest	-		_	_	-	
	Notic	e!		×		
nen No 🍦 Da	ate (1	Confirm Complete Smear	& Culture Te	est?	d 🔶	Contamina
202	20-04		ок	CANCEL		
202	20-04					bacteri
2 of 2 entries						
est				Culture Test		
		0 (Negative)		No growth repo	rted	
er 100 HPF		Scanty (and report number of AFB)		Fewer than 10	colonies	
B per 100 HPF		+ (Low)		10 - 100 colorie	s	

Figure 5.7.2.11 "Complete Test" button on the selected patient's history report interface cont.

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5.7.3 DST Test

After the collection of sputum sample, the patient record/row will be added in the **Figure 5.7.2.4** and DST test. Click on the "DST Test" a drop-down list will show with "Create Report" and "History Report" then click on the "Create Report". The patient record/row shown in the report creation dashboard are waiting for carry DST test as shown in figure 5.7.3.1 below.

Tuberculosis	≡	TB Lab Management System 🔒 LAB SCIENTIST									
MAIN TASK Sputum Sample Smear & Culture Test Drug-Susceptibility Test	< < ~	LAB SCIENTIST DRUG-SUSCEPTIBILITY TEST (DST) Lab Scientist Drug-Susceptibility Test (DST) / Report Creation Dashboard REPORT CREATION DASHBOARD									
Create Report		Date/Time (Today) : Mon Apr 20 2020 19:36:56 GMT+0800 (Singapore Standard Time)									
History Report		Show 10 entries	Search:								
		Date/Time (Specimen (Sputumn Sample) Record Date)	Serial No.	♦ Action ♦							
		2020-04-20 16:42:33	S012	Create Test / View							
		2020-04-17 21:08:47	S009	Create Test / View							
		2020-04-17 21:08:17	S008	Create Test / View							
		2020-04-17 21:07:45	S006	Create Test / View							
		2020-04-17 21:05:34	S004	Create Test / View							
		2020-04-17 21:05:20 S003 Create Test / View									
		2020-04-17 17:00:17	S001	Create Test / View							
		Showing 1 to 7 of 7 entries		Previous 1 Next							

Figure 5.7.3.1 DST Test Report Creation Dashboard interface.

The figure 5.7.3.2 will shown after lab scientist click on the "Create Test" button. The lab scientist can fill in all the test information then submit it by press on the "Submit" button at the bottom of the page. The bottom of the page also attached the description/explanation of the test result 'S', 'R' and 'C'.

 Tuberculosis	TB Lab Management System 🎎 LAB SCIENTIST
MAIN TASK	DRUG-SUSCEPTIBILITY TEST (DST) SPECIMEN (SPUTUM) COLLECTION NO: 8
🌚 Smear & Culture Test <	
Vr Drug-Susceptibility Test	Back History Report
	Patient Information > Specimen (Sputum) Sample Collection Information > Smear & Culture Test >
	Date * S H R E Z Km Am Cm Ofx Other 0 2020-4-20 19:39-33 Select Select

Figure 5.7.3.2 Create report of DST Test interface.

After test record has been submitted successfully, the system would prompt a message "Record Import Successfully" if the record submitted successfully in the system as shown in figure 5.7.3.3 below.

er/DST/Updat	te_DST_Record.php	
	localhost says	
	Record Import Successfully	
	ок	

Figure 5.7.3.3 Create report of DST test interface cont.

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Click on the "History Report", The history report of DST test interface will display all the patient list with created DST test record before in the system. The lab scientist can search a particular patient by patient IC no./passport no., Serial No., or date time with the search function built in at the top right of the patient list as figure 5.7.3.4 below. The lab scientist can set the number of record show in a page. The lab scientist also can click on the patient record/row to see the patient history report or patient information.

Tuberculosis					TB Lab Management System 💄 🛤 SCIENTIST
MAIN TASK					
😵 Sputum Sample <	LAB SCIEN	ITIST DRUG-SUSCI	EPTIBILIT	FY TEST (DST) HISTORY	Lab Scientist Drug-Susceptibility lest (DS1) / History Report
Smear & Culture Test	REPORT				
😌 Drug-Susceptibility Test 🛛 🗸					
Create Report					
History Report	Show 10 entries				Search:
	# 🔺	Serial No. (Specimen)	φ	Patient IC No./Passport No.	Date/Time (Complete DST Test)
	1.	S011		680316017783	2020-04-18 18:25:08
	2.	S006		750216098967	
	3.	S001		051015018967	
	4.	S004		001023015689	
	5.	S009		760501018973	
	6.	S012		950921018967	
	7.	S010		890607018932	2020-04-18 09:02:11
	8.	S003		780619015689	
	9.	S005		A903289	2020-04-18 09:06:13
	10.	S008		A089231	
	Showing 1 to 10 of 10 ent	ries			Previous 1 Next

Figure 5.7.3.4 History report of DST test interface.

The figure 5.7.3.5 will be shown after click on the patient record/row, the screen shows the selected patient information, sample Collection (Sputum) information and the DST test records created. The lab scientist also can press "view" button to see more information of the selected patient row's test record. Moreover, the lab scientist also can clicks "Edit" button on selected patient row/record to edit the test information/result.

 Tuberculosis		TB Lab Management System 🚨 🖽 SCIENTIST
MAIN TASK	Less Than 3ml	Pulmonary
😵 Sputum Sample <	Reffering (Specimen Collection) Place:	
💱 Smear & Culture Test <		
Contract Con	Examined By:	
	Name: Yu Hong Quek	Date/Time: 2020-04-20 16:42:33
	Position:	Contact:
	Lab Scientist Smear & Culture Test	0156894365
	Show 10 entries	Search:
	Specimen No Date (Test Done) S H R E Z Km	Am Cm Ofx Other Record Edited View Edit
	1 2020-04-20 19:43:50 R R R R R S	
	Z ZUZO44-0 ISSKT10 C K K K K S Showing to 2 of 2 entries R: Resistant IS Susceptible C:Contaminated	C S S Previous 1 Next
	Comple	ele Test
	© 2020 TB. All rights reserved	^

Figure 5.7.3.5 Selected patient's history report of DST test interface.

The figure 5.7.3.6 will be shown after the "Edit" button has been clicked, the lab scientist can edit the patient test information that created by them before. The lab scientist is not allowed to edit patient's test information created by another user.

Tuberculosis	TB Lab Management System 🔐 🚥 scienter
MAIN TASK	EDIT REPORT TEST ID: 8 SPECIMEN ID : 1
Smear & Culture Test	
Drug-Susceptibility Test	Back
	Smear & Culture Test Record
	Search
	Specimen No A S 0 H 0 R 0 E 0 Z N N 0 An 0 Cm 0 Ofx 0 Other 0
	1 R R R S
	Submt
	8 2020 TB All rights reserved

Figure 5.7.3.6 Edit DST Test Report interface.

After the lab scientist click the "Submit" button, a window will be prompted as shown in figure 5.7.3.7 below. After press the "OK" button, system will display "Patient Record Updated

Successfully". If the lab scientist clicks on the "Cancel" button, the edit request will not submit to system and edit action will seems as failed.

						TBL
8 SPECIMEN	Edit Record	l Confirmation			×	
	Are you s	ure you want to eo	iit this record?			
				ок	CANCEL	
d						
¢н	¢ R	¢ E	¢ Z	¢ Km	4 Ai	m © Cm
K	3	C	K	3	3	3

Figure 5.7.3.7 Edit DST Test Report interface cont.

The lab scientist also can keep track the edit history of every test record by clicks on the "Edited" button as shown in Figure 5.7.3.8

Tuberculosis	TB Lab Management System 🏖 Les sourrist	*
Smear & Culture Test <	Examined by.	
😌 Drug-Susceptibility Test <	Name: Date/Time:	
	Tu holig Quek 2020-04-20 16.42.35	
	Position: Contact:	
	Lab Scientist 0156894365	Ц
	Smear & Culture Test	
	Social and a Date (Test Done) & S & H & B & F & Z & Km & Am & Cm & Ofr & Other & Becord Edited & View &	I
	1 2020-04-20 19-43-50 R R S C R S S S S Edited	•
	2 2220-04-20 19-44-10 C R R R R S C S S	I
	Showing 1 to 2 of 2 entries Previous 1 Next R: Resistant S: Susceptible C:Contaminated	
	Complete Test	
	© 2020 TB. All rights reserved A	*

Figure 5.7.3.8 "Edited" button on the selected patient's history report interface.

After clicks on the "Edited" button, the test information edits before and after will be stored in the log table. The edition date is also an important information stored in the log table as shown in figure 5.7.3.9 below. The editor information will also display at the top of the right on the log table.

