TB DIAGNOSIS LABORATORY INFORMATION SYSTEM

(OPERATION, MAINTENANCE AND REPORTING)

BY

TAN SIN PING

A REPORT

SUBMITTED TO

Universiti Tunku Abdul Rahman

in partial fulfillment of the requirements

for the degree of

BACHELOR OF INFORMATION SYSTEMS (HONS)

BUSINESS INFORMATION SYSTEMS

Faculty of Information and Communication Technology

(Kampar Campus)

JAN 2020

UNIVERSITI TUNKU ABDUL RAHMAN

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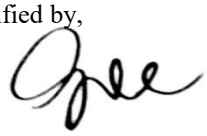

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Date: 23 April 2020

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DECLARATION OF ORIGINALITY

I declare that this report entitled "**METHODOLOGY, CONCEPT AND DESIGN OF A 2-MICRON CMOS DIGITAL BASED TEACHING CHIP USING FULL-CUSTOM DESIGN STYLE**" is my own work except as cited in the references. The report has not been accepted for any degree and is not being submitted concurrently in candidature for any degree or other award.

Signature : 

Name : TAN SIN PING

Date : 23 April 2020

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ABSTRACT

This project is a Tuberculosis Diagnosis Laboratory Information System, this is a team-based project which I will handle the project with my teammate - **Lau Jia Wei**. This is a web-based platform system, the PHP framework is used to develop the system. The main objective of this system is to digitalize all the documentation and provide a single platform for the users to ease the inter-facility communication. With this proposed system, it enables to manage the TB clinical and laboratory data in order to have a better infection control on TB. The goal of this system is early detection the possible outbreak of TB, rapid disease reporting and carry the intervention planning. The methodology that used in this project is prototype methodology because this method can minimize the risk of failure as a prototype is created to demonstrate the system functionality to user. The system can be divided into few modules such as administration, reception, skin/blood tests, chest x-ray test, smear/culture/DST test and treatment modules. The users involve in this system are nurse, radiologist, scientist and doctor. Each of the user will have different functionality and different task to present.

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LIST OF ABBREVIATIONS

DR TB	Drug-Resistant Tuberculosis
DST	Drug Susceptibility Testing
HAI	Healthcare-associated Infection
MRD-TB	Multidrug-resistant tuberculosis
SDLC	System Development Life Cycle
TB	Tuberculosis
WHO	World Health Organization
XDR	Extensively drug-resistant

Chapter 1: Introduction

1.1 Problem Statement and Motivation

Currently, the TB laboratory are unable to keep track the person who are diagnosed with TB but not started treatment efficiently. Such information cannot be retrieved if the testing and treatment result are not linking. The different laboratory conduct different testing for a patient, the medical personnel need to communicate with each other and collect the result to generate report. If the inter-facility communication is not doing well, this will cause extra time needed and extra human resource to proceed the report. Without effective communication mechanize, it takes time and may delay the patient's treatment.

Some of the TB laboratories in Malaysia recorded all the data and result by handwriting and each of the laboratory keep the paper file in their own cabinet of the laboratory. The redundant or missing data may occur like a patient has more than one medical card. This will also be hard for the medical personnel to do the analyses because of the storage issues and fail to detect earlier of potential outbreak because of the inefficient analyses. The limitation of early detection of bacteria and early prevention may cause an unexpected issue or the annual risk of TB infection getting worse.

This is extremely hard for medical personnel to calculate and compare the rate of infection by multi-drug resistant bacteria on admission and during hospitalization without a proper information tools.

1.2 Project Scope

This system is designed for the University Tunku Abdul Rahman's (UTAR) new specialist training hospital of tuberculosis laboratory in Kampar which expected to be working by the end of 2021.

The main function in the system which are account maintenance, registration, record test results and generate a report. The system able to analyze the data relevance of TB disease to calculate the rate of infection by multi-drug resistant bacteria on admission and during hospitalization. Thus, the system also able to further analyze based on a group of people infection TB such as address and district of the TB disease carrier to carry out a hot-spot map to identify the potential area of TB disease occurrence for early detection and outbreak prevention activities.

The system will generate reports and summaries using static and interactive visual representation of research data on the frequency, types and locations of targeted Healthcare-associated Infection (HAI). This also can helps to raise of alert on the inappropriate infection precautions, device use and antibiotic prescription. The Data validation, logical flow of the procedure will be checked to ensure the accuracy and integrity of the data. For example, a person has a treatment record only when they have a testing record and TB.

In the proposed system, care coordination can be improved through the collaboration of multiple care teams from the different laboratory. In a single platform, end users are able to complete work flows and manage clinical communications. Thus, all medical personnel are able to access the data to search for the needed specific information because all the patient information are stored in a shared database.

1.3 Project Objective

The objectives of this project are:

- Clinical communications and work-flow can be completed in a single platform by end users.
- Care coordinate can be improved through the help of multiple care team from different laboratory.
- 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.
- Improve the accuracy, quality and timeliness of data available to infection control personnel, allowing better infection control on TB.

1.4 Impact, significance and contribution

This proposed system will benefit all users of the tuberculosis laboratory, it eases the user to collect, store and retrieve a patient's record in a single platform and all of the testing results and reports are stored in a shared database. Thus, this system had eliminated all the manual processes and all of the documents will be digitized. By having this system, it can reduce the time to pass the documents between radiology, reception, laboratory and clinics. The system can also improve the efficiency and effectiveness of work flow.

The goal at the end of this project is to do data analytic and also use data mining technique to detect new and unexpected patterns that lead to analysis and development of interventions. Thus, the analytic reports will enhance the early detection of infection and potential of TB outbreak. Moreover, the relevant departments also can use the information to have a good infection control planning, routine surveillance and outbreak prevention activities.

1.5 Background information

Tuberculosis (TB) is a disease that caused by the Mycobacterium tuberculosis. Nowadays, TB had become a global and one of the major health issue, it has caused millions of people to continue fall sick with TB every year. TB caused an estimated 1.3 million deaths in 2017 among HIV-negative people and there were an additional 300000 deaths from TB among HIV-positive people. TB is also one of the top 10 causes of death and the leading cause of a single infections agent (Anon, 2018).

According to the World Health Organization (WHO) about one of the third population of the worldwide had diseased Latent TB infection. The people who diseased with Latent TB infection will not spread to other people, and the symptom are not prominent. The chest x-ray of the person who with Latent TB usually is normal and has TB bacteria in their body that is alive but inactive. The way to identified patient infected with Latent Tb is to get a positive reaction of the tuberculin skin test or TB blood test.

Some people with Latent TB infection might become Active TB disease later. The person with Active TB will feel or look sick and some symptoms such as a cough more than 3 weeks, weight loss, chest pain, night sweats, haemoptysis (coughing up blood) and fever.

A person who is in contact with a person might develop active TB. He or she is recommended to have a check. The 3 main diagnosis method in Malaysia are Radio-logical, bacteriological and clinical assessment. The medical personnel will conduct the skin test which is the most common diagnosis testing. The TB Skin test is carry out by injecting a small volume of tuberculin (fluid) on the inner surface of the for arm. After 48 to 72 hours, the person who had the TB skin test must return to determine the reaction. The result depends on the size of the raised, hard area or swelling. If the person gets a positive result on TB skin test, this means that the person has very high chances of infected by the TB bacteria and additional test are needed. If the result is negative, it means that the person is not infected by the TB bacteria.

If the patient has positive skin test result in the past, the doctor will order a chest X-ray. If the patient's chest X-ray looks abnormal and has abnormal spots on the lungs which might be a prove of TB. Thus, the patient's sputum sample will also be collected and sent to different laboratory for sputum smear test and culture test to

determine the treatment. After the diagnosis testing report has completed, the medical personnel will give treatment to the patient according to the TB type.

Drug susceptibility testing (DST) is a test to make sure the patient's TB does not resistant to the drugs. The medical personnel will perform a test on the patient before treatment because if the patient take the drug incorrectly, the TB is harder to be treated if the drug used does not response. The TB might become resistant to drug and it is harder to treat, the patient may need more medication for a longer time.

After the research, there are some problems may occur in the TB laboratory operation. The patient may have more than one medical card due to the handwriting too illegible scrawl that nobody can read it. Different diagnosis testing is conducted in different laboratory and different testing have different results come out while each of the laboratory may have different ways to store the testing result. Most of the laboratory keep the result in the manual paper file, a large storage is also required to store these documents. This storage method may cause the medical personnel hard to retrieve data for the further analyses.

Nowadays, information technology had been used in aspect of medical field. A developed information system is very important for a TB lab. This system is able to record and keep track all patient personal information and data such as name, duration of hospital stay and so on. Patient testing result, treatment information and drug using during treatment will also be recorded. The patient previous treatment record also able to be kept track. The data collected will be analyzed for further use. This system is also developed for outbreak prevention activities. The system will use the incidence report to analyses and do some early detection of potential outbreaks and bacteria reservoirs.

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 Image Computer Laboratory Information Management System (iLIMS)

The case study is on the Image Computer Laboratory Information Management System (iLIMS). This system is planned to manage daily laboratory operations, efficiently and seamlessly with best performs on browser-based technology.

The primary objective of this system is to improve Patient Care. Such as reducing human errors and efforts and ensures that clinicians receive the patient critical data in timely. With the innovative reporting and easy access to patient test data, clinicians are able to make a better decision to treat the patient in a maximally error-free reporting environment. The end user can remotely access the browser based software with the help of internet so the lease line and VPN expense can be reduced by lab. Patient can get their report from any centre of the lab because the database will be stored on the central server.

The figure2.1.1.1 shows a patient registration form, the patient will register through the walk-in patient registration form, the personal information like name, age, sex will be recorded. The majority of the patient information will automatically show from the patient master if the patient has his/her patient id card. For the new patient who without patient ID, system will automatically generate a new patient ID. Other information like referring doctor and collection centre will also be recorded.

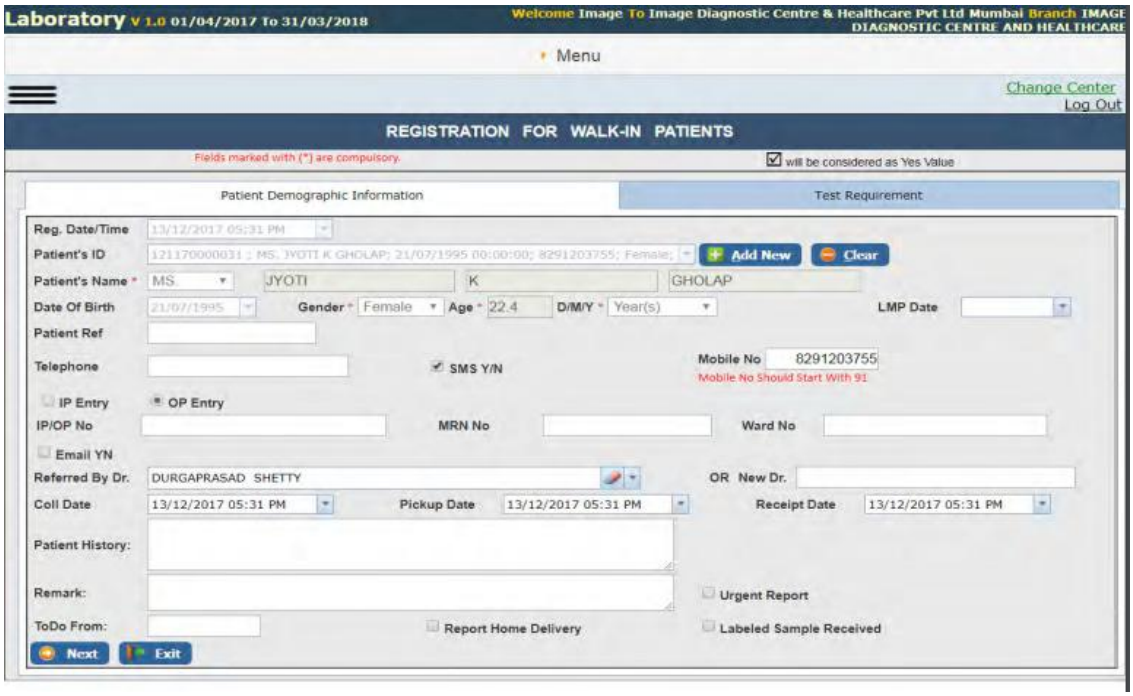


Figure 2.1.1.1 Patient Registration form by iLIMS

Figure 2.1.1.2 show that a navigation menu on top of the page, user can select one of the features to proceed the task, and the selected feature will be shown at the middle and the navigation menu also can be minimized or hidden.

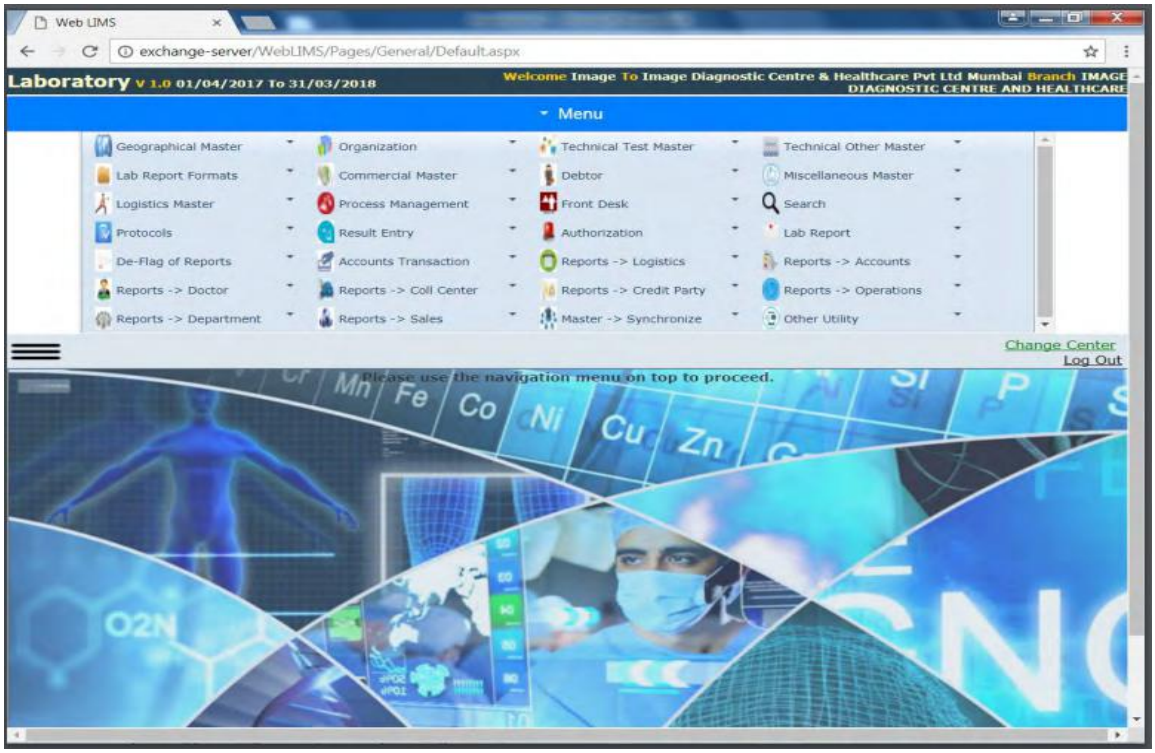


Figure 2.1.1.2 Navigation menu of the iLIMS system

The figure 2.1.1.3 below shows the second authentication module. Before the patient report can be printed, the report must be authorized first through the second level authorization. In this module, the selected test report are ready to print, that will be shown for the final authorization. User can select more than one test and the user also can preview the selected test result before move to the final authorization.

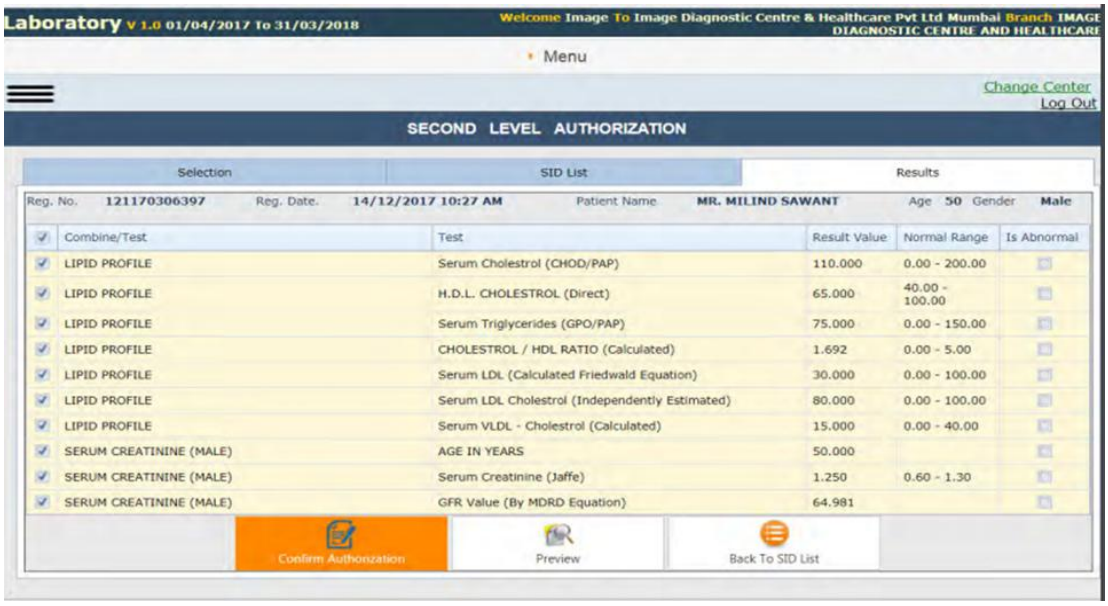


Figure 2.1.1.3 the second authentication module of iLIMS

After the final authorization, the report of the patient can be printed. The system has provided a complete user-defined report format, user can set the order of how the reports need to be printed and have multiple report format based on the test.

Figure 2.1.1.4 the final authorization module of iLIMS

2.1.2 Tuberculosis Information Management System (TBIMS)

TBMS is a web-based reporting and recording system that is capable of storing data from TB patient. The system is developed in 2005 by Chinese Centre for Disease Control and Prevention (CDC). The system has the capability to capture data on TB cases through the health facilities that are utilized to diagnose and treat TB. The database of the system comprised of three linked databases. The first database stores record of patient who are diagnosed with pulmonary TB and extra-pulmonary TB. The second database is tasked with storing patient info who are diagnosed with presumptive multidrug-resistant TB while the last database is responsible for keeping track of confirmed multidrug-resistant TB cases that occurred in 2011.

The aim of the system is to improve and reinforce current TB control programme by creating a list of reports. The system is capable of creating report on care-seeking behaviour and diagnosis and treatment of TB cases that are registered in the system. Last but not least, the system is able to raise the quality and timeliness of data available to policy-makers, thus indirectly providing insights on how to make the right decisions when it comes to TB control investment.

All of the confirmed TB cases in China must enter according the required detail to the system within 24 hour by the designated hospital and the staff in TB dispensaries.

Table 2-1-2 Translated list of variables recorded in the TBIMS

Category	Variables
Demographic information	Gender; Ethnic group; Occupation; Age; Date of birth; Residential status (local or outside of catchment area)
Registration information	Date of registration; Registration type; Treatment supervisor; Registration Number; Source of patient referral
Location information	District of first diagnostic visit; Health facility of first diagnostic visit
Delay to diagnosis information	Date first TB related symptom appeared; Date symptom was identified at a CDC health facility for the first time; Date of confirmed of TB
Laboratory test results	Diagnosis category; Diagnostic result; Drug resistance status; X-ray examination result at diagnosis; Result and dates of sputum examinations in months 2, 3, 5 and end of treatment
Treatment information	Date of treatment initiation; Date of end of treatment; Reason for ending the treatment
Information related to presumptive MDR-TB	Date and result of rapid drug sensitivity tests; Strain identification results; Date and results of traditional drug sensitivity tests; Final diagnostic results (MDR-TB, XDR-TB, rifampicin-resistant TB etc.)
Information related to confirmed MDR-TB	Date of treatment initiation; Result and dates of sputum examinations; Modifications in treatment; Date of end of treatment; Treatment outcome

Strengths of TBIMS system

Good quality control and information dissemination process

The system had built in the quality control features to improve the quality of data such as the timeliness and accuracy of the data. First, a logical check is performed when entering data. For example, date of onset should be earlier then notification date. Thus,user required to ask permission from supervisor to edit the data that has been entered to avoid the accidentally edits to the data shows in Figure2.1.2.1.

Figure 2.1.2.1 Problematic record can be identified as well in TBIMS

Partial connection with IDRS

The TBIMS and IDRS have a connection between each other to ease the process of data exchange in the real time. The TB cases in China are required to report the cases to the IDRS within 24hour. Once the cases have been updated in the IDRS, the interface linking the IDRS and TBIMS can be alerted by the staff at TB health facilities.

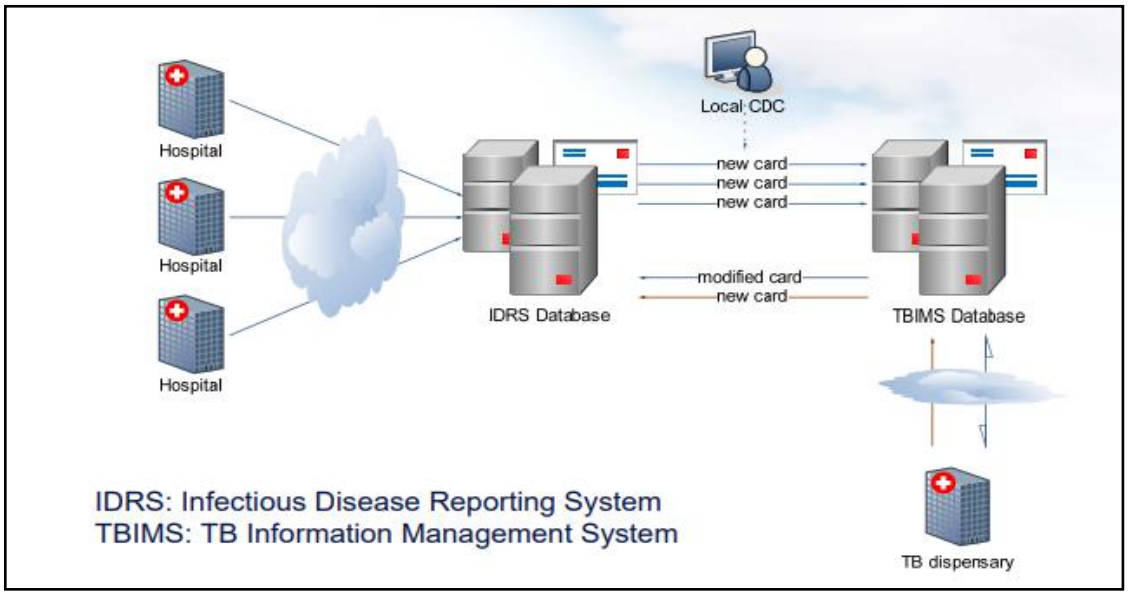


Figure 2.1.2.2 Relationships between IDRS and TBIMS

2.2 Features

Hotspot Map

The main major of transmission the dengue fever disease is the aedes mosquitoes, the infected person will have a fever and need to receive treatment to recovery. In some countries they started to use hotspot map, it can more effective and efficient to control mosquito by focus on the high-risk dengue fever area (2018, Clark. C). Figure 2.2 below show that the risk map analysis is based on the Dengue Fever cases that happened in Selangor. The diagram below clearly stated and show which street or location has been recognized as a high risk of the transmission of dengue fever. The analysis below is generated based on the total number of dengue fever occurred in the Selangor. The analysis from the map is based on the total number that happened in Selangor. The map using colour to show which area has the highest cases and which area has the lowest cases. In this map, it used red colour to state the area with highest cases occurred and the green colour stated the area with the lowest cases occurred dengue fever. We can develop this map in the system as one of the feature for infection control personnel to early prevention of potential outbreak and control the TB.

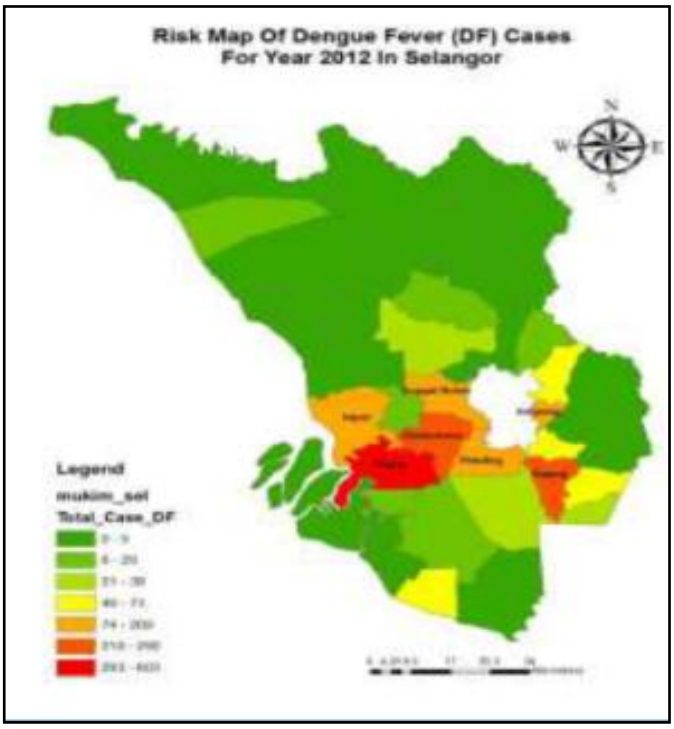


Figure 2.2 Risk Map of Dengue Fever

Chapter 3: System Design

3.1 System Design

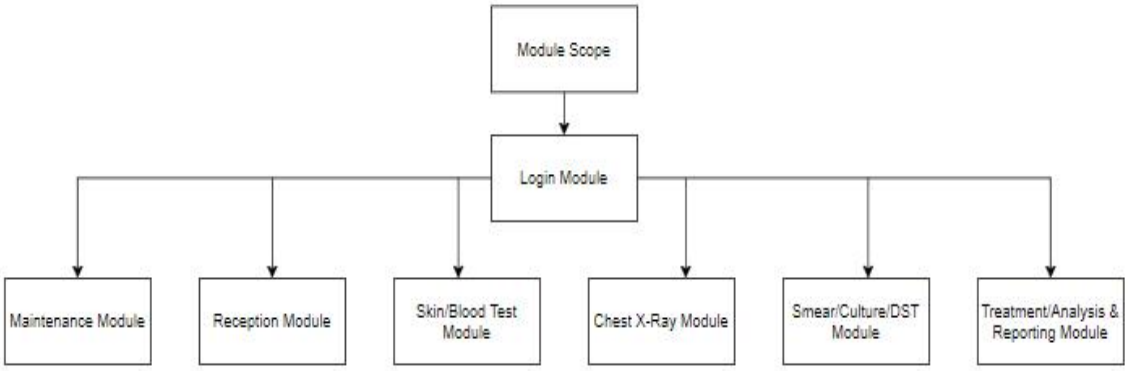


Figure 3.1.1 Block Diagram

This proposed project is completed in team-based, my teammate (Lau Jia Wei) and I will handle different parts of modules. Lau Jia Wei will handle the Login module and maintenance module while I will be handling the test module which includes the skin/blood test module and smear/culture/DST module.

Login Module

The login module is the entry point in the system, the login interface design maintains a consistent look to every user. The main function of the login module is authentic to the user and limit the unauthorized user to access the system. The credential to verify the user consists of the set of username and password. Every user will have a unique username. User needs to key in the correct username and password to access the system. The system will deny the user to access when they enter the incorrect credential and system will ask for the user to enter again.

Maintenance Module

This module is used by the administrator. The administrator can create a new user account for the new staff in TB laboratory, clinical or radiology, the administrator also can modify the existing user information if there is any changes like updating information such as an address, contact, email, etc. Thus, the administrator can search and keep track of all the existing users' information.

If there are any new job positions occurred, the administrator can create a new job position. The administrator also can modify the existing job position to make any correction or updating. If a user is resigned, the administrator can remove the account by inactivating the account, and the inactivate account will show in the historical account. The inactivate account will be denied to access to the system. The administrator also can reactivate the account from the historical user when a user returns to work, he or she is allowed to access the system again.

Apart from that, the administrator can do some setting on a particular part to improve the system functionality and system flexibility to enhance the system quality. For example, administrator able to modify and manage the country list because it could have some new countries counted as a high TB burden country or some countries not included in the high TB burden country list anymore. Thus, the administrator able to add new drug for DST if there is a new drug published in the market or world for the TB disease.

Reception Module

This module is handled by the nurse in charge of the patient reception. The new patient in the clinical will register through this module, the patient details and personal information such as a current address, country or state travelling before, and emergency contact of the patient will also be recorded. Thus, the nurse also can modify and update the existing patient record if they had changed their address or contact number. The nurse also can search for a particular patient's information with the IC number for local patient and passport number for the foreign patient to view the patient's profile. Besides, the registered patient record will be updated to other tests module to ease the process to carry further testing.

Skin /Blood Test Module

The skin/blood test module is used by the nurse who responded to the skin test and blood test. The registered patient record will be shown in the dashboard. The nurse can search for the particular patient record with the IC number or passport number. Thus, the nurse will carry the skin test/blood test and record the test performed.

After the result come out, the nurse will insert the test details and test result. For skin test, the nurse will record the test details such as the diameter of the in-duration, left/right arm performed injection and the test result. Furthermore, the skin test result must be record within 72 hours for the accurate test result. For the blood test, the nurse will record the importance test details such as the blood test type and the test result. The record will be stored in the database to do further relevant decision and analysis.

Chest X-Ray Test Module

The Chest X-Ray Test Module is performed by the radiologist. The registered patient record will be shown in the dashboard. The radiologist can search for the particular patient record with the IC number or passport number. After completed the test, the radiologist will upload the image of the chest x-ray, provide appearance if any, and insert the test result.

Smear and Culture Test Module

This module is used by the lab scientist. The sputum sample collected from the patient is needed to record in the system and the sample record will be used for the further analysis. Each of the patients will have a unique serial number to keep their sputum sample, lab scientist also able to search the patient's history record with the patient's IC number or passport number. Once the result come out, all the smear and culture test result information will be updated to the specific patient's record and stored into the database.

Drug Susceptibility Test (DST) Module

This module is used by the lab scientist. If a patient obtains a negative test result at both the smear test and culture test, the patient is not carry the DST. The registered patient record will be shown in the dashboard. The lab scientist can search the particular patient record with the IC number or passport number. Thus, the lab scientist will upload the test details and test result once the test's result is come out. The record will be stored in the database to do further relevant decision and analysis.

Treatment Module

This module is used by the doctor. The dashboard for this module will show the patient information or record which had go through all of the TB tests. The patient's IC number, patient number and each of the test's final result will be shown in the dashboard. If a patient obtains all of the test results with positive, it will align at the top of the patient list at the dashboard and highlighted with red colour, this design can alert the doctor to review the patient's record first. Thus, the doctor can click on the patient record and insert all of the data like treatment, drug, comment, etc. Besides, the doctor also can view the historical record for a particular patient to help the doctor to make a better decision. The doctor also can print out the summary report for the patient to review or for the patient to keep it.

Analysis and Reporting Module

This module is the most important part of this system. This module includes all the related analysis part based on the database's data which collect from all the module mention previously.

Analysis

- No. of unique cases per year, the prevalence rate in the hospital
- Specimen types examined
- No. smear/culture-positive/negative (method, turnaround time (TAT))
- DST (Molecular Drug Susceptibility Tests) patterns (method, TAT)
- No. Local and foreign TB-tester
- No. of TB diagnosed patient with HIV and Non-HIV
- Demogrpahic Analysis (e.g. gender, race, state, group of age etc.)
- Diagnosed Patient Pin Map
- Recap report of diagnosed patient (daily/ monthly/ yearly report)
- State/Country diagnosed patient's travelled before

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.

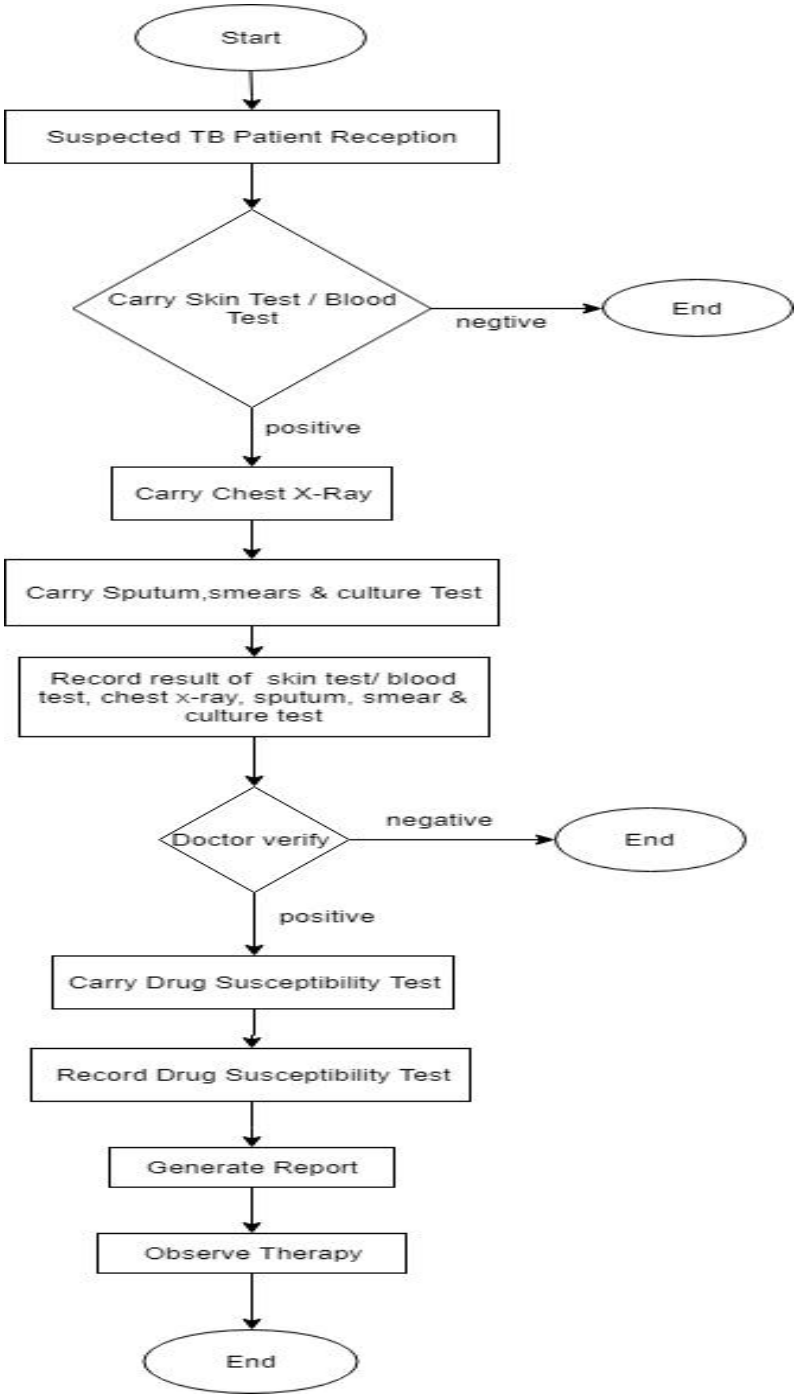


Figure 3.2.1 General Flow Chart of Diagnosis Laboratory Information System.

3.2.2 System Flow Diagram (Maintenance Module)

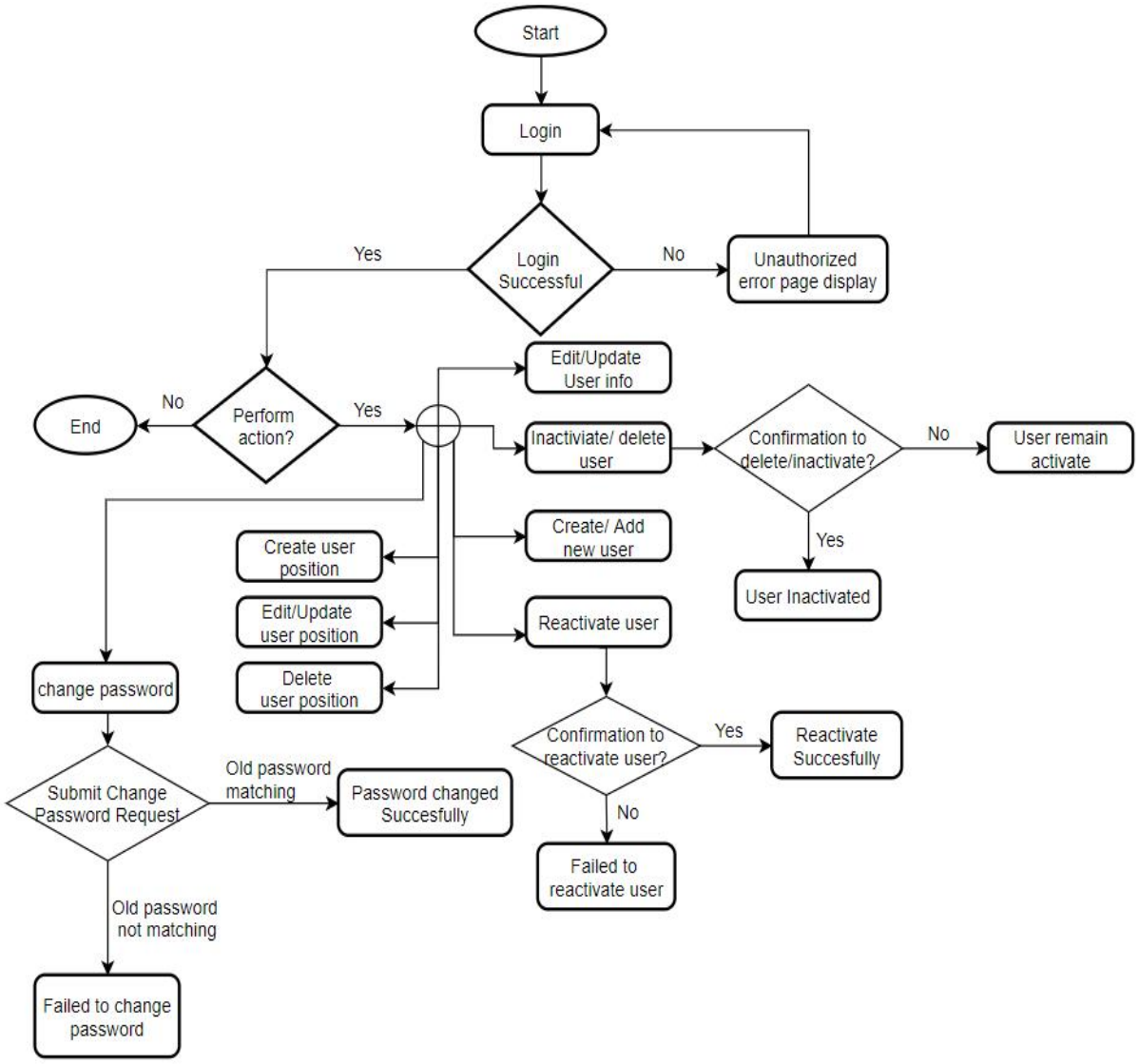


Figure 3.2.2.1 System Flow Diagram of Diagnosis Laboratory Information System (Maintenance Module).

3.2.3 System Flow Diagram (Reception Module)

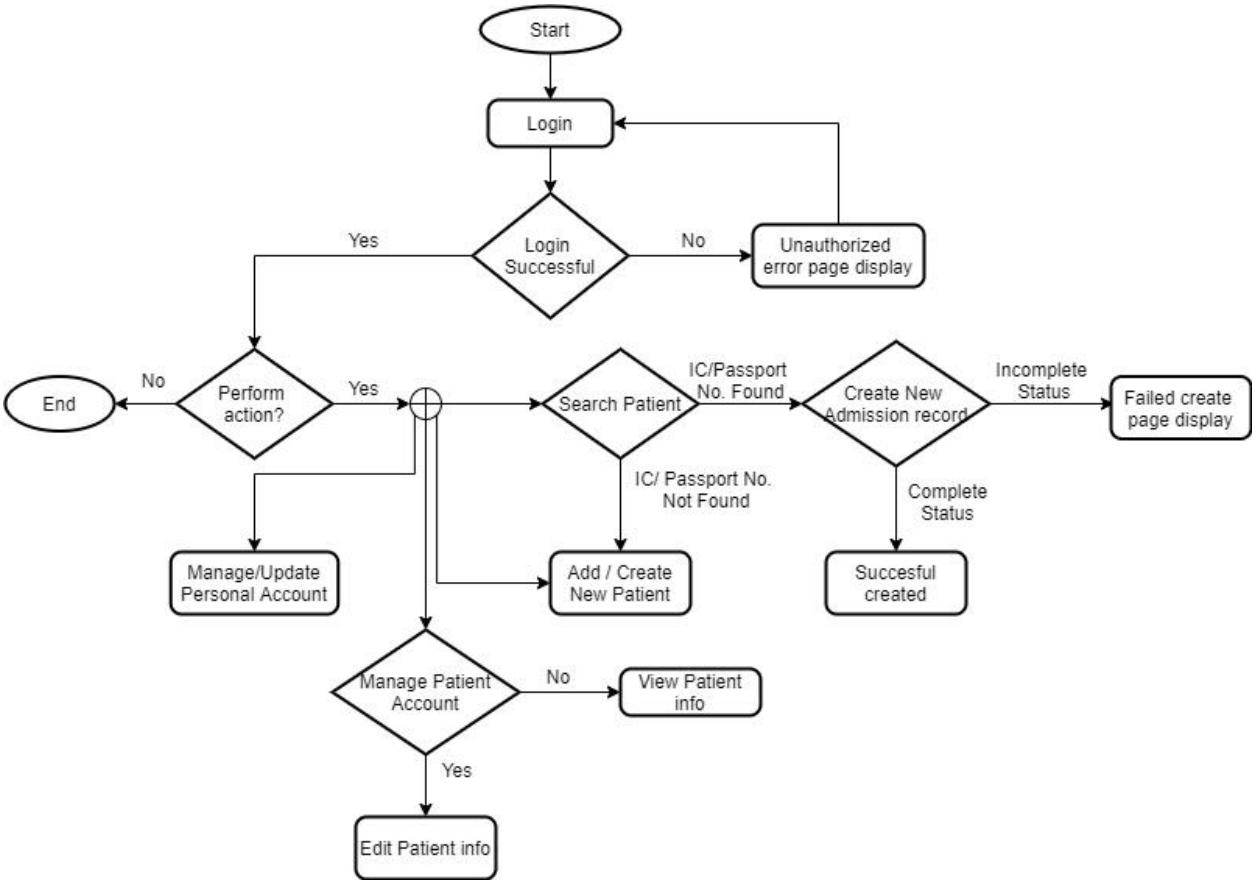


Figure 3.2.3.1 System Flow Diagram of Diagnosis Laboratory Information System (Reception Module).

