INFO 6068 Capstone

Test Strategy

Intellectual Ability

### Amendment History:

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| --- | --- | --- |
| Version | Date | Amendment History |
| 0.01 | 22/01/2023 | Initial Draft |
| 0.02 | 24/01/2023 | Add content up to Scope |
| 0.03 | 25/01/2023 | Roles and Responsibilities, Environment and Tools added |
| 0.04 | 27/01/2023 | Test types, approaches, stages draft |
| 0.05 | 28/01/2023 | Entry, exit criteria, Test execution, Test Data |
| 0.06 | 29/01/2023 | Test standard, Test approaches, Test documentation amendment |
| 0.07 | 30/01/2023 | Manual and automated testing described |
| 0.08 | 02/02/2023 | Finalized after review of team members |

### Reviewers:

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| Sumeet Dhillon  Boney Anugha  Libin George  Olga Golovatenko  Stephy Johnson  Sameep Mahajan | *Sumeet Dhillon*  *Boney Anugha*  *Libin*  *Olga*  *Stephy Johnson*  *Sameep Mahajan* | Project Manager  Tech Support Engineer  Test Lead SQE  Software Quality Engineer  Software Quality Engineer  Build Manager | 02/02/2023  02/02/2023  02/02/2023  02/02/2023  02/02/2023  02/02/2023 |  |

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| Name | Signature | Title / Responsibility | Date | Version |
| Sushmita Haldar |  | Project Owner | 03/02/2023 |  |

### Related Documents:

These documents will provide additional information.

|  |  |  |  |
| --- | --- | --- | --- |
| Ref no | Doc Reference Number | Title | Version |
| 1 | 001.A | Travel-and-Tourism-Management-System.doc |  |
| 2 | 001.B | Travel-and-Tourism-Management Project Plan |  |
| 3 | 001.C | Travel-and-Tourism-Management Project Requirements Specification Document |  |
| 4 | 001.D | Travel-and-Tourism-Management Project Schedule |  |
|  |  |  |  |

### Glossary of Terms:

|  |  |  |
| --- | --- | --- |
| Term | Acronym | Definition |
| STLC | Software TestingLife Cycle |  |
| SW | Software |  |
| SQE | Software Quality Enineer |  |
| SAT | Software Automation Test |  |
| AST | Appication Under Test |  |
| ROI | Return on Investment |  |
| UAT | User Acceptance Test |  |

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# Introduction

This document will outline the high-level test strategy for EWHEELZ application which is an automated system for travel and tourism office. A web-based application system– named EWHEELZ is proposed to be delivered to support Stately Sojourn Travel and Tourism Company. The successful implementation of this project will increase the profitability of this company by allowing it’s customer easy access for a complete travel arrangement.

## Objectives

This application will ensure information collecting, storing, accessing and managing for the customers to make satisfactory travel arrangements. The whole system will be tested according to this test strategy document from the beginning to the end of the project.

The main objectives are-

* To determine which aspects of the system will be examined.
* To figure out the severity and coverage
* To define entry and exit criteria
* To discuss about the test data, tools and environment etc. of the testing process
* To establish the environment and the system successfully
* To test if all components of the application are working appropriately
* To test the whole system is working after integration
* To check the functionality according to requirement
* To see if the system works in multiple browsers, on different devices, and with different operating systems.
* The system is capable of handling large amounts of data.
* The system performs as planned.
* System is storing and retrieving information properly from the database

This document will be created and followed by the project test team as a guideline on overall testing procedures for this project.

* 1. **Scope**

The following topics will be covered in this Test Strategy:

* Administrator module
  + An administrator will be assigned from the Travel Company’s office with login credentials implemented
  + Administrator will be able to
    - Add / View/ Delete Route information
    - Add / View/ Delete Travel information
* Travels module
  + Users will be able
    - Book Ticket
      * Checking availability
      * Submitting booking request
    - Cancel Ticket
      * Submitting cancel request
* Routes module
  + Users will be able to
    - View Routes Information
    - Select Desired Route
* Reservations module
  + Users will be able to
    - View available hotel and reservation information
    - Create Reservation
    - Cancel Reservation
* Testimonials module
  + Users will be able to
    - View Testimonial Information
    - Give Testimonial- by submitting feedback

**Out of scope**

This Test Strategy will exclude the following as out of scope area:

* Financial Transactions for Ticket Purchases
* Monetary Transactions for Making Reservations
* Security / Penetration Testing
* Data Protection
* Systems & Service Management
* Network Integrity
* Recovering from a disaster
* Helpdesk Tools & Processes
* Information Reporting for Management
* Audit
* Resilience
* Capacity Planning
* Data Transfer
* Processes, Contents, and Effectiveness of Training

# Roles and Responsibilities

The roles and responsibilities of the Software Testing team members are represented in the following table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Name | Designation | Role | Responsibility |
| 1 | Sushmita Haldar | Product Owner | Provide direction, approval, funding | Ensure signing for approval, ensure funding and coordination. |
| 2 | Sumeet Dhillon | Project Manager | Managing the project schedule, budget, resources etc. | Oversees QA processes through proper leadership, communication with Test team , Product Owner, Developer and Users |
| 3 | Boney Anugha | Tech Support Engineer | Designing and implementing set up, installation and Non Functional testing | Maintain setup and installation, perform non-functional testing. |
| 4 | Libin George | Build Manager | Handling automated build procedure for applications and components | Monitor and Updates the automated build procedure throughout the project |
| 5 | Olga Golovatenko | Test Lead SQE | Designing test procedure, leading testing team | Managing and tracking SW system test planning and ensuring maximum test coverage |
| 6 | Stephy Johnson | Software Quality Engineer | Executing test script, defect log, validating repaired bugs | Test execution, defect logging, Regression testing |
| 7 | Sameep Mahajan | Software Quality Engineer | Executing test script, defect log, validating repaired bugs | Test execution, defect logging, Regression testing |

# 

# Testing Overview

The testing will be done systematically in several phases using Software Testing Life Cycle (STLC) strategy to ensure software quality standards. During the whole project, phases of the STLC may be performed multiple times to improve the product quality.

## Test Lifecycle

The test life cycle represents the methods to formalize the testing process. The phases of STLC are as follows.

* Requirement Analysis
* Test Planning
* Test Case Development,
* Test Environment Setup,
* Test Execution,
* Test Cycle Closure

Fig 1: Testing Life Cycle in agile methodology

The testing will begin just after the primary structure of the software will be developed and it will be ready for smoke test. Ongoing integration will be involved between testing and development. Unlike waterfall testing model, here the testing will be continuous through ongoing feedback with product owner and developers. So this test life cycle will be agile testing with the following principles [[Agile Testing:](https://www.amazon.co.uk/Agile-Testing-Practical-Addison-Wesley-Signature/dp/0321534468) Lisa and Janet]

1. Continuously provide feedback.
2. Provide value to customers.
3. Make face-to-face communication possible.
4. Have courage.
5. Stick to the basics.
6. Continuously enhance your skills.
7. Respond to change.
8. Self-organize.
9. Concentrate on the people.
10. Enjoy.

Through this agile testing process, testers will communicate with product owner to meet the project expectations. The reports about quality issues will help to improve further development. Testers may be required to play the role of a semi-developer. All members will act together for the product quality assurance.

## Test Approach

We will do black box testing for the EWHEELZ application system mostly using manual testing techniques. But we will also require automated testing for some functional and non-functional testing like- volume testing, load testing etc.

### Types of Software Testing

#### Functional Test

Under the functional testing- we will perform

1. Component Testing

2. Integration Testing

3. System Testing

4. Smoke Testing

5. Regression Testing

6. User Acceptance Testing

A functional test will be performed to ensure correctness, suitability, interoperability, and compliance, among other things. Because the entire system can break minutes after deployment at the production level if any user does something the developers did not expect, functional test automation as well as manual testers will be used.

#### Non Functional Test

Under this test criterion the following testing will be performed to ensure overall performance:

1. Documentation testing

2. Installation testing

3. Reliability testing

4. Usability testing

5. Efficiency testing

Because browsers are frequently updated, cross-browser testing is required for this project. This will be accomplished using automated crow-browser testing, which assures that any web application remains compatible with the stated versions of operating systems, browsers, and devices.

Fig: Types of Testing [Infographic: <https://www.edureka.co/blog/types-of-software-testing/>]

### Manual Approach vs. Automated Approach

Automated tastings are very necessary now a day because it increases the testing efficiency and coverage within very short time. When the number of test cases and the number of executing each test case are really high, then automated testing is preferable. But it is not applicable for small and short term projects where repetition of similar test case execution is less.