Tuberculosis	TB Lab Management System 💄 🖙 🐨
MAIN TASK	Drug-Susceptibility Yest (DST) / Edition Log Table
Smear & Culture Test	Lab Scientist Drug-Susceptibility Test (DST) Edition Log Table Test ID : 8
Orug-Susceptibility Test	Editor : Yu Hong Quek Contact : 0156894365
	Changed Data
	# Edition Date \$\$
	Showing to 1 of 1 entries Previous 1 Ned Previous Data
	Search:
	1. 2020-04-2019:255:03 Resistance Resistance Susceptible Contaminated Resistance Susceptible Susceptib

Figure 5.7.3.9 Edition log table of DST test interface.

Every patient will carry difference times of DST tests, the lab scientist can click the "Complete test" button as a close test or completion of create report for the specific patient as shown in figure 5.7.3.10 below. Before click on the "Complete Test" button, the lab scientist needs to confirm all

the test result recorded are correct. The lab scientist is not allowed to add more test result for the patient after clicks the button.

Tuberculosis	TB Lab Management System 🎎 🖽 SCIENTIST	
Sputum Sample Smear & Culture Test Smear & Culture Test C Drug-Susceptibility Test	Examined By: Name: Date/Time: Yu Hong Quek 2020-04-20 16:42:33	
	Postton: Contact: Lab Scientist 0156894365 Smear & Culture Test	
	Show 10 entries Search: Search: <th colspa="6" search:<="" th=""></th>	
	2 2220-04-2015-44-10 C R R R S C S S Showing 1 to 2 of 2 entries R: Resistant S: Susceptible C:Contaminated	
	Complete Test	

Figure 5.7.3.10 "Complete Test" button on the selected patient's history report interface.

The figure 5.7.3.11 will be shown after click on the "Complete Test" button to ensure that the lab scientist confirm complete the DST test and will not add any test result for the selected patient later.



Figure 5.7.3.11 "Complete Test" button on the selected patient's history report interface cont.

Besides that, system also allows lab scientist to manage their personal account by clicking on the "Manage Account" shows in the drop-down list at the top of the right. The "Manage Account" function designed was same with the Receptionist module and the functionality has mentioned before in the receptionist module. From the drop-down list, user can also log out from the system as shown in figure 5.7.3.11.



Figure 5.7.3.12 Drop down list on the top right of the lab scientist module

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5.8 Doctor Module (Treatment/Analysis and Reporting Module)

After doctor login into the system, the first interface is the data analytic dashboard as shown in the figure 5.8.1 below. In the Doctor module, the doctor able to search patient, create a new patient account and manage patient account.

Tuberculosis			TB Lab Management System 🔬 👓
MAIN TASK	COCAL (TB-TESTER) 13		CORECON (TB-TE-STER) 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
Create Report	67% OFTOTALTD-TESTET		13% OF FULA TO-LESSER
History Report	15 Total TB-Tester	2 Diagnosed More info ©	11 Suspected
	HIV PATIENT (TB DIAGNOSED PATIENT) 1 Case(s)		NON-HIV PATIENT (TB DIAGNOSED PATIENT) 1 Case(s)
	Demographic Analysis (Tuberculosis)		-
		Categories	Cases
		Gender	
		Male	5
		Femele	10
		Total	15
	Overall Patient (TB-Tester)	Race	
	ereau auen (12-leater)	Malay	3
		Chinese	8
		Indian	2

Figure 5.8.1 Dashboard of doctor module interface.

The figure below describes the total number of local TB-tester and the total number of foreign TB-tester, the probability of the total number of local TB-tester and total number of foreign TB-tester will also be shown in figure 5.8.2 below. Out of the 15 patients, 13 (87%) were local TB-tester and 2 (13%) were foreign TB-tester. The doctor can be based on this diagram keep up to date with the latest total number.



Figure 5.8.2 Total number of local TB-tester and total number of foreign TB-tester.

The figure 5.8.3 below shows the total number of TB tester in this system and divided into three categories: Diagnosed, Suspected and Non-diagnosed. The suspected TB patient are those

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TB-tester still carrying TB tests and the total number of 11 suspected TB patient. After carried the test, we can identify and verify the TB-tester whether diagnosed with TB or not. Based on the diagram, there were 2 TB diagnosed patient with the positive final TB test result thus 2 Non-diagnosed patients with the negative final TB test result.



Figure 5.8.3 Number of diagnosed, suspected and non-diagnosed TB patient.

The interface as figure 5.8.4 will show if the doctor clicks on the "More info" button under the non-diagnosed. The table will display the patient information which was verified as a nondiagnosed TB patient. The doctor also can sort and search the patient with the built-in search function at the top right of the table by date, first name, last name, and remarks. The doctor also can click on the patient record/row, the selected patient's full report will show.

Tuberculosis				TB Lab	Managen	nent System 💄 😋
MAIN TASK						Doctor / Non-Diagnosed Patient
III Dashboard	DOCTOR NON-E	IAGNOSED PATI	IENT			
Create Report						
History Report	Back					
						Search:
	Result Date	Reception Date	First Name	Last Name 🕴	Result 🕴	Remark adm_status 🔅
	2020-04-17 19:02:37	2020-04-15 06:25:41	Kimi	Liu	Negative	Complete
	2020-04-17 19:03:02	2020-04-16 23:44:35	Poh Yee	Yap	Negative	Complete
	Showing 1 to 2 of 2 entries					Previous 1 Next

Figure 5.8.4 Non-diagnosed patient interface.

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Based on the research, we knew that a HIV patient will have greater probability than a non-HIV patient to get a positive final TB result so HIV is also one of the importance data should be keep track. The figure 5.8.5 shows the table records the latest number of TB diagnosed patient with HIV and the latest number of TB diagnosed patient with non-HIV.



Figure 5.8.5 Total number of TB diagnosed patient with HIV and Non-HIV.

The demographic analysis as shown in figure 5.8.6 below is focused on overall patient/TB-tester in system and categories it in 2 group: Gender and Race. There are 5 male's TB tester and 10 female's TB tester. The analysis of the race distribution indicated that the majority were 8 Chinese TB-tester, followed by 3 Malay TB-tester and 2 Indian TB-tester. Only 2 TB-Tester from other races, including foreign patients from other countries such as American and England.

Demonranhic Analysis (Tuherculosis)					
	Categories	Cases			
	Gender				
	Male	5			
	Femele	10			
	Total	15			
Overall Defiert (TR Tester)	Race				
Overall Patient (TB-Tester)	Malay	3			
	Chinese	8			
	Indian	2			
	Other	2			
	Total	15			

Figure 5.8.6 Demographic analysis (1).

	Quarter		
	Genaer		
	Male	0)
	Female	2	2
	Total	2	2
	State (Malaysia)		
	Johor	0)
	Kedah	0)
	Kelantan	0)
	Melaka	1	I
	Negeri Sembilan	0)
	Pulau Penang	0)
	Pahang	0)
	Perak	1	
	Perlis	0)
	Sabah	0)
	Sarawak	0)
Patient (DIAGNOSED)	Selangor	0)
	Kuala Lumpur	0)
	Labuan	0)
	Putrajaya	0)
	Terengganu	0)
	Total	2	
	Group of Age		
	Below 9 year old	0	
	10 - 19 year old	0	
	20 - 29 year old	0	
	30 - 39 year old	0	
	40 - 49 year old	1	
	50 - 59 year old	1	
	60 - 69 year old	0	
	70 - 79 year old	0	
	80 year old and above	0	
	Total	2	

Figure 5.8.7 Demographic analysis (2).

Figure 5.8.7 present the data about TB Diagnosed Patient's demographic analysis, as the figure 5.8.7 showing above, user can acquire the information about TB Diagnosed patient's gender, from which state and the group of age.







Figure 5.8.9 TB Tester (Admission) Monthly Recap Report.



Figure 5.8.10 TB Tester (Admission) Yearly Recap Report.

Figure 5.8.8 – Figure 5.8.10 present the Recap Report (Line Chart) about the TB tester who has register for TB disease testing. All these data will be group by day, month and year which will

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present to the user by using the Line Chart. From these recap reports, user can acquire the information about which day/month/year is the peak season of the TB suspected cases.



Figure 5.8.11 TB Diagnosed Patient Daily Recap Report.



Figure 5.8.12 TB Diagnosed Patient Monthly Recap Report.



Figure 5.8.13 TB Diagnosed Patient Yearly Recap Report.

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Figure 5.8.11 – Figure 5.8.13 present the Recap Report (Line Chart) about the TB Diagnosed patient who has confirmed to the TB infection after going through all the relevant test. All these data will be group by day, month and year which will present to the user by using the Line Chart.



