



American International University-Bangladesh (AIUB)

Department of Computer Science

Faculty of Science & Technology (FST)

Spring 21 22

Section: G

Software Quality Assurance and Testing

**Cancer Detection Through Image Processing**

A Report submitted

By

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# Software Test Plan

for

## <Cancer Detection>

Version 1.0 approved

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26, April 2023

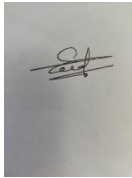
**Checked By Industry Personnel**

Name: Faisal Ibn Awal

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Sign:



Date: 13 April 2023

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## Revision History

Revision	Date	Updated by	Update Comments
0.1	2007.06.04	Scot Robinson	First Draft
0.2	2007.06.19	Amit Nimse	

1. TEST PLAN IDENTIFIER: TP\_CancerDetection\_01.3

## 2. REFERENCES

<https://itrexgroup.com/blog/ai-in-cancer-detection-treatment-applications-benefits-challenges/#header>

<https://www.cancer.gov/news-events/cancer-currents-blog/2022/artificial-intelligence-cancer-imaging>

# INTRODUCTION

## Background to the Problem

Cancer can be considered as one of the leading cause of death globally and millions of new cases reported each year. Early detection can help to have a successful treatment and which will increased chances of survival. Though traditional diagnostic methods which includes biopsies and imaging scans are both time-consuming, and expensive moreover the accuracy of these methods are limited which might lead to missed or misdiagnosed cases. So, for a better diagnostic more reliable method will be needed for cancer detection.

Root Cause of the Problem: The root cause of the problem is the mainly the limited diagnostic methods which are invasive, time-consuming, and expensive. The importance of the problem lies in the fact that early detection is crucial for successful treatment and increased chances of survival.

## Solution to the Problem

Cancer detection is a software which is designed to analyze medical images and data to help healthcare professionals detect and diagnose cancer in patients. The software uses a algorithms which can identify suspicious areas of tissue and classify them as cancerous or non-cancerous by studying the patterns from the medical imaging data, such as X-rays, MRI scans, and CT scans. The purpose of cancer detection is to identify the presence of cancer in a patient's body also identify the location of cancerous growths at an early stage when it is most treatable as it increases the chances of successful treatment and survival rates. This software can analyze medical images and data more quickly than a human expert, reducing the time needed for diagnosis. By accurately identifying cancer at an early stage, it can reduce the number of unnecessary procedures that may be performed on patients who do not have cancer. This information is then used by healthcare professionals to determine the best course of treatment and can provide accurate results in a timely manner.

## 3. REQUEIREMNT SPECIFICATION

### 3.1 System Features

#### 1. Patient Data Management

##### Functional Requirements

1.1 The program must enable qualified medical personnel to enter and modify patient information, such as names, dates of birth, medical histories, and test results.

1.2 The program is responsible for making sure that patient data is kept legally and securely.

Priority Level: High

Precondition: Medical staff have valid login information and appropriate access permissions.

## **2. Cancer Detection**

Functional Requirements

2.1 The software must enable licensed medical staff to use the proper diagnostic equipment to conduct cancer screening tests on patients.

2.2 The program must be capable of analyzing test findings and giving a precise cancer diagnosis.

Priority Level: High

Precondition: Patient data has been entered and updated in the system.

## **3. Treatment Planning**

Functional Requirements

3.1 The software must enable licensed medical staff to use the proper diagnostic equipment to conduct cancer screening tests on patients.

3.2 The program must be capable of analyzing test findings and giving a precise cancer diagnosis.

Priority Level: High

Precondition: Cancer diagnosis has been confirmed for the patient.

## **4. Treatment Progress Monitoring**

Functional Requirements

4.1 The software must enable qualified medical personnel to keep track and trace a patient's cancer therapy over time.

4.2 The program must send alerts and notifications if the patient's condition or treatment plan changes or raises any concerns.

Priority Level: Medium

Precondition: Treatment plan has been created for the patient.

## **5. Reporting and Analytics**

Functional Requirements

5.1 The program must produce reports and analytics on patient information, cancer diagnosis, treatment strategies, and results.

5.2 The program must enable qualified medical personnel to create unique reports and analytics based on predetermined standards or parameters.

Priority Level: Medium

Precondition: Sufficient patient data has been entered and updated in the system.