3.2.4 System Flow Diagram (Skin/Blood Test Module)

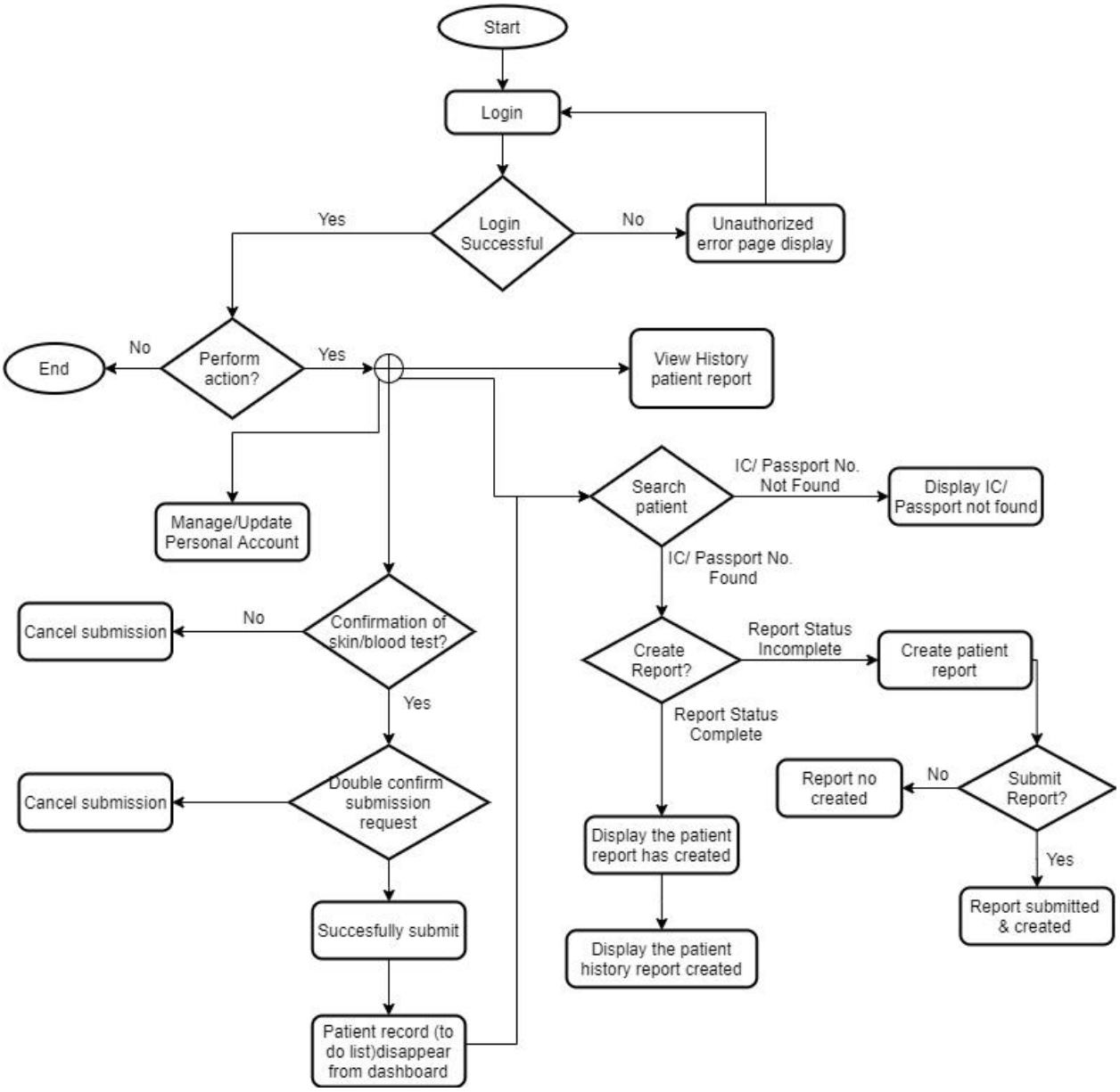


Figure 3.2.4.1 Flow Diagram of Diagnosis Laboratory Information System (Skin/Blood Module).

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

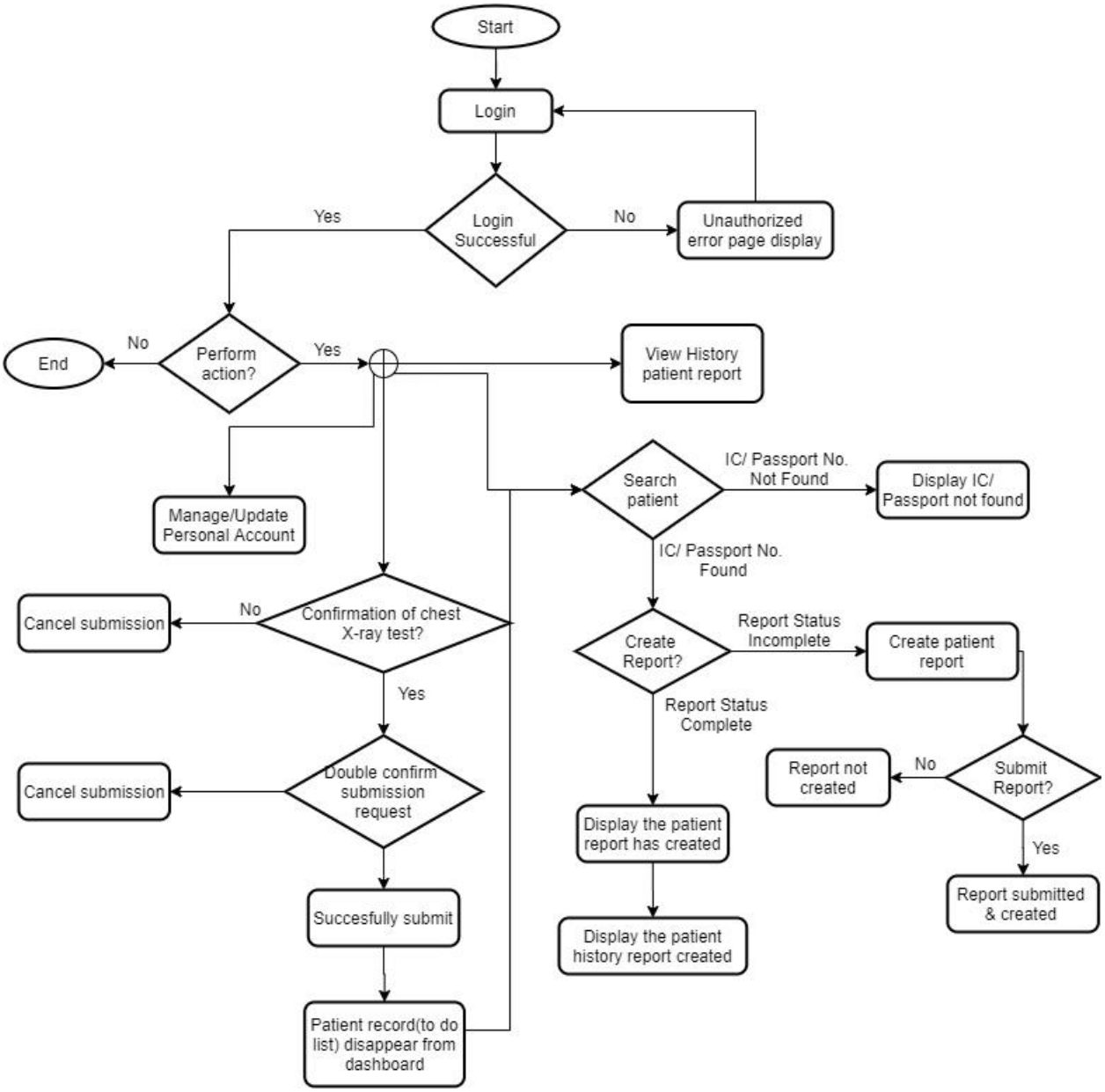


Figure 3.2.5.1 Flow Diagram of Diagnosis Laboratory Information System (Chest X-Ray Test Module).

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

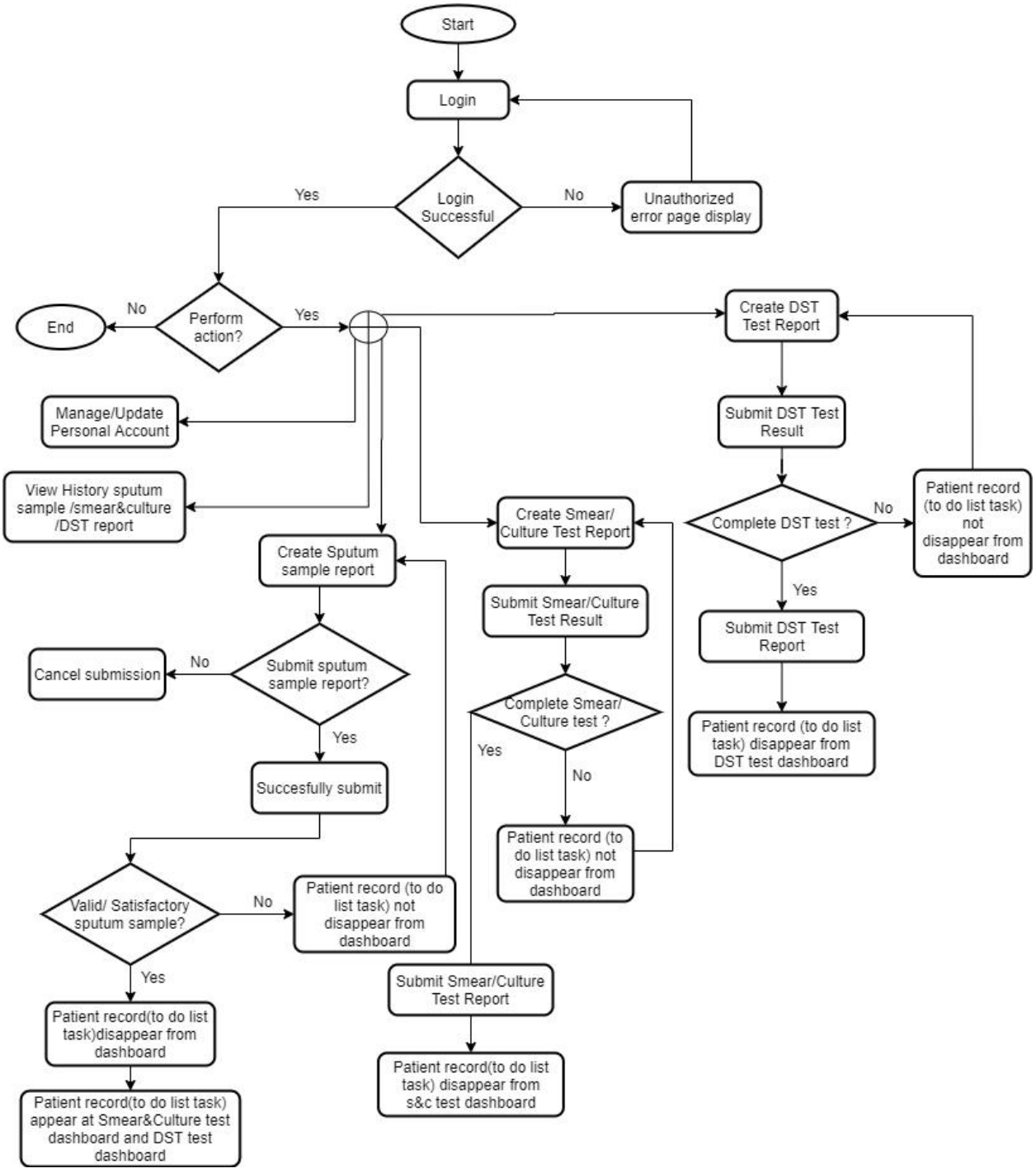


Figure 3.2.6.1 Flow Diagram of Diagnosis Laboratory Information System (Smear/Culture/ DST Test Module).

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

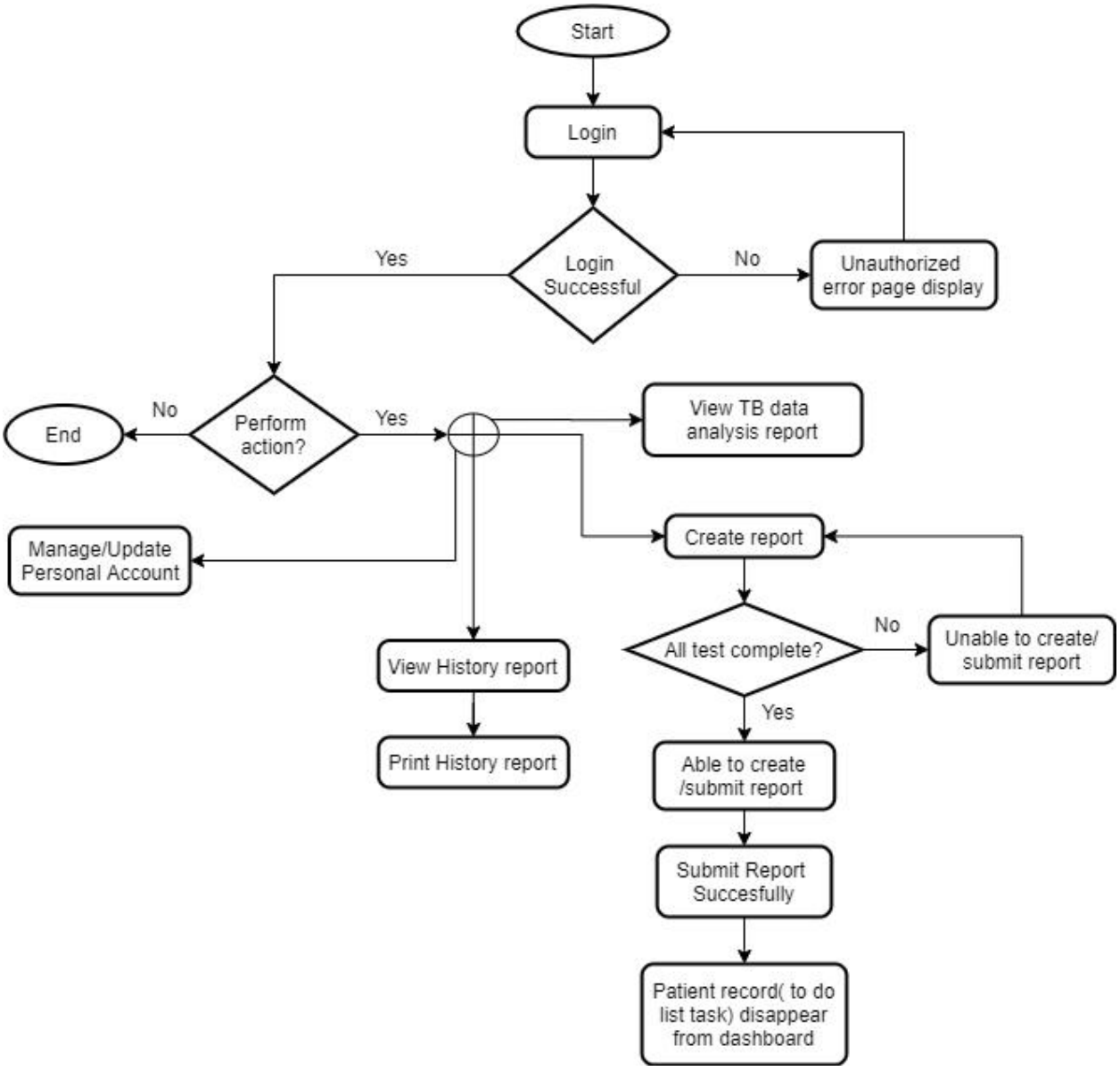


Figure 3.2.7.1 Flow Diagram of Diagnosis Laboratory Information System (Treatment/Analysis and Reporting Module).

3.3 Entity Relationship Diagram (ERD)

Figure 3.3.1 Entity Relationship Diagram

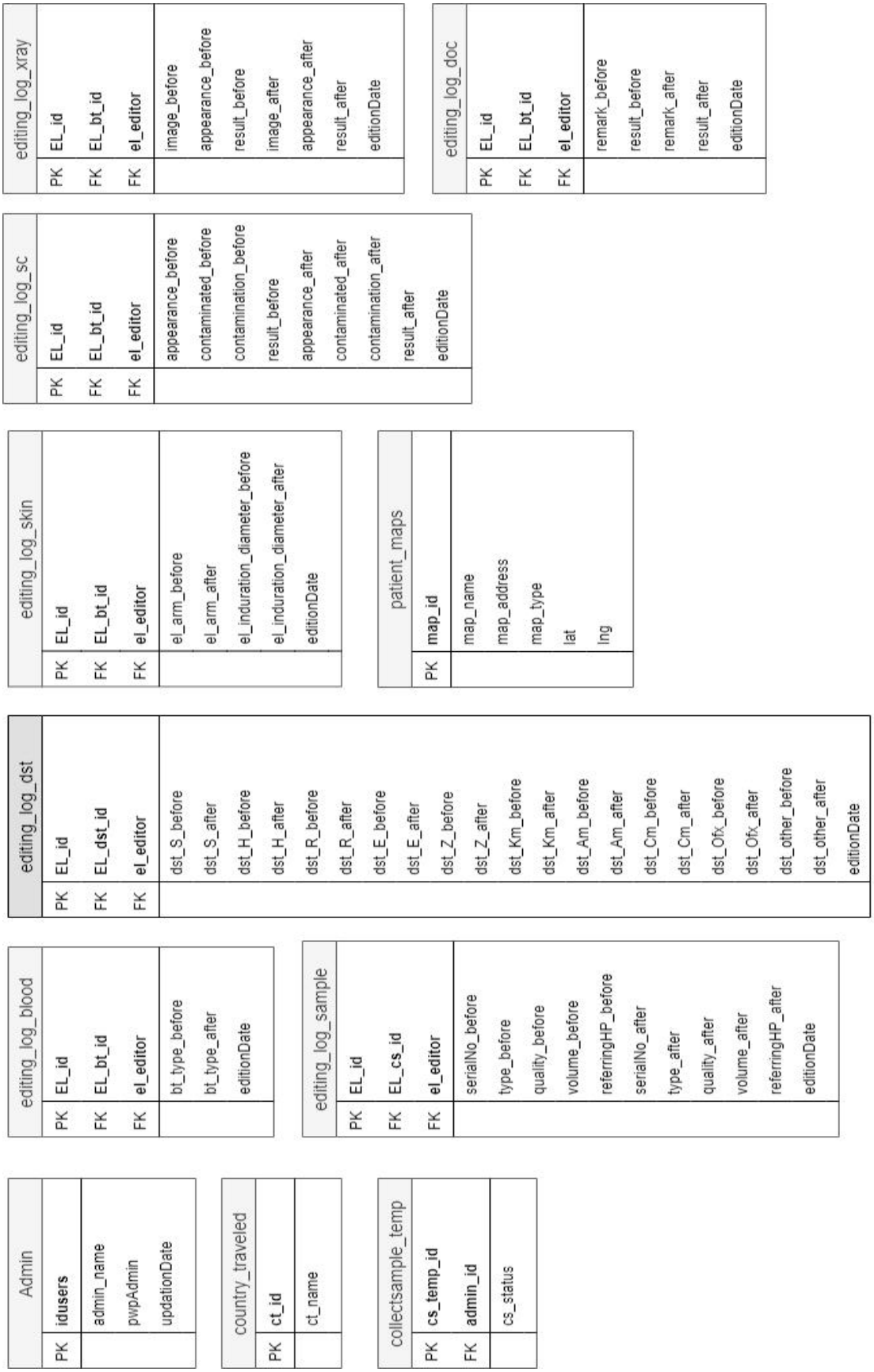


Figure 3.3.2 Entity Relationship Diagram Cont.

3.4 Data Dictionary

Table 3-4-1 : Admin table

TABLE: admin

Column Name	Key	Data type	Size	Default	Null	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	lawjiawei0829
updationDate		timestamp		current_timestamp()	N	Date store administer's info	3/31/2020 19:31

Table 3-4-2 : Admission table

TABLE: admission

Column Name	Key	Data type	Size	Default	Null	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	N	Unique ID of user key in admission result	1
adm_remark		varchar	##	Null	N	Doctor's remark	Null
adm_result		varchar	##	Null	N	Final TB test result	Positive
adm_status		varchar	15	Null	N	Status of admission	Complete
adm_saveDate		timestamp		current_timestamp()	N	Save date of admission	3/31/2020 19:31
adm_resultDate		timestamp		Null	N	Result date of admission	4/3/2020 8:53
adm_updationDate		timestamp		Null ON UPDATE current	N	Updation date of admission	4/3/2020 8:53
p_street		longtext		Null	N	street of patient	222, Jalan Jarak
p_city		longtext		Null	N	city of patient	Taiping
p_state		longtext		Null	N	state of patient	Perak
p_postcode		longtext		Null	N	postcode of patient	34000
p_HIVstatus		varchar	50	Null	N	HIV status of patient	Yes
p_referring		varchar	##	Null	N	Referring hospital of patient	Pantai Hospital
p_reasonExam		longtext		Null	N	Reason exam of patient	Diagnosis
country1		varchar	##	Null	N	1st country's patient travel before	Australia
country2		varchar	##	Null	N	2nd country's patient travel before	Singapore
state1		varchar	50	Null	N	1st state's patient travel before	Johor
state2		varchar	50	Null	N	2nd state's patient travel before	Kelantan

Table 3-4-3 : Blood test table

TABLE: bloodtest

Column Name	Key	Data type	Size	Default	Null	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	N	Type of blood test	QFT
bt_result		varchar	15	Null	N	Result of blood test	Negative
bt_saveDate		timestamp		NULL ON UPDATE currer	N	Save date of blood test	4/3/2020 8:54
bt_status		varchar	15	Null	N	Status of blood test	Complete

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

TABLE: chestxray

Column Name	Key	Data type	Size	Default	Null	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	N	Unique ID for user	5
r_image		blob			NN	Image of chest x-ray	[file image location]
r_appearance		varchar	50	Null	N	appearance of chest x-ray	Unclear
r_result		varchar	15	Null	N	result of chest x-ray	Positive
r_saveDate		timestamp		NULL ON UPDATE currer	N	save date of chest x-ray result	4/3/2020 8:57
r_creationDate		timestamp		Null	N	creation date of chest x-ray test	4/3/2020 8:57
r_status		varchar	15	Null	N	status of chest x-ray test	Complete

Table 3-4-5 : Collect sample table

TABLE: collectsample

Column Name	Key	Data type	Size	Default	Null	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	N	Unique ID for user	4
cs_status		varchar	15	Null	N	status of collect sample	Complete
sc_serialNo		varchar	50		NN	Sputum sample of serial No	S001
cs_dateReceived		timestamp		NULL ON UPDATE currer	N	Receive date of sputum sample	4/3/2020 9:00
cs_type		varchar	50	Null	N	Type of sputum sample	Extrapulmonary
cs_quality		varchar	30	Null	N	Quality of sputum sample	Unsatisfactory
cs_volume		varchar	40	Null	N	Volume of sputum sample	More Than 3ml
cs_referringHP		varchar	40	Null	N	Referring hospital of patient's sputum	Pantai Hospital
cs_dateCollected		timestamp		Null	N	Date collected of sputum sample	4/3/2020 9:00
cs_test_Status		varchar	15	Null	N	Status of collect sputum sample	Complete
cs_test_Date		timestamp		Null	N	Date of complete sputum collected	4/3/2020 9:00
cs_dst_Status		varchar	15	Null	N	Status of DST test	Complete
cs_dst_Date		timestamp		Null	N	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	Null	Description	Sample Data
cs_temp_id	PK	int	11		NN	Unique ID for temporary collect sample	1
adm_id	FK	int	11	Null	N	Unique ID for admission	12
cs_status		varchar	##	Null	N	status of collect sample	Complete

Table 3-4-7 : Country travelled before table

TABLE: country_traveled

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

Table 3-4-8 : DST test table

TABLE: dst

Column Name	Key	Data type	Size	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	N	Unique ID for user	4
cs_id	FK	int	5	Null	N	Unique ID for sputum sample	3
dst_status		varchar	15	Null	N	Status of DST test	Complete
dst_S		varchar	50	Null	N	Value of Streptomycin	Resistance
dst_H		varchar	50	Null	N	Value of Isoniazid	Resistance
dst_R		varchar	50	Null	N	Value of Rifampin	Resistance
dst_E		varchar	50	Null	N	Value of Ethambutol	Resistance
dst_Z		varchar	50	Null	N	Value of Pyrazinamide	Resistance
dst_Km		varchar	50	Null	N	Value of Kanamycin	Resistance
dst_Am		varchar	50	Null	N	Value of Amikacin	Resistance
dst_Cm		varchar	50	Null	N	Value of Cpreomycin	Resistance
dst_Ofx		varchar	50	Null	N	Value of Ofloxacin	Resistance
dst_other		varchar	50	Null	N	Other remark	Remark
dst_saveDate		timestamp		Null	N	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	Null	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	N	Type of blood test edit before	QFT
bt_type_after		varchar	10	Null	N	Type of blood test e after edit	QFT
editionDate		timestamp		current_timestamp()	N	Edition date of blood test	4/3/2020 8:54

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

TABLE: editing_log_doc

Column Name	Key	Data type	Size	Default	Null	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	N	Doctor's remark edit before	Null
result_before		varchar	10	Null	N	Final TB test result edit before	Positive
remark_after		varchar	##	Null	N	Doctor's remark after edit	Null
result_after		varchar	10	Null	N	Final TB test result after edit	Negative
editionDate		timestamp		current_timestamp()	N	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	Key	Data type	Size	Default	Null	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	N	Injection on which arm of patient edit before	Right
el_induration_diameter_before		int	10	Null	N	Induration diameter of patient edit before	15
el_arm_after		varchar	10	Null	N	Injection on which arm of patient after edit	Left
el_induration_diameter_after		int	10	Null	N	Induration diameter of patient after edit	13
editionDate		timestamp		current_timestamp()	N	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	N	Unique ID for DST test	6
el_editor	FK	int	50	Null	N	Unique ID for user	6
dst_S_before		varchar	50	Null	N	Value of Streptomycin edit before	Resistance
dst_H_before		varchar	50	Null	N	Value of Isoniazid edit before	Resistance
dst_R_before		varchar	50	Null	N	Value of Rifampin edit before	Resistance
dst_E_before		varchar	50	Null	N	Value of Ethambutol edit before	Resistance
dst_Z_before		varchar	50	Null	N	Value of Pyrazinamide edit before	Resistance
dst_Km_before		varchar	50	Null	N	Value of Kanamycin edit before	Resistance
dst_Am_before		varchar	50	Null	N	Value of Amikacin edit before	Resistance
dst_Cm_before		varchar	50	Null	N	Value of Cpreomycin edit before	Resistance
dst_Ofx_before		varchar	50	Null	N	Value of Ofloxacin edit before	Resistance
dst_other_before		varchar	50	Null	N	Other remark edit before	Remark
dst_S_after		varchar	50	Null	N	Value of Streptomycin after edit	Resistance
dst_H_after		varchar	50	Null	N	Value of Isoniazid after edit	Resistance
dst_R_after		varchar	50	Null	N	Value of Rifampin after edit	Resistance
dst_E_after		varchar	50	Null	N	Value of Ethambutol after adit	Resistance
dst_Z_after		varchar	50	Null	N	Value of Pyrazinamide after edit	Resistance
dst_Km_after		varchar	50	Null	N	Value of Kanamycin after edit	Resistance
dst_Am_after		varchar	50	Null	N	Value of Amikacin after edit	Resistance
dst_Cm_after		varchar	50	Null	N	Value of Cpreomycin after edit	Resistance
dst_Ofx_after		varchar	50	Null	N	Value of Ofloxacin after edit	Resistance
dst_other_after		varchar	50	Null	N	Other remark after edit	Remarks
editionDate		timestamp		current_timestamp()	N	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	Null	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	N	Sputum sample of serial No edit before	S001
type_before		varchar	50	Null	N	Type of sputum sample edit before	Extrapulmonary
quality_before		varchar	30	Null	N	Quality of sputum sample edit before	Unsatisfactory
volume_before		varchar	40	Null	N	Volume of sputum sample edit before	More Than 3 ml
referringHP_before		varchar	40	Null	N	Referring hospital of patient's sputum edit before	Pantai Hospital
serialNo_after		varchar	50	Null	N	Sputum sample of serial No after edit	4/3/2020 9:00
type_after		varchar	50	Null	N	Type of sputum sample after edit	Extrapulmonary
quality_after		varchar	30	Null	N	Quality of sputum sample after edit	Unsatisfactory
volume_after		varchar	40	Null	N	Volume of sputum sample after edit	More Than 3 ml
referringHP_after		varchar	40	Null	N	Referring hospital of patient's sputum after edit	Pantai Hospital
editionDate		timestamp		current_timestamp()	N	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	Null	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	N	Appearance of tests edit before	Blood-Stained
contaminated_before		varchar	10	Null	N	Contaminated of test edit before	Yes
contamination_before		varchar	##	Null	N	Contamination of test edit before	Bacteria
result_before		varchar	10	Null	N	Result of test edit before	Positive
appearance_after		varchar	40	Null	N	Appearance of tests after edit	Blood-Stained
contaminated_after		varchar	10	Null	N	Contaminated of test after edit	Yes
contamination_after		varchar	##	Null	N	Contamination of test after edit	Bacteria
result_after		varchar	10	Null	N	Result of test after edit	Positive
editionDate		timestamp		current_timestamp()	N	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	Null	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	N	Image of chest x-ray edit before	[file image location]
appearance_before		varchar	50	Null	N	appearance of chest x-ray edit before	Unclear
result_before		varchar	15	Null	N	result of chest x-ray edit before	Positive
image_after		blob		Null	N	Image of chest x-ray after edit	[file image location1]
appearance_after		varchar	50	Null	N	appearance of chest x-ray after edit	Unclear
result_after		varchar	15	Null	N	result of chest x-ray after edit	Negative
editionDate		timestamp		current_timestamp()	N	Edition date of chest x-ray test	4/3/2020 8:57

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

Table 3-4-17 : Patient maps table

TABLE: patient_maps

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

Table 3-4-18 : State travelled before table

TABLE: state_traveled

Column Name	Key	Data type	Size	Default	Null	Description	Sample Data
st_id	PK	int	11		NN	Unique ID for State traveled before	1
st_name		varchar	##	Null	N	Name of the state travelled before	Johor

Table 3-4-19 : Skin test table

TABLE: skintest

Column Name	Key	Data type	Size	Default	Null	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	N	Injection on which arm of patient	Right
st_induration_diameter		int	10	Null	N	Induration diameter of patient	15
st_result		varchar	15	Null	N	Skin test result of patient	Positive
st_saveDate		timestamp		NULL ON UPDATE currer	N	Save date of skin test	4/3/2020 8:55
st_ExpirationDate		timestamp		Null	N	Expiration Date of skin test	4/6/2020 2:44
st_status		varchar	15	Null	N	Status of skin test	Complete

Table 3-4-20 : Tests table

TABLE: tests

Column Name	Key	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	N	Unique ID for sputum sample	3
uid	FK	int	11	Null	N	Unique ID for user	4
t_savedate		timestamp		Null	N	Save date of tests	4/3/2020 9:03
t_appearance		varchar	40	Null	N	Appearance of tests	Blood-Stained
t_contaminated		varchar	10	Null	N	Contaminated of test	Yes
t_contamination		varchar	##	Null	N	Contamination of test	Bacteria
t_result		varchar	10	Null	N	Result of test	medium
t_Status		varchar	10	Null	N	Status of test	Complete

Table 3-4-21 : User position table

TABLE: userposition

Column Name	Key	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	N	Name of user position	Doctor
creationDate		timestamp		current_timestamp()	N	Creation date of user position	8/8/2019 9:23
updationDate		timestamp		NULL ON UPDATE currer	N	Updation date of user position	1/8/2020 13:36

Table 3-4-22 : Users table

TABLE: users

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

Chapter 4 : Design Specification

4.1 Methodology involved

4.1.1 Prototyping Methodology

There are several of model inside SDLC, each of the model has it owns advantage and disadvantage. According to the key factor in selecting a proper development approach, the most suitable methodology for our system are prototyping methodology. The prototyping methodology perform analysis, design & implementation phases concurrently, and repeat these three phases in a cycle until system complete.

The reason that chosen prototyping methodology is because it can clarify requirement which are not clear hence reducing ambiguity and improving the communication between the developer and the client. Thus, this methodology can deliver the system within a short time of period compare to other methodology and reassures user working on system.

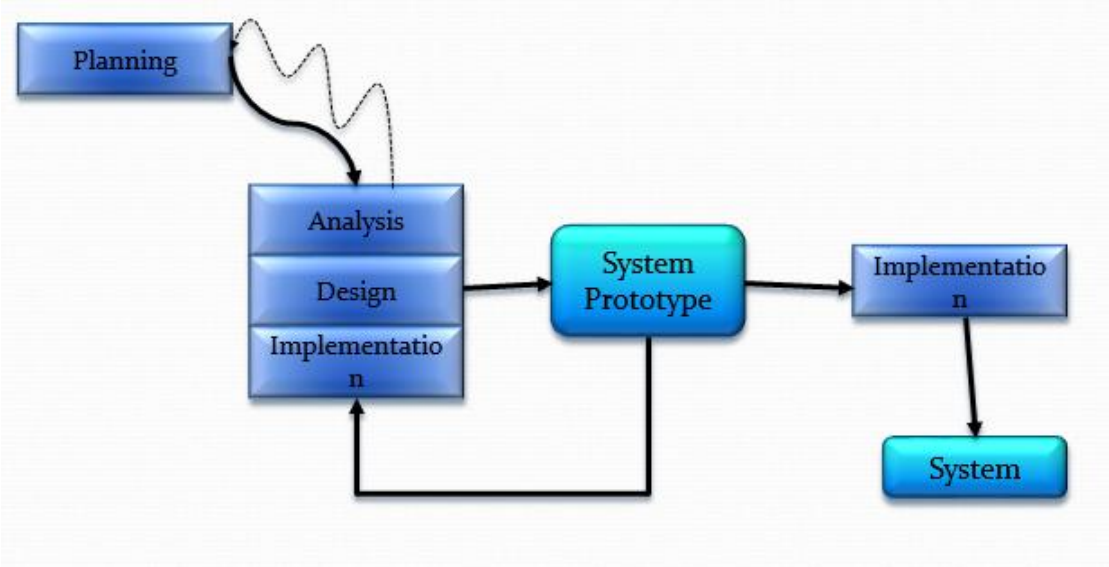


Figure 4.1.1.1 Flow diagram of the Prototyping Methodology

4.1.2 Project Phase

1. Planning Phase

A prototyping model begins with a best understanding on the requirement and the requirements of the system should defined in details. An interview session will conduct in order to know the requirements of the system and also know the user needs and wants. The relevant interviewer in this propose title which are laboratory administrator, doctor, and medical personnel.

Deliveries: Gantt chart, project plan

2. Analysis Phase

In this phase, investigate and study the information to determine who will use the system, what the system can use, when and where the system is working. It also include a well understanding to the existing system. Finalize the user requirement and propose a new concept of the system.

Deliveries: System proposal, user requirements

3. Design Phase

A preliminary design or quick design for the system is created in this phase, this will give user an idea of the system. Entity Relationship Diagram (ERD) will draw out to build the database structure for the system and a storyboard will create to let user have an “actual look” to the system interface design

Deliveries: Storyboard, ERD diagram

4. Implementation Phase

In this phase, developer will start to build and code the actual system. Developer will also perform system testing to verification and validation of the system just built to ensure that the system meets the stated specification. One of the purpose for software testing is to detect the bugs and error in the system.

However, a final system has been developed to user but the system might have some bugs and features cannot function well. So the developers needs to carry out regular maintenance to ensure the system themselves continue to work smoothly and avoid the system break down.

Deliveries: system installation, maintenance plan, programming, testing

5. System Prototype

Developer perform analysis, design and implementation phase concurrently to build a prototype. The prototype will give user an "actual look" of the system, and user can gives a feedback to developer. Developer will repeat these three phase in a cycle until the system is completed.

Deliveries: system prototype

6. System

The final system is construct when all of the feedback and review is collected from the user, the final system is generally created based on the latest or final prototype model.

Deliveries: Final System

4.2 Tools for Developer

4.2.1 Software /technology involved

- **JavaScript**

  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.

- **PHP**

  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 and delete the data from/to the database. Other advantages included the widely available community support and is a user-friendly language.

- **Visual Studio Code**

  Visual Studio Code as text editor because it supports all the languages for our system development.

- **HTMLS and CSS3**

  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.

- **MySQL**

  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.

- **XAMPP**

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.

- **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.**

  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".

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 4-2-2-1 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 4-2-2-1 Minimum requirements of the PC/Laptop.

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 4-3-1-1 Connectivity Requirements for Users

Connectivity	Requirement
WiFi/Data Connection	Recommended

As table 4-3-1-1 shown, Wi-Fi/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 Wi-Fi/Data is needed to display the Diagnosed Patient Pin Maps (Google Maps) on the Dashboard.

4.3.2 Hardware Requirements

Table 4-3-2-1 Minimum Hardware Requirements for Users.

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

Table 4-3-2-1 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 4-3-3-1 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 Download XAMPP - Website (see Table 4-3-3-1).

4.4 User requirements

Administrator

I. System maintenance

II. Manage TB laboratory's staff and patients record such as delete, assign and update.
   - Add or remove job position.
   - Add or edit user
   - Active or inactive a user accounts.
   - Review historical user
   - System access control based on each user's role.

Nurse

I. Manage patient record
   - Search related patient's record
   - Insert new patient's record
   - Update existing patient's record

II. Manage Skim Test and blood test
   - Upload TB skin test and blood test result of patients.
   - Edit skin test/blood test result.
   - View history test result.

Radiologist

I. Manage Chest X-Ray Test

- Upload chest X-Ray image according to the particular patients.
- Provide appearance if needed.
- Upload the chest X-Ray result (positive or negative to TB)
- View history chest X-Ray test result
- Edit chest X-Ray test result

Lab Scientist

I. Manage Sputum sample

- Record sputum sample record.
- View sputum sample record
- Edit sputum sample record

II. Manage smear and culture test

- Upload sputum smears and cultures result of patients.
- View History sputum and culture test record
- Edit sputum and culture test record.

III. Manage DST

- Upload DST result
- View history DST result
- Edit DST result

Doctor

I. Review all the patient report.

II. Manage final result of the patient

- Examine patient
- Insert comment or remark for particular patient

III. Generate final diagnosis based on clinical, radio-logical and laboratory evidence.

IV. Keep up of date the total number of TB tester and patient.

V. Acquire the information about differences between suspected patient and actual (diagnosed) patient.
VI. Acquire the information about TB Multi-Drug cases and XDR (Extensively drug-resistant) cases.
VII. Keep track the State and Country diagnosed patient traveled before.

4.5 Implementation Issue and Challenges

A well understanding or research on TB diagnosis information and the TB diagnosis laboratory's work-flow are required to build a TB Diagnosis Laboratory Information System with no error. Without the knowledge or information on the TB field, it is hard to develop a system accurately for the TB Diagnosis Laboratory's Staff.

The second implementation issues will be gathering the requirement as some of the data or information are hard to obtain in the journal or online article, it requires a longer time to discover. In this project, a meeting or interviewing the end-user is required in order to have a clear requirement. Moreover, it is difficult to collect the sample data of form to develop an accurate ERD because it may offend the personal data privacy policy. It is also important to clearly understand the usage of each form and the importance of data or value needed 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 to further study and integrate it in our proposed system. Another possible challenge could be the combination of all the modules to form a complete system which may raise some problems when compounding it, it may need a long duration to figure out and fix the bugs.