Figure 5.8.14 Google Pin Maps (Diagnosed Patient).

phpMyAdmin	Compared to the second se
🟫 🗾 😣 🗊 🌼 😋	🔄 🗄 Browse 🧏 Structure 🖉 SQL 🔍 Search 💱 Insert 🚍 Export 📾 Information and Privileges 🥜 Operations 26 Triggers
Recent Favorites	
60	
phpmyadmin	SPIFCT * FROM 'nation' mans'
- tbdatabase	
New	Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [Refree
🔁 🛂 admin	
I admission	Show all Number of rows: 25 • Filter rows: Search this table Sort by key: None •
Je bloodtest	+ Options
the chestxray	(→¬→) ▼ map id map name map address map type lat lng
Collectsample	📄 🥒 Edit 👫 Copy 🥥 Delete 1. Connie Gob. 85 Jalan BP 6/3. 47120. Pulau Sebang, Selangor NULL 2, 958363. 101.612930
Collectsample_temp	C Fult Set Conv. C Delate 2. Anv. Chan 10E 107 Jalan DM2 Taman Residuction Mardela NULL 2.254001 102.240050
+ dst	
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🖶 🥂 editing_log_dst	
⊕-₩ editing_log_sample	
Image: Barbar and	Show all Number of rows: 25 V Filter rows: Search this table Sort by key: None V
editing_log_skin	
+ editing_log_xray	Query results operations
+ patient	🚔 Print 🗚 Copy to clipboard 拱 Export 🏭 Display chart 🔄 Create view
+	
+ state traveled	
tests	
+ userposition	
+ users	
🛨 💷 test	A
	/ Console

Figure 5.8.15 Database (Diagnosed Patient's actual address) of Google Pin Maps.

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Figure 5.8.14 present the diagnosed patient's address by using the Google Maps (Pin), the TB Laboratory Management System will automatically generate the diagnosed patient current "Lat" (Latitude) and "lng" (Longitude) based on the current address of them through the Google Maps API and store these data into the database as figure 5.8.15 showing above, these data will be used for forming the Google Pin maps and display it on the "Dashboard".



Figure 5.8.16 Bar Chart (Displaying the state(s) of Malaysia that diagnosed patient traveled).

Drug(s)	Susceptible (Cases)	Resistance (Cases)	Contaminated (Cases)	
Streptomycin (S)	4	3	2	
soniazid (H)	3	4	2	
Rifampicin (R)	4	3	2	
Ethambutol (E)	4	3	2	
Pyrazinamide (Z)	4	4	1	
Kanamycin (Km)	3	5	1	
Amikacin (Am)	2	5	2	
Capreomycin (Cm)	4	5	0	
Ofloxacin (Ofx)	4	5	0	
Multiple Dr	😝 ug Resistance(MDR) Cases	Extensively Drug-Re	😝 sistant TB (XDR TB) Cases	
	3		0	
	(CASES)	(CASES)		

Figure 5.8.17 Table describes the DST (Drug-susceptibility testing) relevant data (1).

Overall Suscentible (Cases)	Drug-susceptibility te	sting (DST) Analysis Overall Resistance (Cases)	
Strentomycin (S)	4/9	Strentomycin (S)	3/0
Isoniazid (H)	3/0	leoniazid (H)	4/9
Diferenciaio (D)	Ji J	Diferenciaie (D)	2/0
Rhampicin (R)	4/9	Ritampicin (K)	3/0
Ethambutor (E)	4/9	Etnambutor (E)	3/9
	4/9	Pyrazinamide (Z)	4/9
	3/9	Kanamycin (Km)	2/9
Amikacin (Am)	2/9		2/9
	4/9	Capreomycin (Cm)	2/9
UTIOXACIN (UTX)	4/9	Utioxacin (Utx)	5/9

Figure 5.8.18 Table describes the DST (Drug-susceptibility testing) relevant data (2).

When doctor clicks on the "Create report", the interface will show as figure 5.8.19 below. The table shows the patient waiting list (to do list), the doctor will create the report for the patient had complete the TB tests. The yellow highlighted patient row/record are completed test with the negative test result in Chest X-ray while the red highlighted patient row/record are completed all TB tests with the Chest X-ray result's positive.

						TB Lab Managem	ient System 💄 😋
MAIN TASK	DOCTOR CREA	TE REPORT					Doctor / Creste Report
붵 Create Report 🛛 🔶							
History Report	Date/Time (Today) : Mon A	pr 20 2020 23:21:22	: GMT+0800 (Sing	apore Standard Ti	me)		
							Search:
	Patient IC No./Passport No.	Patient First Name	Skin Test Result	Blood Test Result	♦ Chest X-Ray Result	Smear & Culture Test Status	Drug-Susceptibility Test (DST)
	950921018967	Connie	Positive		Negative	Complete	Complete
	890607018932	Christine	Positive		Negative	Complete	Complete
	A903289	Katty		Positive	Positive	Complete	Complete
	A089231	Lady	Positive		Negative	Pending	Pending
	051015018967	Dek Fong	Positive			Pending	Pending
	001023015689	Jayasuriya	Positive		Positive	Pending	Pending
	930506018967	Nicholas	Positive		Positive	Pending	Pending
	750216098967	Noorazlin Hidayu		Positive		Pending	Pending
	760501018973	Mazlah Baharum		Positive	Positive	Pending	Pending
	780619015689	Siew Foong		Positive	Positive	Pending	Pending
	Showing 1 to 10 of 11 entries						Previous 1 2 Next

Figure 5.8.19 Create report in doctor module.

The figure 5.8.20 will be shown after doctor clicks on the patient row/record. The doctor can review the patient information and all the tests carried by the patient before, doctor also can minimize the tab to hide the complete information of the section or choose the test he/she preferred to review and maximize it. The doctor can base on the tests results and his/her judgment to give the final review and diagnosis. The doctor needs to fill in the final TB result and give any remarks then press the "Submit" button to submit the report.

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 Tuberculosis	TB Lab Managemer	nt System 🤽 😳
MAIN TASK	PATIENT'S ID: 7 PATIENT'S NRIC/PASSPORT: 950921018967	Doctor Create Report / Create Report
Create Report		
History Report	Back	History Report
	Patient Information	1
	Skin Test Result : Positive	1
	Specimen (Sputum) Sample Collection Information	1
	Smear & Culture Test	2
	Drug-Susceptibility Test Result	2
	Remark	2
	Final Review and Diagnosis	
	Tuberculosis (TB) Diagnosis:	
	Please Select One	
	Remark:	

Figure 5.8.20 Create report in doctor module cont.

Click on the "History Report", the interface will display the patient list with full report created. The doctor can search a specific patient by patient IC no./passport no., patient first name, patient last name and patient no. with the search function built in at the top of the patient list as figure 5.8.21 below. The doctor can set the number of record show in a page. The doctor also can click on the patient record/row to see the patient full history report.

■ Tuberculosis			Т	B Lab Management System	
MAIN TASK Dashboard Create Report	DOCTOR HISTORY RE	EPORT		Doc	tor / History Report
History Report	Date/Time (Today) : Mon Apr 20 2020	23:42:32 GMT+0800 (Singapore Standard Ti	me)		
	Show 10 entries			Search:	
	Patient No.	Patient IC No./Passport No.	Patient First Name	Patient Last Name	0
	1	980504018972	Kimi	Liu	
	2	890405018923	Poh Yee	Үар	
	7	950921018967	Connie	Goh	
	10	680316017783	Amy	Chan	
	14	980202017843	Mickey	Lee	
	Showing 1 to 5 of 5 entries			Previo	us 1 Next
5.4					

Figure 5.8.21 Full history report in doctor module.

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The figure 5.8.22 will shown after click on the patient record/row, the screen shows the selected patient information, all tests record and final diagnosis result. The doctor also can press "print this page" button to print the full report or save the full report as PDF in desktop. Moreover, the doctor also can clicks "Edit" button on the top left to edit the final diagnosis result and remarks given before.

Tuberculosis	TB Lab Managemer	t System 보 👓
MAIN TASK		Doctor Create Report / Create Report
Dashboard Create Report	PATIENT'S ID: 7 PATIENT'S NRIC/PASSPORT: 950921018967	
History Report		
	Back Print this page	Edit
	Patient Information	1
	Skin Test Result : Positive	1
	Chest X-Ray Result : Negative	1
	Specimen (Sputum) Sample Collection Information	2
	Smear & Culture Test	1
	Drug-Susceptibility Test Result	1
	Final Diagnosis Result : Positive	 Z
	Tuberculosis (TB) Diagnosis: Positive	
	Remark:	
	Examined By:	

Figure 5.8.22 The selected patient's full history report in doctor module.

The figure 5.8.23 will be shown after click the "Edit" button, the doctor is allowed to edit the report that created by them before. The doctor is not allowed to edit patient's report created by another user.

Tuberculosis	TB Lab Management System 🔐 👓
MAIN TASK	EDIT REPORT TEST ID: 7
III Dashboard	
Create Report	
History Report	Back
	Final Review and Diagnosis
	Remark:
	no remark given
	Result:
	Positive
	Submit

Figure 5.8.23 Edit report in doctor module interface.