## **6. Electronic Medical Records**

Functional Requirements

6.1 The software must provide access to and viewing of electronic medical records (EMRs) of patients in the system by authorized medical personnel.

6.2 The software must uphold the security and confidentiality of EMRs in accordance with all applicable laws.

Priority Level: High

Precondition: Patient data has been entered and updated in the system, and medical staff have appropriate access permissions.

## **7 Appointment Scheduling**

Functional Requirements

7.1 The software shall allow authorized medical staff to schedule appointments with patients for cancer screening tests, consultations, and follow-up visits.

7.2 The software shall provide reminders and notifications for scheduled appointments to patients and medical staff.

Priority Level: Medium

Precondition: Patient data has been entered and updated in the system.

## **8 Prescription Management**

Functional Requirements

8.1 The program must enable licensed medical staff to prescribe drugs to cancer patients based on their treatment plan and medical histories.

8.2 The program must issue alarms and notifications in the event that there are any possible drug interactions or medication contraindications.

Priority Level: High

Precondition: Treatment plan has been created for the patient.

## **9 Patient Communication**

#### Functional Requirements

9.1 The software must give medical personnel and patients secure channels for exchanging messages and data regarding the diagnosis, course, and outcome of cancer.

9.2 Through a secure gateway, the program must enable patients to access their test results and medical information.

Priority Level: Medium

Precondition: Patient data has been entered and updated in the system.

## 10 Quality Assurance

#### Functional Requirements

10.1 The software shall track and monitor the quality and accuracy of cancer screening tests, diagnoses, and treatment plans performed by medical staff.

10.2 The software shall provide feedback and recommendations for improving the quality and accuracy of cancer care.

Priority Level: High

Precondition: Sufficient patient data has been entered and updated in the system.

## 3.2 System Quality Attributes

1. **Reliability:** The system shall have an uptime of at least 99.9% and shall not lose or corrupt patient data under any circumstances
2. **Scalability:** The system shall be able to handle an increasing number of patients and medical staff without degradation in performance or responsiveness.
3. **Security:** The system shall implement appropriate security measures to protect patient data from unauthorized access, modification, or disclosure.
4. **Accuracy:** The system shall provide accurate and reliable cancer diagnosis results to minimize false positives or false negatives.
5. **Performance:** The system shall be able to process cancer screening tests and treatment plans within an acceptable time frame to minimize delays and ensure timely treatment for patients.



6. **Compatibility:** The system shall be compatible with standard medical software and hardware devices commonly used in healthcare facilities.
7. **Maintainability:** The software shall be designed in a modular and good manner to allow for easy maintenance and future upgrades. All code shall be well-documented and written using industry-standard coding practices to ensure maintainability.

### 3.3 System Interface

Prescription Page

HomeLogout

Patient Information

Patient Name:

Patient Age:

Patient Gender:

Select Gender

Patient Height (in cm):

Patient Weight (in kg):

Patient Blood Group:

Select Blood Group

Prescription:

Medicines (with dosage and frequency):

Create Prescription

Prescription View

HomeLog Out

Patient Information

Name: John Doe

Age: 35

Gender: Male

Prescribed Medicines

Aspirin	For headache	Morning, Afternoon
Ibuprofen	For fever	Afternoon, Night
Paracetamol	For pain	Morning, Night

Scan: 

Choose File

 No file chosen

Scan Now

No cancer detected.

Registration Form

Name:

Email:

Phone:

Password:

Confirm Password:

Account Type:

Select Account Type

Register

Treatment Option	Recommendation	Action	
Chemotherapy	Weekly sessions for 6 months	Edit	Delete
Radiation Therapy	Daily sessions for 3 weeks	Edit	Delete
Surgery	Removal of affected area followed by recovery period	Edit	Delete
Immunotherapy	Bi-weekly injections for 3 months	Edit	Delete

# Login

Account Type: ☐ Medical Staff ☐ Patient

Login

## Patient Medical Records

Patient Name	Age	Gender	Medical Condition	Treatment	Medication	Action
John Smith	45	Male	Diabetes	Insulin	Metformin	<div>EditDelete</div>
Jane Doe	32	Female	Asthma	Inhaler	Albuterol	<div>EditDelete</div>

## Message Page

Home Sign Up Log Out

Hi, I have some concerns about my recent test results.

Hi, how can I help you today?

Sure, let me take a look at your file.

Based on your results, it looks like you may have a mild infection. I would recommend some antibiotics.