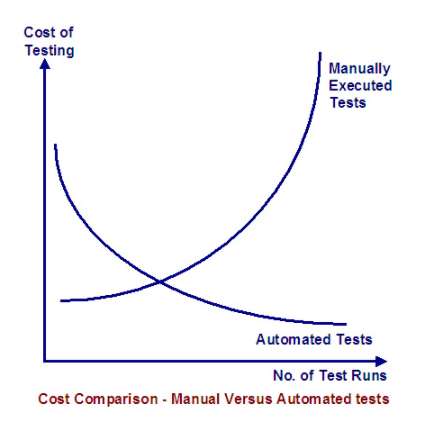
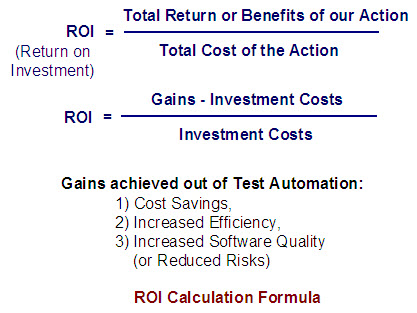


Fig 2: Changes of Automated and Manual Testing over project time

[<https://www.softwaretestinggenius.com/writing-a-good-business-case-the-first-step-towards-test-automation/>]

The travel and tourism project we are working also has some time and budget constraints. In other hand, it also has some resource constraints. So our testing approach should be a combination of both manual and automated tests. However we will use some metrics like ROI to judge the potential of implementing automated approach in real terms for our project.



<https://www.softwaretestinggenius.com/writing-a-good-business-case-the-first-step-towards-test-automation/>

To test critical scenarios and usability testing which requires expert skills to execute different types of test cases- those will be tested manually.

Automated testing will be used to test the general scenarios, especially for positive test cases which has huge amount of test data. Component testing and integration testing will get priority. The types of test cases eligible for automated testing also depends on availability of test data and environment set up.

It will also be used for some non-functional testing, like- performance testing, volume testing, load testing etc.

## Standards

The following severity levels are proposed for issues arising throughout the Test Lifecycle:

|  |  |
| --- | --- |
| Severity Levels | Description |
| Critical | When any bug interrupts the regular functioning of the system and stops it. |
| High | When any bug interrupts the regular functioning of the system partially and also affects the major functionality of the product. |
| Medium | When any bug does not interrupt the regular functioning of the system but affects the minor functionality of the product. |
| Low | When any bug does not interrupt the regular functioning of the system and does not impact the working of the product. |

## Test Stages

Each test stage is a distinct type of testing with its own objectives, techniques, and coverage of requirements, as well as a collection of test scripts. Below is a coverage matrix of all the Test Stages / Test Areas that must be covered in each Test Release.

| Test Areas/ Test Type | Component | Integration | System | Smoke | Regression | UAT |
| --- | --- | --- | --- | --- | --- | --- |
| Functional | **Y** | **Y** | **Y** | **Y** | **Y** | **Y** |
| Non-Functional | **Y** | **Y** | **Y** | **Y** | **Y** | **Y** |
| Business Processes | Y | **Y** | N | N | Y | Y |
| Volume | N | N | N | N | N | N |
| Performance | **Y** | Y | Y | Y | Y | Y |
| Security (including Penetration Testing) | N | N | N | N | N | N |
| Data Protection | N | N | N | N | N | N |
| Usability | **Y** | Y | Y | **Y** | Y | Y |
| Interface Tests | **Y** | Y | Y | **Y** | Y | Y |
| Installation & Configuration | **Y** | Y | Y | **Y** | Y | Y |
| Systems & Service Management & Service Level Reporting | N | N | N | N | N | N |
| Network Worthiness | N | N | N | N | N | N |
| Disaster Recovery | N | N | N | N | N | N |
| Helpdesk Tools & Processes | N | N | N | N | N | N |
| Management Information Reporting | N | N | N | N | N | N |
| Audit | N | N | N | N | N | N |
| Resilience | N | N | N | N | N | N |
| Capacity Planning | N | N | N | N | N | N |
| Data Migration | N | N | N | N | N | N |
| Training Processes, Contents & Effectiveness | N | N | N | N | N | N |
| Cutover & Fallback & Go-Live Simulation | N | N | N | N | N | N |
| Back-up, recovery, journaling | N | N | N | N | N | N |
| Operations Support Processes | N | N | N | N | N | N |
| Commissioning | N | N | N | N | N | N |

## Reviews and Inspections

### Reviews

The test strategy plan and all the respective documents will be reviewed by multiple stakeholders and updated accordingly. Reviews and inspections are effective instruments for identifying and eliminating faults before they have a negative impact on production, as well it will help in sharing information with the team and stakeholders.