After the doctor click the "Submit" button, a window will be prompted as shown in figure 5.8.24 below. After press the "OK" button, system will display "Patient Final Review and Diagnosis Update Successfully". If the doctor clicks on the "Cancel" button, the edit request will not submit to system and edit action will seems as failed.

				TB Lal
_			_	
	Edit Record Confirmation		×	
	Are you sure you want to edit this record?			
		ок	CANCEL	

Figure 5.8.24 Edit report in doctor module interface cont.

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The doctor also can keep track the edit history by clicks on the "Edited" button as shown in Figure 5.8.25.

Tuberculosis		TB Lab Management System	
MAIN TASK Dashboard Create Report	2 202048-20193410 Contaminated Resistance Resistance	kesistance kesistance susceptible contaminated susceptible Previous	Next
History Report	Final Diagnosis Result : Positive Edited		1
	Tuberculosis (TB) Diagnosis: Positive Remark: no remark given		
	Examined By:		
	Name: Ru Sian Tey	Date/Time: 2020-04-20 23:42:26	
	Position: Doctor	Contact: 0156894365	
With a farmer in a sec			

Figure 5.8.25 "Edited" button on the selected patient's full history report interface.

After clicks on the "Edited" button, the test information edits before and after will be stored in the log table. The edition date is also an important information stored in the log table as shown in figure 5.8.26 below. The editor information will also display at the top of the right on the log table.

Tuberculosis ■		TB Lab Manageme	nt System 💄 👓
MAIN TASK			Einel Diamonic Beruit / Edition Los Table
III Dashboard	Doctor Final Diagnosis Result Edition Log Table Test ID : 7		That Diagnosis Result 77 Edition Edg Table
Create Report			
History Report			
	Back	Editor : Ru Sian Tey	Contact : 0156894365
	d A Filling Data A Damark (Datasa)		Search:
	# - Edution Date = Remark (Berore) =	Remark(Alter) = Result (Before)	Result (Alter)
	Desvice 4 & 4 + 4 + 4 + et = -	Horeman given	During It Not
	Snowing Lto For Fentines		Previous 1 Next

Figure 5.8.26 Edition log table interface in doctor module

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CHAPTER 5 : System Implementation

Thus, system also allows doctor to manage their personal account by clicking on the "Account" shows in the drop-down list at the top of the right. The "Account" function designed was same with the "Manage Account" function in Receptionist module and the functionality has mentioned before in the receptionist module. From the drop-down list, user can also log out from the system as shown in figure 5.8.27.



Figure 5.8.27 Drop-down list on the top right of the doctor module.

Chapter 6 System Testing

6.1 Login Module Testing

Table 6-1-1 Login Module Testing Table.

No.	Testing Method	Action Done	Expected Result	Actual Result	Meet Expectation $(\sqrt{/x})$
1	Login with a valid account username and valid password.	Login the user account with the correct username and the correct password.	User successfully login into the system.	A pop-up message display "Login Successfully" and system allow the user to login.	V
2	Login with an invalid account username and valid password	Login the user account with incorrect username and correct password.	User does not allow to login into the system.	A pop-up message display "No User Found" and not allowed user to login into the system.	V
3	Login with incorrect/ invalid password and valid username	Login the user account with the correct username and the incorrect password	User does not allow to login into the system	A pop-up message display "Wrong Password" and not allowed to login into system.	V
4	Login with the both field is empty	Press the login button without key in the username field and password field.	User does not allow to login into the system.	The system denies user to login into the system.	V
5	Login with an inactivate/deleted user	Login the inactivate/ deleted user with correct password and correct username.	User does not allow to login into the system.	A pop-up message display "Inactive User" and not allowed to login into system.	v
6	Login with an reactivate user	Login the reactivate user with correct password and correct username.	Reactivate user successfully login into system.	A pop-up message display "Login Successfully" and system allow the user to login.	V

7	Login with a new password after changed the password	Login with the correct username and new password after changed the password.	User successfully login into the system.	A pop-up message display "Login Successfully" and system allow the user to login.	V
8	Login with the old password after changed the password	Login with the correct username and old password after changed the password.	User does not allow to login into the system.	A pop-up message display "wrong password" and user not allowed to login into the system.	V
9	Verify the visible function in password field	Press the 'Eye/Visible' icon after key in the password.	The password is visible/ not hidden.	The system will show the password key in after user clicks on the eye icon.	V

Table 6-1-2 Login Module Testing Table Cont.
6.2 Maintenance Module Testing

 Table 6-2-1 Maintenance Module Testing Table.

No	Testing Method	Action Done	Expected Result	Actual Result	Meet Expectation $(\sqrt{/x})$
1	Add User Position	Create a new user position after press the submit button.	New user position created.	A new user position created in the system.	V
2	Edit User Position	Edit a user position and press the update button to submit.	User position edited and updated.	The edited user position successfully update in the system.	v
3	Delete User Position	Press the delete button and confirmed to delete a user position.	User position deleted.	The user position is deleted/ inactivated in the system.	v
4	Add a new user	Create a new user with filled in all field provided.	New user created.	The new user is created in the system.	v
5	Add a new user with username already existed	Create a new user with filled in all field and key in username already existed.	No new user created.	No new user created in system and 'Username already existed' display under the username field.	V
6	Add a new user with not matching password	Create a new user with filled in all field and not matching password and confirmed password.	No new user created.	No new user allow to created in system. A pop-up message "Password and confirm password do not match" display after user click on the "Create" button.	V
7	Add a new user with IC already existed	Create a new user with filled in all field and key in IC already existed.	No new user created	No new user allow to created in system and display 'IC already existed' under the User IC no. field.	V

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1					
8	Add a new user with email already existed	Create a new user with filled in all field and key in email already existed.	No new user created	No new user allow to create in the system and the "Create" button has been disable.	V
9	Edit user info	Edit existing user info and press update button to submit.	User details successfully updated	The edited user details successfully updated in system.	V
10	Edit user's username with username already existed in system	Edit user's username with key in username already existed in system.	Username failed to update to the system.	Update failed, system does not allow duplicate username exist.	V
11	Edit user's email address with email address already existed in system	Edit user's email address with key in email address already existed in system.	Email failed to update to the system.	Updated failed, system does not allow duplicate email address exist.	V
12	Delete/inactivate a user	Inactivate a user by click on the button 'X'.	Successfully inactivate a user.	The system successfully inactivate the user and move it in the 'Historical User' side.	V
13	Reactivate a user	Reactivate a user from historical user.	Successfully reactivate a user.	The system successfully reactivate the user and remove it from the 'Historical user'.	V
14	Verify the total number of user	Add/ Delete an user to calculate the total number of user on dashboard.	Display the accurate total number of user in system on Dashboard.	The system can display the correct total number of user and the total number of each user position.	V

 Table 6-2-2 Maintenance Module Testing Table Cont.

6.3 Manage User Account Function Testing

No	Testing Method	Action Done	Expected Result	Actual Result	Meet Expectation (\sqrt{x})
1	Edit personal account with correct current password	Edit info at manage account side with key in correct current password.	Successfully update edited info.	The system successfully update the edited info.	V
2	Edit personal account with incorrect current password	Edit info at manage account side with key in incorrect current password.	Failed to update edited info.	The system failed to update the edited info and display "Password incorrect".	v
3	Edit personal account with blank/empty current password field	Edit info at manage account side without key in current password.	Failed to update edited info.	The system failed to update the edited info and display "Current password field is empty".	V
4	Change username	Edit and change username.	Successfully change username and re- login into system.	Successfully change username and re- login into system.	V
5	Change username with existing username in system	Edit and change username with key in username already existed in system.	Failed to change username.	The system failed to change the username.	V
6	Change password with matching password	Edit and change password with key in matching password and confirm password.	Successfully change password.	Successfully change password.	V
7	Change password with not matching password	Edit and change password with key in difference new password and confirm password.	Failed to change password.	The system failed to change the password and display"Password and Confirm Password Field do not match !!".	V

 Table 6-3-1 Manage User Account Function Testing.

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6.4 Reception Module Testing

 Table 6-4-1 Reception Module Testing Table.