Okay, thank you for your help.

Type your message here...

Send

### 3.4 Project Requirements

#### **Physical resources:**

Workstations: A minimum of 5 workstations with high-end specifications for development and testing.

Special hardware devices: Medical imaging devices, such as CT scanners, MRI machines, and X-ray machines for testing and integration purposes.

Testing labs: A dedicated testing lab with controlled environmental conditions and access control measures.

Testing tools and equipment: A variety of testing tools and equipment are available, including automated testing tools, performance testing tools, and network testing tools.

Team rooms: A designated team room for the development team with adequate space, furniture, and amenities.

Videoconferencing equipment: High-quality videoconferencing technology is available for distant meetings and cooperation.

#### **Staff training:**

User documentation: Comprehensive user documentation, including training materials, tutorials, reference manuals, and release notes.

Training materials: A variety of training materials, including videos, webinars, and online courses, are available to supplement employee training.

Reference manuals: Detailed system reference guides, containing technical specs, system architecture, and installation methods.

#### **Legal protection:**

Intellectual property: Requirements and procedures for obtaining legal protection (patents, trademarks, or copyrights) for any intellectual property related to the software.

### Effort Estimation:

SLOC (Source Lines of Code) of code of our project are 80,000 and the following effort factors:

Software Project Type : Semi-detached

$$\begin{array}{llll} \text{Coefficient} & <\text{Effort} & \text{Factor}> & = & 3.0 \\ P & & = & & 1.12 \\ T = 0.35 & & & & \end{array}$$

$$\text{Effort} = \text{PM} = \text{Coefficient} <\text{Effort Factor}> * (\text{SLOC}/1000)^P$$

$$\text{PM} = 3.0 * (200,000/1000)^{1.12}$$

$$\text{PM} = 13.74 \text{ person-months}$$

Using the formula for development time and required number of people, we get:

$$\text{Development time} = \text{DM} = 2.50 * (\text{PM})^T$$

$$\text{DM} = 2.50 * (13.74)^{0.35}$$

$$\text{DM} = 5.56 \text{ months (rounded up to the nearest whole number =6)}$$

$$\text{Required number of people} = \text{ST} = \text{PM}/\text{DM}$$

$$\text{ST} = 13.74/5.56$$

$$\text{ST} 2.47 \text{ (rounded up to the nearest whole number =3)}$$

Therefore, the estimated effort for the project is 13.74 person-months, the development time is 6 months, and the required number of people is 3

## FEATURES NOT TO BE TESTED

System scalability: If the system has been designed to handle a certain number of users, it won't be needed to test its scalability beyond that number, unless there are plans to increase the user rate.

2. Compatibility with obsolete software: If the system is already designed to work with the latest versions of certain software or operating systems then it isn't necessary to test its compatibility with older versions.

3. Modifications: If the system is not designed to be customized by users then checking how well it handles such modifications isn't really necessary.

4. Security of third-party software: If the system relies on third party security software then testing on this won't be needed as it would be the responsibility of the third-party provider to ensure the security of their software.

5. Usability for users with disabilities: If the system is not specifically designed to be accessible to users with disabilities, it may not be necessary to test its usability for such users.

## 4. TESTING APPROACH

### 4.1 Testing Levels

1. **Unit testing:** Testing the individual units and making sure that those are perfectly functioning. The developer runs unit tests and sends feedback to team leader and he checks if modules are working as expected then he approves the testing progress.

2. **Integration Testing:** After unit testing, The integration testing is done by developer combining functioning units and checking if the new module is flawlessly linked with the current system.

3. **System testing:** The entire system tests testing the entire system as a whole and it's tested in a black-box fashion by the testers to make sure all modules function properly with one another.

4. **Acceptance Testing:** Acceptance testing tests user acceptance. And let the users of the product use it in real-time and provide feedback if anything need to be fixed have defects.

**5. Regression testing:** This level of testing involves retesting the system after changes or modifications have been made to ensure that existing functionality has not been affected and it's is still working as expected.