4.6 Timeline

The project timeline for Project 1 (current semester) and Project 2 (next semester) are shown in the Gantt chart below. It is important to have an accurate timeline to track the progress of the project and knowing the finish date for the task supposed to be done, the timeline also shows the duration for each task.

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		Review Project Proposal	2 days	Mon 27/5/19	Tue 28/5/19	
2		Meet with Supervisor	1 day	Wed 29/5/19	Wed 29/5/19	1
3		System Requirement Analysis	11 days	Thu 30/5/19	Thu 13/6/19	2
4		System Design	7 days	Fri 14/6/19	Mon 24/6/1	3
5		Confirmation with Supervisor	1 day	Tue 25/6/19	Tue 25/6/19	4
6		Meet with End-user	1 day	Mon 8/7/19	Mon 8/7/19	5
7		Finalize System Design	1 day	Tue 9/7/19	Tue 9/7/19	6
8		Build Prototype	9 days	Wed 10/7/1	Sun 21/7/19	7
9		Testing on Prototype	2 days	Mon 22/7/19	Tue 23/7/19	8
10		Finalize Prototype	3 days	Wed 24/7/1	Fri 26/7/19	9
11		Submit Draft Repor	1 day	Mon 29/7/1	Mon 29/7/1	10
12		Finalize Report	5 days	Tue 30/7/19	Mon 5/8/19	11
13		Submit Project1	1 day	Fri 16/8/19	Fri 16/8/19	12
14		Presentation Preparation	3 days	Mon 19/8/19	Wed 21/8/19	13
15		Oral Presentation	1 day	Thu 22/8/19	Thu 22/8/19	14

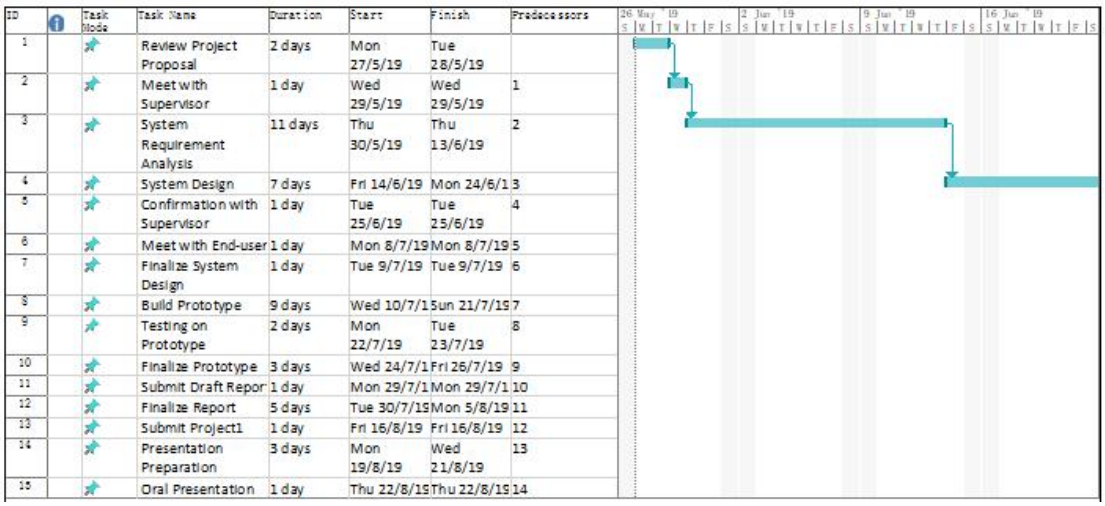


Figure 4.6.1 Project 1 Timeline.

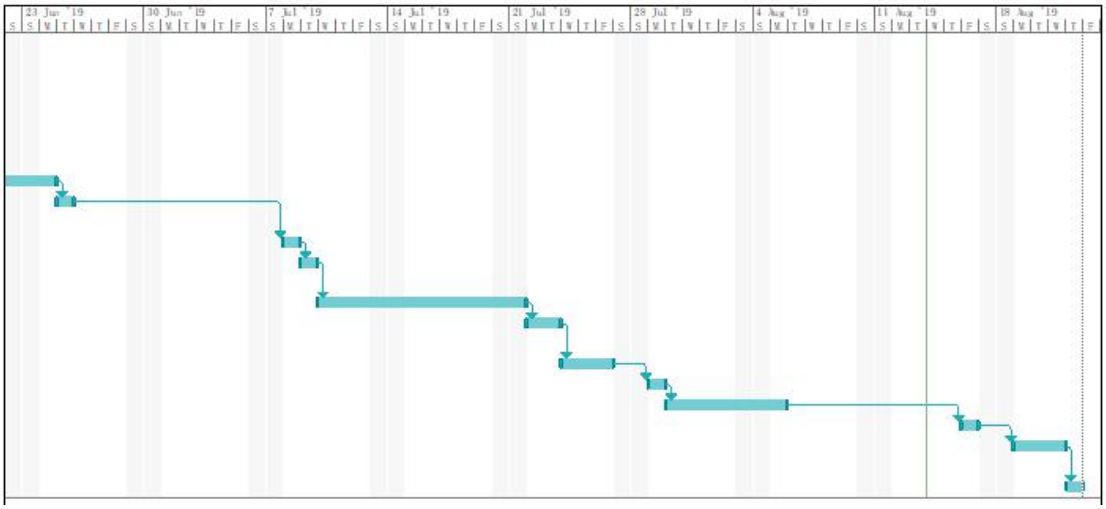


Figure 4.6.2 Project 1 Timeline (Cont)**.**

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		Review Project 1	2 days	Mon 13/1/2	Tue 14/1/20	
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
6		Submit Draft Repor	1 day	Tue 18/2/2	Tue 18/2/2	5
7		Review Prototype	3 days	Wed 19/2/2	Fri 21/2/20	6
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	8
10		Finalize report	5 days	Wed 11/3/2	Tue 17/3/2	9
11		Submit Full Report	1 day	Wed 18/3/2	Wed 18/3/2	10
12		Presentation Preparation	2 days	Thu 19/3/20	Fri 20/3/20	11
13		Oral Presentation	1 day	Mon 23/3/2	Mon 23/3/2	12
14		Submit Project	1 day	Tue 24/3/2	Tue 24/3/2	13

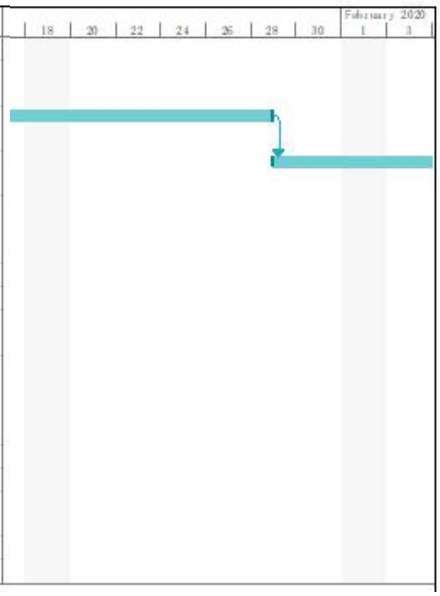


Figure 4.6.3 Project 2 Timeline.

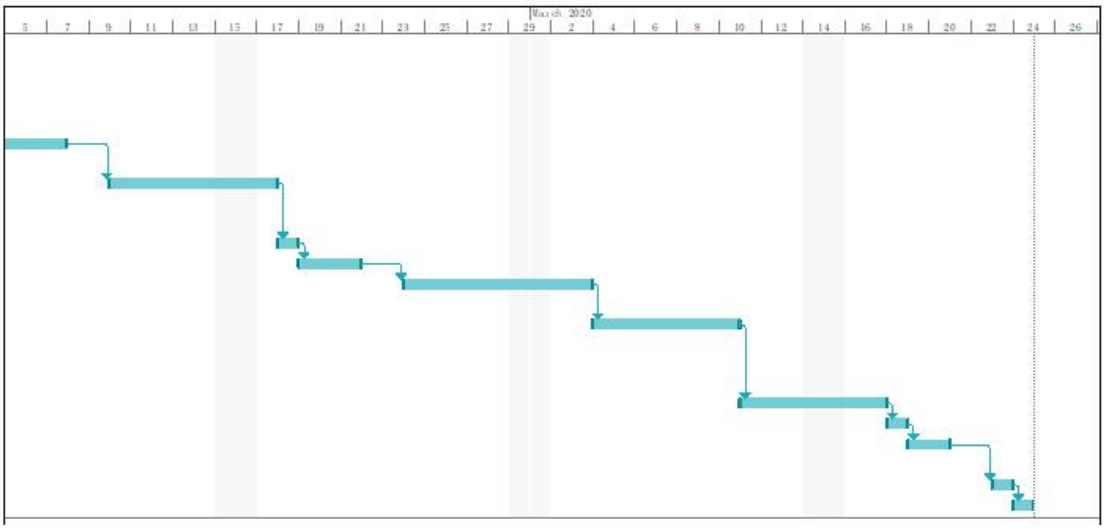


Figure 4.6.4 Project 2 Timeline (Cont.).

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: https://www.apachefriends.org/index.html

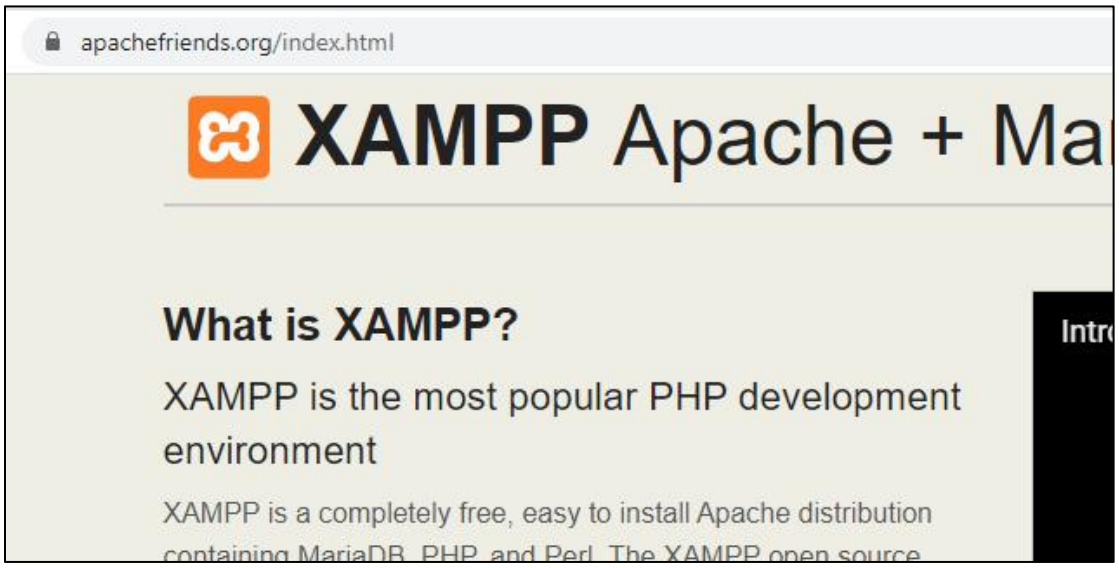


Figure 5.1.1 Screenshot of XAMPP Hyperlink

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.

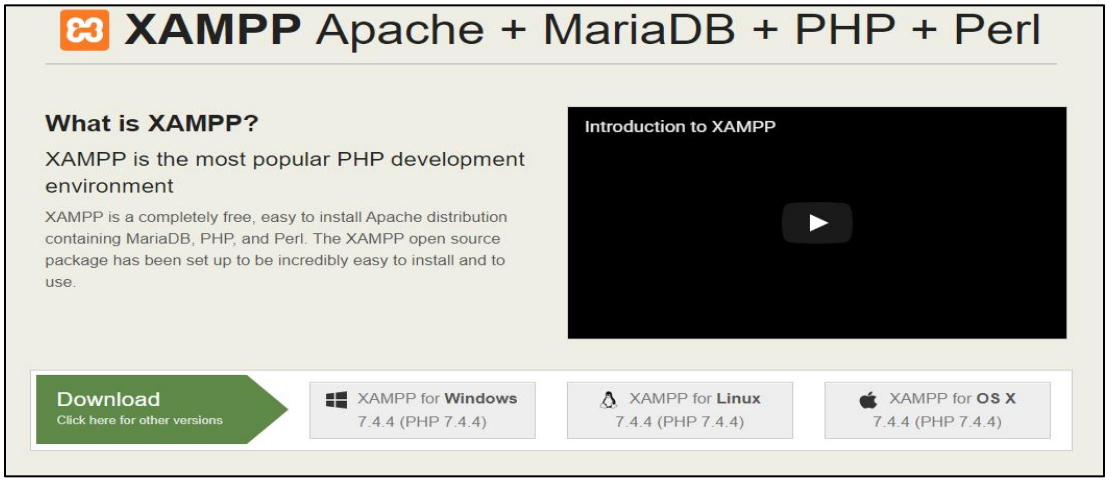


Figure 5.1.2 Screenshot for interface of "XAMPP for windows" button

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.**

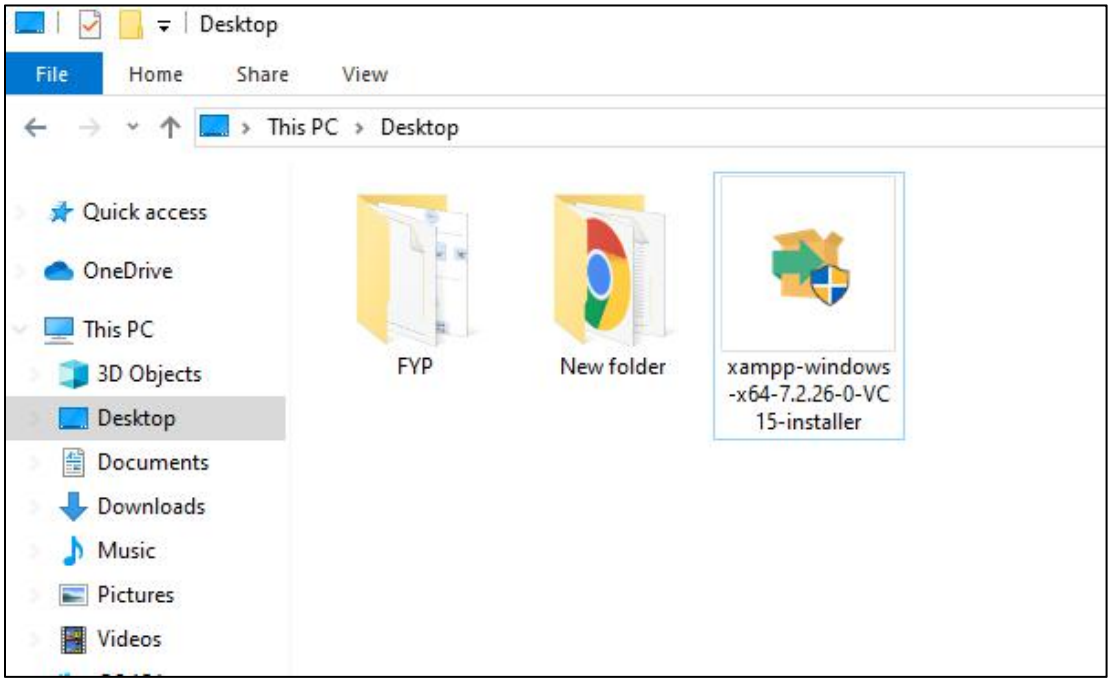


Figure 5.1.3 Screenshot for downloaded file in desktop

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

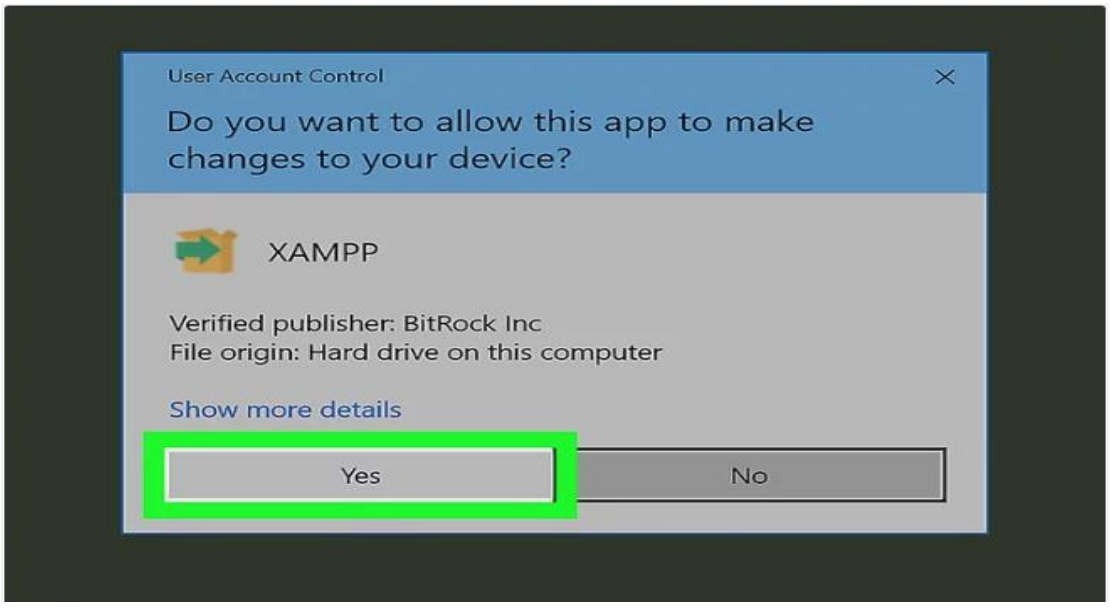


Figure 5.1.4 Screenshot of XAMPP ask for permission make changes on device.

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.

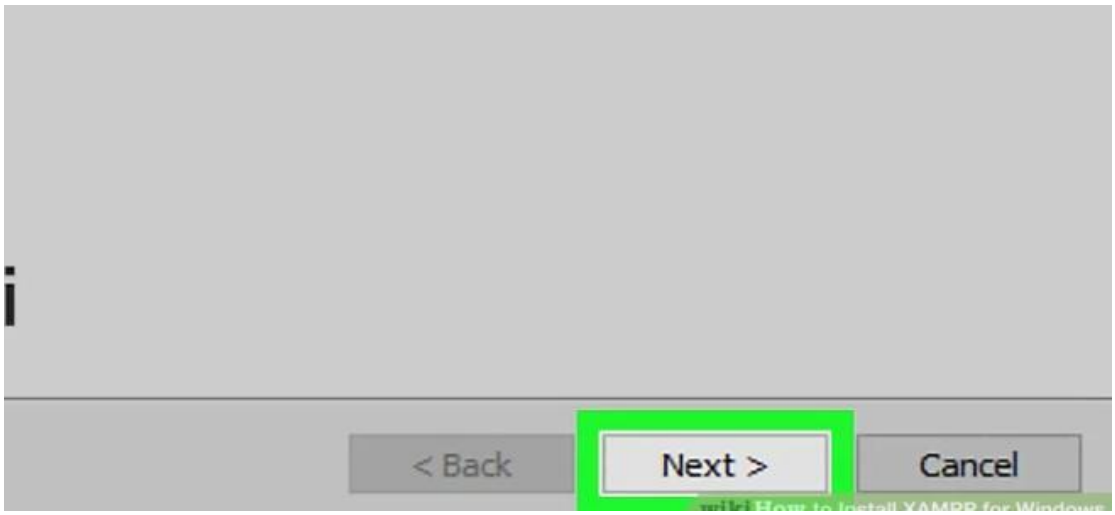


Figure 5.1.5 Screenshot of the XAMPP setup window

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.

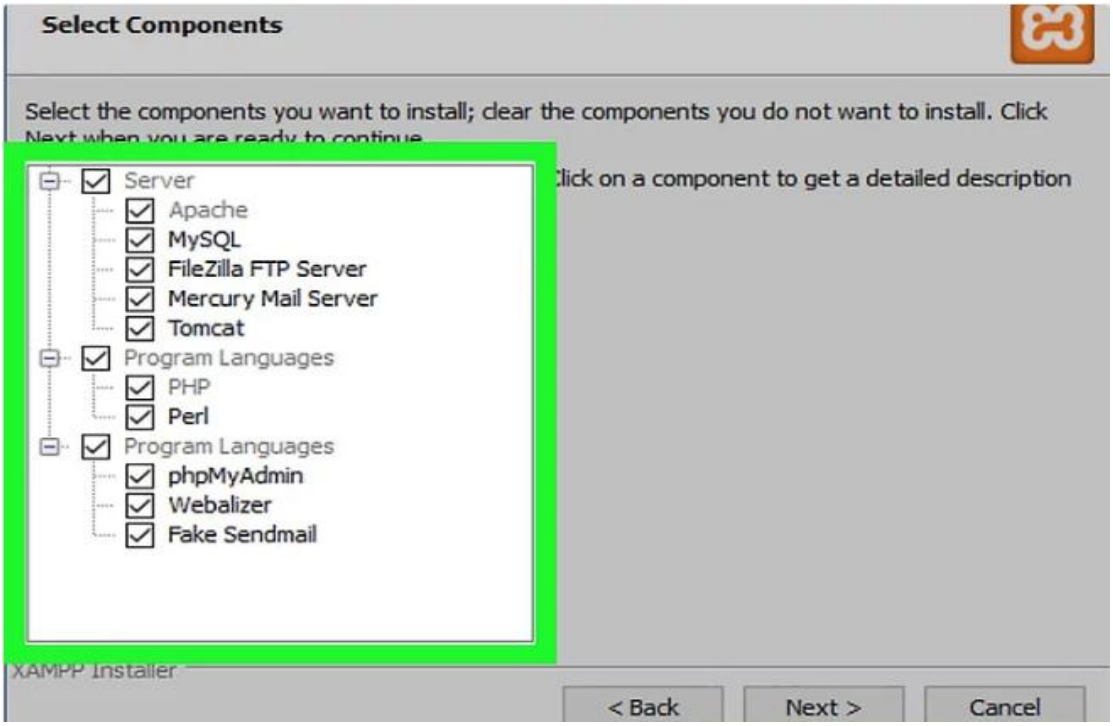


Figure 5.1.6 Screenshot Select components of XAMPP to install

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.

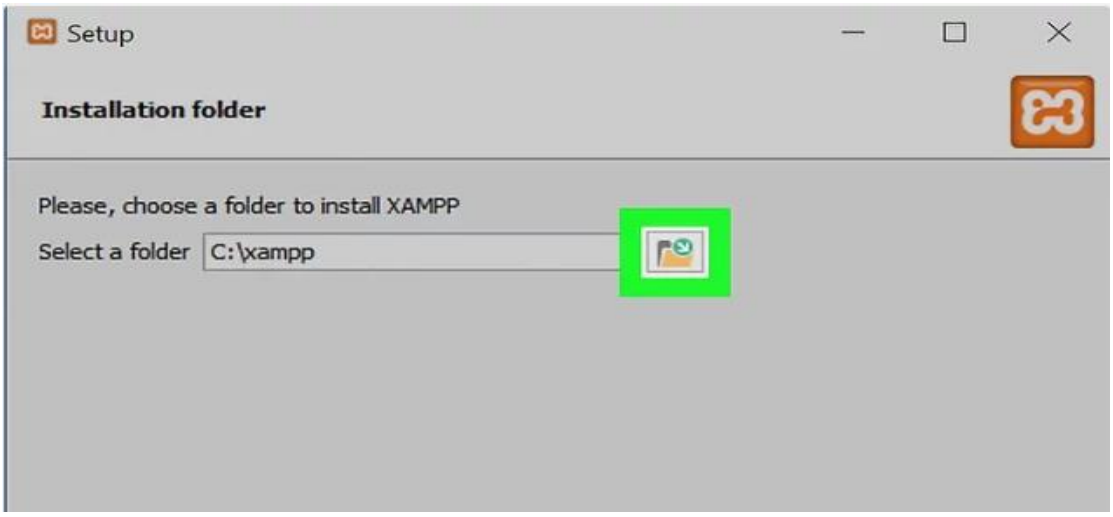


Figure 5.1.7 Screenshot of select installation location for XAMPP

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

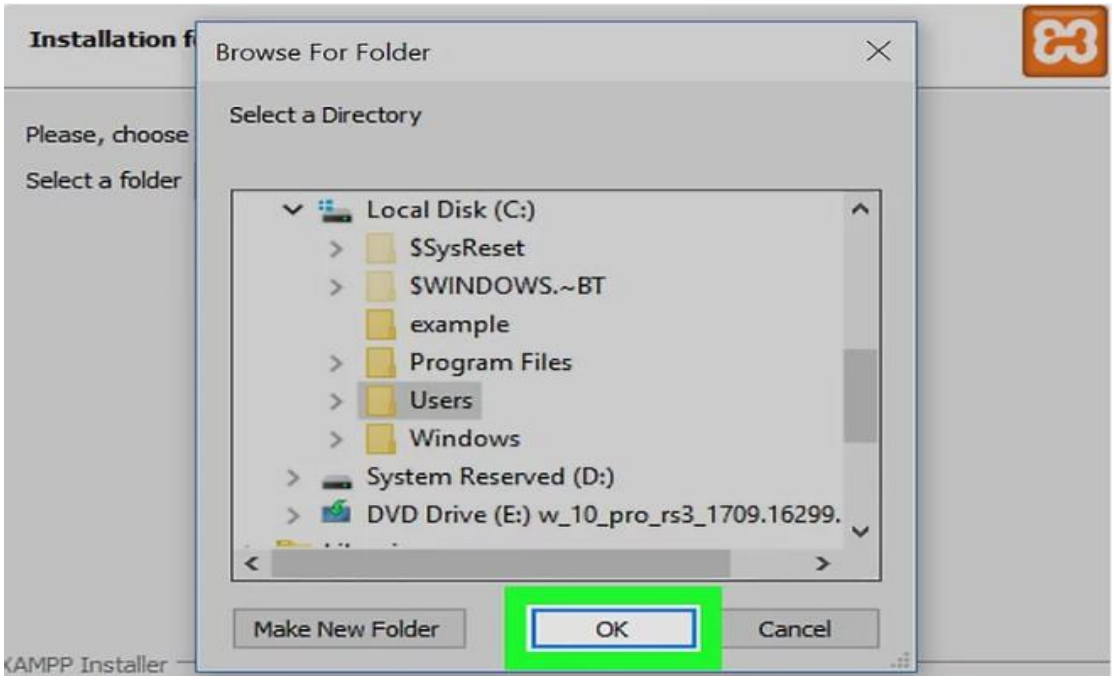


Figure 5.1.8 Screenshot of browse for folder in XAMPP

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.

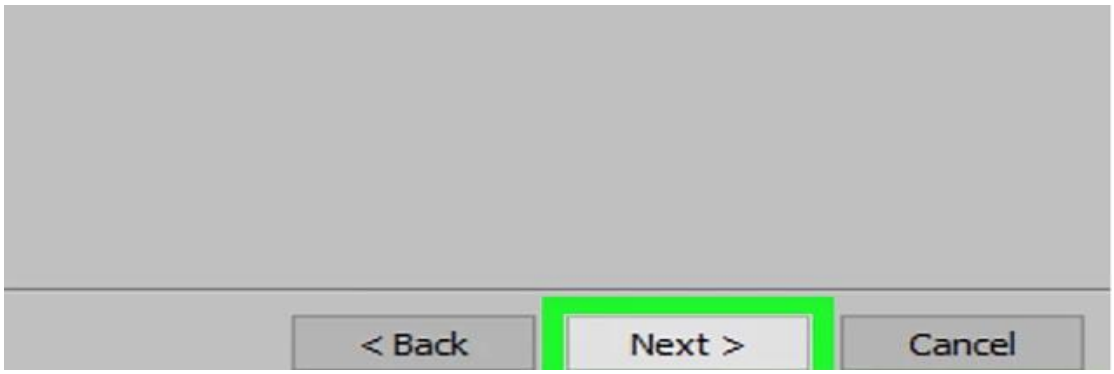


Figure 5.1.10 Screenshot for Begin Installing XAMPP

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.

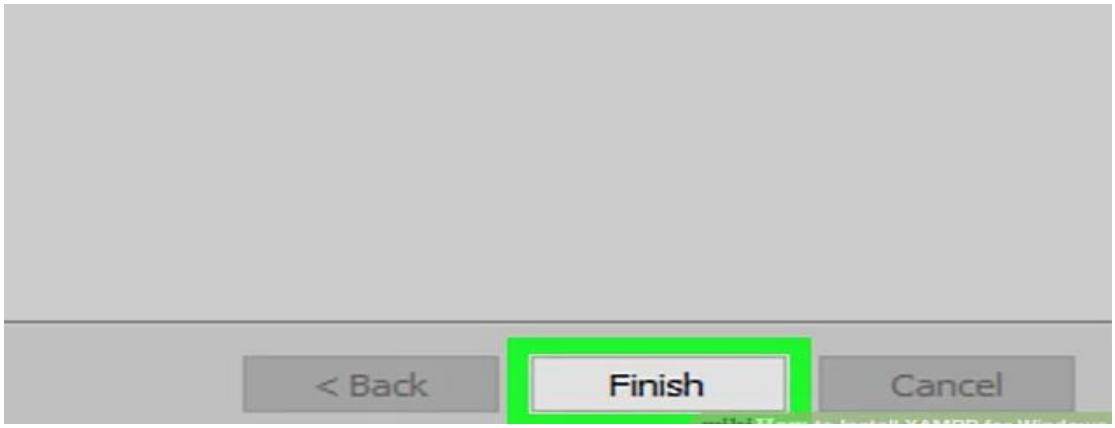


Figure 5.1.11 Screenshot of the XAMPP installation window with “Finish” button.

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.

Figure 5.1.12 Screenshot for select language in XAMPP.

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.

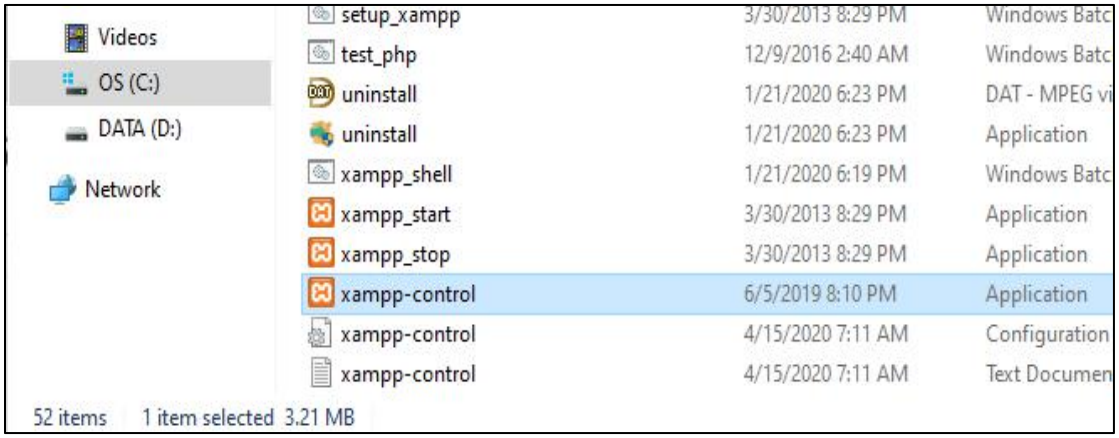


Figure 5.1.13 Screenshot of xampp-control

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

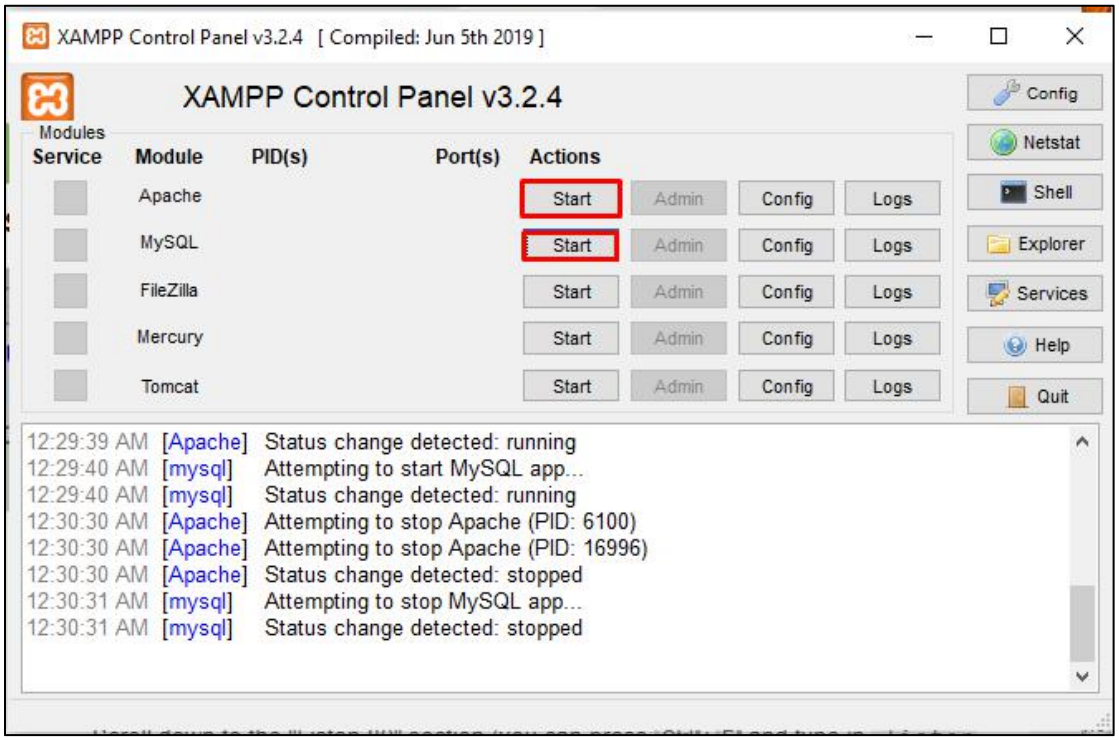


Figure 5.1.4 Screenshot of main XAMPP Control Panel Page.

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.

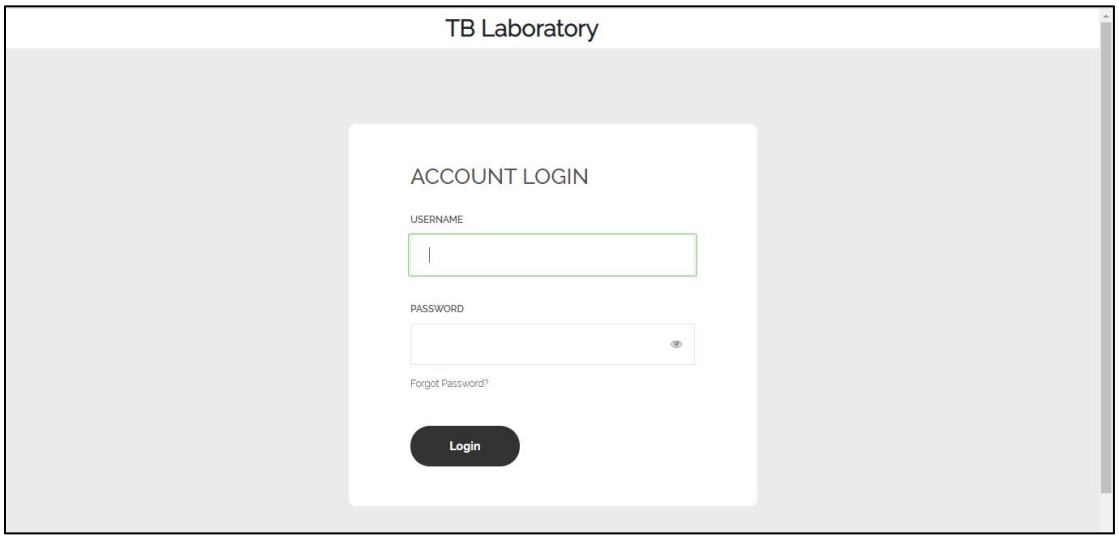


Figure 5.2.1 Login page of TB Laboratory

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.

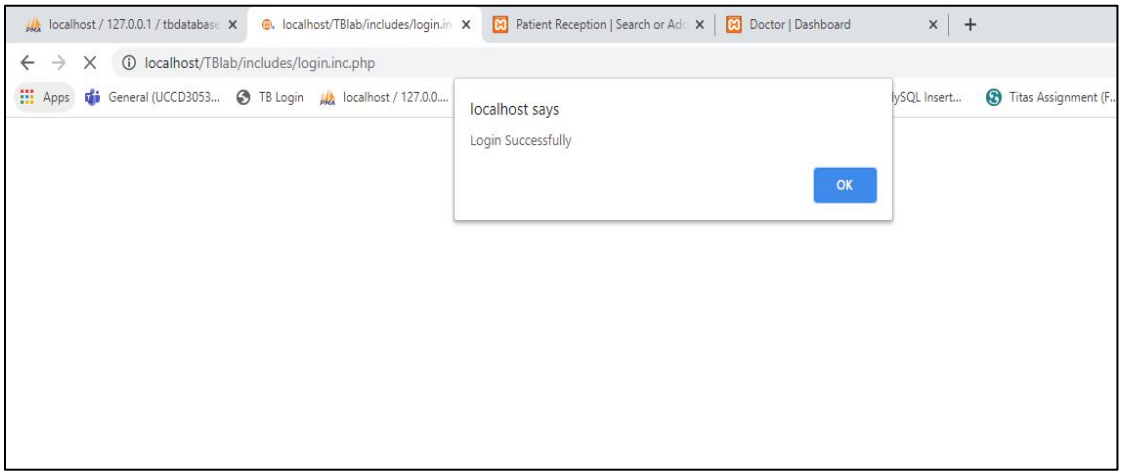


Figure 5.2.2 System prompt a message "Login Successfully"

5.3 Administrator Module

After system administrator login into the system, the first interface is the dashboard interface as shown in the figure5.3.1 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.

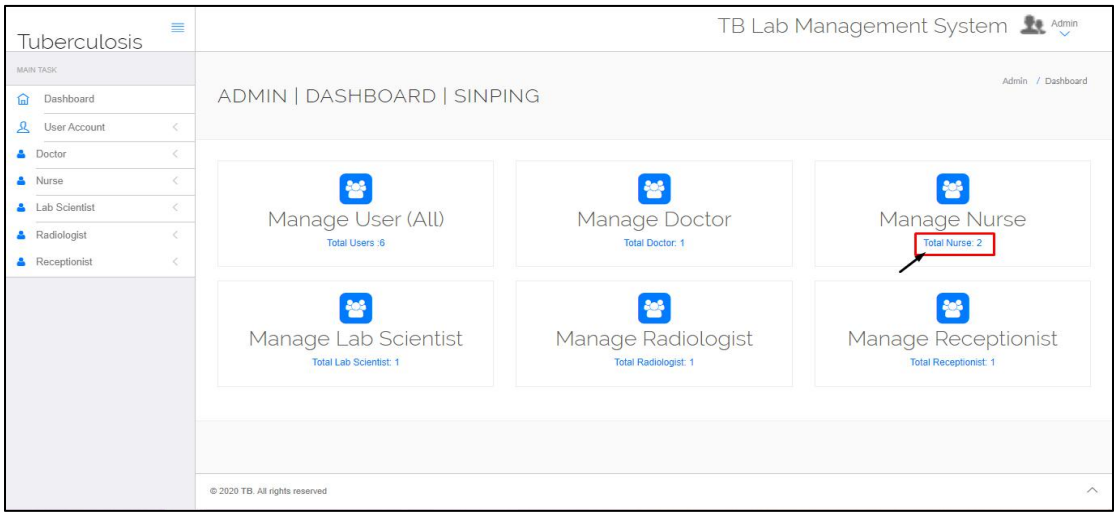


Figure 5.3.1 Dashboard of Administrator

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.

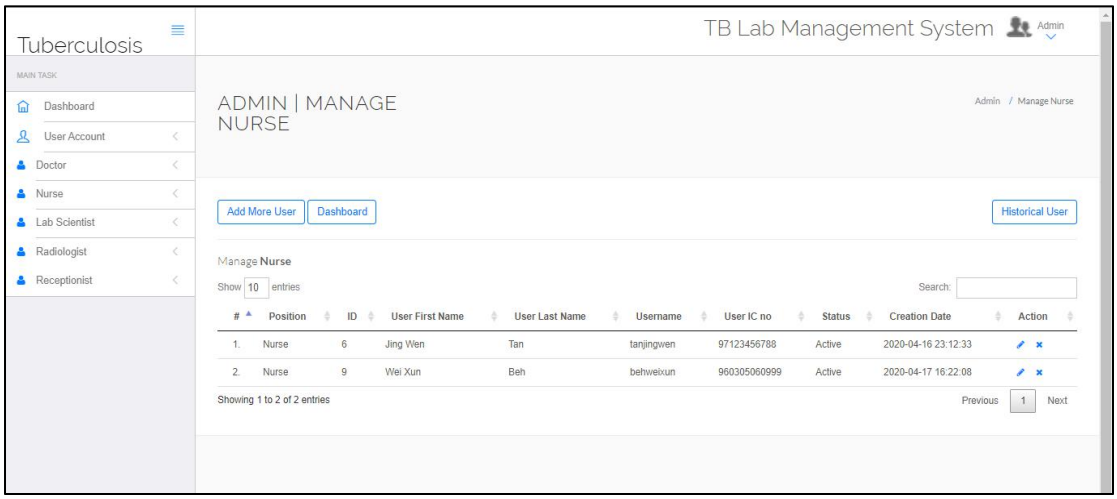


Figure 5.3.2 Screenshot for Manage Nurse

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.