No	Testing Method	Action Done	Expected Result	Actual Result	Meet
					Expectation
1	Search using new IC no./passport no.	Enter the IC no. or passport no. of patient which does not exist in system before.	Brings user to the create new patient form.	System will display "IC no./Passport no. Not found" under the field. Clicks on the "Search" button, it will lead user to a create new patient form.	(√ / ×) √
2	Search using existing IC no./ passport no.	Enter the IC no. or passport no. of patient which exist in system before.	Display the patient info created in system before.	After key in the IC no/ passport no. ,click on the "Search" button, it will lead user to the page which show the patient info created in system before.	V
3	Create new admission record (with Complete Status)	Searching IC/Passport no. of existing patient with complete status and key in/update the patient info then click on the button 'Create new admission record'.	Successful created a new admission record.	Successful created a new admission record.	V
4	Create new admission record (with Incomplete Status)	Searching IC/Passport no. of existing patient with incomplete status and key in/update the patient info then click on the button 'Create new admission record'.	Failed to create a new admission record.	Failed to create a new admission record.	V
5	Edit patient info	From the manage patient side to edit/update the existing patient info.	Successful to edit/update the patient info.	The system successfully edit/update the patient info.	v

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6	Create a patient account	Fill in all the patient info at the create patient form and click the "Create" button to submit.	Successfully create a new patient account.	The system successfully create a new patient account.	V
7	Create a patient account (with existing IC no./password)	Fill in all the patient info and IC/ Password which already existed in system and click the "Create" button to submit.	Fail to create a new patient account.	Display message "IC / Password already exists" under IC/ Passport Field, user unable to press the "Create" button to submit and failed to create a new patient account.	V
8	"Reason for TB Exam" text box in Create Patient Form	Key in any text in the "Reason for TB Exam" textbox.	User able to key in any text in the "Reason for TB Exam" textbox.	User able to key in any text in the "Reason for TB Exam" textbox.	V
9	The functionality of "Diagnosis" selection	Click on the "Diagnosis" selection.	Show/display "Diagnosis" in the "Reason for TB Exam" textbox.	Click on the 'Diagnosis' selection, it will appear "Diagnosis" in the "Reason for TB Exam" textbox.	V

6.5 Common Function in Dashboard - Function Testing

 Table 6-5-1 Common Function in Dashboard - Function Testing Table.

No	Testing Method	Action Done	Expected Result	Actual Result	Meet Expectation (\sqrt{x})
1	Dashboard paging/pagination setting	Add more than 10 patients from the reception side.	10 record/ entries to display on a single page.	Every 10 records display on a page.	V
2	Order of column on dashboard	Press on the button "\$" to check the functionality of the order in every column.	The order fo thecolumn will become descending/ascendi ng after press the button"\$".	The order of column will make changes once press the button "\$".	V
3	Search function on the dashboard(IC/Passport no.)	Search for specific patient info and sorting with patient ic/passport no.	Search and display the matching patient info in the system	The system is able to sort ing,searching and display the. matching/specific patient info.	V
4	Search function on the dashboard(date time)	Search for specific patient info and sorting with the date time.	Search and display the matching patient info in the system.	The system is able to sort ing, searching and display the matching/specific patient info.	V
5	Search function on the dashboard(patient first name)	Search for specific patient info and sorting with the patient first name.	Search and display the matching patient info in the system.	The system is able to sort ing, searching and display the matching/specific patient info.	V
6	Search function on the dashboard(patient last name)	Search for specific patient info and sorting with the patient last name.	Search and display the matching patient info in the system.	The system is able to sort ing, searching and display the matching/specific patient info.	V
7	Search function on the dashboard(Report status)	Search for specific patient info and sorting with the report status.	Search and display the matching patient info in the system.	The system is able to sort ing, searching and display the matching/specific patient info.	V

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Table 6-5-2 Common Function in Dashboard - Function Testing Table C

8	Search function on the dashboard(patient no.)	Search for specific patient info and sorting with the patient no.	Search and display the matching patient info in the system.	The system is able to sort ing, searching and display the matching/specific patient info.	V
9	The current date/Time	The current date/time display in the system.	The accurate current date/time is display in the system.	The system display the correct current date/time at the top of the dashboard.	V

6.6 Common Function in History Report - Function Testing

 Table 6-6-1 Common Function in History Report - Function Testing Table.

No	Testing Method	Action Done	Expected Result	Actual Result	Meet Expectation $(\sqrt{/x})$
1	History report paging/pagination setting	If 5 records removed from the dashboard, then history report should added 5 new history record.	10 record/ entries to display on a single page.	Every 10 records display on a page.	V
2	Order of column on history report	Press on the button "\$" to check the functionality of the order in every column.	The order fo thecolumn will become descending/ascendi ng after press the button"\$"	The order of column will make changes once press the button "\$".	V
3	Search function on the history report(IC/Passport no.)	Search for specific patient info and sorting with patient ic/passport no.	Search and display the matching patient info in the system.	The system is able to sort ing, searching and display the. matching/specific patient info.	V
4	Search function on the history report (date time)	Search for specific patient info and sorting with the date time.	Search and display the matching patient info in the system.	The system is able to sort ing, searching and display the matching/specific patient info.	V
5	Search function on the history report (patient first name)	Search for specific patient info and sorting with the patient first name.	Search and display the matching patient info in the system.	The system is able to sort ing, searching and display the matching/specific patient info.	v
6	Search function on the history report (patient last name)	Search for specific patient info and sorting with the patient last name.	Search and display the matching patient info in the system.	The system is able to sort ing, searching and display the matching/specific patient info.	V
7	Search function on the history report (Report status)	Search for specific patient info and sorting with the report status.	Search and display the matching patient info in the system.	The system is able to sort ing, searching and display the matching/specific patient info.	v

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1	1	1	1		
8	Search function on the history report (patient no.)	Search for specific patient info and sorting with the patient no.	Search and display the matching patient info in the system.	The system is able to sort ing, searching and display the matching/specific patient info.	V
9	Search function on the history report (specimen no.)	Search for specific patient info and sorting with the specimen serial no.	Search and display the matching patient info in the system.	The system is able to sort ing, searching and display the matching/specific patient info.	V
10	History report keep up to date	Complete the test and check with the history report.	The completion of test will remove patient info from dashboard and added in history report side.	Complete the test will remove the patient info from dashboard and added in history report side.	V
11	Edit History Report	Press the "Edit" button to edit the chest x-ray test result and press "Submit" button to submit.	The system should update the edited history patient report succesfully.	The system succesfuly update the edited history patient report.	V
12	Edit the patient history report created by other user	Press the "Edit" button to edit the patient history report created by other user.	The system does not allow user to edit/update report created by other users.	User unable to click the "Edit" button if the report is created by other users.	V

|--|

6.7 Skin/Blood Test Module Testing

 Table 6-7-1 Skin/Blood Test Module Testing Table.

No	Testing Method	Action Done	Expected Result	Actual Result	Meet
					Expectation
1	Confirmation of TB Skin/Blood Test	Click on the selected patient in the dashboard, choose the test type and submit.	The selected patient should removed from the dashboard, and available to create a report for the patient.	The selected patient has been removed from the dashboard and available now to create a report for the patient.	(√ / ×) √
2	Search IC/Passport No. (Not in system)	Searching the IC/ Passport No. not store in system in create report side.	The system should not jump to create report page if IC/passport number not found.	Display "IC/Passport number not found" under the field and it could not jump to create report page.	V
3	Search existing IC/Passport No. (with confirmation of TB Skin/Blood Test)	Searching the IC/ Passport No.store in the system with the confirmation of TB Skin/Blood Test in create report side.	The system should jump to the create report form page if IC/Passport number is found.	After clicks on the "Search" button, system leads the user to the create report form page.	V
4	Search existing IC/Passport No. (without confirmation of TB Skin/Blood Test)	Searching the patient IC/ Passport No.store in the system without the confirmation of TB Skin/Blood Test in create report side.	The system should not jump to create report page without the confirmation of TB skin/blood test.	The system won't leads user to the create report form page.	V
5	Search existing IC/ Passport No. (With expired confirmation of TB Skin/Blood Test)	Searching the patient IC/ Passport No. store in the system with the expired confirmation of TB Skin/Blood Test.	The system should not jump to create report page if confirmation of TB skin/blood test is expired.	The system won't leads user to the create report form page and a pop-up message "Expired Skin Test ! Please redo the test again" will display.	V
6	Submit TB skin/blood test report form	Fill in the test result/data and click on the "Submit" button to submit the report.	The report should submitted into the system.	The report was submitted into the system and a pop-up message display "patient record update succesfully".	V

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6.8 Chest X-Ray Test Module Testing

 Table 6-8-1 Chest X-Ray Test Module Testing Table.

No	Testing Method	Action Done	Expected Result	Actual Result	Meet
					Expectation
1	Confirmation of Chest X-Ray Radiology Test	Click on the selected patient in the dashboard, check the patient info and click on"Submit" button to submit.	The selected patient should removed from the dashboard, and available to create a report for the patient.	The selected patient has been removed from the dashboard and available now to create a report for the patient.	(
2	Search IC/Passport No. (Not in system)	Searching the IC/ Passport No. not store in system in create report side.	The system should not jump to create report page if IC/passport number not found.	Display "IC/Passport number not found" under the field and it could not jump to create report page.	V
3	Search existing IC/Passport No. (with confirmation of Chest X-Ray Test)	Searching the IC/ Passport No.store in the system with the confirmation of Chest X-Ray Test in create report side.	The system should jump to the create report form page if IC/Passport number is found.	After clicks on the "Search" button, system leads the user to the create report form page.	V
4	Search existing IC/Passport No. (without confirmation of Chest X-Ray Test)	Searching the petient IC/ Passport No.store in the system without the confirmation of Chest X-Ray Test in create report side.	The system should not jump to create report page without the confirmation of Chest X-Ray test.	The system won't leads user to the create report form page.	V
5	Search existing IC/Passport No. (created report)	Key in the patient IC/ passport number with a report created and press "Search" button.	The system should leads user to the patient history report if the user already created a report for the patient.	A pop-up message display "This Patient Report has been Created" and leads the user to the selected patient history report.	v
7	Submit Chest X-Ray Test Report Form	Fill in the test result/data and click on the "Submit" button to submit the report.	The report should submitted into the system.	The report was submitted into the system and a pop-up message display "patient record update succesfully".	V

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6.9 Lab Scientist - Sputum Sample Module Testing

 Table 6-9-1 Lab Scientist - Sputum Sample Module Testing Table.