Project Name: Cancer Detection		Test Designed by: Tanima Islam		
Test Case ID: CD_FR_1		Test Designed date:15-Mar-2023		
Test Priority (Low, Medium, High): High		Test Executed by: Tanima Islam		
Module Name: Patient Information		Test Execution date:15-Mar-2023		
Test Title: Verify patient information is correctly saved				
Description: Test patient information is correctly saved in the database				
Precondition (If any): None				
Test Steps	Test Data	Expected Results	Actual Results	Status (Pass/Fail)

## 4.2 Test Tools

Selenium WebDriver is a popular open-source testing tool which is compatible with Windows, Mac, and Linux operating systems to use for automating web applications. It's useful for web application testing because it supports multiple programming languages such as Java, Python, Ruby, and C# and it also supports multiple browsers such as Chrome, Firefox, Safari, and Edge, enabling testers to test their web applications across different browsers and ensure that they function consistently. And it is easy to integrate with other tools such as TestNG, JUnit, and Cucumber to create powerful testing frameworks.

## Meetings

The test team will meet once in every week to evaluate progress to date and to identify error trends and problems as early as possible. The test team leader will meet with development and the project manager once every two weeks as well. These two meetings will be scheduled on different weeks. Additional meetings can be called as required for emergency situations.

## 5. TEST CASES/TEST ITEMS

Project Name: Cancer Detection			Test Designed by: Rufaida Mamun	
Test Case ID: CD_FR_3			Test Designed date:23-Mar-2023	
Test Priority (Low, Medium, High): Medium			Test Executed by: Rufaida Mamun	
Module Name: Report Generation			Test Execution date:23-Mar-2023	
Test Title: Verify report generation				
Description: Test cancer test report is generated correctly				
Precondition (If any): Cancer test results are determined				
Test Steps	Test Data	Expected Results	Actual	Status
Test Steps	Test Data	Expected Results	Actual Results	Status (Pass/Fail)
1. Perform cancer test	N/A	Cancer test results are accurate	As expected,	Pass
2. Determine cancer test results				
Post Condition: Cancer test results are correctly determined				



			Results	(Pass/Fail)
1. Generate cancer test report  2. Verify report details	N/A	Cancer test report is accurate	As expected,	Pass
Project Name: Cancer Detection			Test Designed by: Mysara Nur Tanha	
Test Priority (Low, Medium, High): Medium			Test Executed by: Tanima Islam	
Module Name: Patient Notification			Test Execution date:28-Mar-2023	
Test Title: Verify patient notification				
Description: Test patient is notified of cancer test results				
Precondition (If any): Cancer test results are determined				
Test Steps	Test Data	Expected Results	Actual Results	Status (Pass/Fail)
1. Notify patient of cancer test results  2. Verify notification details	N/A	Patient is informed of cancer test results	As expected,	Pass
Post Condition: Patient is notified of cancer test results				

Test Case ID: CD_FR_5		Test Designed date:28-Mar-2023		
Test Priority (Low, Medium, High): Medium		Test Executed by: : Mysara Nur Tanha		
Module Name: Data Privacy		Test Execution date:28-Mar-2023		
Test Title: Verify data privacy				
Description: Test patient information is secure				
Precondition (If any): Patient information is saved in database				
Test Steps	Test Data	Expected Results	Actual Results	Status (Pass/Fail)
1. Test data privacy measures 2. Verify data privacy details	N/A	Patient's information is secure	As expected,	Pass
Post Condition: Patient's information is secure				

## 6. ITEM PASS/FAIL CRITERIA

The test case will be deemed successful if the actual results match the predicted ones. The test case will be deemed unsuccessful if the actual findings do not match the predicted results.

The following criteria can be used to determine whether the overall testing of the system is a pass or a fail:

1. Every crucial test case must pass: For the testing to be deemed successful, all critical test cases must pass. These are tests that are critical to the system's security or functionality.
2. A certain percentage of all test cases must pass: For the testing to be deemed successful, a minimum percentage of all test cases, such as 80% or 90%, must pass.
3. All high-priority defects must be corrected: Prior to the testing being deemed successful, all high-priority flaws must be corrected. Defects with a high impact on the system's functionality or security are considered high priority.

## 7. TEST DELIVERABLES

Test deliverables are the physical products that are created during the testing process and are used to document the testing effort and results. These deliverables are shared with stakeholders to let them know how the testing is progressing, how well the software is working, and if there are any problems or concerns that need to be addressed.

In the above test plan, the following deliverables are listed:

- 1. Acceptance test plan:** This document describes the acceptance testing technique and the requirements that must be satisfied before the system can be released.
- 2. System/Integration test plan:** In this document, the testing strategy for the system as a whole, including the integration of its many components, is described.
- 3. Unit test plans:** This file defines the system's specific modules or units' testing procedures.
- 4. Screen prototype:** Screen prototypes are mockups or designs of the user interface of the system that are used to test the user experience and make sure it complies with the specifications.