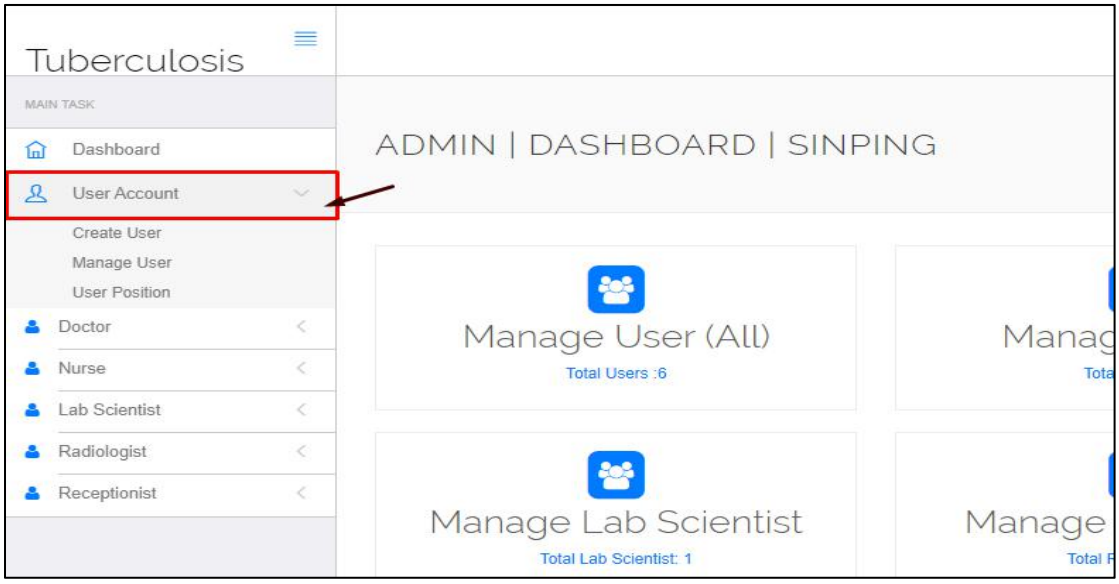


Figure 5.3.3 User Account's drop-down list.

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".

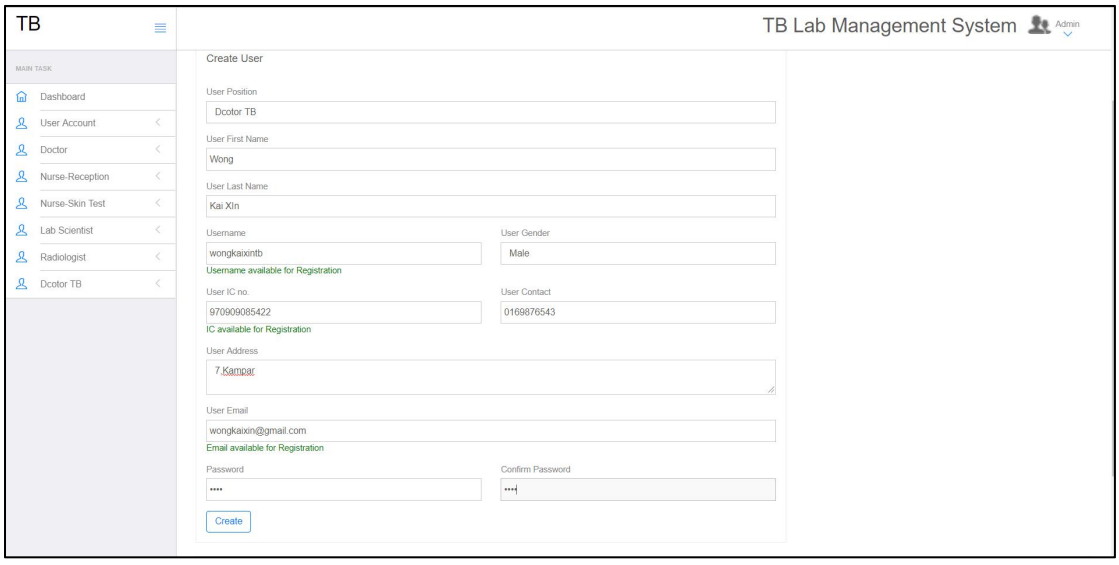


Figure 5.3.4 Create User Interface

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.

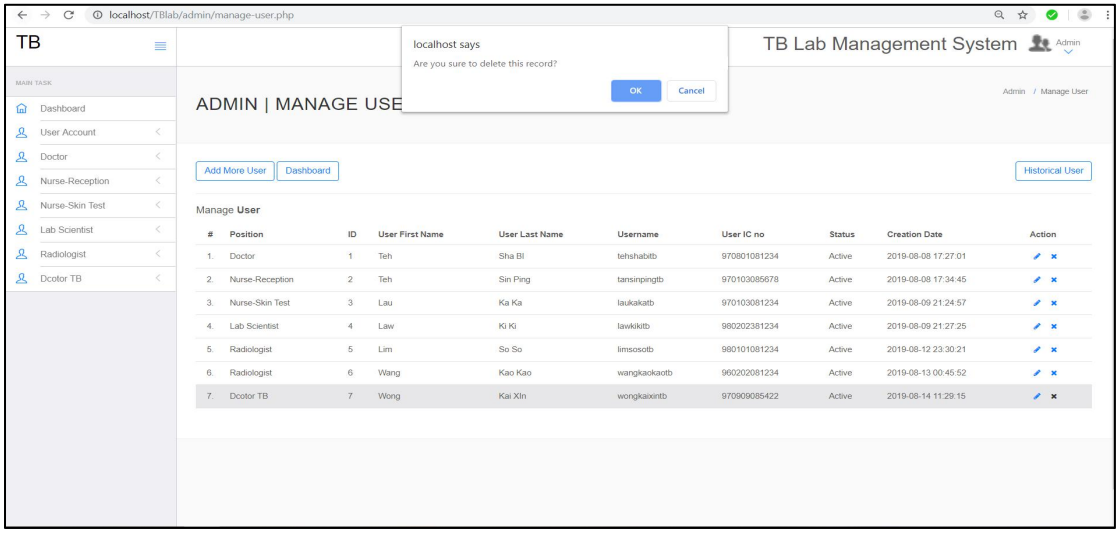


Figure 5.3.5 Manage user account interface

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.

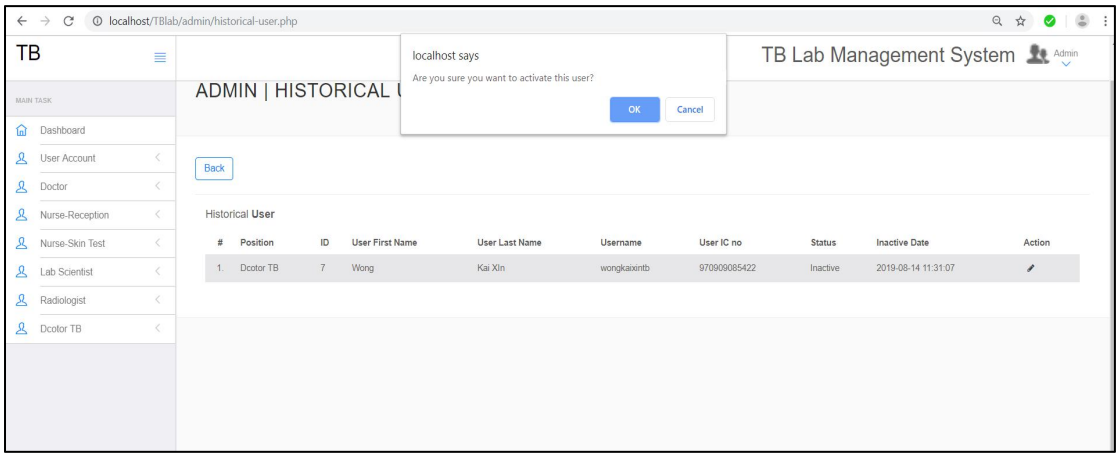


Figure 5.3.6 Historical user interface

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.

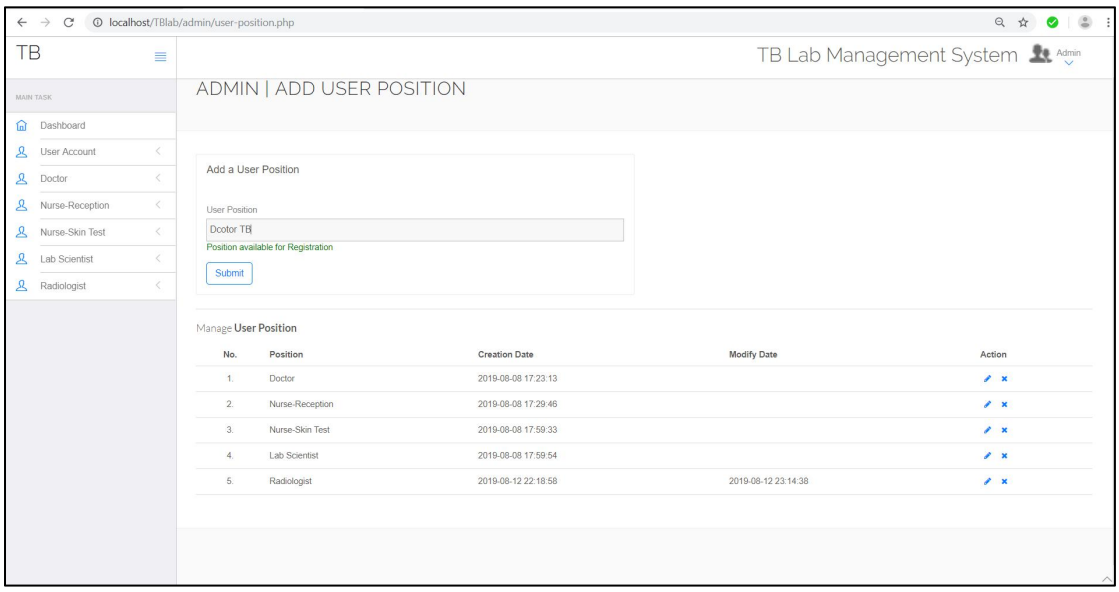


Figure 5.3.7 Add User Position

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.

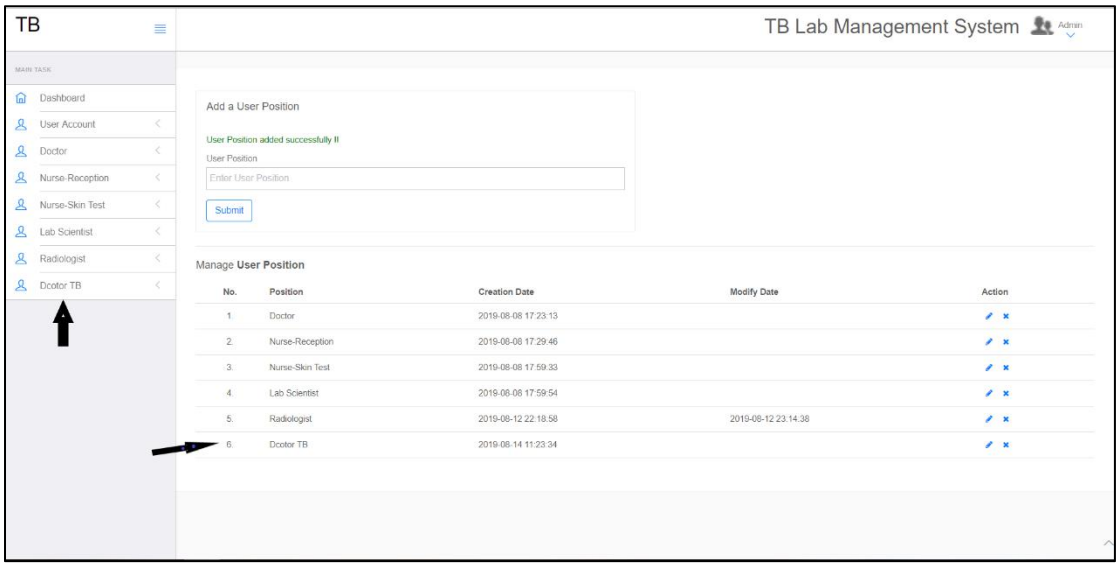


Figure 5.3.8 Add User Position Interface (Cont.)

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.

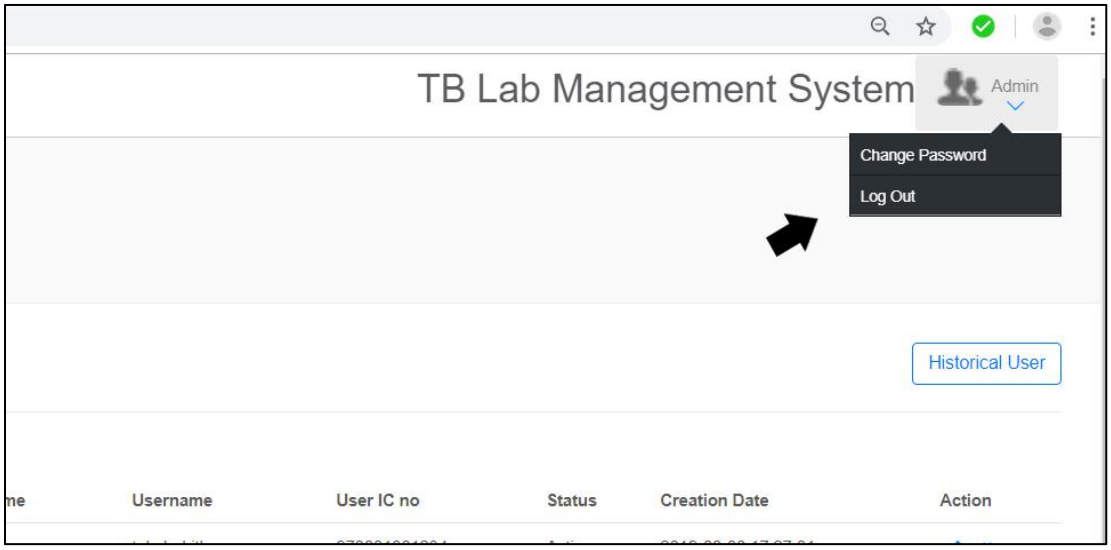


Figure 5.3.9 Drop down list with "Change Password" and "Log Out"

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.

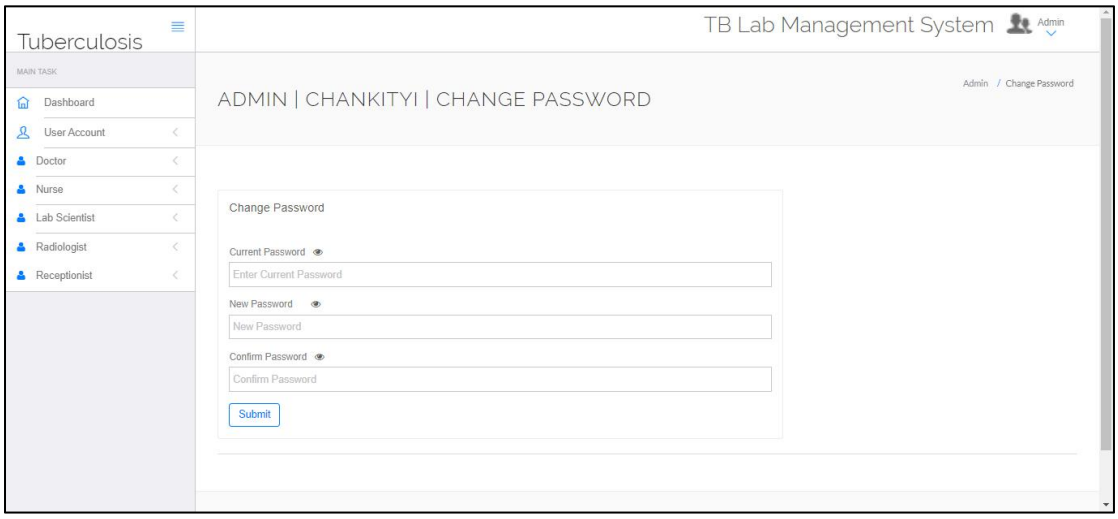


Figure 5.3.10 Change Password interface

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.

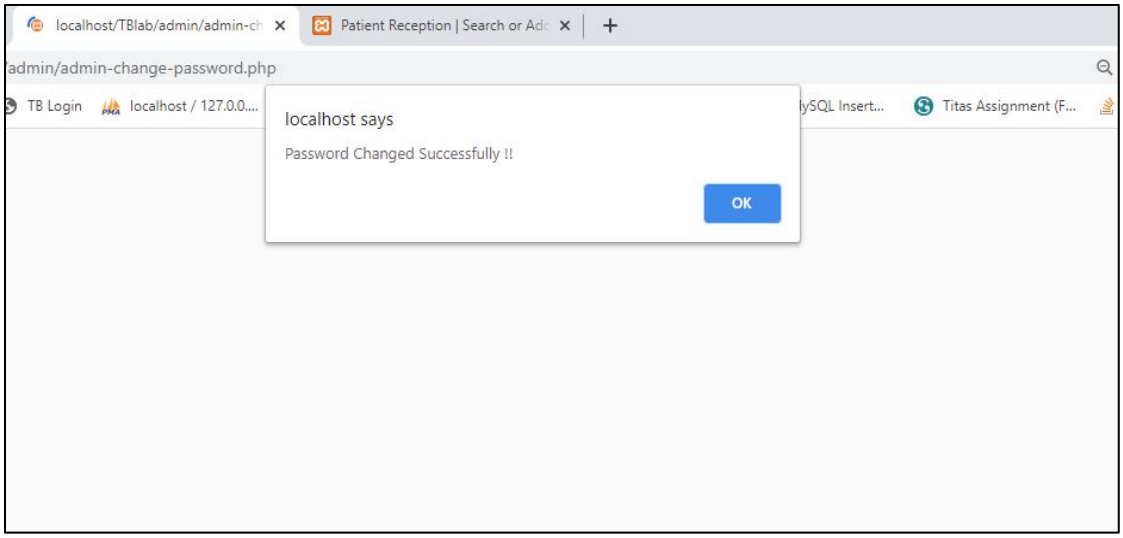


Figure 5.3.11 System prompt a message “Password Changed Successfully”

5.4 Receptionist Module

After receptionist login into the system, the first interface is the Search or Add interface as shown in the figure5.4.1 below. In the Receptionist module, Receptionist able to search patient, create a new patient account and manage patient account.

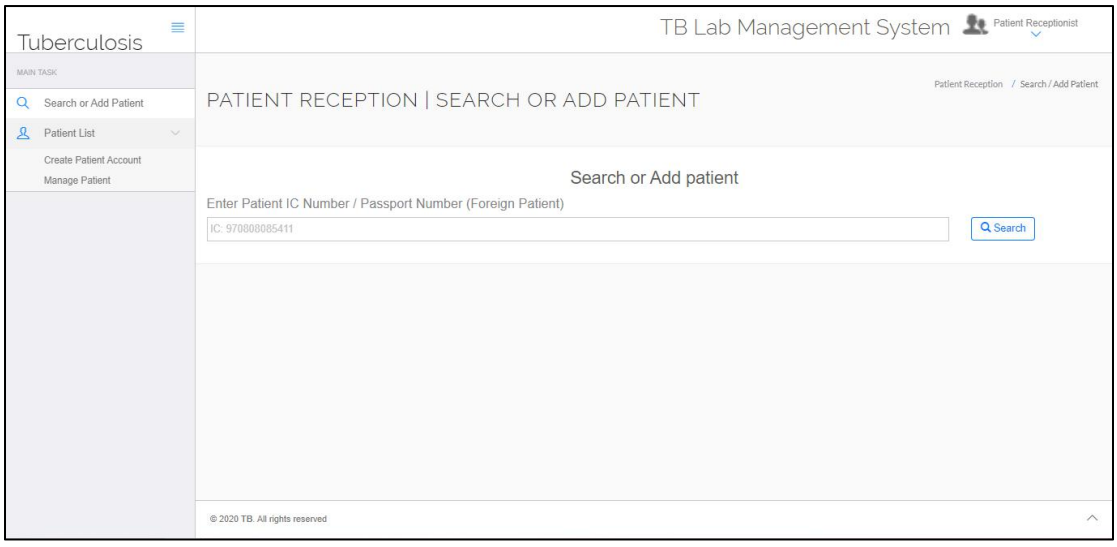


Figure 5.4.1 Search or add patient interface in Receptionist module

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.

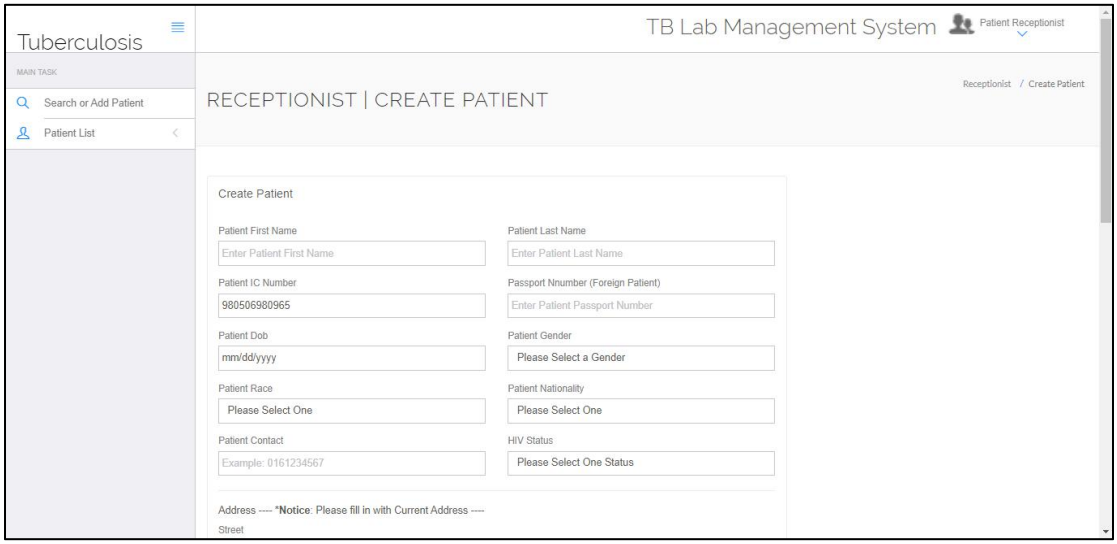


Figure 5.4.2 Create patient interface

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.

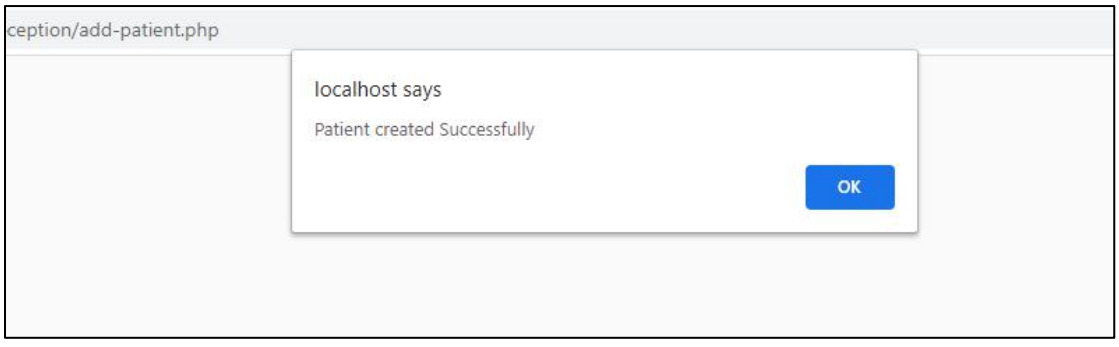


Figure 5.4.3 A pop-up message display “Patient created successfully”

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.

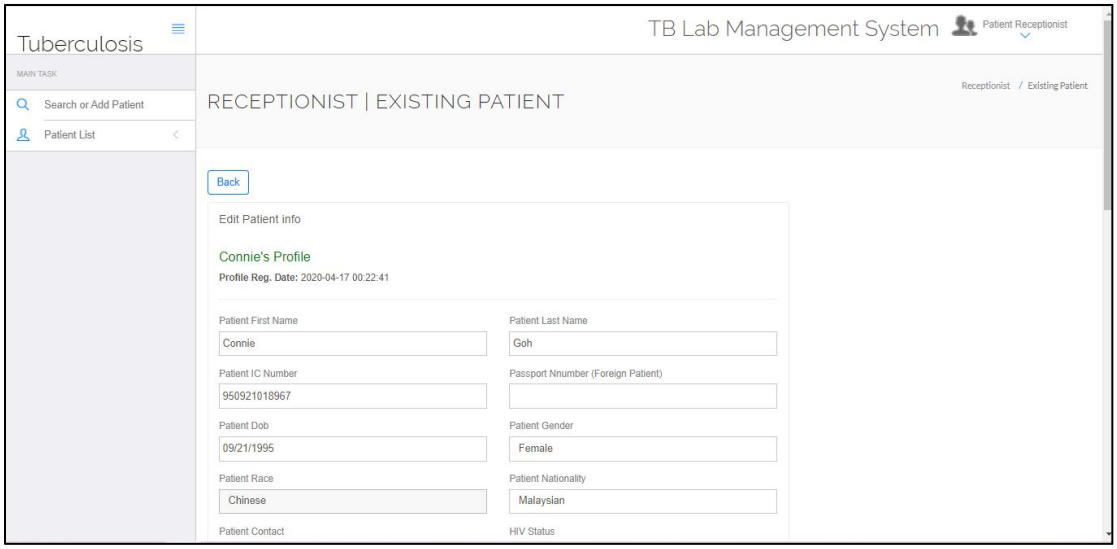


Figure 5.4.4 Existing patient's profile interface

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.

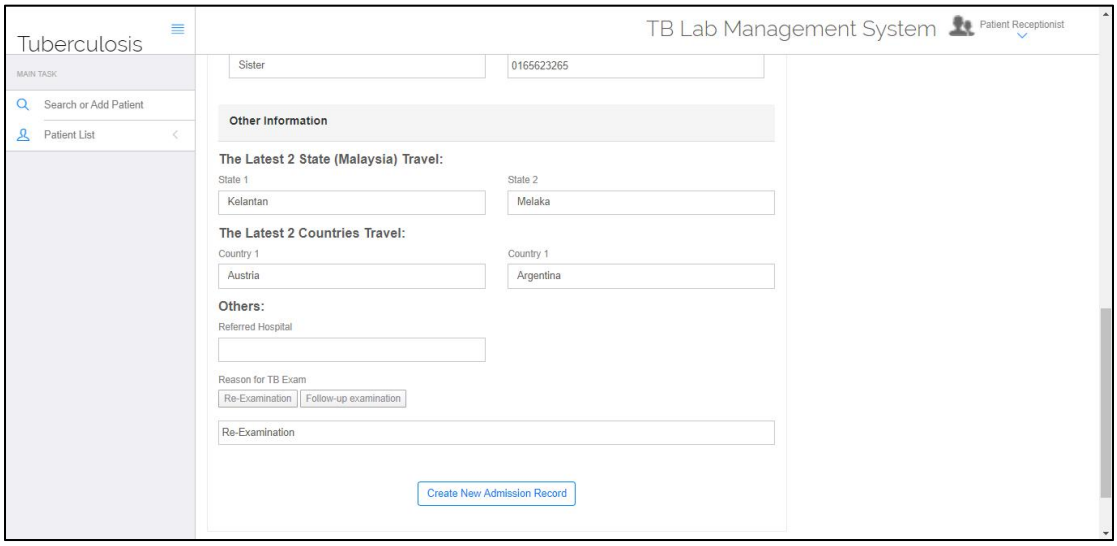


Figure 5.4.5 Existing patient's profile interface cont.

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.

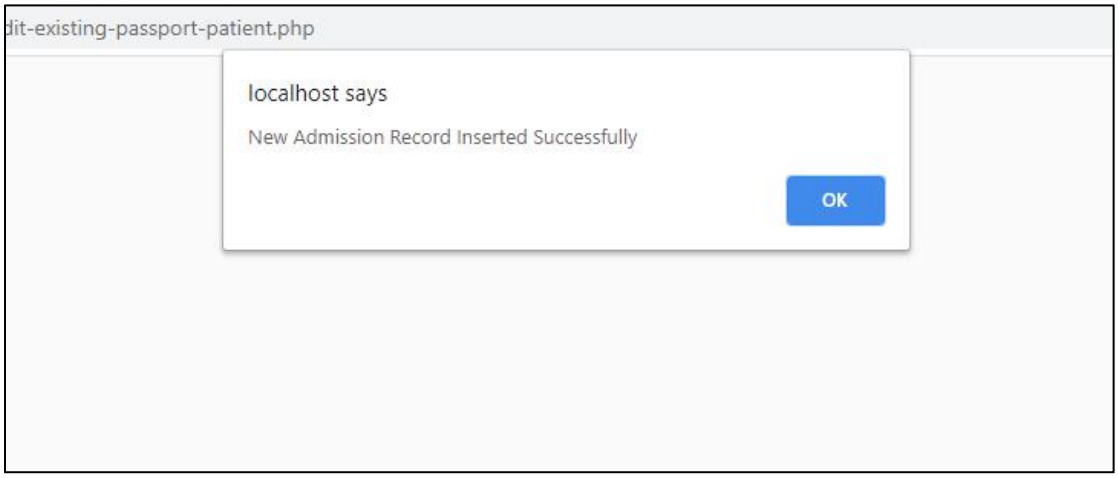


Figure 5.4.6 A pop-up message display "New Admission Record Inserted Successfully"

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.

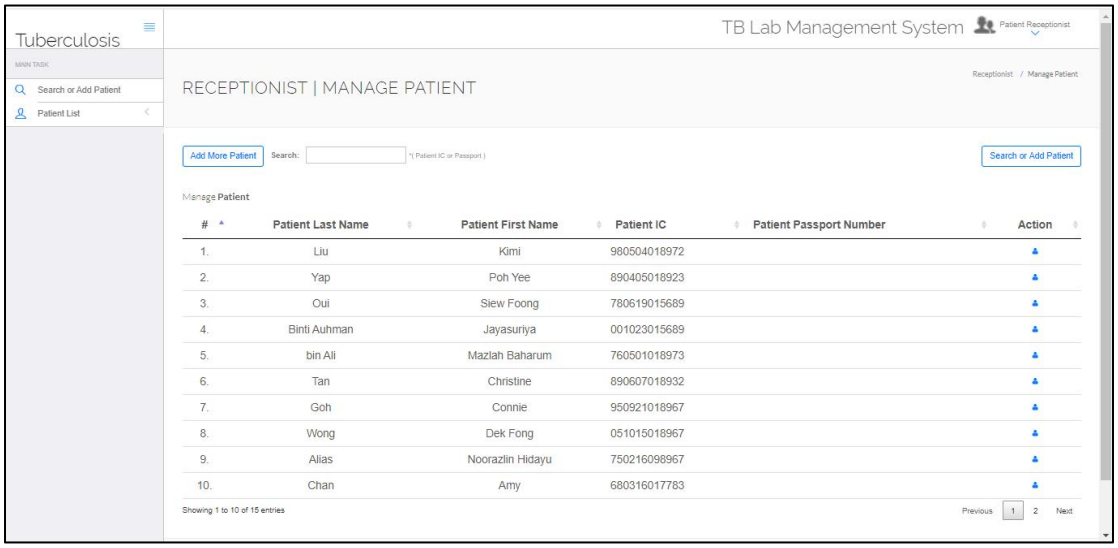


Figure 5.4.7 Manage patient interface

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.

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 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.

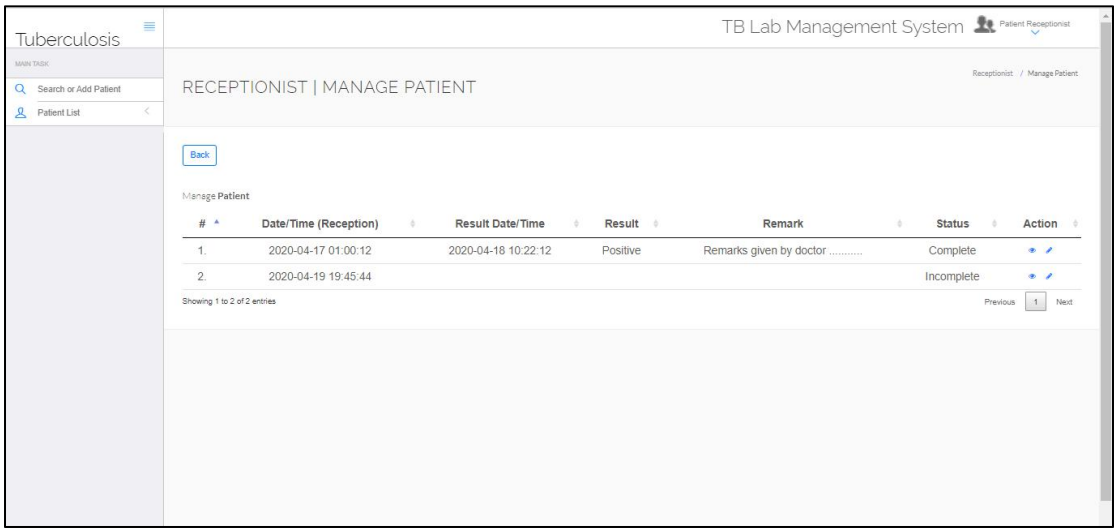


Figure 5.4.9 Selected patient's admission records interface

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

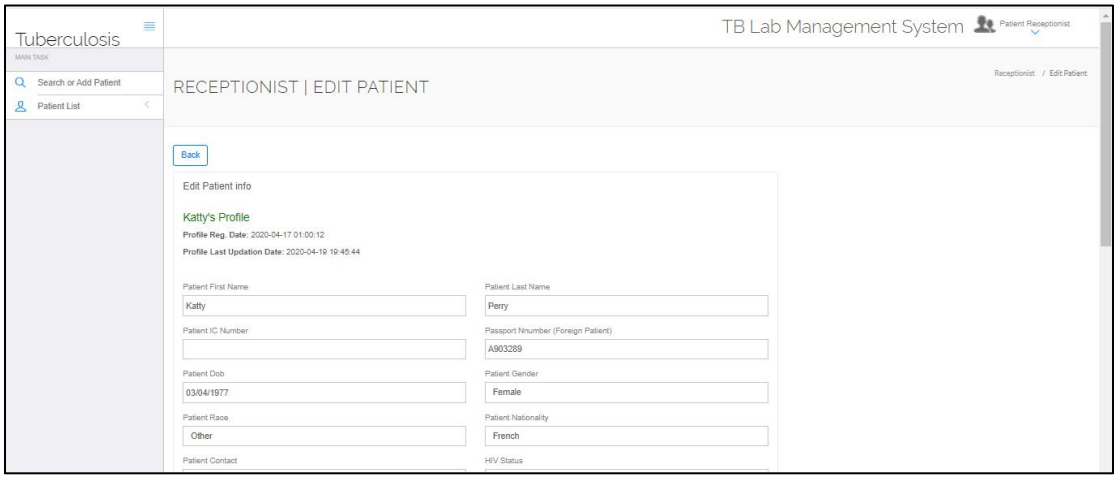


Figure 5.4.10 Edit Patient interface

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.

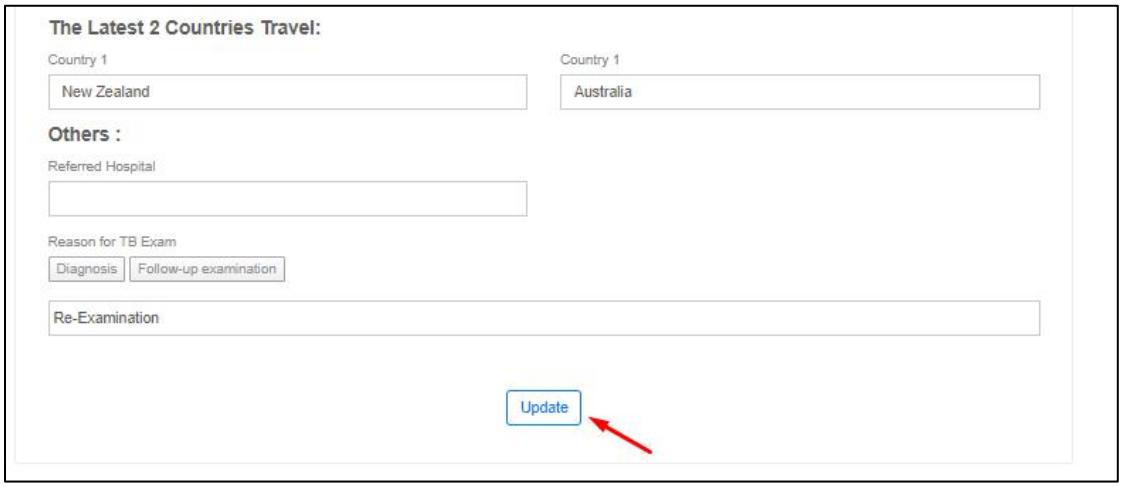


Figure 5.4.11 Edit Patient interface cont.

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.

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

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.

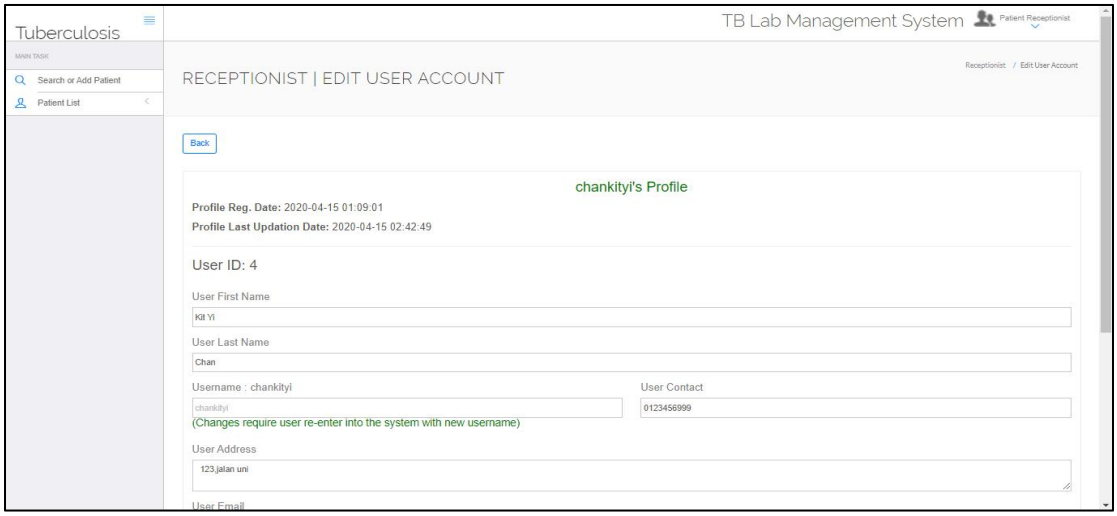


Figure 5.4.13 Edit user account interface.

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.

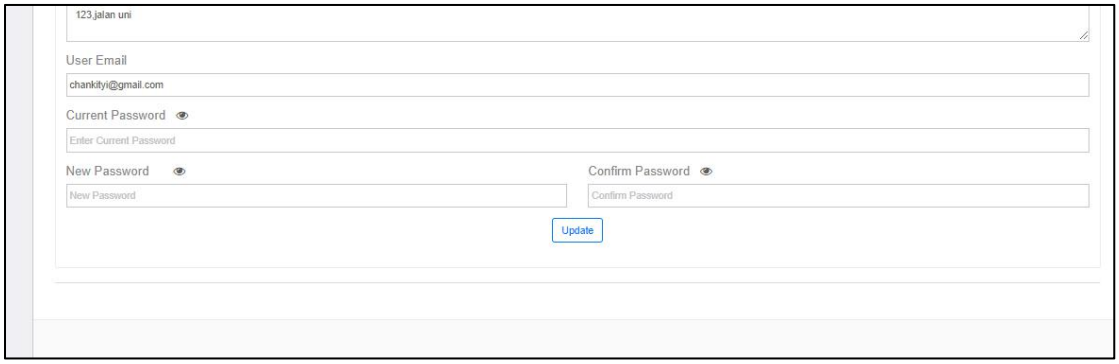


Figure 5.4.14 Edit user account interface cont.

5.5 Skin/Blood Test Module

After nurse login into the system, the first interface is the dashboard interface as shown in the figure5.5.1 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.