No	Testing Method	Action Done	Expected Result	Actual Result	Meet Expectation
					(√ / ×)
1	Create sample report	Fill in the create sample sputum report form and press the "Submit" button to submit.	Succesfully submit the report and the selected patient info disappear from dashboard.	User sucessfully submit the report, a pop -up message Patient Record Updated Successfully (Sputum Specimen Collection)" and system removed the patient info from dashboard.	V
2	Create sample report (with existing serial no.)	Fill in the create sample sputum report form with existing serial no. and submit.	Failed to submit the report.	User failed to submit the report and system display the "Serial No. already exist " under the serial no. field.	V
3	Create sample report (with unsatisfactory specimen quality)	Fill in the create sample sputum report form with unsatisfactory specimen quality and submit.	Succesfully submit the report and the selected patient info does not disappear from dashboard.	User sucessfully submit the report, a pop up message display "Patient Record Updated Successfully (Sputum Specimen Collection)" but system does not remove the patient info from dashboard and the patient's status will changed to "FAILED".	V

6.10 Lab Scientist – Smear & Culture Test Module Testing

 Table 6-10-1 Lab Scientist – Smear & Culture Test Module Testing Table.

No	Testing Method	Action Done	Expected Result	Actual Result	Meet Expectation $(\sqrt{/x})$
1	Create Smear&Culture Test	Create Smear/Culture Test and press the "Submit" button to submit.	Succesfully submit the test result.	User successfully submit the test result.	V
2	Repeating Create Smear & Culture Tests	Create smear / culture tests 6 times.	Succesfully create and store 6 smear/culture tests result.	User succesfully create and store 6 smear/ culture tests result in system.	V
3	View more information of the history test result	From the history report side, press the "eye" icon to view more information about the test result .	Succesfully to view more information about the selected test result.	User successfully to view more information about the selected test result such as examinator information.	V
4	Edit History Test Result	From the history report side, press the "edit" icon to edit the test result and press the "submit" button to submit.	Succesfully to edit the selected test result and updated to the system.	User succesfully edit the test result and update the test result to the system.	V
5	View Record Edited	From the history report side, press the "edited" button to view the record edited.	Succesfully to view the record edited.	User succesfully to view the record edited before.	V
5	Complete Test	Press the "Complete Test" button to complete the test.	Succesfully complete the smear&culture test.	Succesfully complete the smear&culture test.	V
6	Complete test without create smear&culture test	Press the "Complete Test" button to complete the test.	Failed, unable to complete the smear & culture test.	Failed, unable to complete the smear & culture test.	V

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7	Create smear & culture test after complete	Create Smear/Culture	Unable to create smear& culture test	User unable to create smear & culture test for a	٧
	test	"Submit" button to submit.	after complete test.	culture test for a patient who had complete the test, the patient info had	
				been removed from dashboard.	

Table 6-10-2 Lab Scientist - Smear&Culture Test Module	Testing Table Cont.
--	---------------------

6.11 Lab Scientist - DST Test Module Testing

 Table 6-11-1 Lab Scientist - DST Test Module Testing Table.

No	Testing Method	Action Done	Expected Result	Actual Result	Meet Expectation (√ / ×)
1	Create DST Test	Create Smear/Culture Test and press the "Submit" button to submit.	Succesfully submit the test result.	User successfully submit the test result.	V
2	Repeating Create DST Tests	Create DST tests 6 times.	Succesfully create and store 6 DST tests result.	User succesfully create and store 6 DST tests result in system.	V
3	View more information of the history test result	From the history report side, press the "eye" icon to view more information about the test result.	Succesfully to view more information about the selected test result.	User successfully to view more information about the selected test result such as examinator information.	V
4	Edit History Test Result	From the history report side, press the "edit" icon to edit the test result and press the "submit" button to submit.	Succesfully to edit the selected test result and updated to the system.	User succesfully edit the test result and update the test result to the system.	V
5	View Record Edited	From the history report side, press the "edited" button to view the record edited.	Succesfully to view the record edited.	User succesfully to view the record edited before.	V
5	Complete Test	Press the "Complete Test" button to complete the test.	Succesfully complete the DST test.	Succesfully complete the DST test.	V
6	Complete test without create DST test	Press the "Complete Test" button to complete the test.	Failed, unable to complete the DST test.	Failed, unable to complete the DST test.	v

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7	Create DST test after	Create DST Test	Unable to create	User unable to	٧
	complete test	and press the	DST test after	create DST test for a	
		"Submit" button to	complete test.	patient who had	
		submit.		complete the test,	
				the patient info had	
				been removed from	
				dashboard.	

Table 6-11-2 Lab Scientist - DST Test Module Testing Table Cont.

6.12 Doctor (Treatment/Analysis and Reporting Module)	Module Testing
Table 6-12-1 Doctor Module Testing Table.	

No	Testing Method	Action Done	Expected Result	Actual Result	Meet
					Expectation
		· · · · · · · ·		.	(v / ×)
1	Create Report (with complete all tests)	Fill in the info and click "Submit" button to submit the report.	Succesfully submit the report and remove the selected patient info from the create report waiting list.	User succesfully created the report and the patient info had dissapear from the ceate report waiting list.	V
2	Create Report (with pending smear&culture test)	Fill in the info and click "Submit" button to submit the report.	Failed to submit the report.	User unable to click the "Submit" button to submit the report.	V
3	Create Report (with pending DST test)	Fill in the info and click "Submit" button to submit the report.	Failed to submit the report.	User unable to click the "Submit" button to submit the report.	v
4	Create Report (with complete of skin/blood test and Chest X-Ray test only)	Fill in the info and click "Submit" button to submit the report.	Failed to submit the report.	User unable to click the "Submit" button to submit the report.	V
5	Create Report (with complete of skin/blood test only)	Fill in the info and click "Submit" button to submit the report.	Failed to submit the report.	User unable to click the "Submit" button to submit the report.	V
6	Edit History Report	Press the "Edit" button to edit the patient report from history report and submit it.	Succesfully edit the patient report and submit it to the system.	User succesfully edit the patient report and a pop- up message display "Patient Final Review and Diagnosis Update Successfully" after submit the edited report.	V

7	Edit History Report(Other user)	Press the "Edit" button to edit the patient report created by other user.	Failed to edit the patient report.	User unable to edit the patient report created by other user.	V
8	Keep track the edited history record	Press the "Edited" button to keep track.	View the changes has made on the records and the edition date.	User able to keep track and view the changes has made on the records and also the edition date.	V
9	Print History Report	Press the "Print this page" button tp print the report.	Succesfully print out the patient full report.	User succesfully print out the patient full report.	V

Table 6-12-2 Doctor Module Testing Table Cont.

Chapter 7: Conclusion and Discussion

7.1 Project Overview

As we know, the current world health situations are facing the biggest challenging issue which is COVID - 19 (Coronavirus). This infections disease brings challenges to all human being domains nowadays. Unfortunately, once again, this disease reminds us or even can say as 'bring motivations' to us to develop a healthcare system is required in this global state.

Similar to the concepts that stated above. The current **TB Diagnosis Laboratory Information System** act as a healthcare system that is able to performs the task such as basic patients' data input update, delete, insert, and edit functionalities as well as some further analytic capabilities based on those patients' data input. This TB laboratory system intends to help user to complete workflows and manage clinical communications on one single platform which allow multiple care teams (Nurse, Lab Scientist, Radiologist and Doctor) from different labs can collaborate to improve care coordination.

Other than taking effort to do the paperwork on recording the patient's relevant information and TB test results. This laboratory system helps to reduce the likelihood of result insertion wrongly and increase the effectiveness and efficiency of each TB test process during the TB testing period.

7.2 System Strengths and Limitations

Although the proposed system successfully achieved all the modules' functionality, the functionalities of each modules can still be improved. Each module can be added in more feature functionalities on it.