**5. Reports and summaries of Defects and Incidents:** These records keep track of any Defects or Incidents discovered during Testing and offer an overview of their impact and severity.

**6. problems that were discovered, and any steps that were done to fix them. Test logs and turnover reports:** These records keep track of all test operations, including the outcomes of each test, any

## STAFFING AND TRAINING NEEDS

The project requires the following in terms of training and personnel:

### Staffing:

- For the system/integration and acceptance testing phases of the project, at least one tester should be hired on a full-time basis.
- The project manager/test manager will take on this responsibility if a separate test person is not available.

### Training

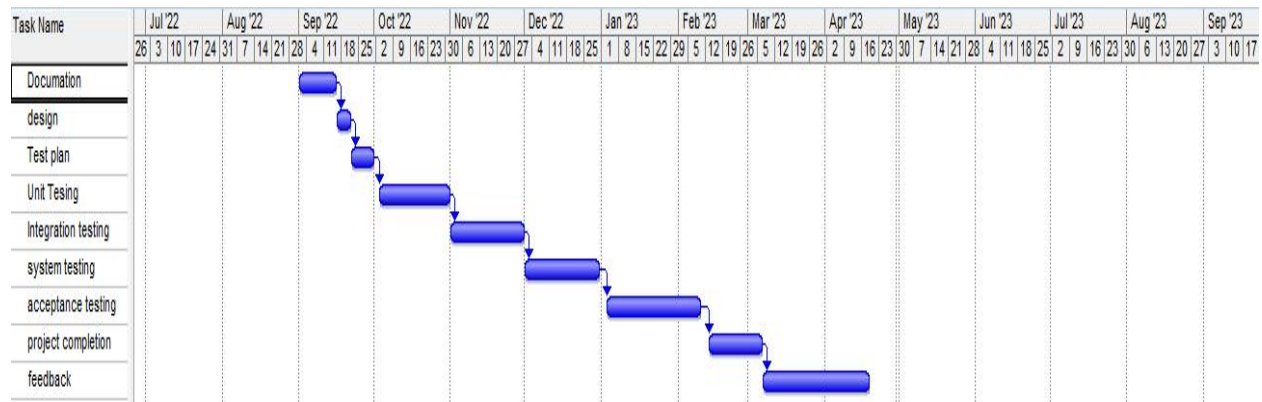
- Depending on the resources available and the desires of the stakeholders, training sessions may be held on-site or off-site.
- Step-by-step instructions, screenshots, and videos should be included as necessary in the training materials, which should be written in a clear and straightforward manner.
- To reduce delays and errors, the training should be delivered as soon as feasible, ideally prior to the commencement of the testing phase or as early as possible in the project timetable.

## 8. RESPONSIBILITIES

	TM	PM	Dev Team	Test Team	Client
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Acceptance test documentation & execution	X	X		X	X
System/Integration test documentation & execution			X	X	
Unit test documentation & execution			X	X	
System Design Reviews		X	X		X
Detail Design Reviews		X	X		X
Test procedures and rules	X			X	
Screen & Report prototype reviews		X	X		X
Change Control and regression testing	X		X	X	

## 9. TESTING SCHEDULE



## 10. PLANNING RISKS AND CONTINGENCIES

Risk	Contingency Plan
Lack of communication between the testing team and development team	Regular meetings between testing and development team to ensure open communication and address any concerns as soon as possible
Inadequate training of staff	Schedule and provide sufficient training sessions for staff prior to system release
Technical issues with testing tools	Have alternative testing tools available as backup and provide technical support to resolve any issues quickly
Delay in delivery of software modules	Adjust the testing schedule and prioritize testing for critical modules to ensure timely delivery
Unavailability of key personnel during critical testing phases	Plan for backup personnel or adjust the testing schedule to accommodate their availability

## 11. APPROVALS

Project Sponsor	Nabiil Mohammed
Development Management	Nabil Mohammed
EDI Project Manager	Tanima Islam
RS Test Manager	Rufaida Mamun
RS Development Team Manager	Mysara Nur
Reassigned Sales	Sheikh Nasif
Order Entry EDI Team Manager	Shalim Sadman