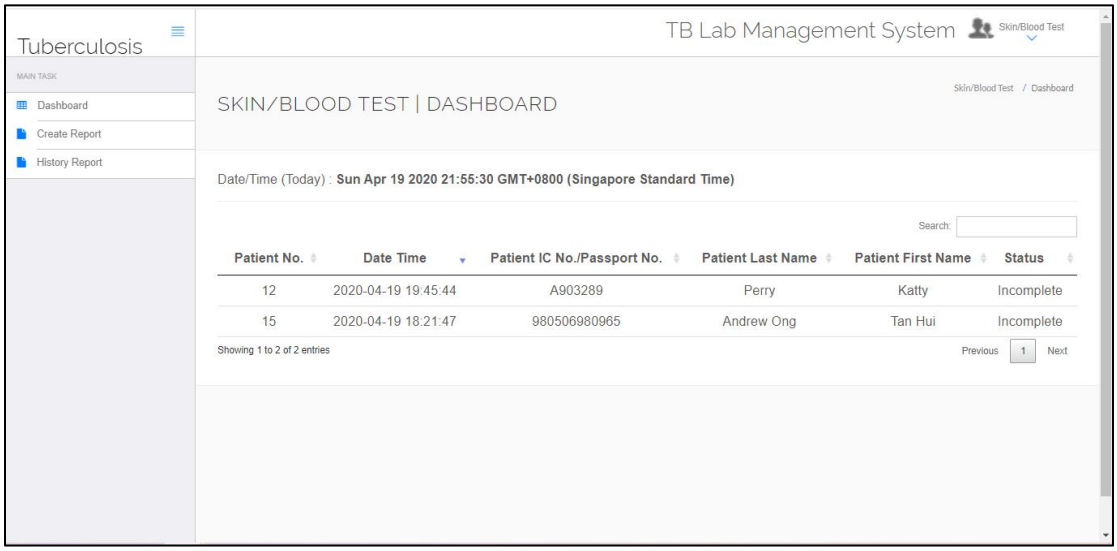


Figure 5.5.1 Dashboard of skin/blood test

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.

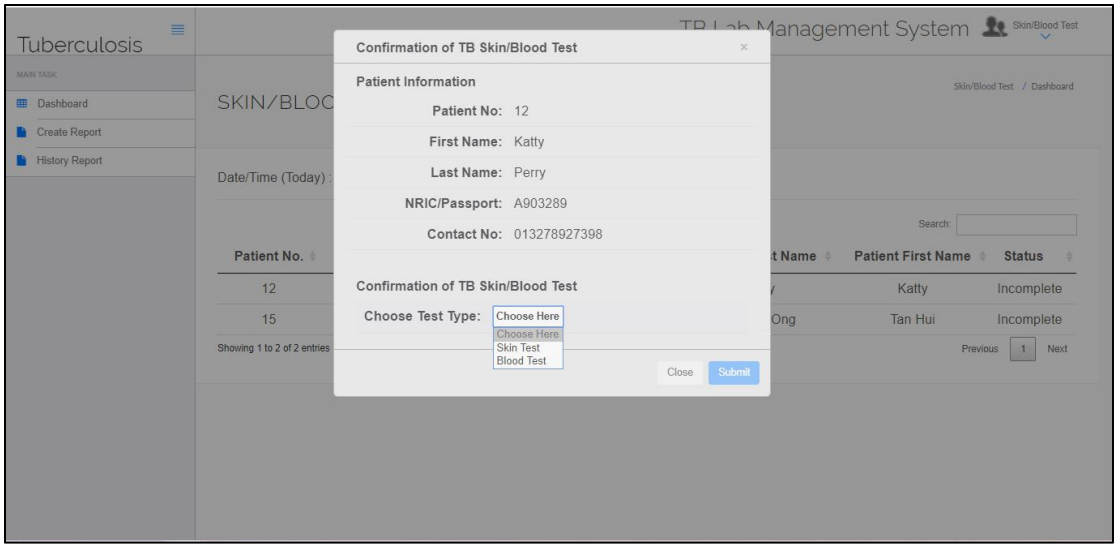


Figure 5.5.2 Confirmation of TB Skin/Blood Test interface

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.

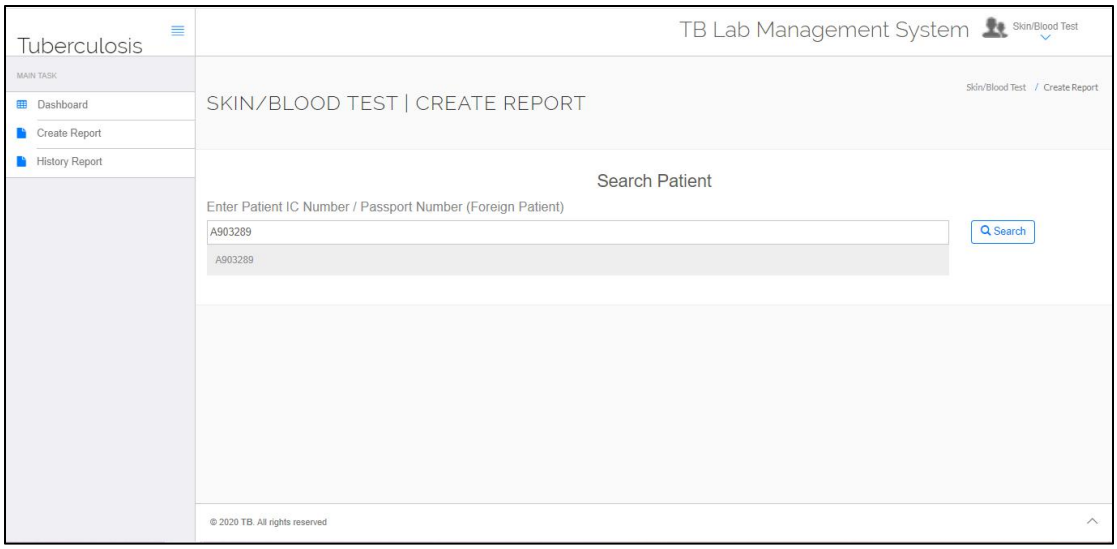


Figure 5.5.3 Search patient interface in skin/blood test module

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.

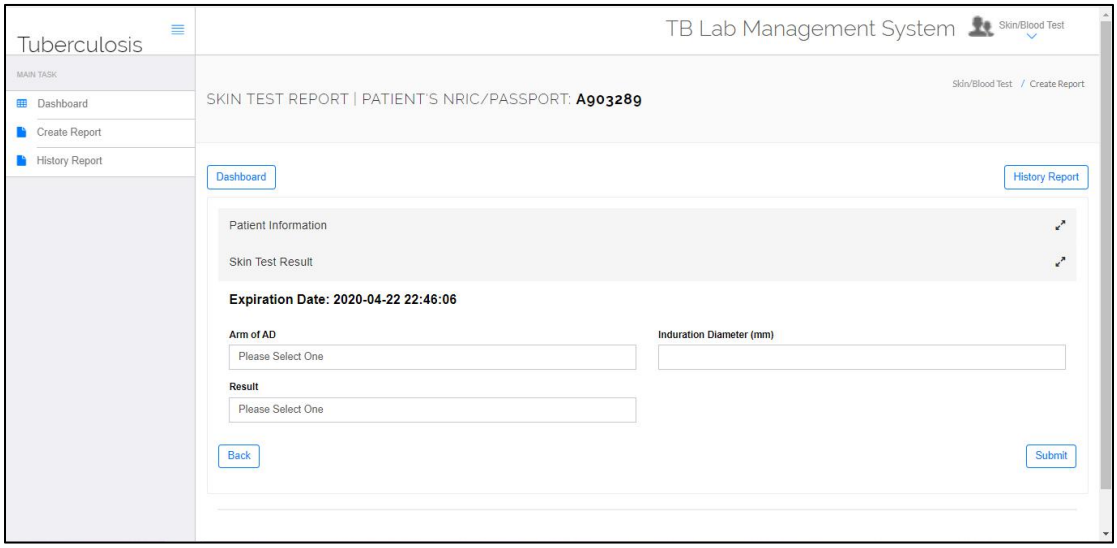


Figure 5.5.4 Create TB skin test report interface

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.

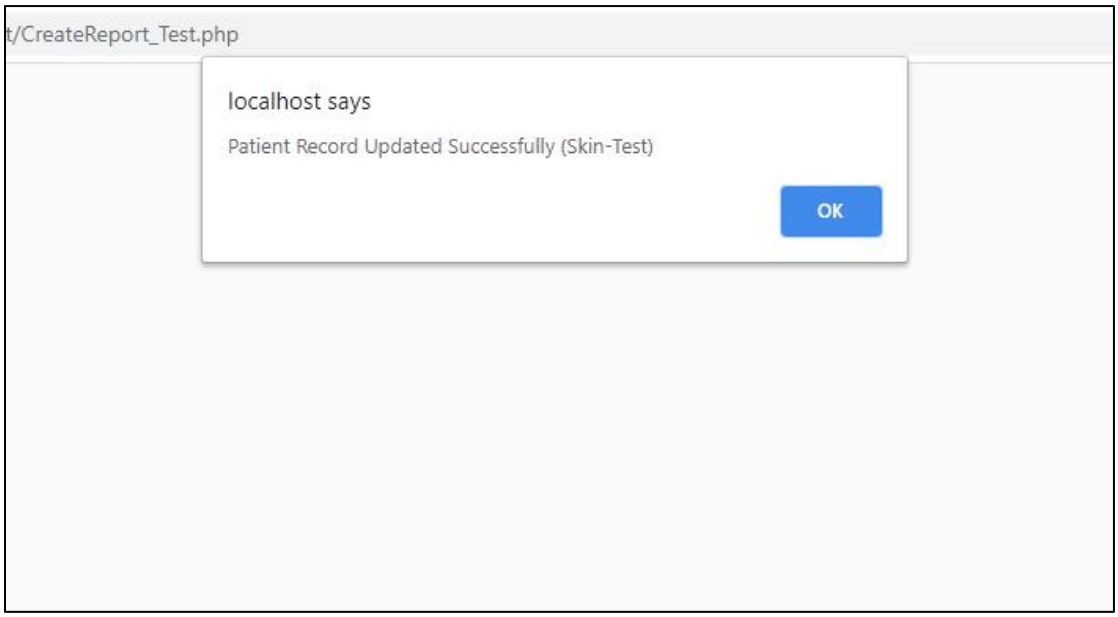


Figure 5.5.5 Create TB skin test report interface cont.

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.

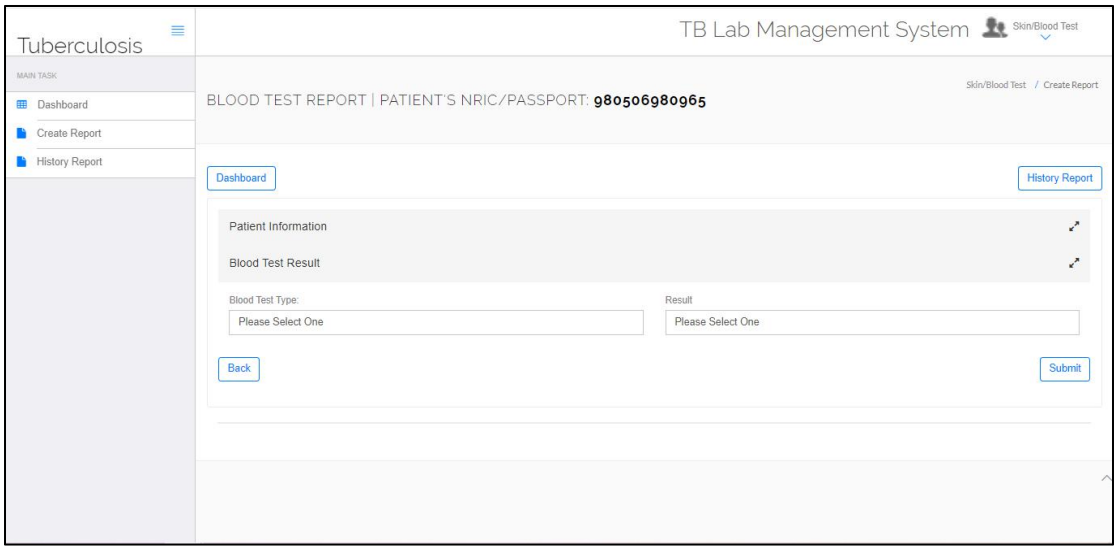


Figure 5.5.7 Create TB blood test report interface

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.

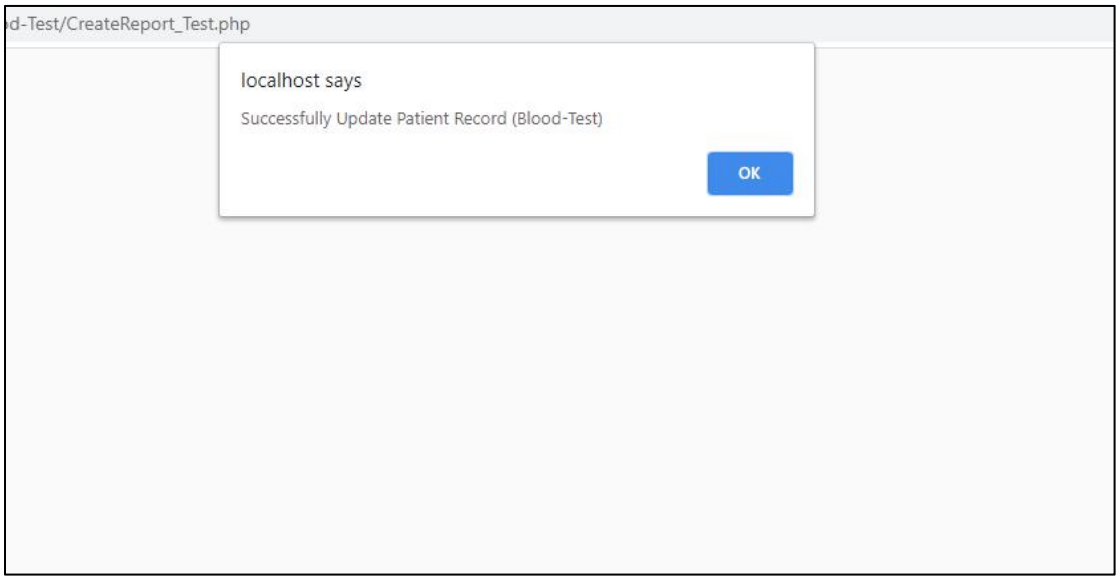


Figure 5.5.8 Create TB blood test report interface cont.

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.

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.

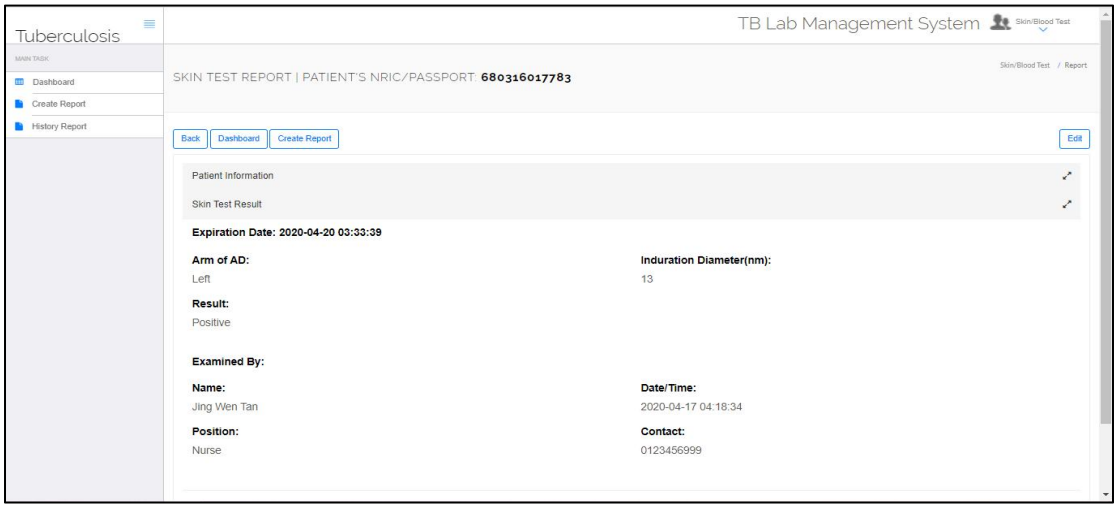


Figure 5.5.10 History report of TB skin/blood test interface cont.

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.

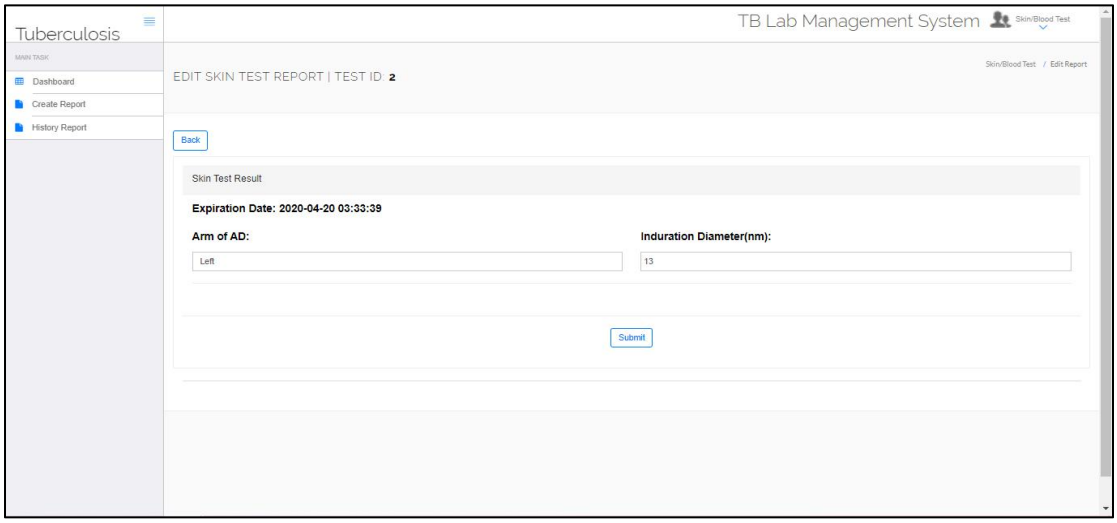


Figure 5.5.11 Edit skin test report interface

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".

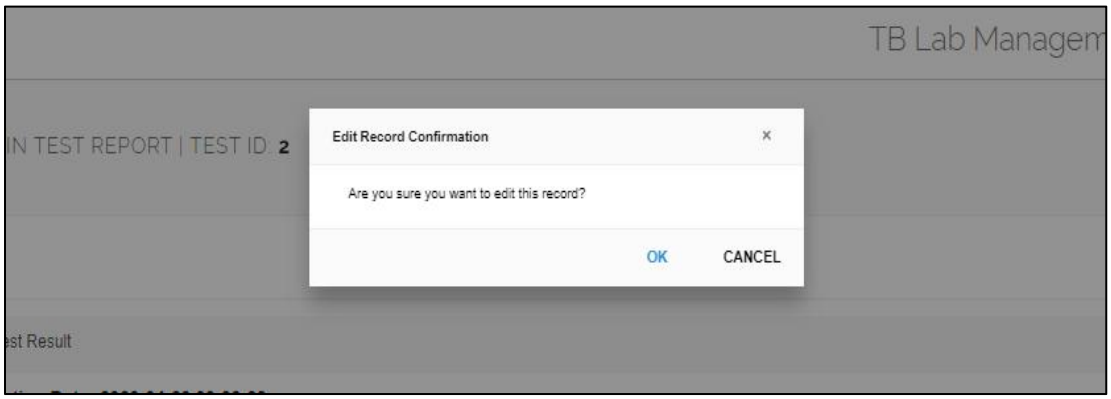


Figure 5.5.12 Pop up window to confirm the edit skin test action

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.

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.

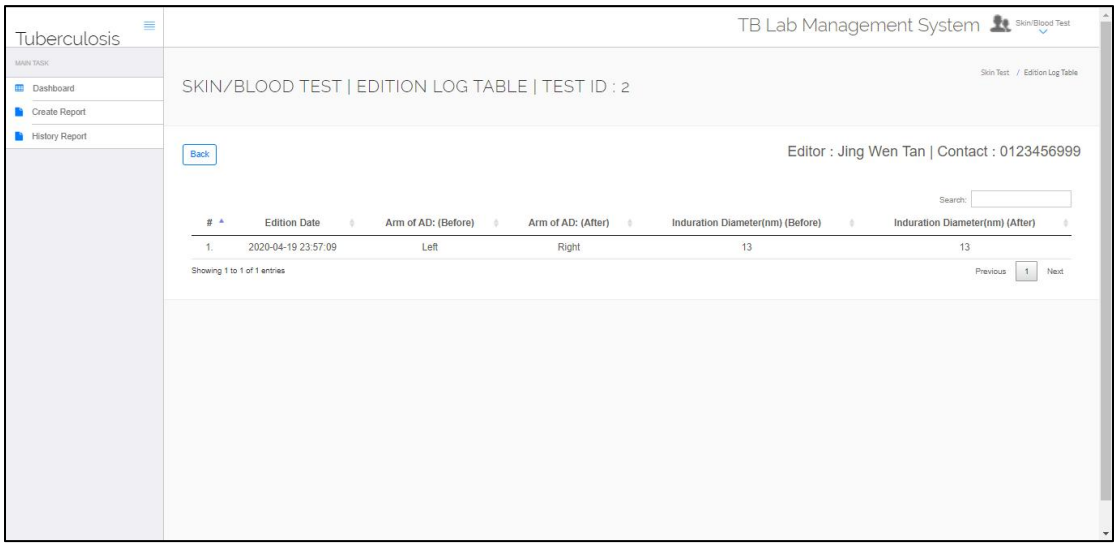


Figure 5.5.14 Edition log table in TB skin test

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.

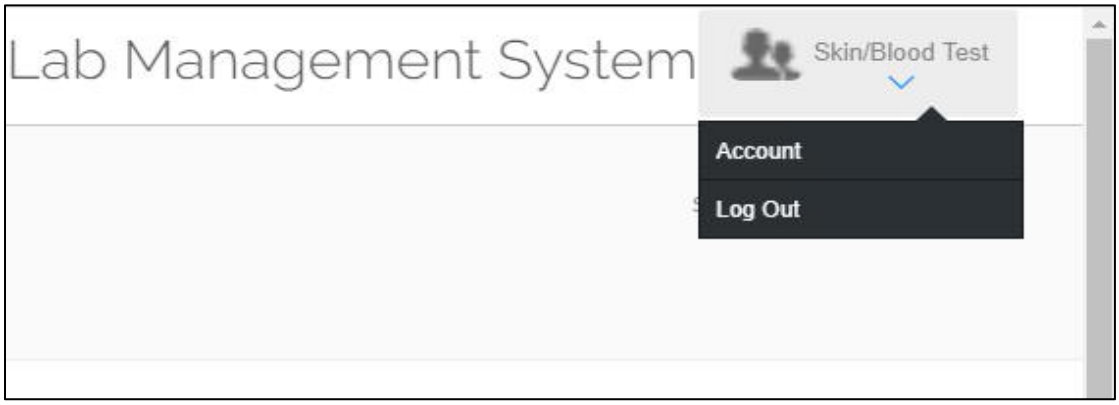


Figure 5.5.14 Drop down list on the top right of skin/blood test

5.6 Chest X-Ray Test Module

After radiologist login into the system, the first interface is the dashboard interface as shown in the figure5.6.1 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.

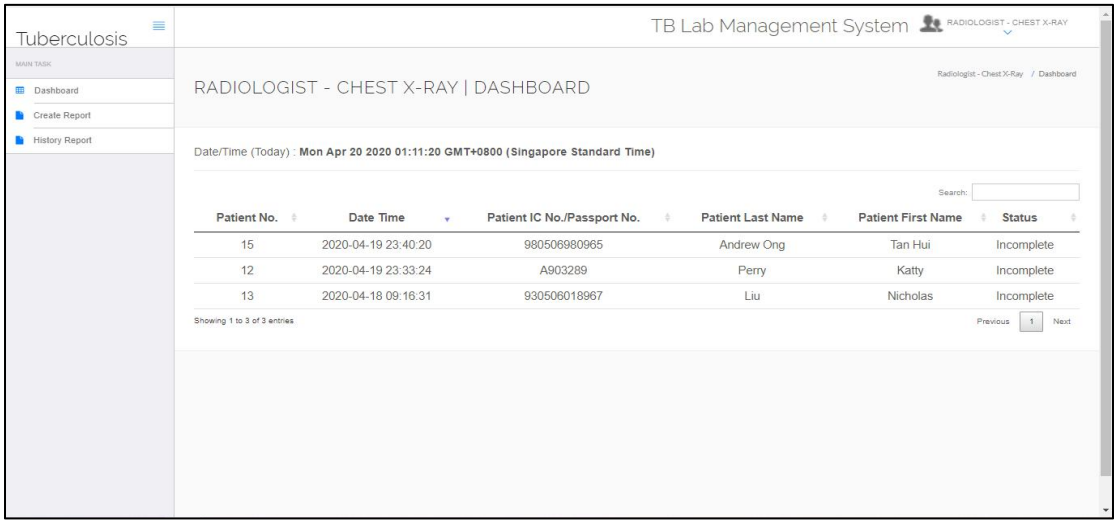


Figure 5.6.1 Dashboard of Chest X-Ray test

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. 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 can find it in the history report.

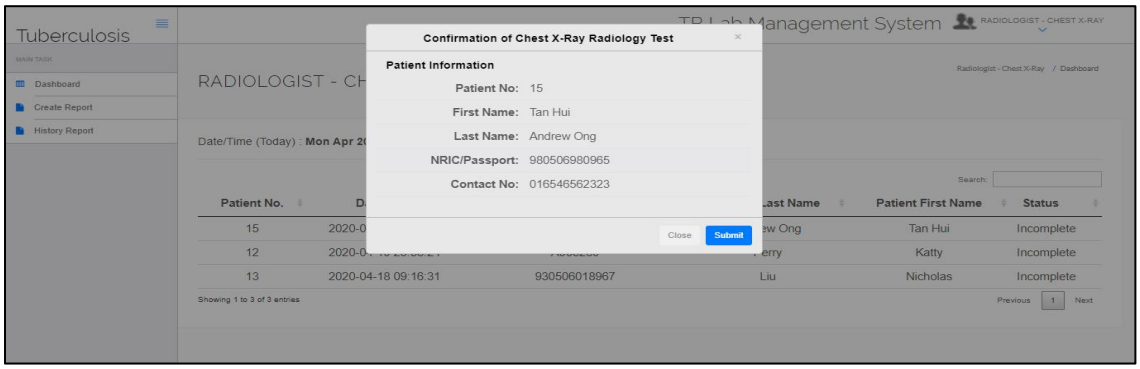


Figure 5.6.2 Confirmation of Chest X-Ray Test interface

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.

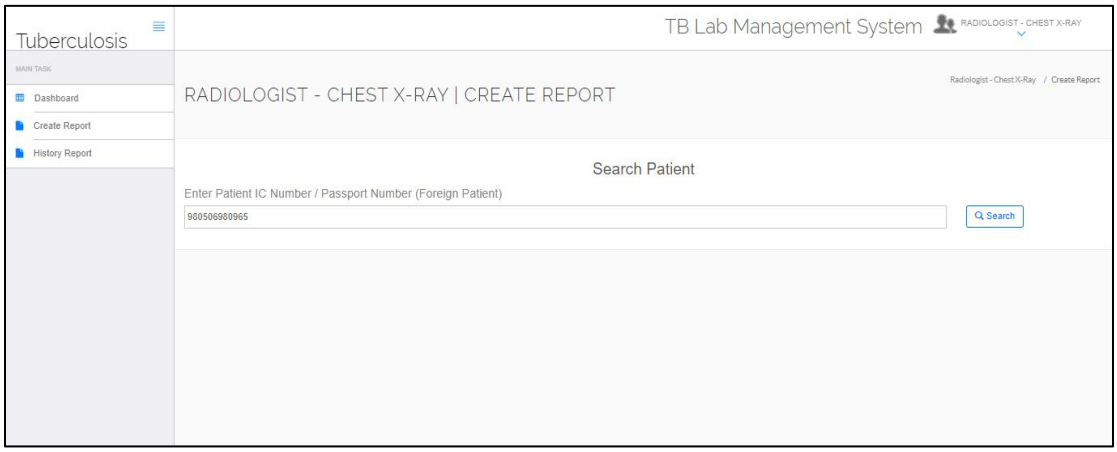


Figure 5.6.3 Search patient interface in chest x-ray test module

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.

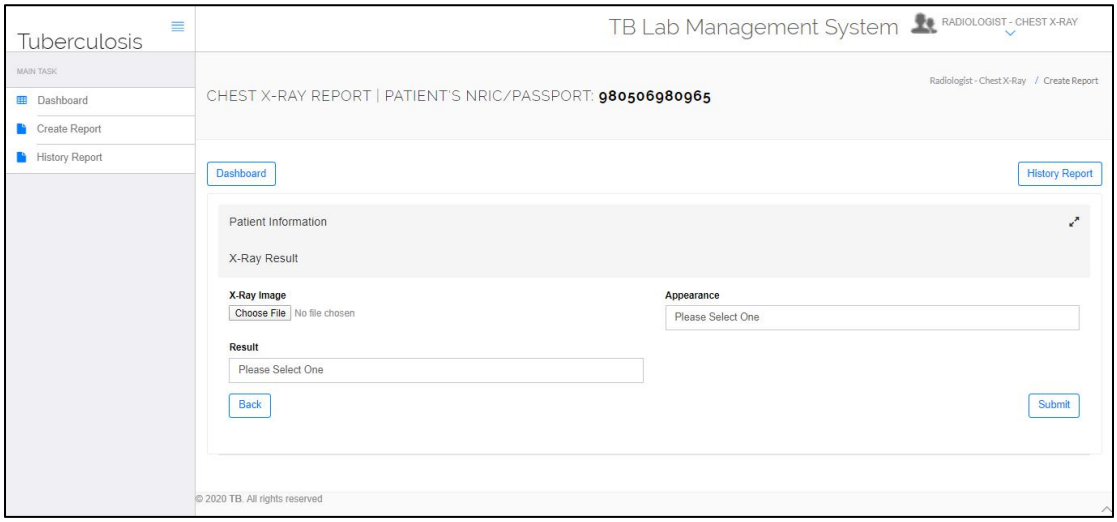


Figure 5.6.4 Create chest x-ray report interface

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.

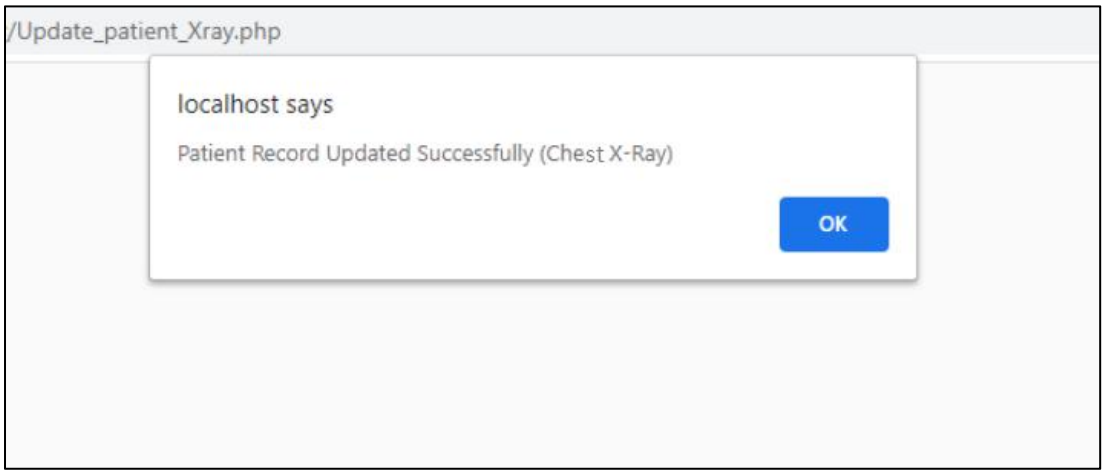


Figure 5.6.5 Create chest x-ray report interface cont.

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.

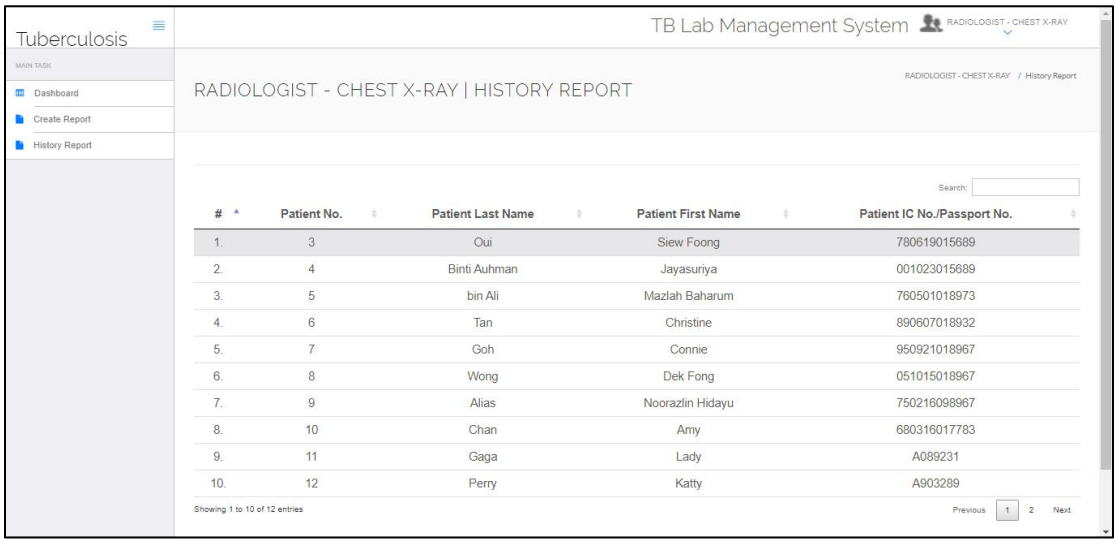


Figure 5.6.6 History report of chest x-ray screen

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.

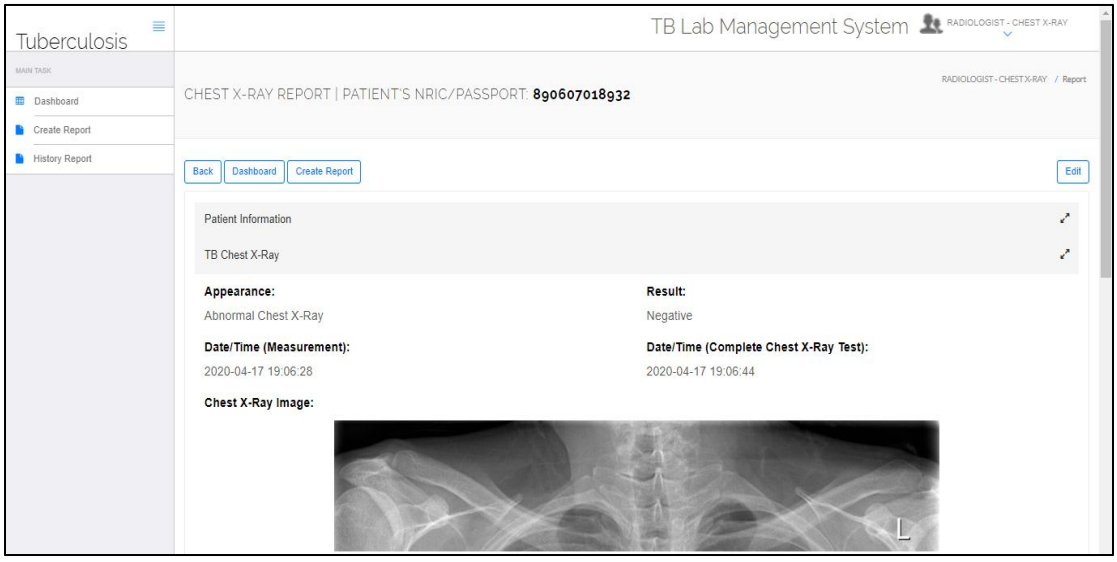


Figure 5.6.7 History report of chest x-ray screen cont.

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.

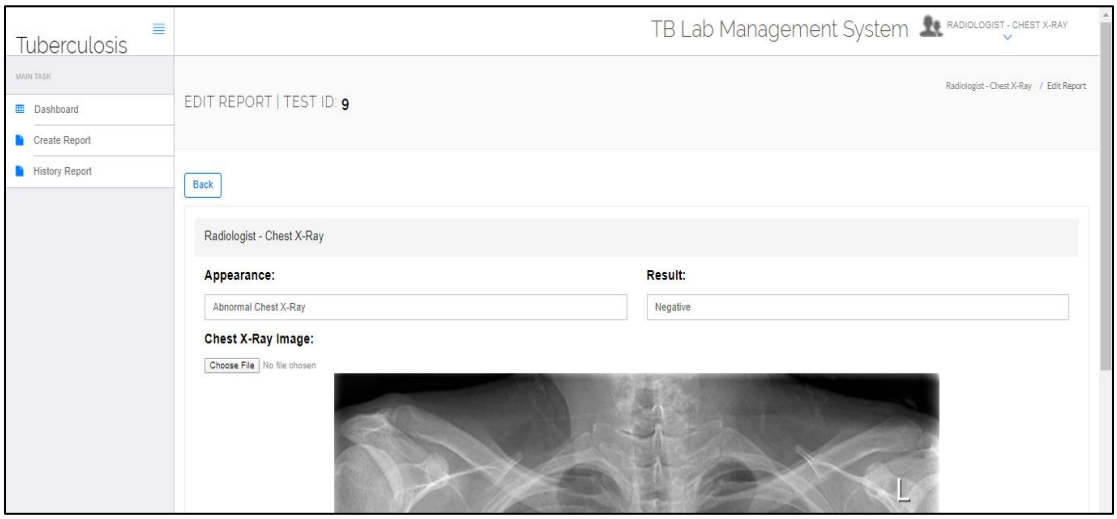


Figure 5.6.8 Edit chest x-ray report interface

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".

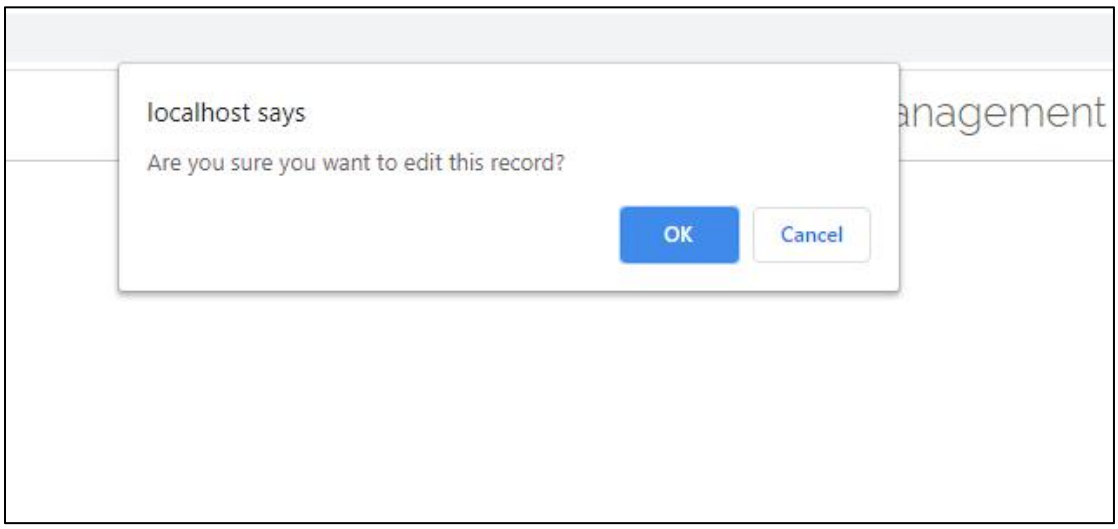


Figure 5.6.9 Edit chest x-ray report interface cont.

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.

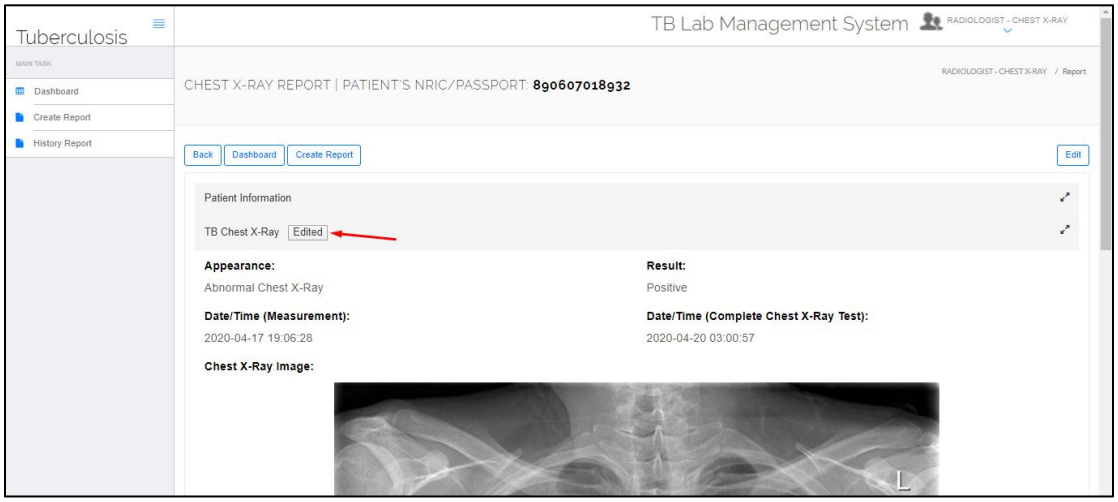


Figure 5.6.10 "Edited" button beside title "TB Chest X-Ray"

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.