Strengths

Other than the exist strengths that mentioned earlier such as enable user to complete workflows and manage clinical communications on single platform, allowing multiple care teams from different labs can collaborate to improve care coordination. The TB Diagnosis Laboratory Information System (Skin/Blood Test Module) also provided the functionality like automate the results that derived from the inputs key in previously which helping for reduce the possibilities of data insertions wrongly. Besides, this module also provides the automated functionality for checking the skin test expirations date to avoid those patients who come for skin test testing that exceed the expirations date and staff may miss out of this issue. The system will auto update the patient record as a failed result, patient required to do the skin test again. Moreover, Treatment/Analysis and Reporting Module includes all the related analysis part based on the database's data which collect from all the module mention previously and display on the "Dashboard" pages. Apart from the analysis that stated in chapter 3.1, One of the feature functionalities called 'TB Diagnosed Pin Maps' which will graphically present all the TB diagnosed patients' by using the 'Google Maps'. Relevant user can see through all the TB diagnosed patient current locations and then perform some surveillance prevention action based on these locations address (Pin).

Limitations

There exist some limitations in the system in term of cloud storage issues, this project still relies on XMAPP (own PC/Laptop) as database server which may not enough storage spaces for the fully development system. Besides, the TB **Diagnosis Laboratory Information System** design is strongly depending on the end user requirement, some of the new requirement such as new drugs or new treatment flow might be invented in the future. This system having the limitation that when

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the new features come out, it need to be changed some part of the coding manually. Besides, the TB data analysis section is still under development, still have the spaces that can be strengthened.

7.3 Future Work

The database storage can be changed to cloud storage since the current system relies on XMAPP (own PC/Laptop) as database server which may not enough storage spaces for the fully development system. The current proposed TB system has provided the fundamental concepts and development of the TB information system. All the database script and query has been set up in the system. Hence, a further enhancement can be implemented to the system which is changing the local storage to the cloud storage services.

The functionalities of the maintenance module can be increased since the current system supports only basic insert, delete (inactivate user), update (edit/activate user). More functionalities like create new drug or new options provided for each of the option selections input of the system.

Card Scanner can be applied to support the efficiency of the system. A card scanner can be implemented to the current system to shorten the TB receptions process since the scanning process is consider fast compare with the action of manually insert the patient record during the reception time. The relevant staff (nurse) can just only scan the patient Identity Card, all the patient's specific record will automatically be inserted into the system which might increase the accuracy of the data insertion.

Finally, **the analysis of the TB data can be further strengthen/improve.** Although the current system provides some of the functionality that allow the TB data graphically presented by using the bar chart, line chart, table, and Google Maps to user. However, data analysis is not an easy road, it required a lot of study and patient to discover additional useful tools or implements that can be unified with the TB Diagnosis Laboratory Information System to analyse and present those useful data for the relevant user. For example, more chart or graph can further use by the system, World Maps (figure 6.3.1) can be applied in future works.

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Figure 7.3.1 World Hotmaps (Coronavirus)

7.4 Conclusion

The infections disease brings challenges to all human being domains nowadays. TB disease has now become the seriously problem which existing all around the world. The shortage of early detection and prevention of the TB disease is one of the major problems which enhanced the TB cases happened in every hole and corner. Hence, a proper TB diagnosis laboratory management system is strong needed for every health care organization in order to effectively and efficiency to resolve the critical TB problem. The proper actions such as coordination by collaborating multiple care teams from different labs and offering the high accuracy data for the medical decision and analysis are strongly required for the relevant TB medical domain nowadays.

Last but not least, the major motivation of the TB Diagnosis Laboratory Information System is to reduce the TB disease cases occurrence gradually. I hope that the TB Diagnosis Laboratory Information System is expected to act as a useful tool for the TB medical domain in helping to resolve the TB disease problem.

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Appendix A: Poster Design

FINAL YEAR PROJECT TBLAB MANAGEMENT SYSTEM

A STANDALONE SYSTEM FOR TB LAB END USERS

- 01 Clinical communications and workflow can be completed in a single platform
- 02 Care coordinate can be improved through the help of multiple care team from different laboratory.
- **03** Medical personnel will be able to access the data in order to search for specific information they needed as all patient information will be stored in a shared database.
- 04 Improve the accuracy, quality and timeliness of data available to infection control personnel, allowing better infection control on TB.

16	a	11 E. 2	6.
HW PATENT (TE DAGAGOED PATEN 1 Case(s)	Mores infa O	ACIA NOV ANY PATERNY (THE DUALING SEE PROTEINT) 2 Case(s)	sarah D
Demographic Analysis (Tuberculosis)			
	Categories	Cases	
	Gender		
	Male		
	Fensie	"	
	Total	15	
Overall Patient (TB-Tester)	Race		
	Malay		
	Crimese		
	Other	3	
	Tatal	16	
	Gender		

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Appendix B: Plagiarism Check Result



Universiti Tunku Abdul Rahman Form Title : Supervisor's Comments on Originality Report Generated by Turnitin for Submission of Final Year Project Report (for Undergraduate Programmes) Form Number: FM-IAD-005 Rev No.: 0 Effective Date: 01/10/2013 Page No.: 1of 1



FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY

Full Name(s) of Candidate(s)	Law Jia Wei
ID Number(s)	16ACB05867
Programme / Course	BACHELOR OF INFORMATION SYSTEMS (HONS) INFORMATION
	SYSTEMS ENGINEERING
Title of Final Year Project	TB DIAGNOSIS LABORATORY INFORMATION SYSTEM – Surveillance &
	Tracking

Similarity	Supervisor's Comments (Compulsory if parameters of originality exceeds the limits approved by UTAR)
Overall similarity index: <u>11</u> %	
Similarity by sourceInternet Sources:4%Publications:2%Student Papers:9%	
Number of individual sources listed of more than 3% similarity:0	

Parameters of originality required and limits approved by UTAR are as Follows:

- (i) Overall similarity index is 20% and below, and
- (ii) Matching of individual sources listed must be less than 3% each, and

(iii) Matching texts in continuous block must not exceed 8 words

Note: Parameters (i) – (ii) shall exclude quotes, bibliography and text matches which are less than 8 words.

<u>Note</u> Supervisor/Candidate(s) is/are required to provide softcopy of full set of the originality report to Faculty/Institute

Based on the above results, I hereby declare that I am satisfied with the originality of the Final Year Project Report submitted by my student(s) as named above.

Signature of Supervisor

Name: _____Ms Yap Seok Gee_____

Signature of Co-Supervisor

Name: _____

Date: _____24 April 2020 _____

Date: _____

B-1

(Project I / Project II)

Trimester, Year: Y3S3 Student Name & ID: Law Jia Wei, 1605867

Study week no.: Week 2

Supervisor: Ms. Yap Seok Gee

Project Title:

TB DIAGNOSIS LABORATORY INFORMATION SYSTEM - Surveillance & Tracking

1. WORK DONE

Do some of the TB DIAGNOSIS LABORATORY INFORMATION SYSTEM's system.

2. WORK TO BE DONE

Contact and arrange a time to meet up Miss Saw and Miss Saw's sister to conduct a short meeting, report our progress and have a short presentation.

3. PROBLEMS ENCOUNTERED

We need to complete the system within 12 weeks and also submit the full report, these might be a bit difficult for us because all these are time consuming work.

4. SELF EVALUATION OF THE PROGRESS

I think the progress of this system is quite slow because we still have a lot of module of system need to code and complete it.

Supervisor's signature

Student's signature

C-1

BIS (Hons) Information Systems Engineering

(Project I / Project II)

Trimester, Year: Y3S3 Student Name & ID:Law Jia Wei, 1605867

Study week no.: Week 3

Supervisor: Ms. Yap Seok Gee

Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM - Surveillance & Tracking

1. WORK DONE

We had meet with Miss Saw, conduct a short meeting and report our progress to them. We also received some feedback and recommendation, we will modified our system and report according their feedback.

2. WORK TO BE DONE

After met with Miss Saw, we had record down their feedback and recommendation, we will modified our system and report according their feedback.

3. PROBLEMS ENCOUNTERED

Some of the function need to code in the system a bit challenge for us.

4. SELF EVALUATION OF THE PROGRESS

I think the progress of this system is quite slow because we still have a lot of task need to complete.

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C-2

(Project I/ Project II)

Trimester, Year: Y3S3 Student Name & ID: Law Jia Wei, 1605867

Study week no.: Week 4

Supervisor: Ms Yap Seok Gee

Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM - Surveillance & Tracking

1. WORK DONE

We had modified some changes on our system based on Miss Saw's suggestion and feedback. For example, placed the specific picture to identify the difference of the position/ person.

2. WORK TO BE DONE

Miss Yap recommend us to try Oracle database as our system database. We will find the person and evaluate whether the database is suitable for our system or not.

3. PROBLEMS ENCOUNTERED

We need to complete skin test module and blood test module within this week.

4. SELF EVALUATION OF THE PROGRESS

I think our progress is moderate, we can complete this project within the deadline.