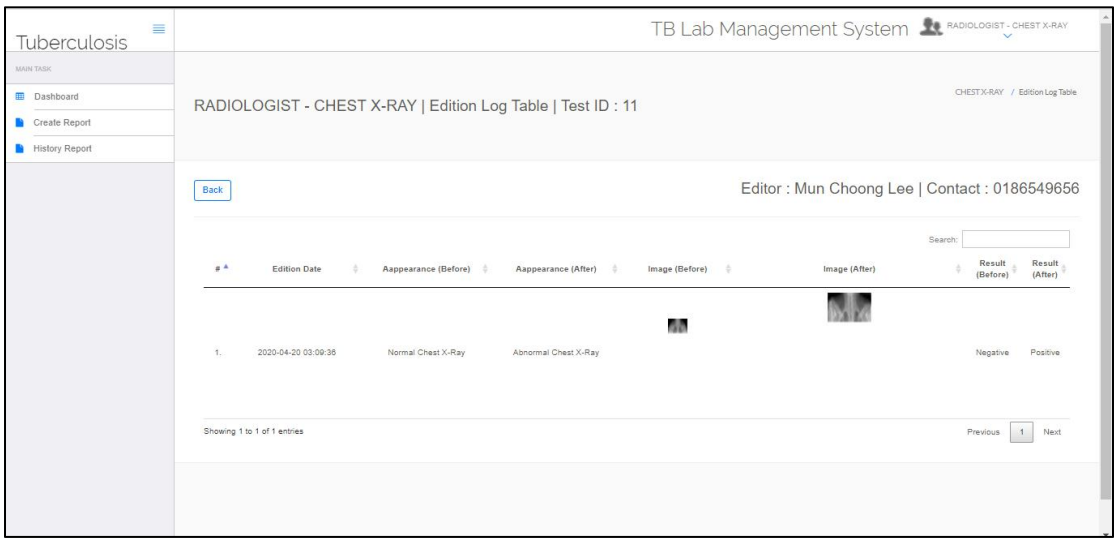


Figure 5.6.11 Edition log table of chest x-ray test

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 5.6.11 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 figure5.7.1.1 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.

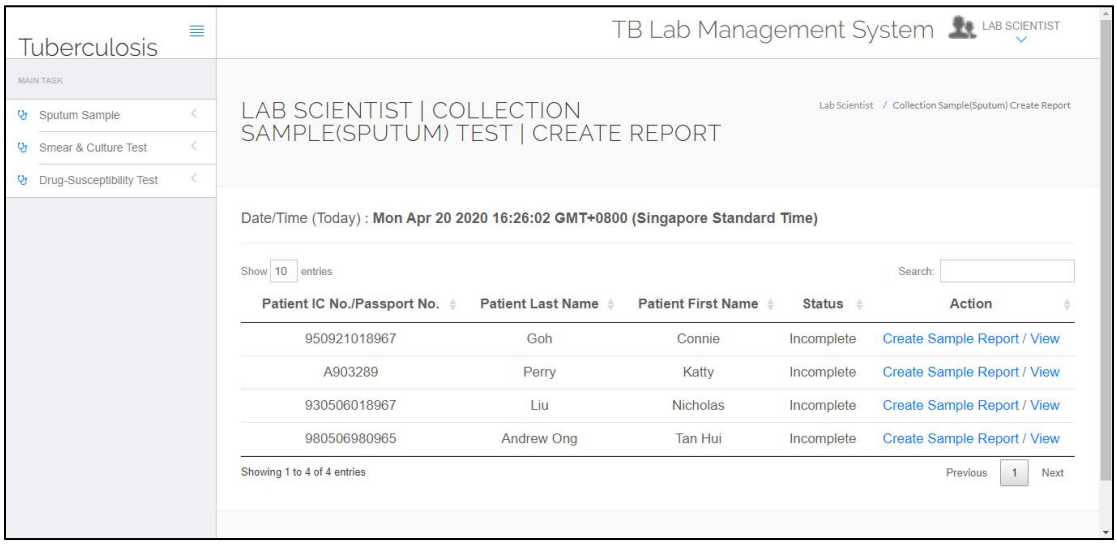


Figure 5.7.1.1 Dashboard of collection sputum sample interface

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.

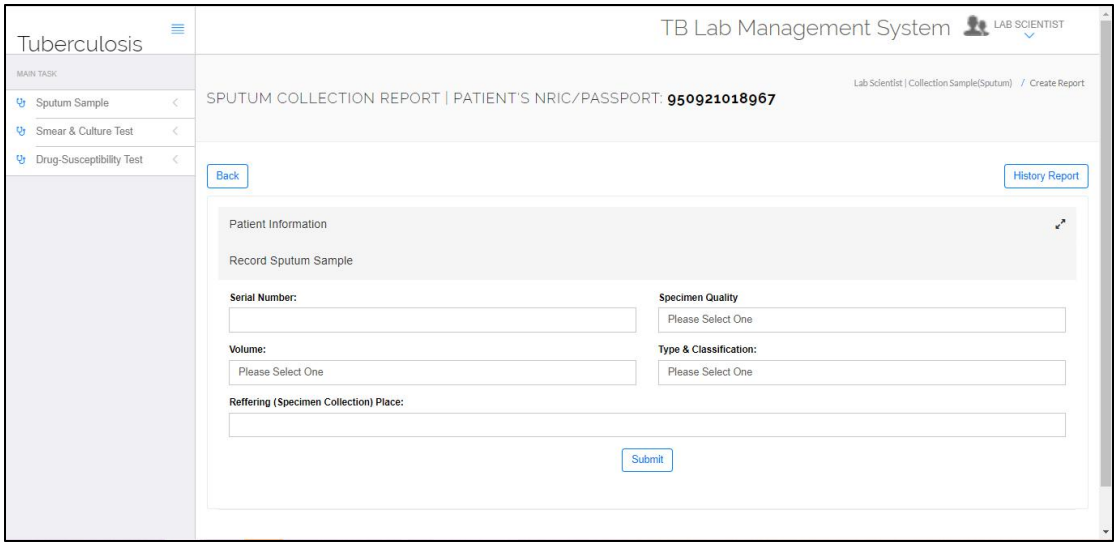


Figure 5.7.1.2 Create sputum sample report interface

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.

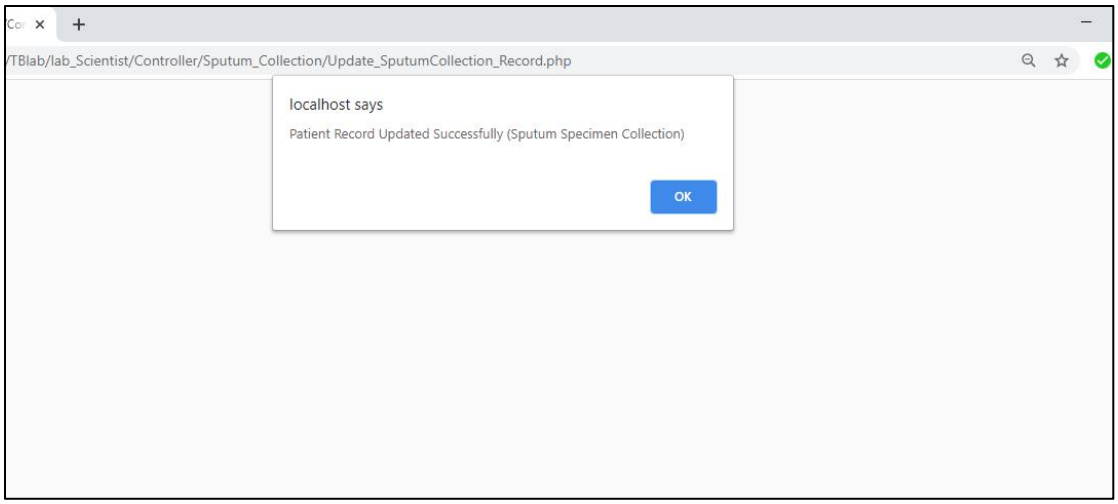


Figure 5.7.1.3 Create sputum sample report interface cont.

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.

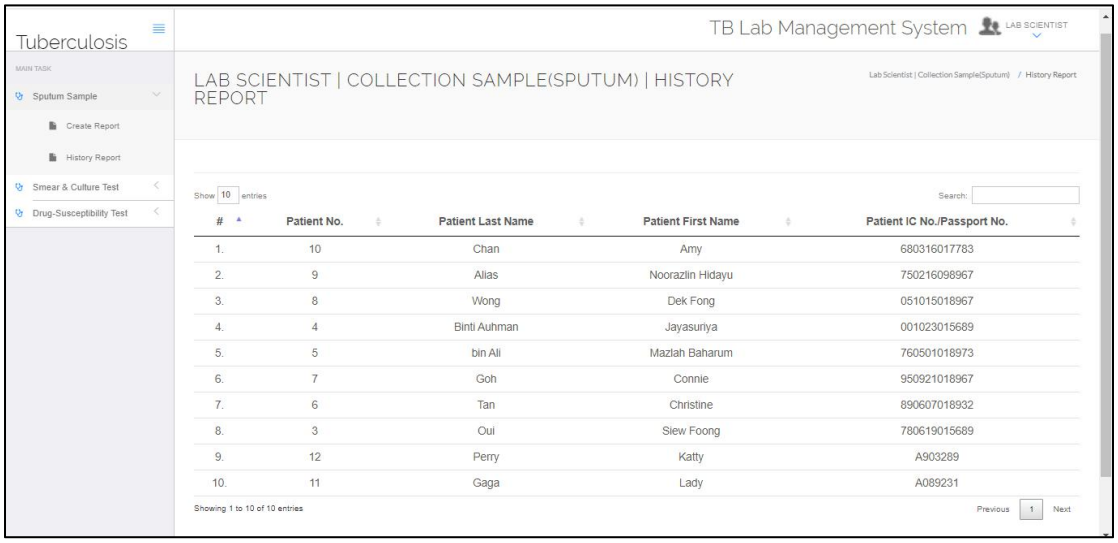


Figure 5.7.1.4 History report of collection sample sputum interface

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.

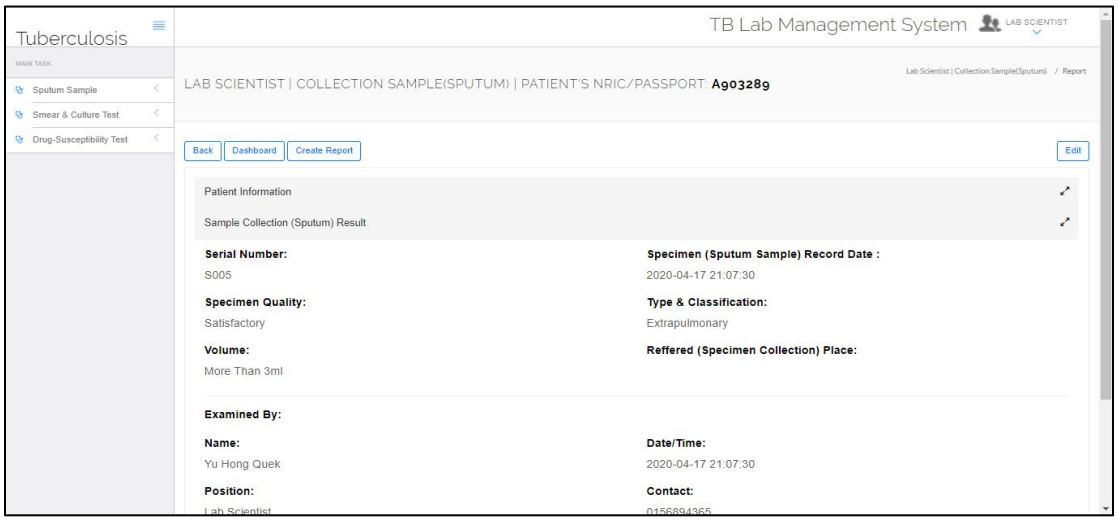


Figure 5.7.1.5 History report of collection sample sputum interface

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.

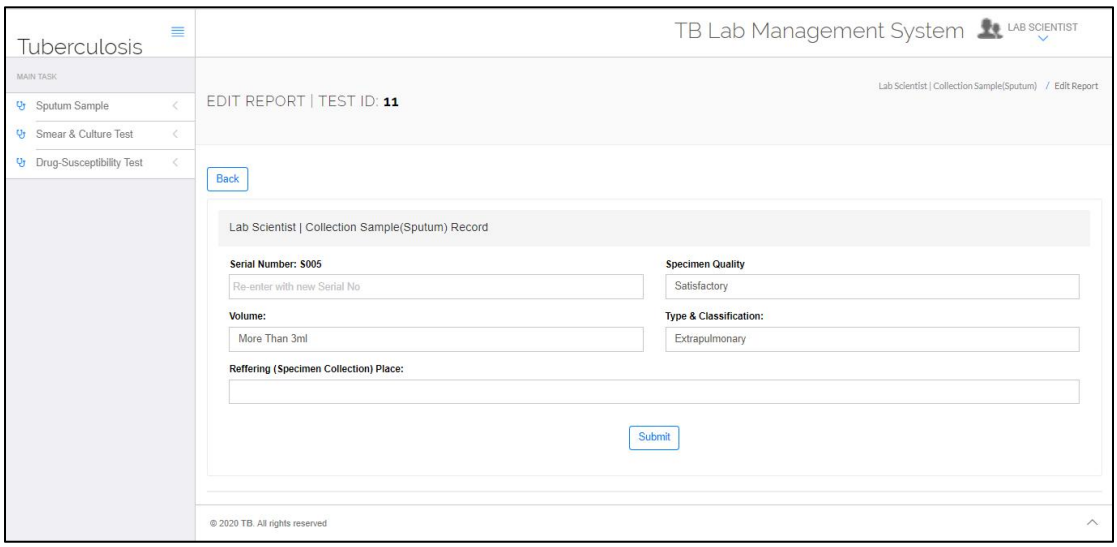


Figure 5.7.1.6 Edit report of collection sputum sample test interface

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".

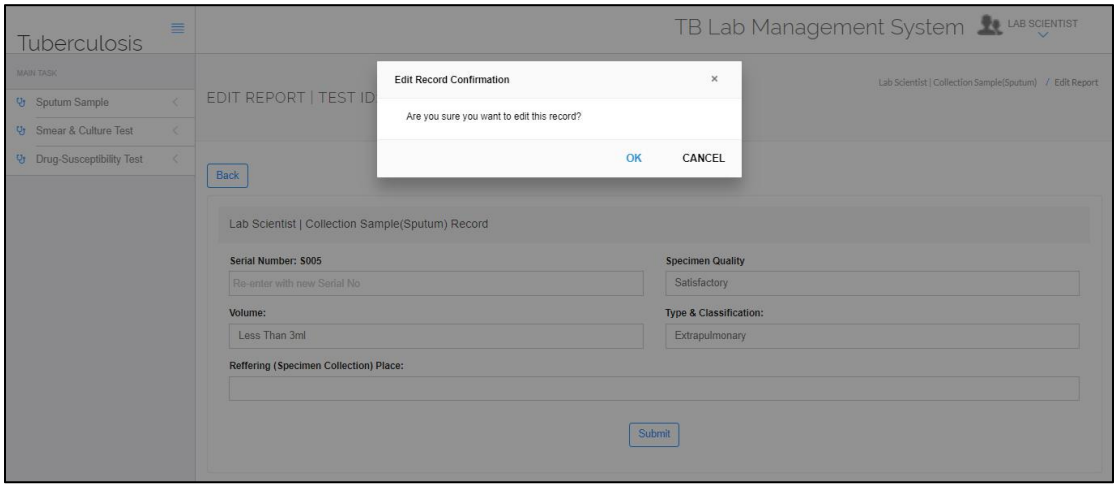


Figure 5.7.1.7 Edit report of collection sputum sample test interface

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.

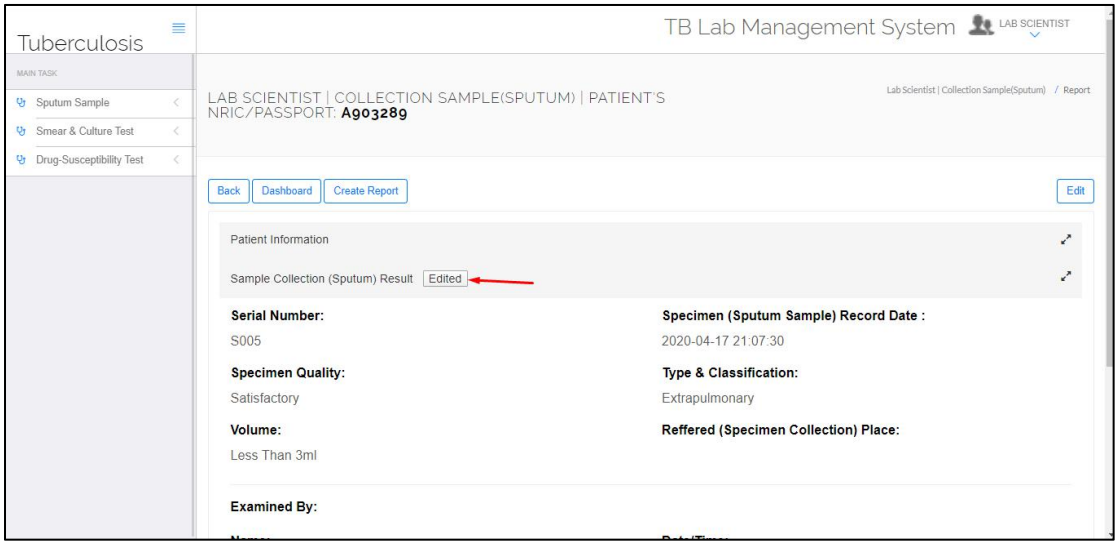


Figure 5.7.71.8 "Edited" button beside the tittle "Sample Collection (Sputum) Result"

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.

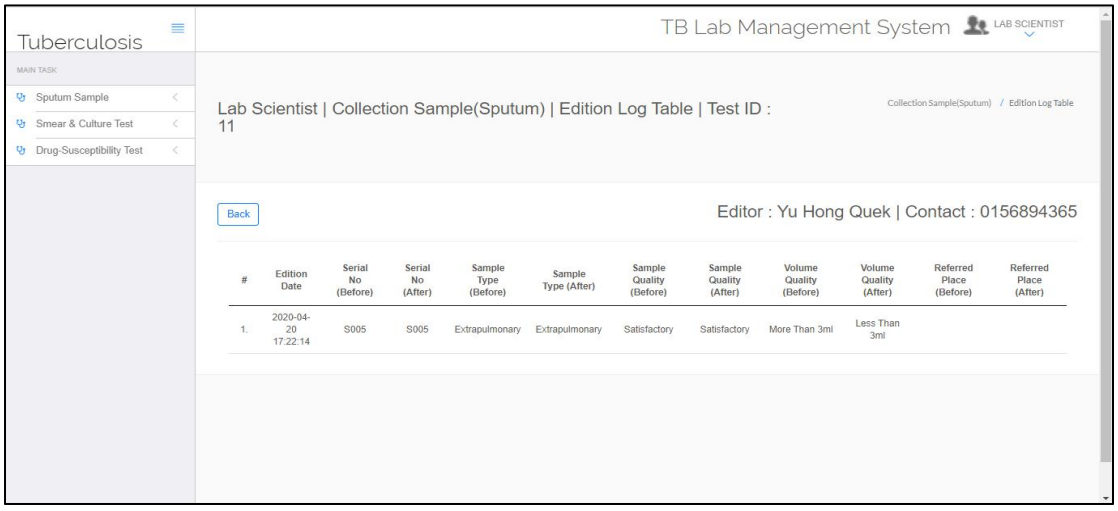


Figure 5.7.1.9 Edition Log Table of Collection Sample (Sputum)

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.

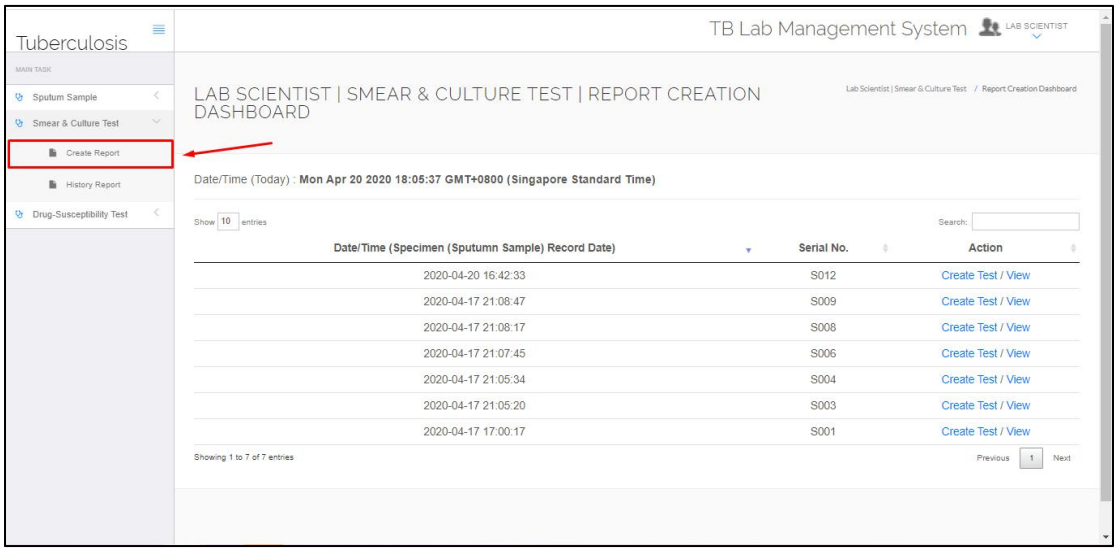


Figure 5.7.2.1 Dashboard of Smear & Culture test

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.

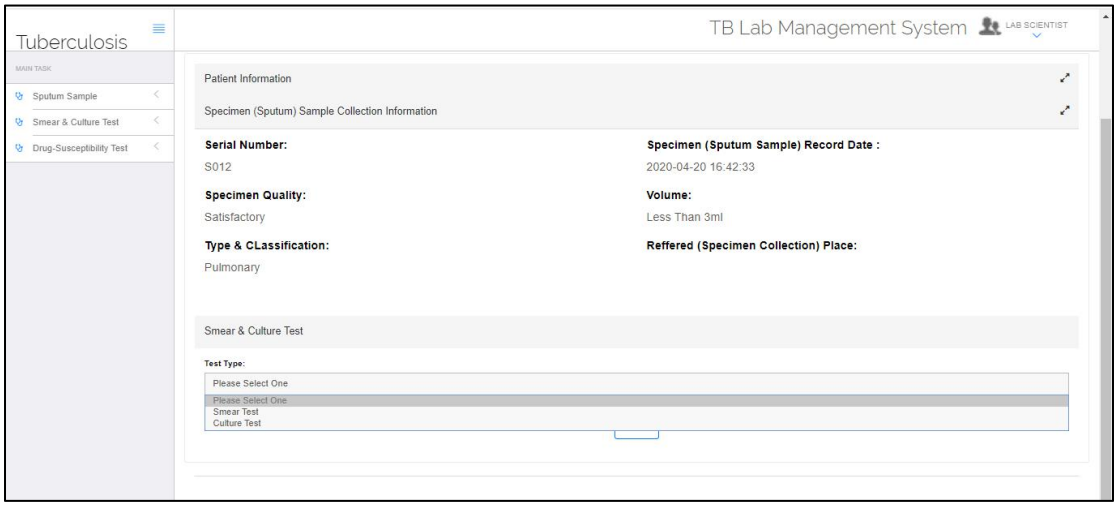


Figure 5.7.2.2. Create report of Smear & Culture test interface

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

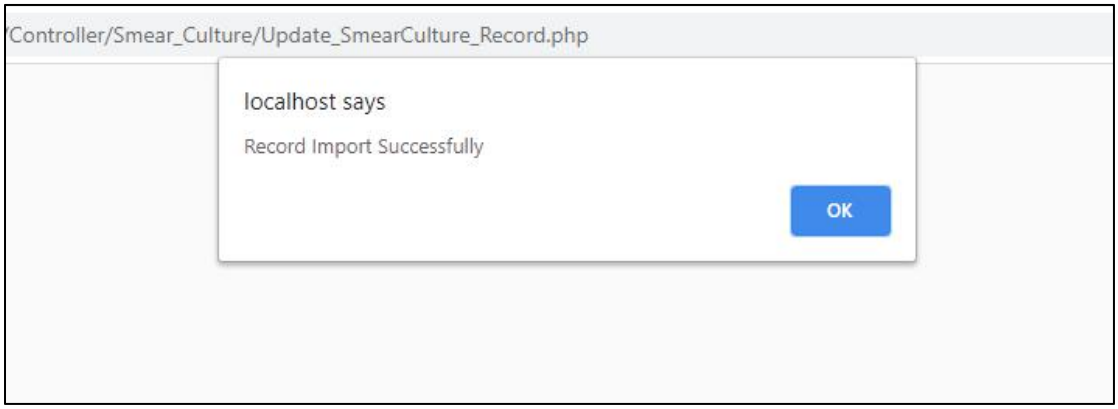


Figure 5.7.2.3 Create report of Smear & Culture test interface cont.

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 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.

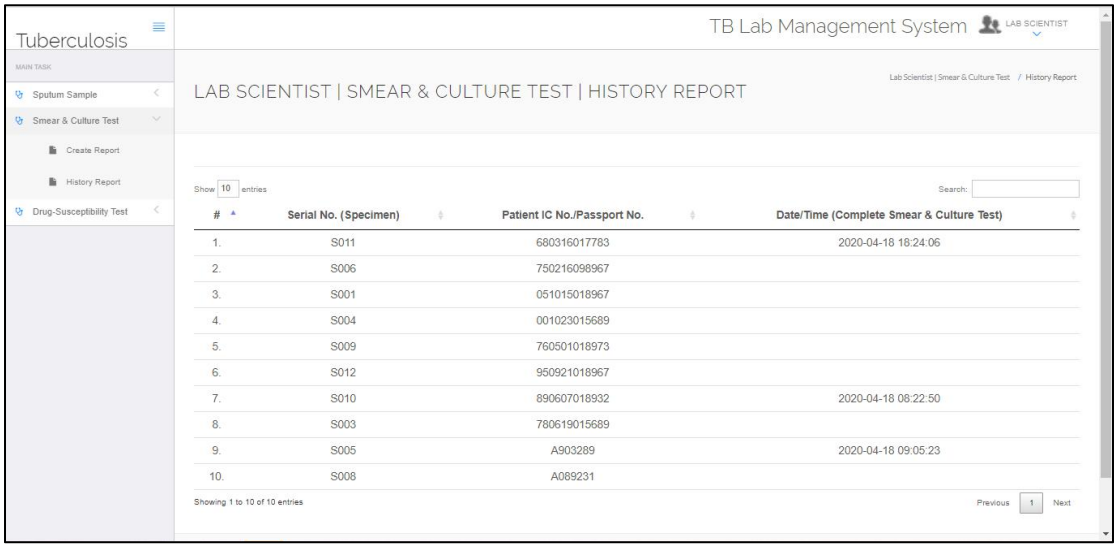


Figure 5.7.2.4 History report of smear & culture test interface

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.

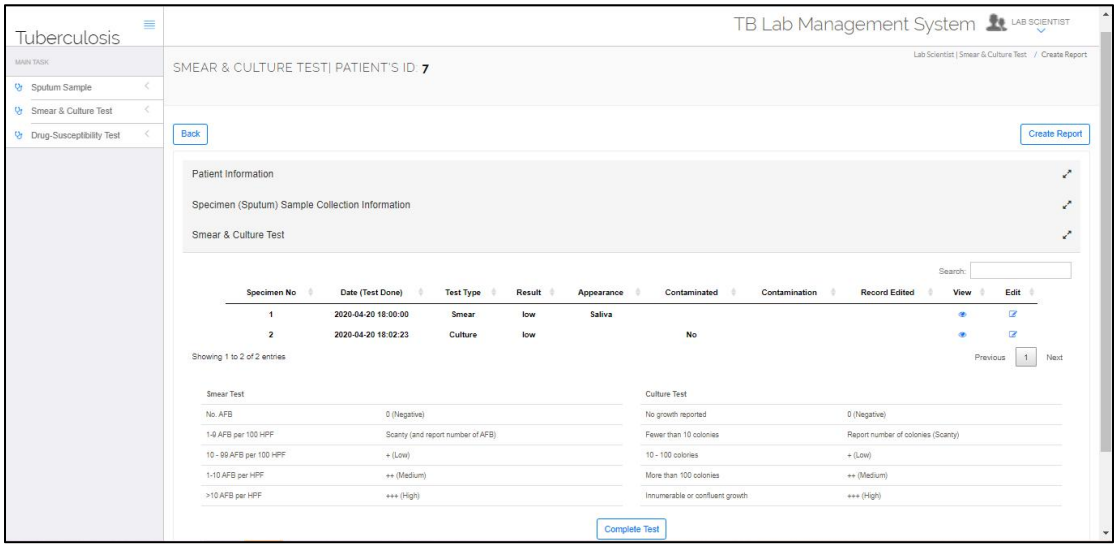


Figure 5.7.2.5 Selected patient's history report of smear & culture test interface

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.

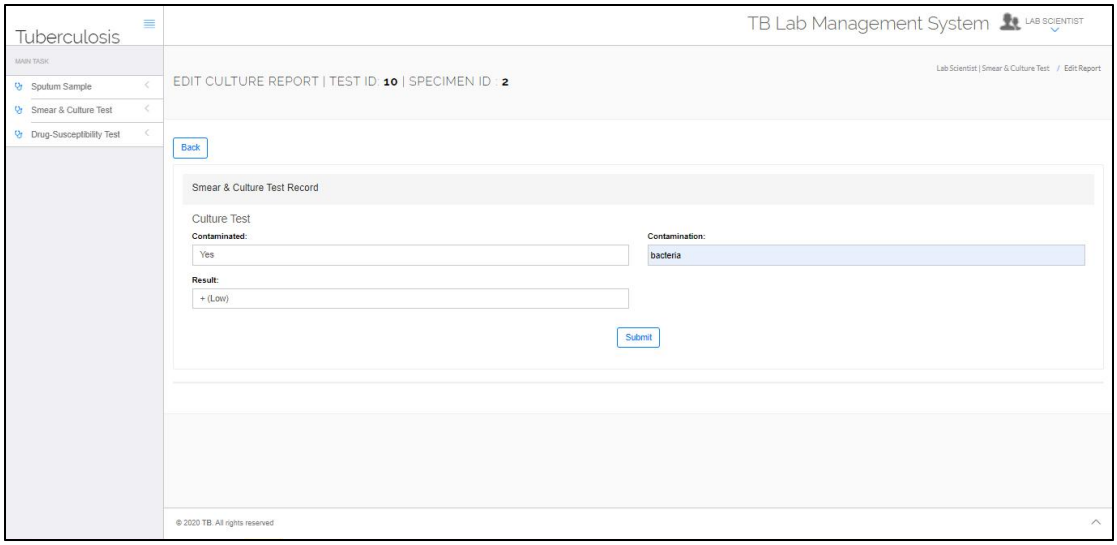


Figure 5.7.2.6 Edit Culture Report interface

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 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.

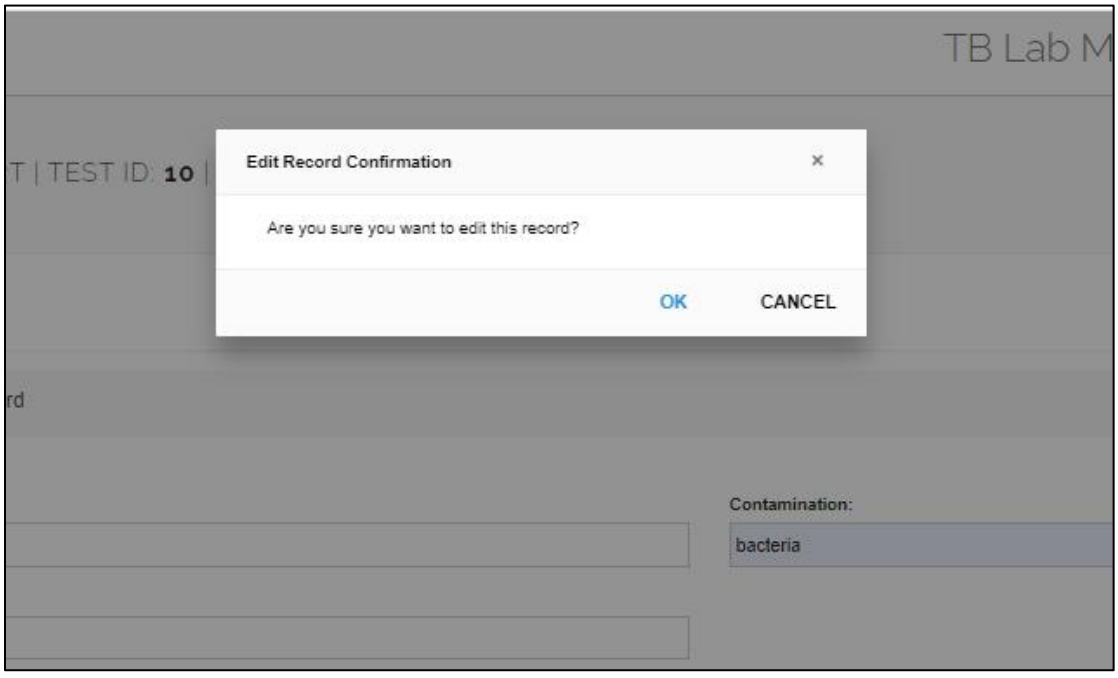


Figure 5.7.2.7 Edit Culture Report interface cont.

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

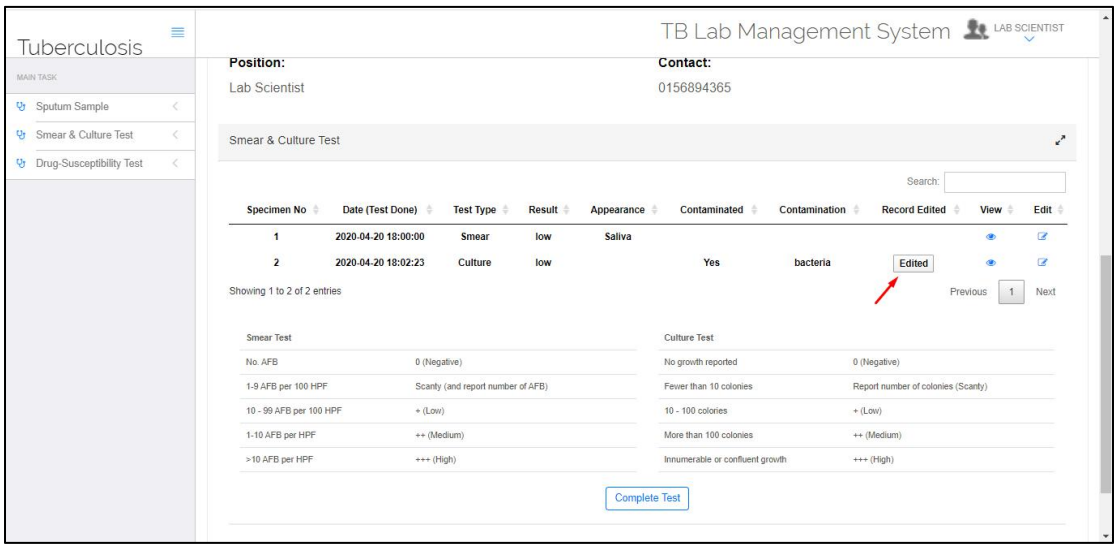


Figure 5.7.2.8 "Edited" button on the selected patient's history report interface

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 5.7.2.9 below. The editor information will also display at the top of the right on the log table.

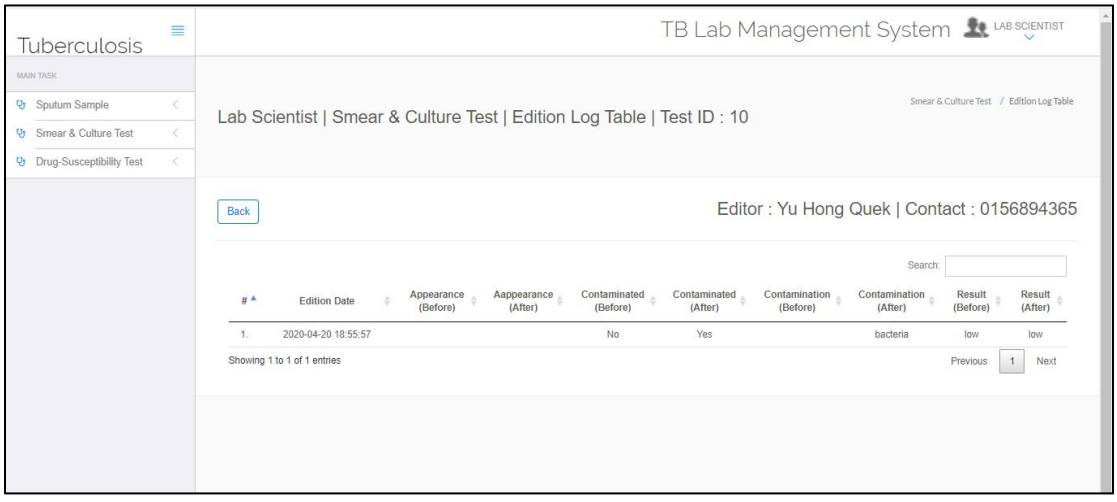


Figure 5.7.2.9 Edition log table of Smear & Culture test interface

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.

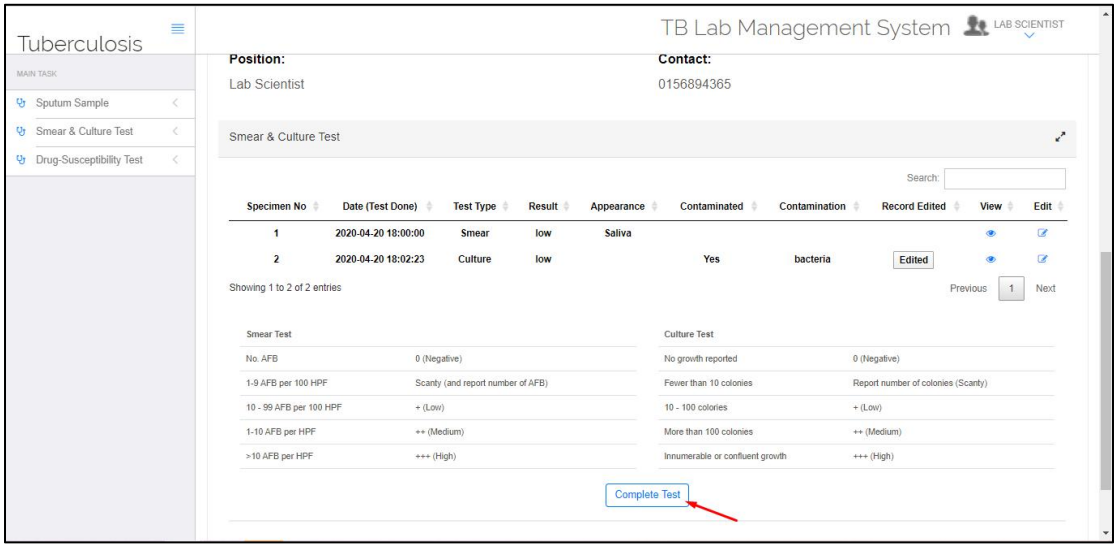


Figure 5.7.2.10 “Complete Test” button on the selected patient’s history report interface

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.

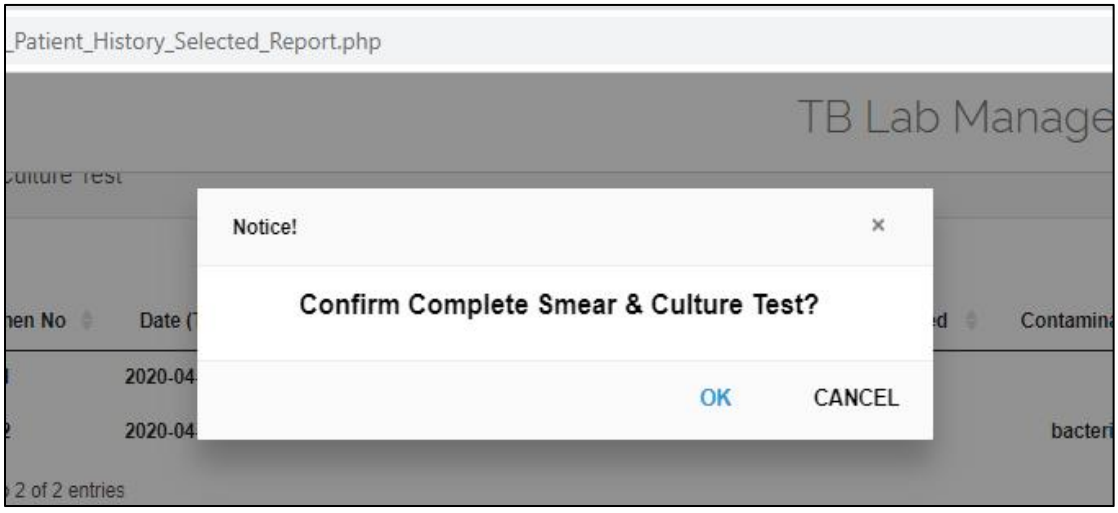


Figure 5.7.2.11 “Complete Test” button on the selected patient’s history report interface cont.

5.7.3 DST 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 "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 figure5.7.3.1 below.

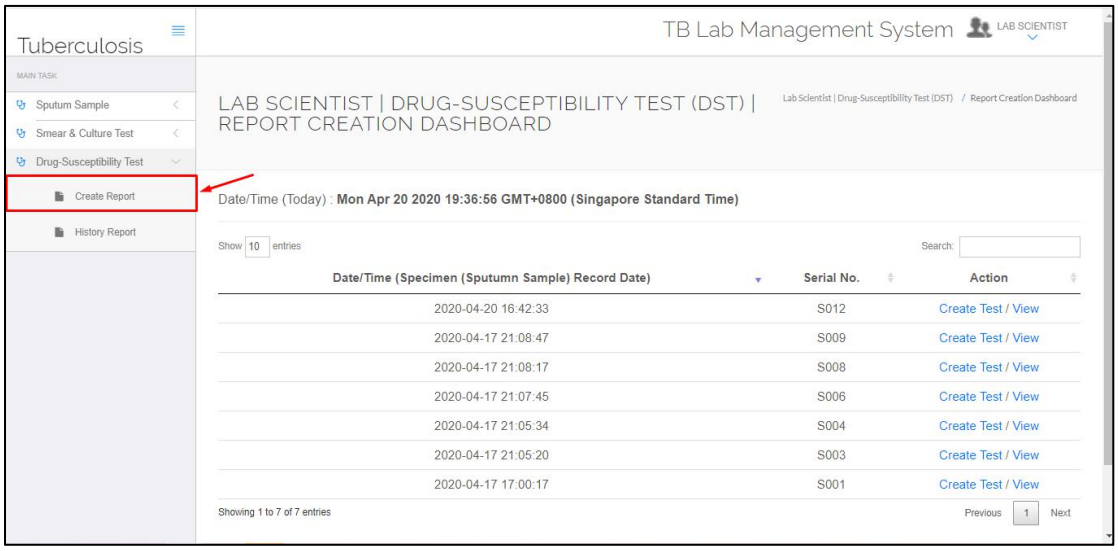


Figure 5.7.3.1 DST Test Report Creation Dashboard interface

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'.

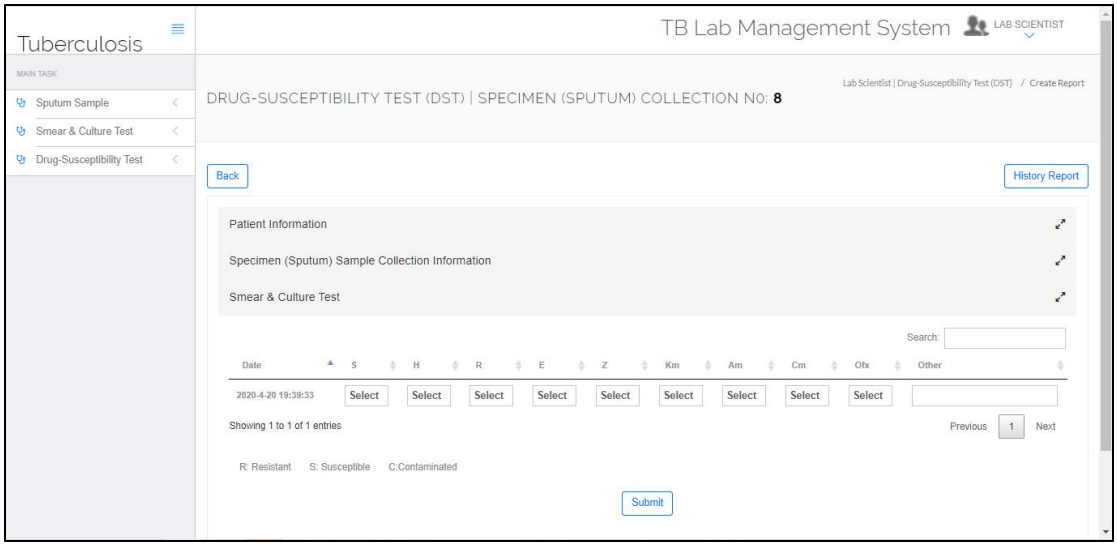


Figure 5.7.3.2 Create report of DST Test interface

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

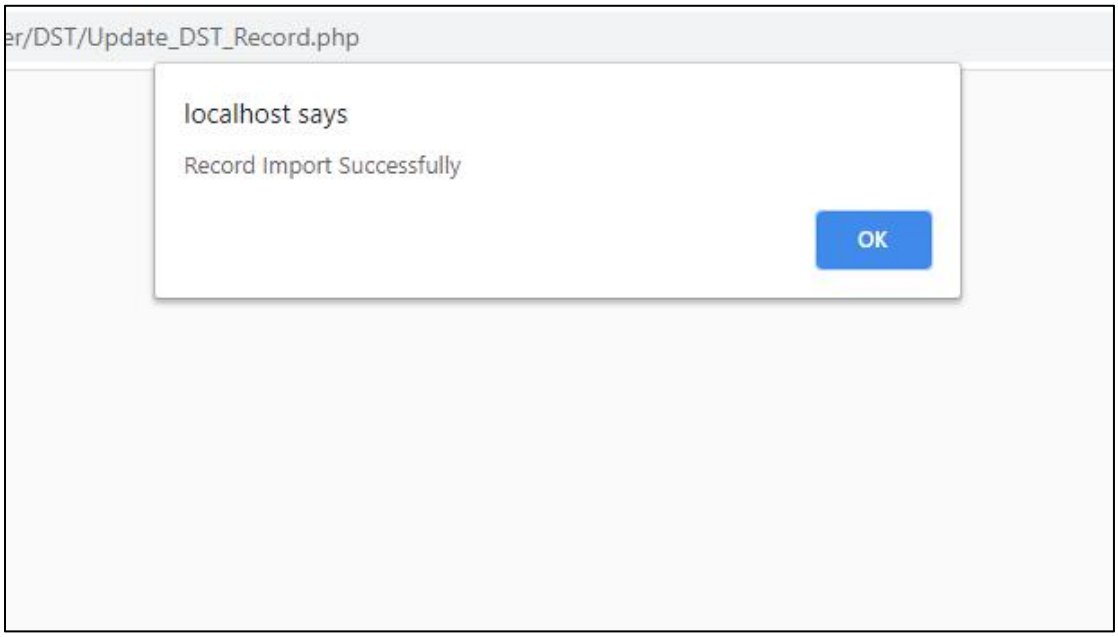


Figure 5.7.3.3 Create report of DST test interface cont.

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.

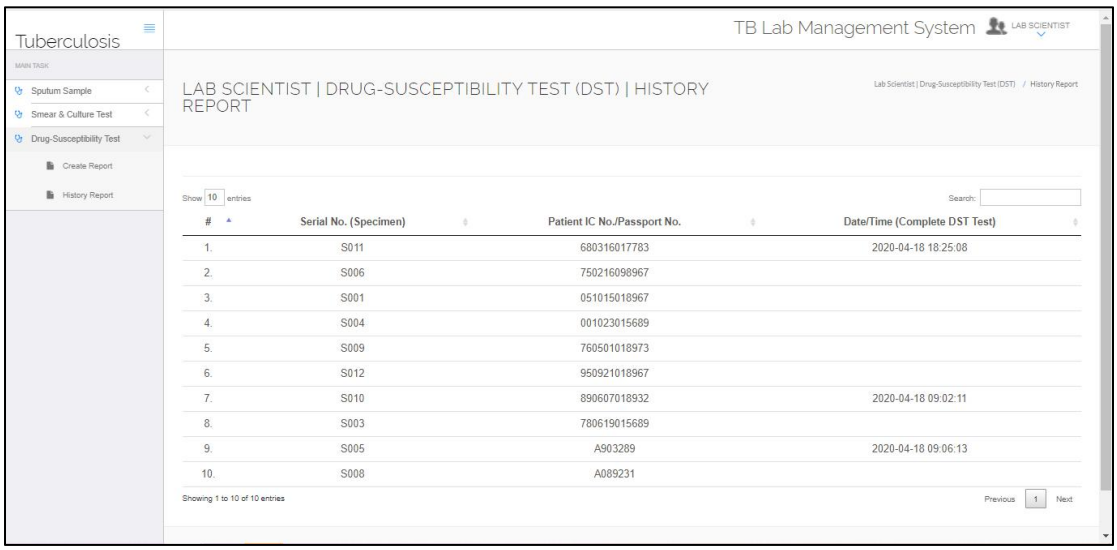


Figure 5.7.3.4 History report of DST test interface

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.

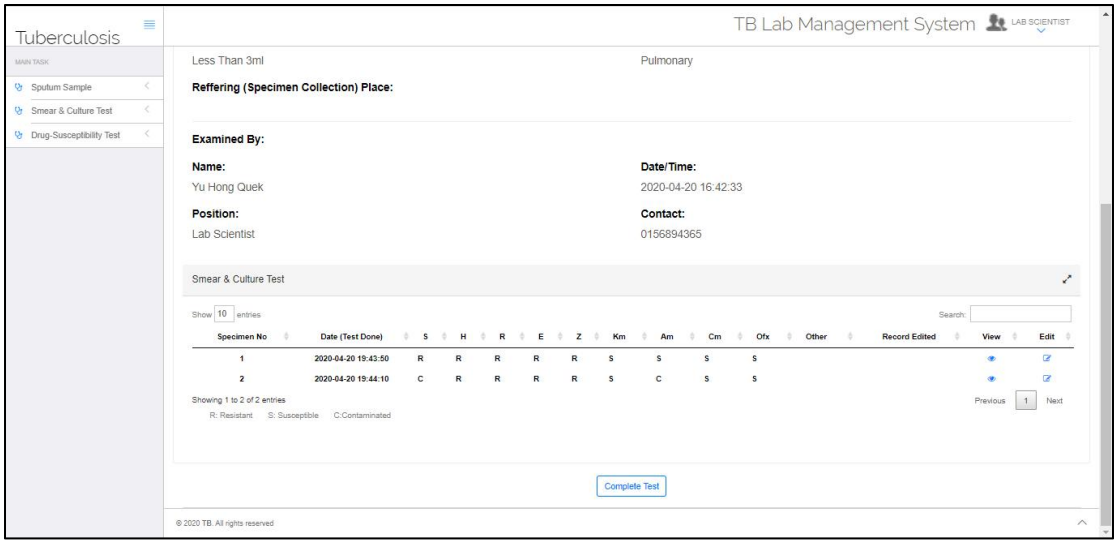


Figure 5.7.3.5 Selected patient's history report of DST test interface

The figure 5.7.3.6 will be shown after the "Edit" button has been clicked, the lab scientist 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.

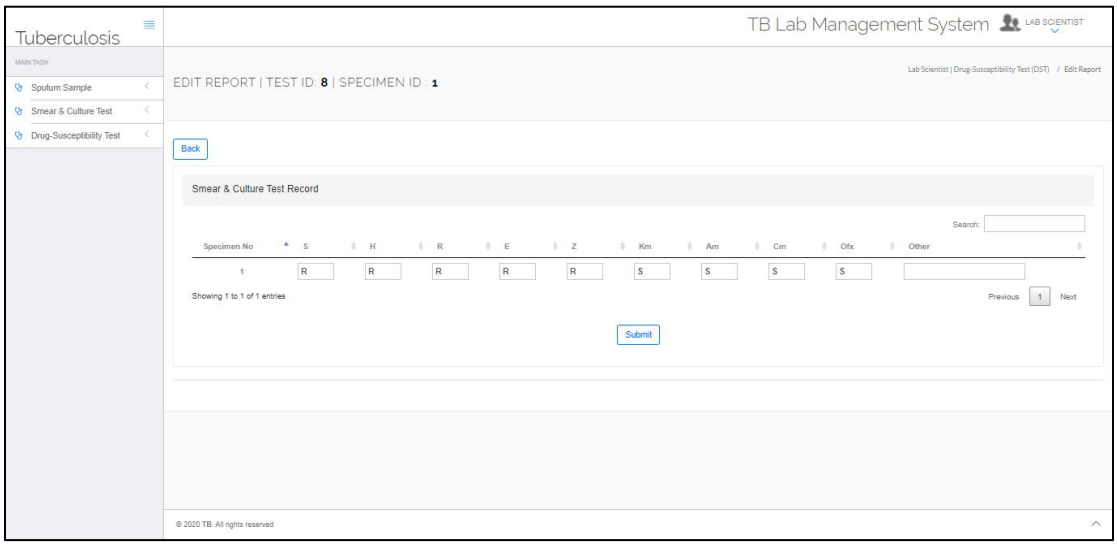


Figure 5.7.3.6 Edit DST Test Report interface

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.

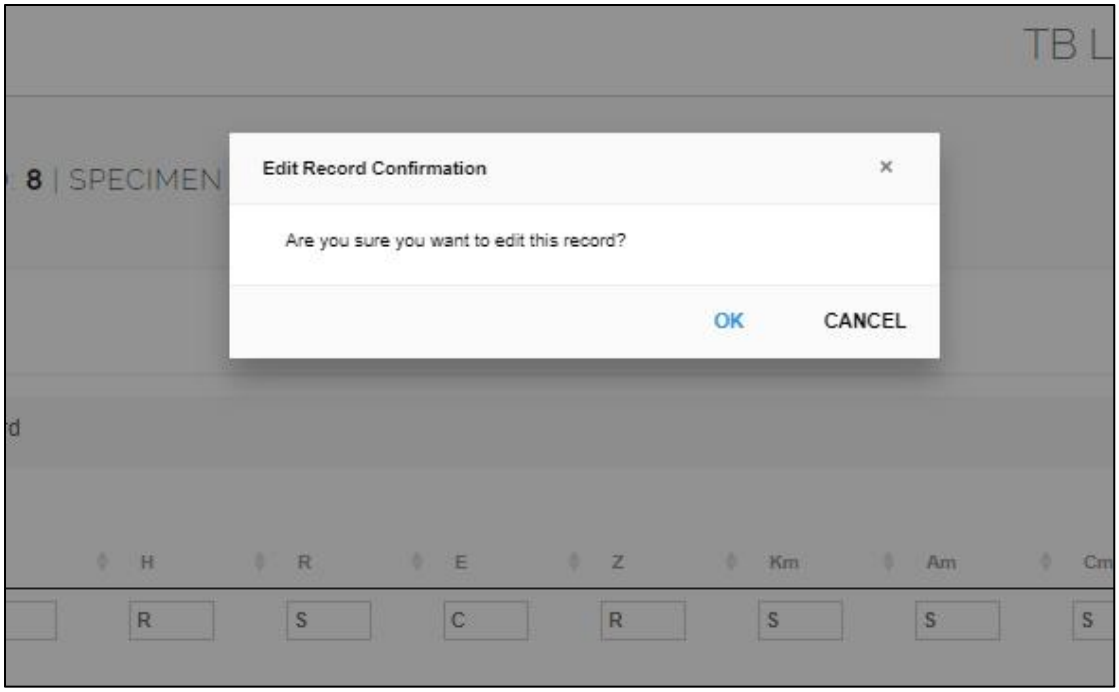


Figure 5.7.3.7 Edit DST Test Report interface cont.

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

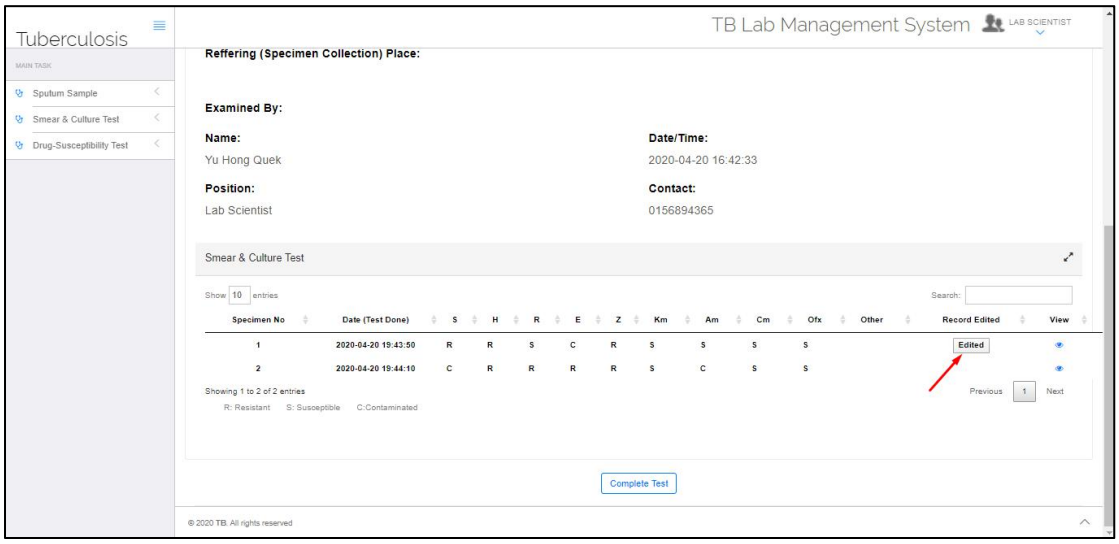


Figure 5.7.3.8 "Edited" button on the selected patient's history report interface

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.

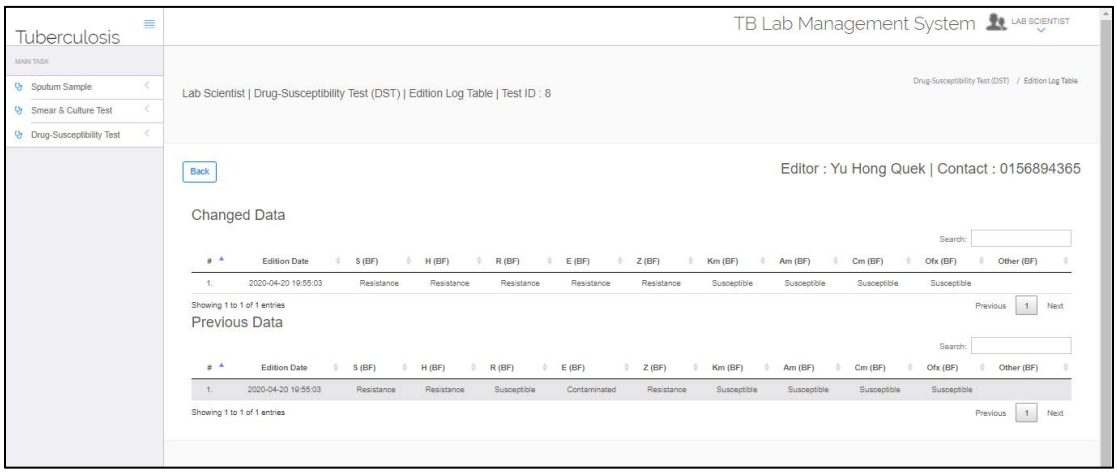


Figure 5.7.3.9 Edition log table of DST test interface

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.

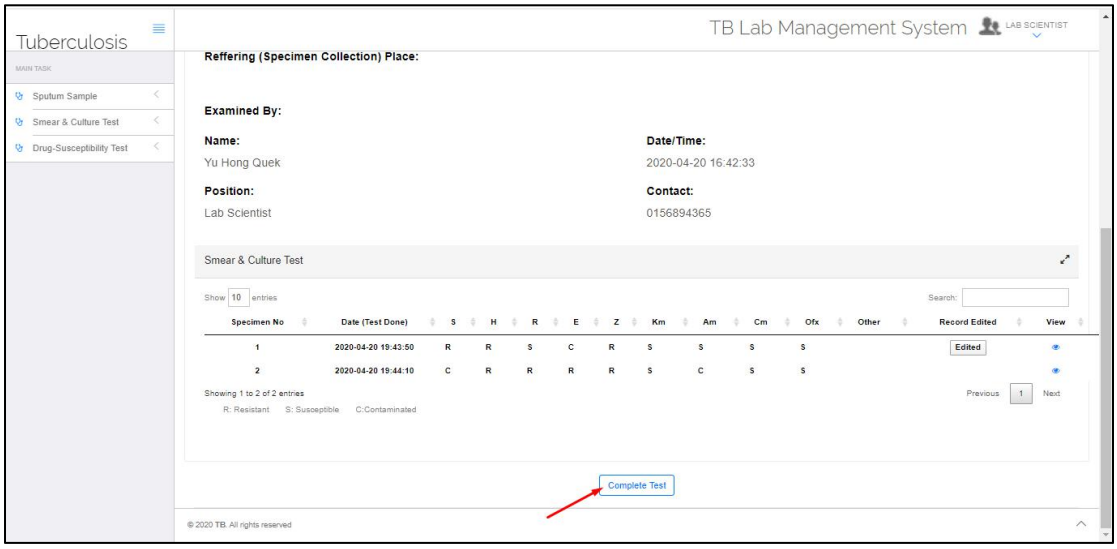


Figure 5.7.3.10 "Complete Test" button on the selected patient's history report interface

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.

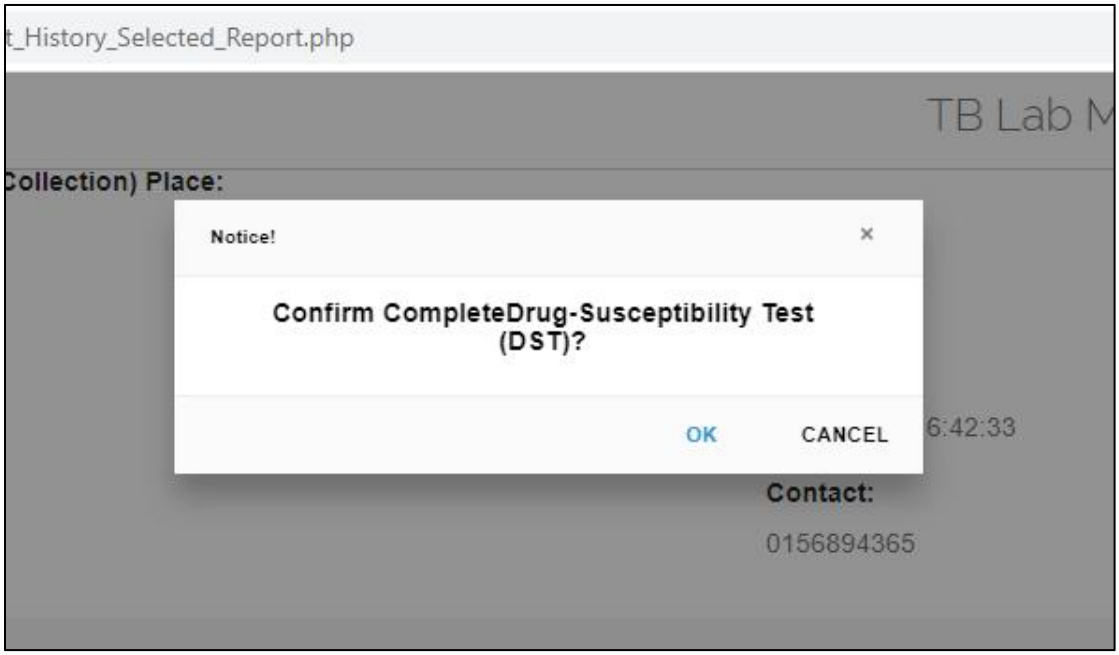


Figure 5.7.3.11 "Complete Test" button on the selected patient's history report interface cont.

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 5.7.3.11 Drop down list on the top right of the lab scientist module

5.8 Doctor 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.

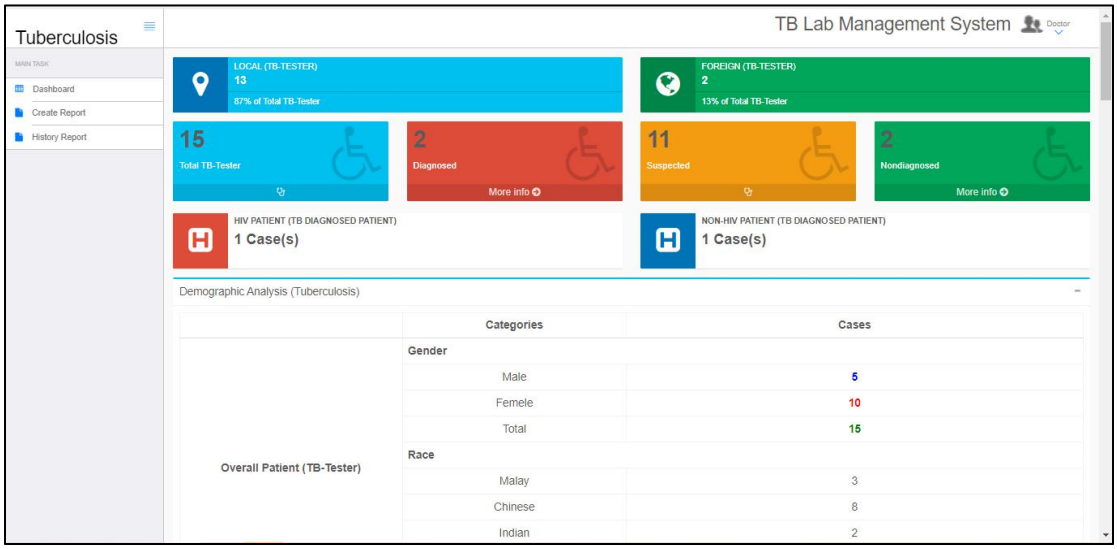


Figure 5.8.1 Dashboard of doctor module interface

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 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 non-diagnosed 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.

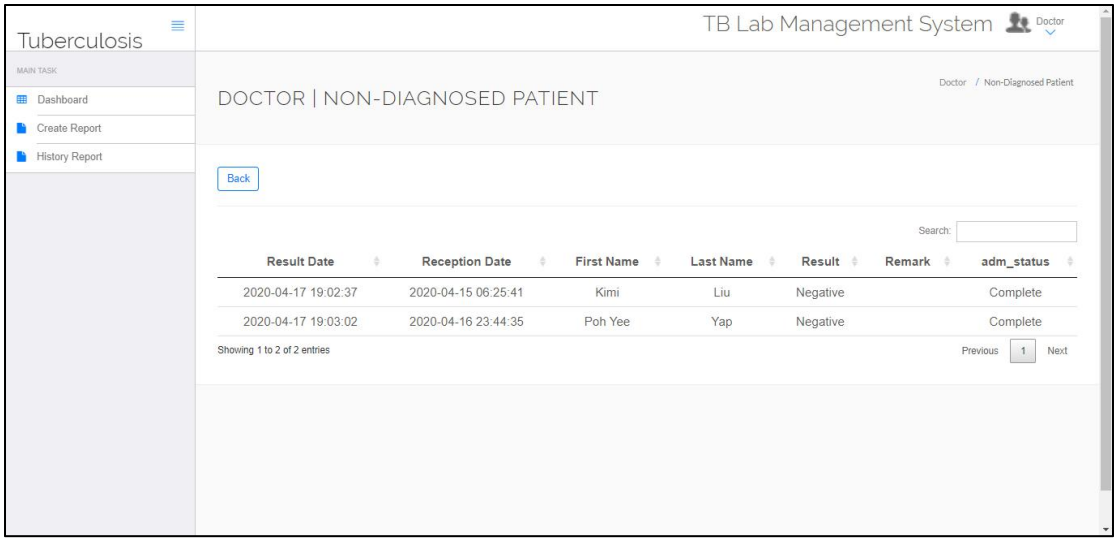


Figure 5.8.4 Non-diagnosed patient interface

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.

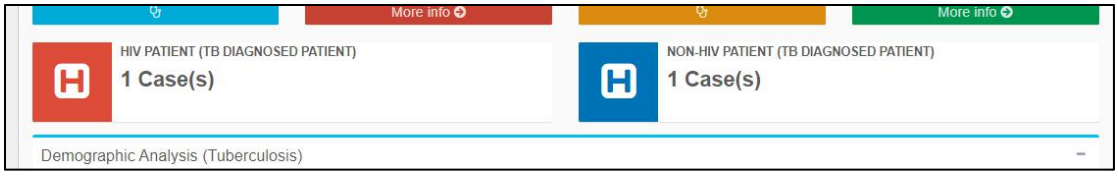
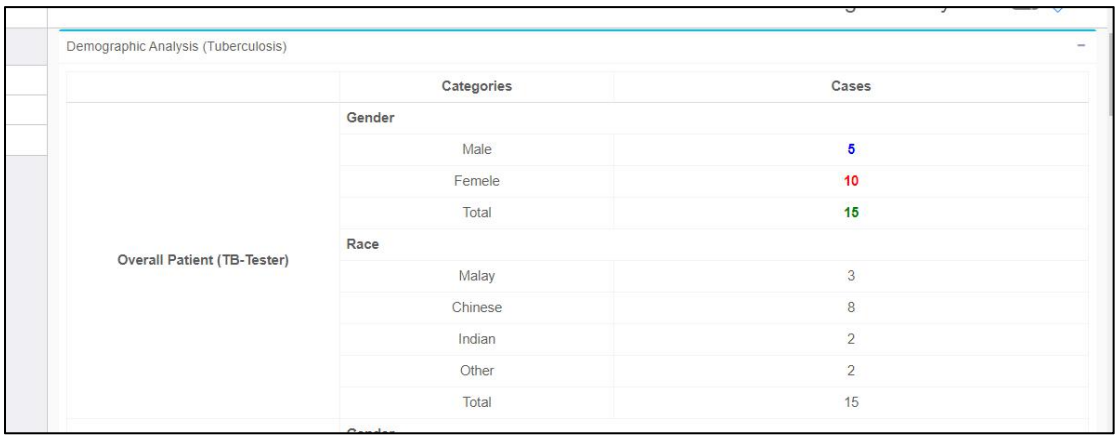


Figure 5.8.5 Total number of TB diagnosed patient with HIV and Non-HIV

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.



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

Figure 5.8.6 Demographic analysis (1)

Patient (DIAGNOSED)	**Gender**	
	Male	0
	Female	2
	Total	2
	State (Malaysia)	
	Johor	0
	Kedah	0
	Kelantan	0
	Melaka	1
	Negeri Sembilan	0
	Pulau Penang	0
	Pahang	0
	Perak	1
	Perlis	0
	Sabah	0
	Sarawak	0
	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.

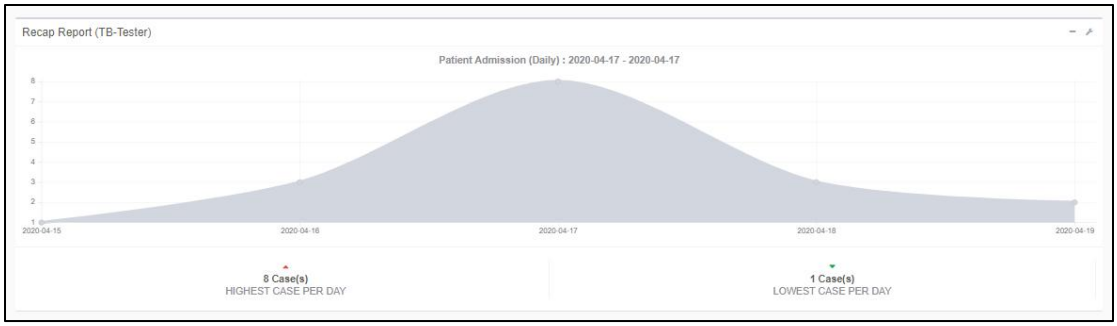


Figure 5.8.8 TB Tester (Admission) Daily Recap Report

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 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.

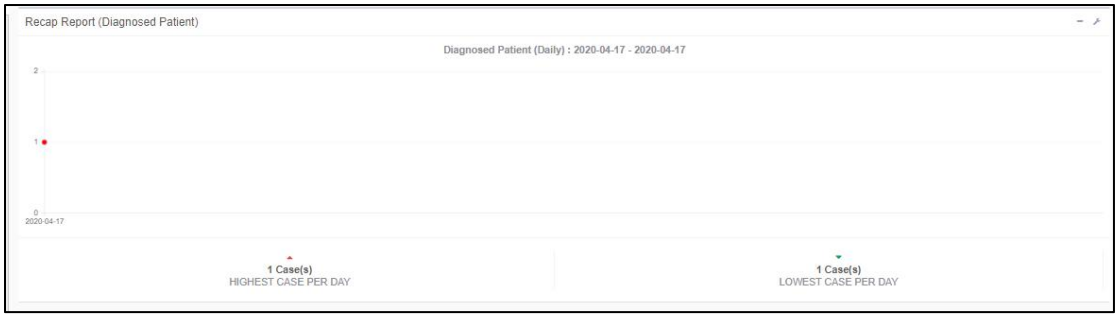


Figure 5.8.11 TB Diagnosed Patient Daily Recap Report

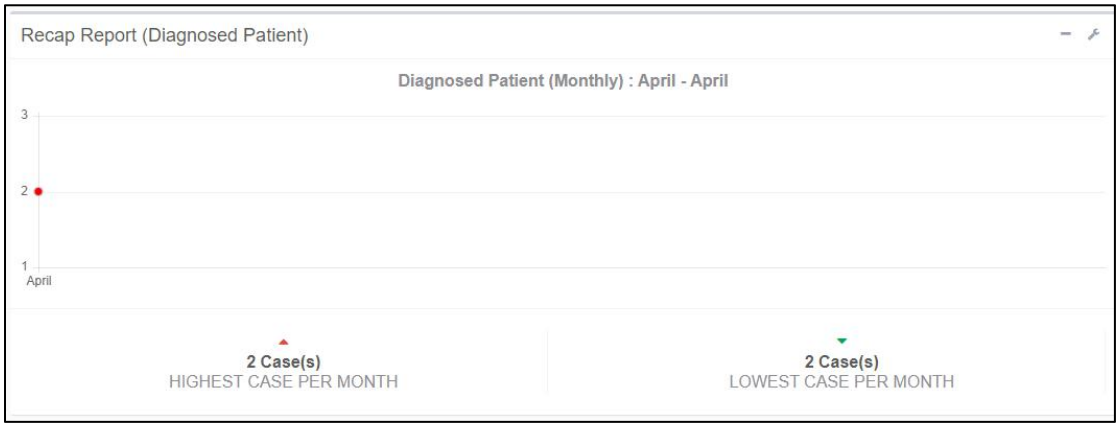


Figure 5.8.12 TB Diagnosed Patient Monthly Recap Report

Figure 5.8.13 TB Diagnosed Patient Yearly Recap Report

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.

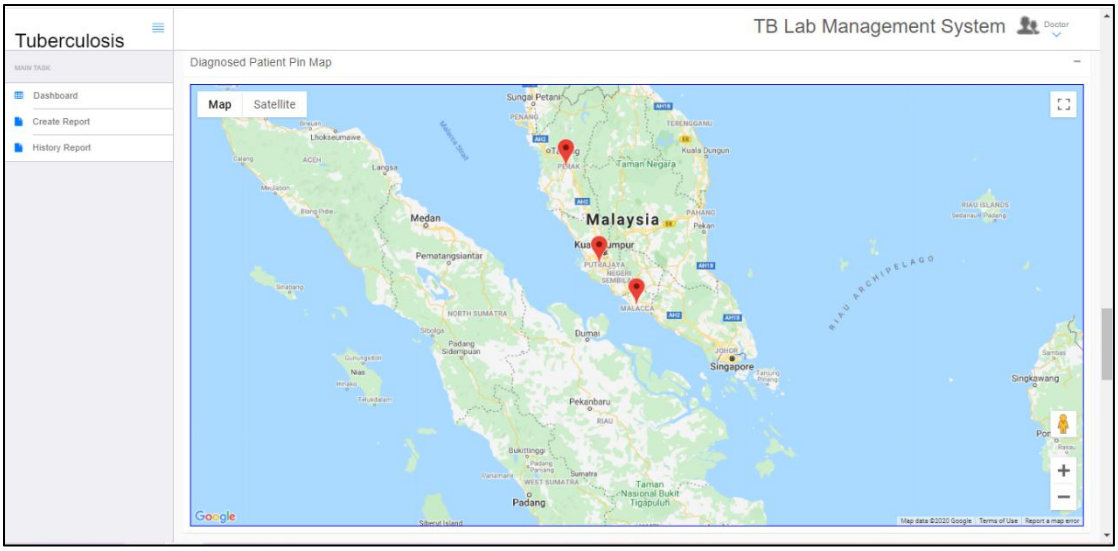


Figure 5.8.14 Google Pin Maps (Diagnosed Patient)

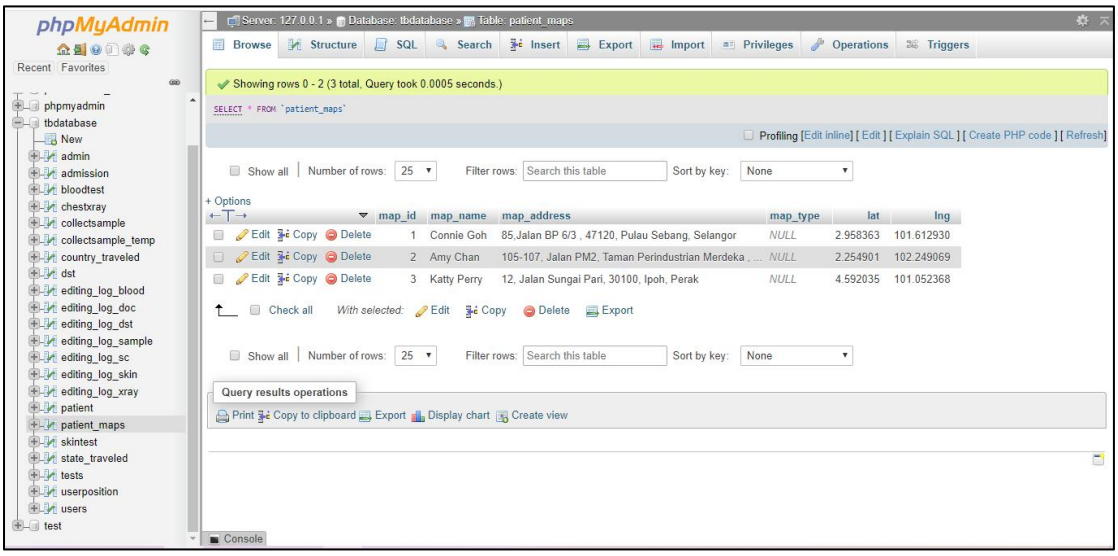


Figure 5.8.15 Database (Diagnosed Patient's actual address) of Google Pin Maps

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)

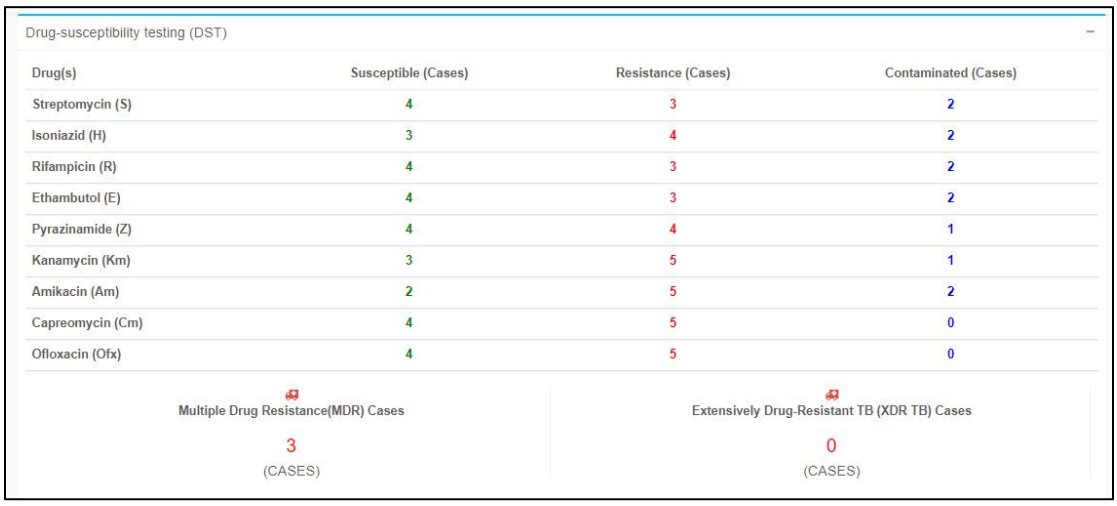


Figure 5.8.17 Table describes the DST (Drug-susceptibility testing) relevant data (1)

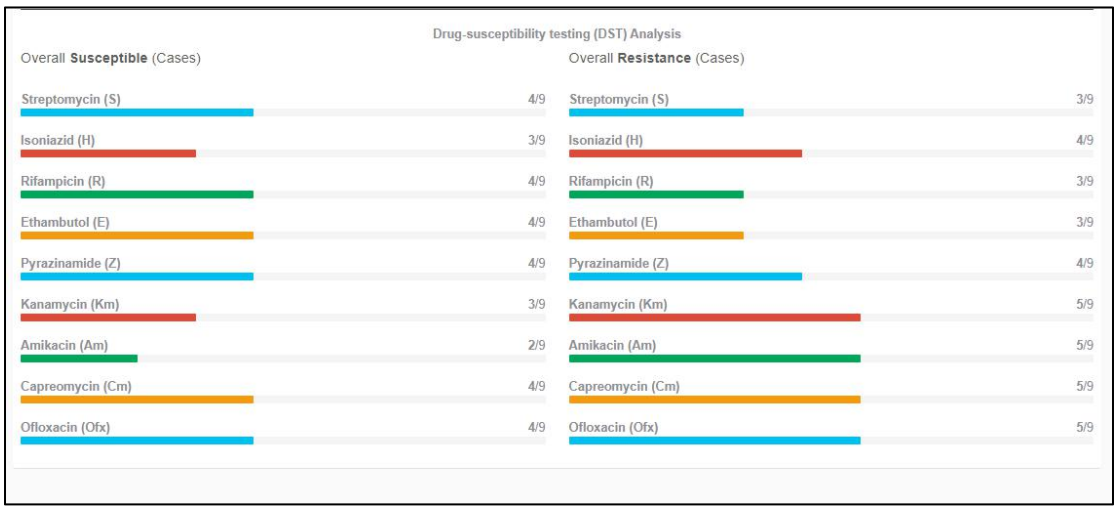


Figure 5.8.18 Table describes the DST (Drug-susceptibility testing) relevant data (2)

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.