Supervisor's signature

Student's signature

C-3

BIS (Hons) Information Systems Engineering

(Project I/ Project II)

Trimester, Year: Y3S3StStudent Name & ID: Law Jia Wei, 1605867

Study week no.: Week 5

Supervisor: Ms Yap Seok Gee

Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM - Surveillance & Tracking

1. WORK DONE

We had find the person recommend by Miss Yap, and we had try to register an account and use it. After discussion with my group mate, we decided not using oracle database because we are not familiar with oracle database and we need the guide of the person to explore the way to use oracle database and it will take some time.

2. WORK TO BE DONE

Meet with Miss Yap, report our decision and present our system's progress.

3. PROBLEMS ENCOUNTERED

We need to modify the skin test and blood test module, if the result is negative then at the admission table it will automatically apply adm_result = negative else will pass the patient's data for the following test.

4. SELF EVALUATION OF THE PROGRESS

I think our progress is moderate, we can complete this project within the deadline.

Supervisor's signature

Student's signature

C-4

BIS (Hons) Information Systems Engineering

(Project I/ Project II)

Trimester, Year: Y3S3StStudent Name & ID: Law Jia Wei, 1605867

Study week no.: Week 6

Supervisor: Ms Yap Seok Gee

Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM - Surveillance & Tracking

1. WORK DONE

We had met with Miss Yap and tell her our concern and our decision why not using oracle database and continue using XAMPP. We also present our system to Miss Yap and received some feedback and recommendation from Miss Yap.

2. WORK TO BE DONE

Modify the system based on Miss Yap's feedback and recommendation. For example, make the field smaller and shorten the patient's information display with display three column in a row.

3. PROBLEMS ENCOUNTERED

How to store the X-Ray image is a problem for us, we will ask Miss Saw about it.

4. SELF EVALUATION OF THE PROGRESS

I think the progress of the project overall is good.

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 Engineering
 Student's signature

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 Information and Communication Technology (Kampar Campus), UTAR

C-5

(Project I/ Project II)

Trimester, Year: Y3S3

Study week no.: Week 7

Student Name & ID: Law Jia Wei, 1605867

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Supervisor: Ms Yap Seok Gee

Project Title:

TB DIAGNOSIS LABORATORY INFORMATION SYSTEM - Surveillance & Tracking

1. WORK DONE

We had modified our system based on Miss Yap's feedback.

2. WORK TO BE DONE

Meet with Miss Saw for our enquiry and also complete radiologist and lab scientist module within this week.

3. PROBLEMS ENCOUNTERED

Beside the problem of how to store the X-Ray image, we will also like to ask about what if the 1st sample sputum is cannot be use, what should the lab scientist do next? Recollect a new sample sputum or ?

4. SELF EVALUATION OF THE PROGRESS

The progress is slower than few weeks before, we need to spend more time to catch up in order to complete the Final Year project before deadline.

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Student's signature

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(Project I / Project II)

Trimester, Year: Y3S3Study week no.: Week 8Student Name & ID:Law Jia Wei, 1605867

Supervisor: Ms Yap Seok Gee

Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM - Surveillance & Tracking

1. WORK DONE

We had met with Miss Saw, we just need to kept the X-Ray normally as image format. The radiologist will transfer the X-Ray into image by themself. Thus, if the sample sputum could not be use, it will recollect with the patient in order to complete the following test. Thus, we are still doing the lab scientist module as it's much more complex compared with the previous module.

2. WORK TO BE DONE

Complete the lab scientist module within this week.

3. PROBLEMS ENCOUNTERED

The hardest part in this module is how should we code it and design the interface to store the DST test result and Smear & Culture test result because different patient might need to carry different times of tests but basically a DST and smear & culture test will carry 3 times.

4. SELF EVALUATION OF THE PROGRESS

The progress is slower than few weeks before, i need to spend more time to catch up in order to complete the Final Year project before deadline.

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(Project I/ Project II)

Trimester, Year: Y3S3StStudent Name & ID: Law Jia Wei, 1605867

Study week no.: Week 9

Supervisor: Ms Yap Seok Gee

Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM - Surveillance & Tracking

1. WORK DONE

We had complete the lab scientist module successfully.

2. WORK TO BE DONE

Meet with Miss Yap to report our system's progress and complete the doctor's module. Thus, meet with Miss Saw for the data analysis part to understand what information needed to further elaborate.

3. PROBLEMS ENCOUNTERED

The patient who has negative in skin test and blood test result will not pass to doctor module. Thus, the doctor can create report only when the patient's complete all the test.

4. SELF EVALUATION OF THE PROGRESS

The progress is slower than few weeks before, we need to spend more time to catch up in order to complete the Final Year project before deadline.

Supervisor's signature

Student's signature

BIS (Hons) Information Systems Engineering

(Project I/ Project II)

Trimester, Year: Y3S3Study week no.: Week 10Student Name & ID: Law Jia Wei, 1605867Supervisor: Ms Yap Seok Gee

Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM - Surveillance &

1. WORK DONE

Tracking

We already met with Miss Saw and understanding what we need to do for analysis part. Thus, we also report to Miss Yap our system progress.

2. WORK TO BE DONE

Miss Yap has give us some feedback on our system, we need to make some changes on

our system such as display the result at the bottom and moved the result definition at the

right side. Thus, we also need to complete the doctor module which are the last module in our system.

3. PROBLEMS ENCOUNTERED

A patient with all positive tests' result should shows at the top of the table and highlighted so that the doctor can review it at the first time.

4. SELF EVALUATION OF THE PROGRESS

The progress is slower than few weeks before, we need to spend more time to catch up in order to complete the Final Year project before deadline.

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FINAL YEAR PROJECT WEEKLY REPORT

(Project I / Project II)

Trimester, Year: Y3S3 Student Name & ID: Law Jia Wei, 1605867

Study week no.: Week 11

Supervisor: Ms Yap Seok Gee

Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM - Surveillance & Tracking

1. WORK DONE

Complete part of the coding in the doctor module.

2. WORK TO BE DONE

Complete the coding for the analysis part in the doctor module and complete the full report.

3. PROBLEMS ENCOUNTERED

We need to register a API account so that e can use the Google map to shows the patient's location and knowing that how many's patient in a same area/ city.

4. SELF EVALUATION OF THE PROGRESS

The progress is slower than few weeks before, we need to spend more time to catch up in order to complete the Final Year project before deadline.

BIS (Hc Supervisor's signature Engineering

Student's signature

Faculty of Information and Communication Technology (Kampar Campus), UTAR

FINAL YEAR PROJECT WEEKLY REPORT

(Project I / Project II)

Trimester, Year: Y3S3Study week no.: Week 12Student Name & ID: Law Jia Wei, 1605867Supervisor: Ms Yap Seok Gee

Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM - Surveillance & Tracking

1. WORK DONE

The coding for the analysis part completed but the report still in progress because while doing the system testing there are some bugs inside the system.

2. WORK TO BE DONE

Solve the bugs inside the system and try to complete the report within this week.

3. PROBLEMS ENCOUNTERED

Needs to open edition log table for form in each module, in order the user able to keep track the history editing records.

4. SELF EVALUATION OF THE PROGRESS

The progress is slower than few weeks before, we need to spend more time to catch up in order to complete the Final Year project before deadline.

Supervisor's signature

Student's signature

C-10

BIS (Hons) Information Systems Engineering

Faculty of Information and Communication Technology (Kampar Campus), UTAR

FINAL YEAR PROJECT WEEKLY REPORT

(Project I/ Project II)

Trimester, Year: Y3S3Study week no.: Week 13Student Name & ID: Law Jia Wei, 1605867Supervisor: Ms Yap Seok GeeProject Title:
TB DIAGNOSIS LABORATORY INFORMATION SYSTEM - Surveillance &
Tracking

1. WORK DONE

Succesfully solved the bug inside the system and complete the system testing. .

2. WORK TO BE DONE

Complete the remaining report such as system implementation and conclusion.

3. PROBLEMS ENCOUNTERED

During the MCO, hard to meet with teammate and all communication needs to relied on the online chatting tools.

4. SELF EVALUATION OF THE PROGRESS

The progress is slower than few weeks before, we need to spend more time to catch up in order to complete the Final Year project before deadline.

Supervisor's signature

Student's signature

BIS (Hons) Information Systems Engineering

Faculty of Information and Communication Technology (Kampar Campus), UTAR

(Signature of Student)

Date: 23 April 2020



UNIVERSITI TUNKU ABDUL RAHMAN

FACULTY OF INFORMATION & COMMUNICATION TECHNOLOGY (KAMPAR CAMPUS)

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Student Id	16ACB05867
Student Name	LAW JIA WEI
Supervisor Name	Ms Yap Seok Gee

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V	Abstract
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V	List of Figures (if applicable)
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V	List of Abbreviations (if applicable)
V	Chapters / Content
V	Bibliography (or References)
V	All references in bibliography are cited in the thesis, especially in the chapter
	of literature review
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V	Poster
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