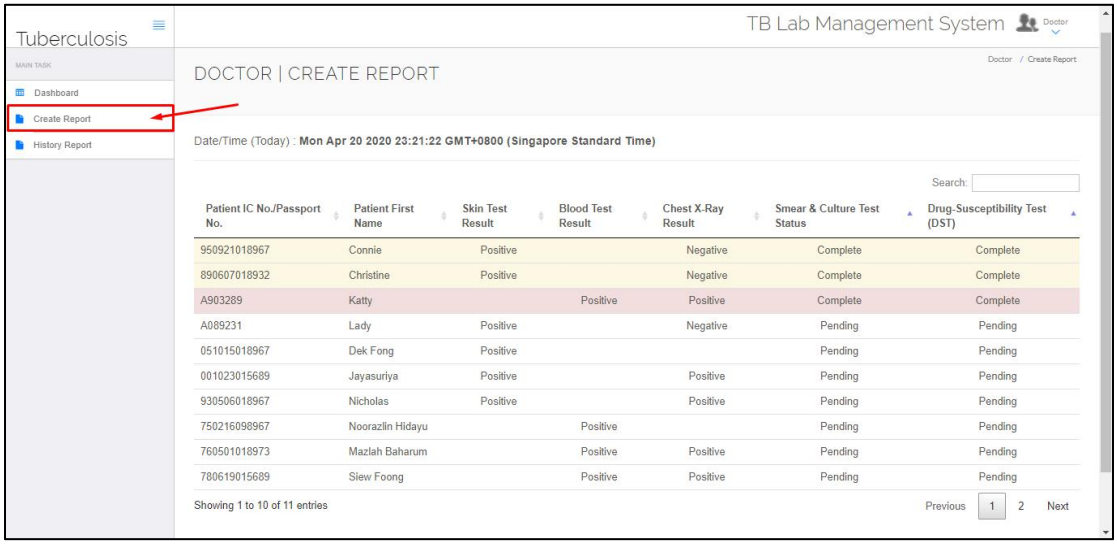


Figure 5.8.19 Create report in doctor module

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.

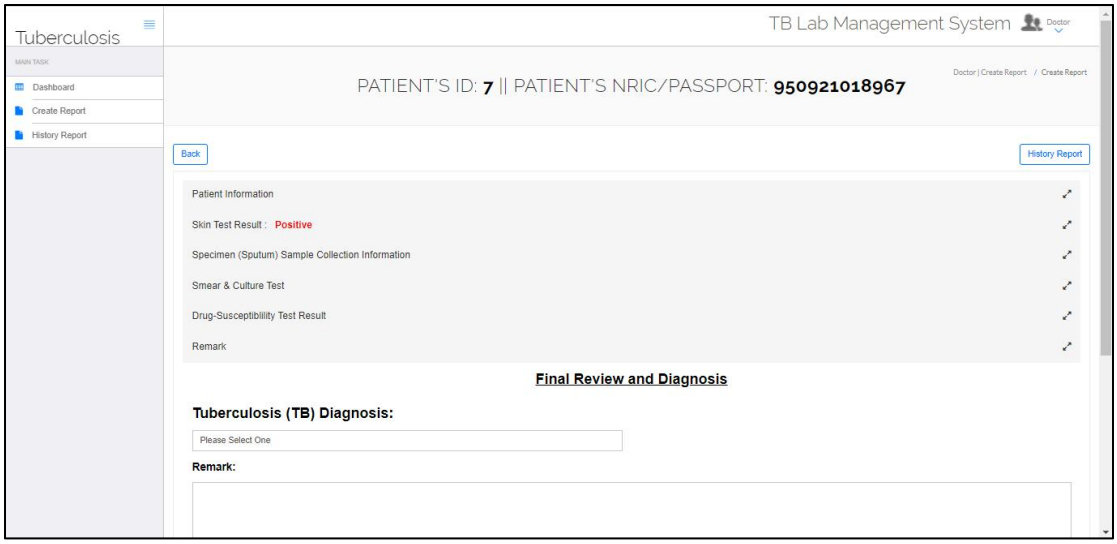


Figure 5.8.20 Create report in doctor module cont.

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.

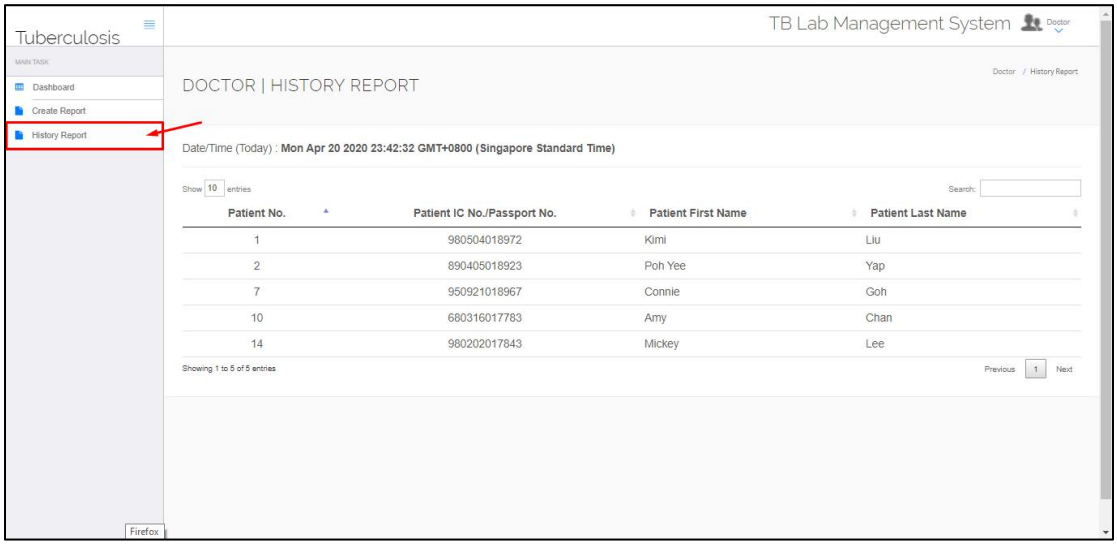


Figure 5.8.21 Full history report in doctor module

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.

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.

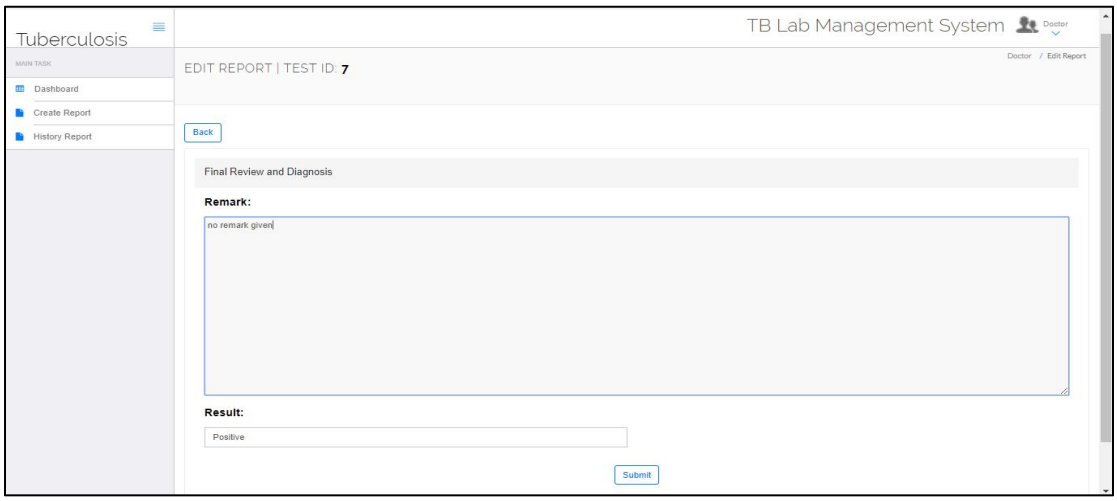


Figure 5.8.23 Edit report in doctor module interface

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.

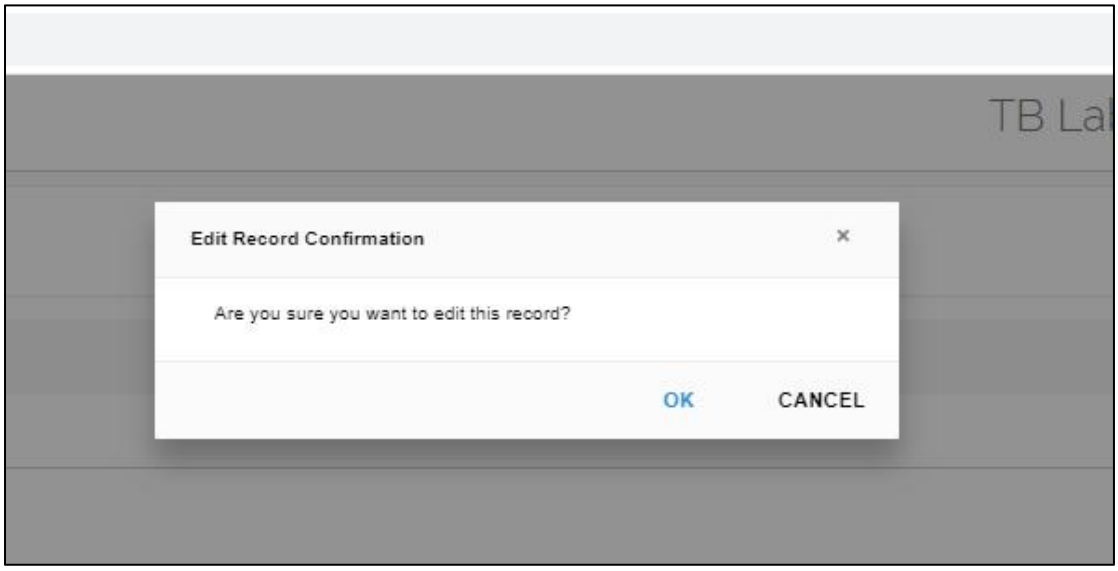


Figure 5.8.24 Edit report in doctor module interface cont.

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

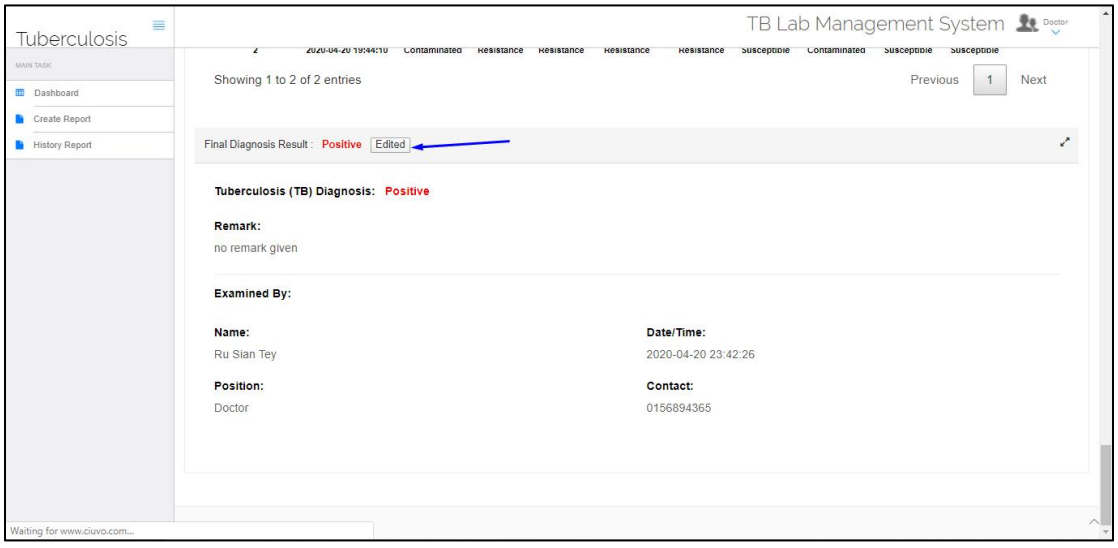


Figure 5.8.25 “Edited” button on the selected patient’s full history report interface

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.

Figure 5.8.26 Edition log table interface in doctor module

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.

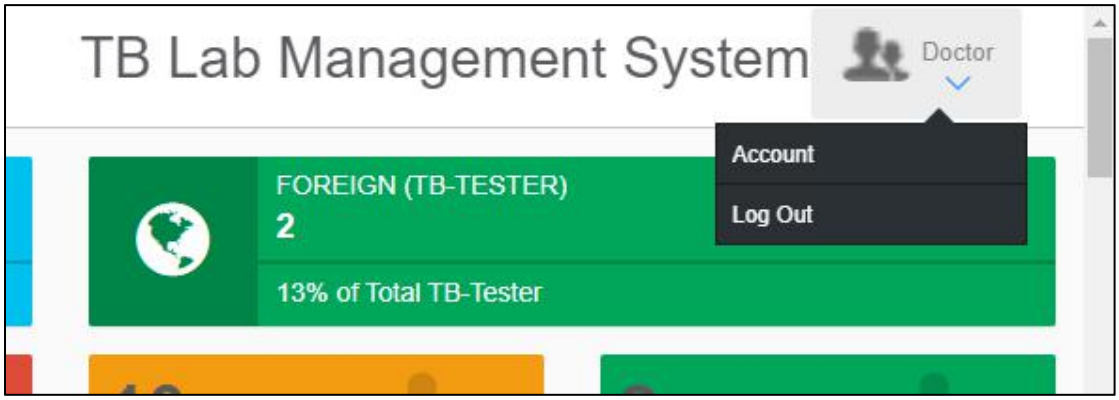


Figure 5.8.27 Drop down list on the top right of the doctor module

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 (√ / ×)
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.	√
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.	√
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.	√
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.	√
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.	√
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.	√

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

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.	√
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.	√
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.	√

6.2 Maintenance Module Testing

Table 6-2-1 Maintenance Module Testing Table.

No	Testing Method	Action Done	Expected Result	Actual Result	Meet Expectation (√ / ×)
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.	√
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.	√
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.	√
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.	√
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.	√
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.	√
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.	√

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

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.	√
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.	√
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.	√
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.	√
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.	√
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'.	√
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.	√

6.3 Manage User Account Function Testing

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

No	Testing Method	Action Done	Expected Result	Actual Result	Meet Expectation (√ / ×)
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.	√
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".	√
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”.	√
4	Change username	Edit and change username.	Successfully change username and re-login into system.	Successfully change username and re-login into system.	√
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.	√
6	Change password with matching password	Edit and change password with key in matching password and confirm password.	Successfully change password.	Successfully change password.	√
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 !!”.	√

6.4 Reception Module TestingTable

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.	√
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.	√
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.	√
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.	√

Table 6-4-2 Reception Module Testing Table Cont.

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.	√
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.	√
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.	√
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.	√

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 (√ / ×)
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.	√
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/ascending after press the button"↕".	The order of column will make changes once press the button "↕".	√
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.	√
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.	√
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.	√
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.	√
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.	√

Table 6-5-2 Common Function in Dashboard - Function Testing Table Cont.

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.	√
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.	√

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 (√ / ×)
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.	√
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/ascending after press the button"↕"	The order of column will make changes once press the button "↕".	√
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.	√
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.	√
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.	√
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.	√
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.	√

Table 6-6-2 Common Function in History Report - Function Testing Table Cont.

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.	√
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.	√
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.	√
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.	√
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.	√

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.	√
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.	√
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.	√
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.	√
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".	√

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.	√
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.	√
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.	√
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.	√
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".	√

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.	√
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.	√
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".	√

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 (√ / ×)
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.	√
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.	√
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.	√
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.	√
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.	√
5	Complete Test	Press the "Complete Test" button to complete the test.	Succesfully complete the smear&culture test.	Succesfully complete the smear&culture test.	√
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.	√

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

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

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.	√
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.	√
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.	√
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.	√
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.	√
5	Complete Test	Press the "Complete Test" button to complete the test.	Succesfully complete the DST test.	Succesfully complete the DST test.	√
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.	√

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

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

6.12 Doctor Module Testing

Table 6-12-1 Doctor Module Testing Table.

No	Testing Method	Action Done	Expected Result	Actual Result	Meet Expectation (√/×)
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.	√
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.	√
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.	√
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.	√
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.	√
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.	√

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

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.	√
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.	√
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.	√

Chapter 7: Discussion and Conclusion

7.1 Project Overview

In a nutshell, tuberculosis diagnosis laboratory information system is a web development system. The system has linked the clinical, laboratory and radiologist in a single platform, as well as ease the inter-facility communication. By using this system, the users able to work more efficiently and lessen the workload because all of the manual processes have been eliminated. With this effective system, the time needed to generate the report is lesser because the doctor can retrieve all the test results in the system instead of collecting the results from the different laboratories.

Furthermore, the waiting time of the patient will be decreased as well as the time needed for diagnosis process and business process decrease because most of the paper form had been transferred to digital form. With the help of this system, medical personnel can calculate and compare the rate of infection by multi-drug resistant bacteria on admission and during hospitalization easily and efficient to do the analyses.

Currently, the globalization is facing the biggest challenge which is COVID - 19 (Corona virus). The infection disease had impacted the human's daily life, human's health issue and affected global economics. This disease has stimulated the demand to develop a health-care system.

Tuberculosis diagnosis laboratory information system act as a health care system which also performed the similar task needed such as basic patient's input insert, delete, update and edit as well as some further analytic capabilities based on those patients' data input.

7.2 System Strengths and Limitations

Even the proposed system was developed successfully and achieved the project objectives on functionality by all modules in the system. Nonetheless all functionality of each single module is still having improvement opportunities towards more functional performance. Every module could be additional implement more feature functionalists into it for better performance.

Strengths

Besides the existing strengths which mentioned before on above such as enabling system user to finish work flows and management on clinical communications on single platform, enabling system to perform multiple care teams from differ labs could get connective on collaboration in order to improve care coordination. The TB Diagnosis Laboratory Information System (Skin/Blood Test Module) at the same time providing automated result which derived from the inputs parameter in previously that potentially reduce the possibilities of wrong data insertions incident.

On the other hand, in this module also providing automated functionality on checking skin test expiration's date resulted to avoid patients who came along for skin test testing would not exceed the expiration's date at the same time ensure staff may miss out issues. Moreover, the system will automatically update patient's record as failed result and will require the particular patient to perform the skin test again.

Furthermore, system Treatment/Analysis and Reporting Module includes all related analysis performance based on the database's data information collected from all other module in the system which mention previously, and will be display at "Dashboard" pages. Apart from the analysis that stated in chapter 3.1, one of the feature functionalists called 'TB Diagnosed Pin Maps', this feature function will graphically present all the TB diagnosed patients with the use of 'Google Maps' to trace patients. Users whom using this feature function could have information of all the TB diagnosed patient current location and further perform some surveillance prevention action based on these location's address (Pin showing in the Map).

Limitations

There are some shortage shows in the system such as the cloud storage issues, this project is using XAMPP as the database server which may not enough storage spaces for the fully developed system.

Furthermore, the **TB Diagnosis Laboratory Information System** design is based on the end-user requirement, the user may come out with new requirements because of the continuous development of new drugs or new treatment. So, medical personal needs keep the health care system up to date.

This system has the limitation that when the new features come out, it needs to be changed some part of the coding manually. Thus, the TB data analysis section is still under development, still have the insufficient that can be improved.

7.3 Future Work

Mykad Card Scanner can be applied to support the efficiency of the system. As the Malaysian Identity Card is the method for patient to make registration, Mykad scanner will be useful for the registration. Instead of manually key in the IC no. , the receptionist can scan the patient identity card, the patient's specific record will automatically be stored into the system. With the help of Mykad Card Scanner, this can help the receptionist to reduce the time needed for register a patient and increase the accuracy of data input.

Bar code Technology also can be applied in our system. Bar code technology will useful for the collection of sputum sample because each of the sputum sample's bottle will have a unique no. Lab scientist can use the bar code scanner instead of manually key in the unique no. This can avoid data entry error issues and decrease the time needed to store a record.

The database storage can be changed to cloud storage since the current system relies on XAMPP (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 functionalists of the maintenance module can be increased since the current system supports only basic insert, delete (inactivate user), update (edit/activate user). More functionalists like create new drug or new options provided for each of the option selections input of the system.

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.

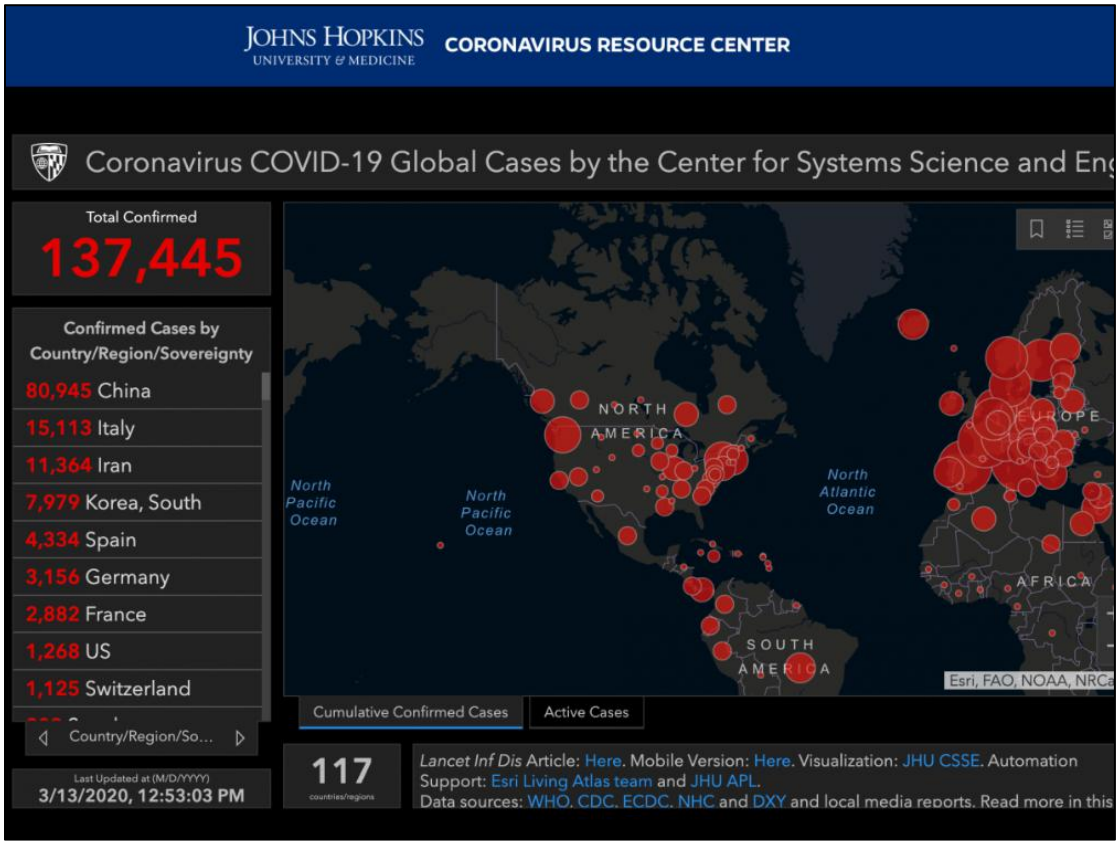


Figure 7.3.1 World Hotmaps (Coronavirus)

7.4 Conclusion

Nowadays, infections disease impact human life and bring the biggest challenges to all human in the world. The lack of early detection and prevention of the TB disease fosters the TB cases happened all over the world and become a serious global health issue. To helps and resolve the critical TB problem along, a useful TB diagnosis laboratory management system is needed. 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.

At the end of this project, this proposed system can help to reduce the annual risk of TB and the implemented function will help to solve the problem of the TB diagnosis laboratory. 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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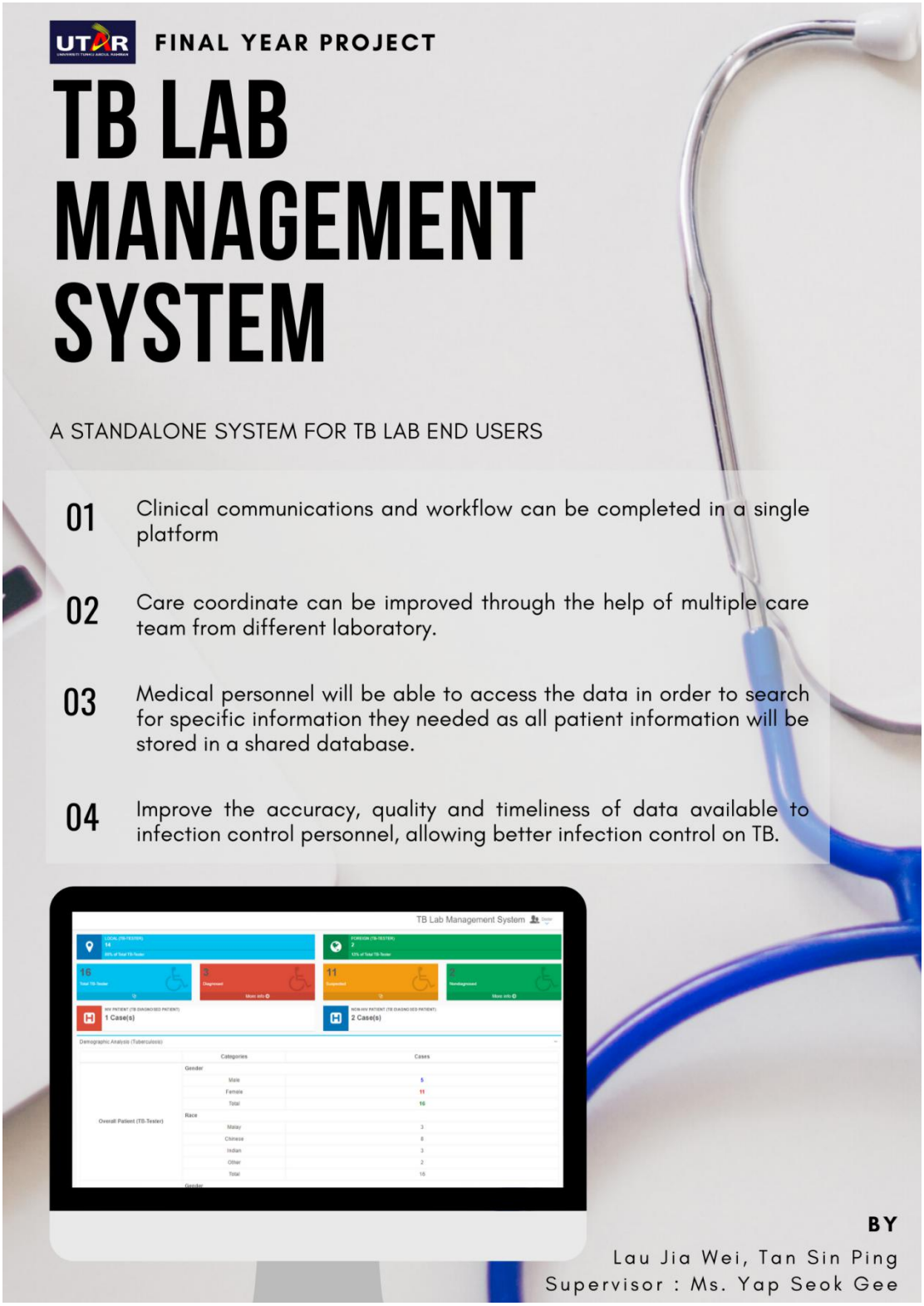
APPENDIX A : POSTER



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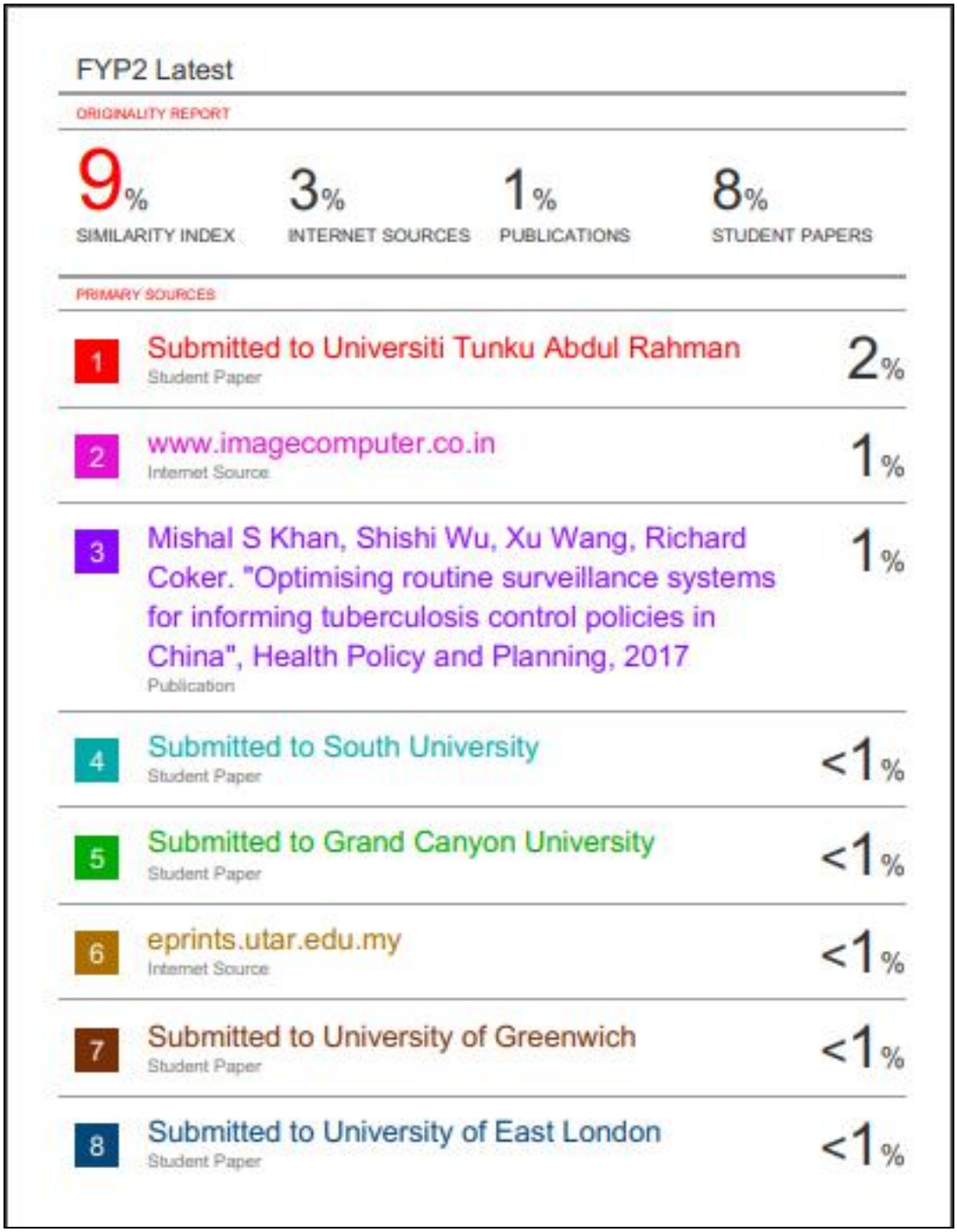

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APPENDIX B : PLAGARISM CHECK

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)	Tan Sin Ping
ID Number(s)	16ACB02180
Programme / Course	BACHELOR OF INFORMATION SYSTEMS (HONS) BUSINESS INFORMATION SYSTEMS
Title of Final Year Project	TB DIAGNOSIS LABORATORY INFORMATION SYSTEM

Similarity	**Supervisor's Comments (Compulsory if parameters of originality exceeds the limits approved by UTAR)**
Overall similarity index: 9 **% Similarity by source** Internet Sources: 3 % Publications: 1 % Student Papers: 8 %	
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.

Note 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

Date: 24 April 2020

Signature of Co-Supervisor

Name: _____

Date: _____

Appendix C : Weekly Report

FINAL YEAR PROJECT WEEKLY REPORT

(~~Project I~~ / Project II)

Trimester, Year: Y3S3	**Study week no.:** Week 2
Student Name & ID: Tan Sin Ping, 1602180	
Supervisor: Ms. Yap Seok Gee	
Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM (OPERATION, MAINTENANCE AND REPORTING)	

1. WORK DONE

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

2. WORK TO BE DONE

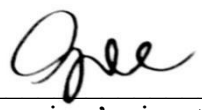
Contact and arrange a time to meet up Miss Saw and Miss Saw's sister to conduct a short meeting, report our progress and have a short presentation.

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

Appendix C : Weekly Report

FINAL YEAR PROJECT WEEKLY REPORT

(Project I / Project II)

Trimester, Year: Y3S3	**Study week no.:** Week 3
Student Name & ID: Tan Sin Ping, 1602180	
Supervisor: Ms. Yap Seok Gee	
Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM (OPERATION, MAINTENANCE AND REPORTING)	

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.

Supervisor's signature

Student's signature

Appendix C : Weekly Report

FINAL YEAR PROJECT WEEKLY REPORT

(~~Project I~~ / Project II)

Trimester, Year: Y3S3	**Study week no.:** Week 4
Student Name & ID: Tan Sin Ping, 1602180	
Supervisor: Ms Yap Seok Gee	
Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM (OPERATION, MAINTENANCE AND REPORTING)	

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

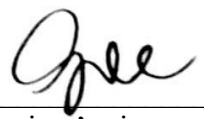
Miss Yap recommend us to try Oracle database as our system database. We will find the person and evaluate whether the database is suitable for our system or not.

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

Appendix C : Weekly Report

FINAL YEAR PROJECT WEEKLY REPORT

(~~Project I~~ / Project II)

Trimester, Year: Y3S3	**Study week no.:** Week 5
Student Name & ID: Tan Sin Ping, 1602180	
Supervisor: Ms Yap Seok Gee	
Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM (OPERATION, MAINTENANCE AND REPORTING)	

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

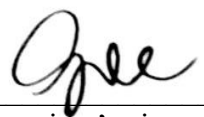
Meet with Miss Yap, report our decision and present our system's progress.

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

Appendix C : Weekly Report

FINAL YEAR PROJECT WEEKLY REPORT

(~~Project I~~ / Project II)

Trimester, Year: Y3S3	**Study week no.:** Week 6
Student Name & ID: Tan Sin Ping, 1602180	
Supervisor: Ms Yap Seok Gee	
Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM (OPERATION, MAINTENANCE AND REPORTING)	

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

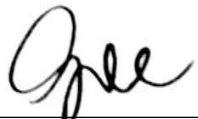
Modify the system based on Miss Yap's feedback and recommendation. For example, make the field smaller and shorten the patient's information display with display three column in a row.

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.



Supervisor's signature

Student's signature

Appendix C : Weekly Report

FINAL YEAR PROJECT WEEKLY REPORT

~~(Project I~~ / Project II)

Trimester, Year: Y3S3	**Study week no.:** Week 7
Student Name & ID: Tan Sin Ping, 1602180	
Supervisor: Ms Yap Seok Gee	
Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM (OPERATION, MAINTENANCE AND REPORTING)	

1. WORK DONE

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

2. WORK TO BE DONE

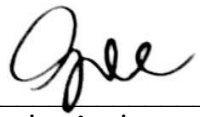
Meet with Miss Saw for our enquiry and also complete radiologist and lab scientist module within this week.

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

Appendix C : Weekly Report

FINAL YEAR PROJECT WEEKLY REPORT

(~~Project I~~ / Project II)

Trimester, Year: Y3S3	**Study week no.:** Week 8
Student Name & ID: Tan Sin Ping, 1602180	
Supervisor: Ms Yap Seok Gee	
Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM (OPERATION, MAINTENANCE AND REPORTING)	

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

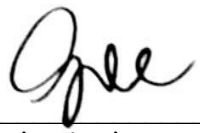
Complete the lab scientist module within this week.

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.



Supervisor's signature

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(~~Project I~~ / Project II)

Trimester, Year: Y3S3	**Study week no.: Week 9**
Student Name & ID: Tan Sin Ping, 1602180	
Supervisor: Ms Yap Seok Gee	
Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM (OPERATION, MAINTENANCE AND REPORTING)	

1. WORK DONE

We had complete the lab scientist module successfully.

2. WORK TO BE DONE

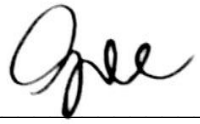
Meet with Miss Yap to report our system's progress and complete the doctor's module.Thus, meet with Miss Saw for the data analysis part to understand what information needed to further elaborate.

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.



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Appendix C : Weekly Report

FINAL YEAR PROJECT WEEKLY REPORT

(~~Project I~~ / Project II)

Trimester, Year: Y3S3	**Study week no.: Week 10**
Student Name & ID: Tan Sin Ping 1602180	
Supervisor: Ms Yap Seok Gee	
Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM (OPERATION, MAINTENANCE AND REPORTING)	

1. WORK DONE

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

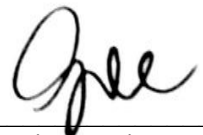
Miss Yap has give us some feedback on our system, we need to make some changes on our system such as display the result at the bottom and moved the result definition at the right side. Thus, we also need to complete the doctor module which are the last module in our system.

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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Appendix C : Weekly Report

FINAL YEAR PROJECT WEEKLY REPORT

(~~Project I~~ / Project II)

Trimester, Year: Y3S3	**Study week no.: Week 11**
Student Name & ID: Tan Sin Ping, 1602180	
Supervisor: Ms Yap Seok Gee	
Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM (OPERATION, MAINTENANCE AND REPORTING)	

1. WORK DONE

Complete part of the coding in the doctor module.

2. WORK TO BE DONE

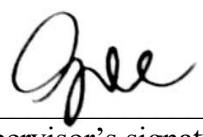
Complete the coding for the analysis part in the doctor module and complete the full report.

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.



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Appendix C : Weekly Report

FINAL YEAR PROJECT WEEKLY REPORT

(~~Project I~~ / Project II)

Trimester, Year: Y3S3	**Study week no.: Week 12**
Student Name & ID: Tan Sin Ping, 1602180	
Supervisor: Ms Yap Seok Gee	
Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM (OPERATION, MAINTENANCE AND REPORTING)	

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

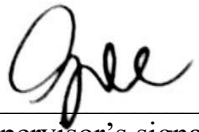
Solve the bugs inside the system and try to complete the report within this week.

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.



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Appendix C : Weekly Report

FINAL YEAR PROJECT WEEKLY REPORT

(~~Project I~~ / Project II)

Trimester, Year: Y3S3	**Study week no.: Week 13**
Student Name & ID: Tan Sin Ping, 1602180	
Supervisor: Ms Yap Seok Gee	
Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM (OPERATION, MAINTENANCE AND REPORTING)	

1. WORK DONE

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

2. WORK TO BE DONE

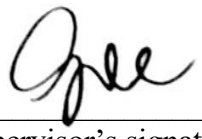
Complete the remaining report such as system implementation and conclusion.

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.



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Appendix D : CHECK LIST

UNIVERSITI TUNKU ABDUL RAHMAN

FACULTY OF INFORMATION & COMMUNICATION TECHNOLOGY (KAMPAR CAMPUS)

CHECKLIST FOR FYP2 THESIS SUBMISSION

Student Id	1602180
Student Name	Tan Sin Ping
Supervisor Name	Ms. Yap Seok Gee

TICK (√)	DOCUMENT ITEMS Your report must include all the items below. Put a tick on the left column after you have checked your report with respect to the corresponding item.
√	Front Cover
√	Signed Report Status Declaration Form
√	Title Page
√	Signed form of the Declaration of Originality
√	Acknowledgement
√	Abstract
√	Table of Contents
√	List of Figures (if applicable)
√	List of Tables (if applicable)
√	List of Symbols (if applicable)
√	List of Abbreviations (if applicable)
√	Chapters / Content
√	Bibliography (or References)
√	All references in bibliography are cited in the thesis, especially in the chapter of literature review
√	Appendices (if applicable)
√	Poster
√	Signed Turnitin Report (Plagiarism Check Result - Form Number: FM-IAD-005)

I, the author, have checked and confirmed all the items listed in the table are included in my report. (Signature of Student) Date: 23 April 2020	Supervisor verification. Report with incorrect format can get 5 mark (1 grade) reduction. (Signature of Supervisor) Date: 24 April 2020