* The business team, project management, development team, and the testing team will evaluate and sign off on all of these actions.
* Each Test Stage will run according to the Test Plan and Test Specification applicable to that stage.

The updates on reviews will be amendment later.

### Inspections and Walkthroughs

As a type of peer evaluation, a Code Walkthrough will be conducted. The project manager will supervise the review, while the rest of the team will ask questions and look for probable violations of development standards and other concerns.

* There will be formal reviews and inspection session.
* The author of the paper under review will be leading the meeting, which is also attended by other team members.
* Prior to the walkthrough meeting, reviewers must prepare a review report and a list of findings must be documented
* The scribe will record the minutes of the meeting and notes any faults or difficulties so that it would be followed through to completion.

## Test Documentation

| Document | Phase and cycle |
| --- | --- |
| Test Strategy | A high-level document that identifies the project's Test Levels (types) to be carried out.  Phase and Cycle:   * Test Planning Phase * Requirement Analysis Phase |
| Test Plans | A test plan is a comprehensive planning document that includes information about the scope, approach, resources, timetable, and other aspects of testing.  Phase and Cycle:   * Test Planning phase * Resource Planning |
| Test Specifications | A detailed explanation of the software that is being developed  Phase and Cycle:   * Requirements Phase * Analysis Phase |
| Test Scripts | Test cases are prepared during this step. Each case specifies the test inputs, processes, conditions of execution, and expected outcomes.  Phase and Cycle:   * Test Case Development Phase * Implementation Phase * Execution Phase |
| Test Environment | Testing environments are developed and provided at this step.  Phase and Cycle:   * Test Environment Setup |
| Test Report | The test summary report is a high-level document that describes both the testing activities and the test results.  Phase and Cycle:   * Test Cycle Closure |

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## Test Execution

This section describes how the tests will be executed. During this process the code will be executed, and the expected and actual outcomes will be compared and tracked.  
The functional and the non-functional aspects are to be tested during this phase.

The test strategy of the EWheelz web application is of prime importance and is dependent for the test execution. It will consist of test cases and the outcome of the test execution will be listed down in the excel sheet with their corresponding pass/fail status which will be then passed onto the developers.

The test execution process is performed virtually for the whole semester period.  
3 environments are to be set up as a part of test execution.

* Lower
* Pre-production
* Production.

**This is basic overview of our test execution approach:**

* Application will be developed followed by unit testing by developers and the code will be deployed on the lower environment.
* The scope of testing will be decided by the Product owner and the QAs for the sprint followed by smoke testing. Post smoke-test, in-depth testing will be carried out for all the designed test cases.
* Simultaneously, an automation framework will be maintained by a team of QAs and the code will be maintained on GIT server. After the code development and testing is

successful on lower environment, the same code will be deployed on pre-production environment followed by regression testing.

* In case of any bugs/defect, a different suite would be maintained for that and reported to dev team. Dev team needs to fix it on lower environment first, and once fixed, it would be deployed on pre-production.
* Once the environment is bug - free, it will be deployed on production environment to go live. A dedicated team of QAs would support the release to test the deployment for any defects/ bugs.
* If any bug is reported, it needs to be fixed by development team on high priority. In parallel, the automation framework built will be used to run the regression cycle every night and the reported needs to be generated and shared among all the team members for the progress and status.   
    
  **For each test execution cycle:**
* Choose a subset of the test suite to run for this cycle based on the risk.
* Assign the test cases in each test suite to testers for execution.
* Each test suite's test cases should be assigned to testers for execution.
* Continuously run tests, notify issues, and record test status.
* Resolve any difficulties that occur as they arise.
* Daily, update status, alter assignments, and re-evaluate goals and priorities.
* Report on the results and status of the test cycle.

### Recording Actual Results versus Expected Results

**Deciding the test-cases and sprint planning:**

* Prior to each sprint there will be a meeting to decide which user stories are in our bucket. The development team and QA team will attend the meeting and decide the schedule, allocated time and owner of each user story.
* Post that the testing team will decide the scope and prepare the test cases accordingly.
* There will be review meetings for those test cases. The PM, QA team, development team will review the cases and update accordingly.
* Post the finalization of the cases the testing will begin for this sprint.

There will be one excel file to note down the test cases. After testing each case the actual results will be noted down to compare against the expected result. If the result varies the team will report to development team to make improvements. The format of the result capturing spreadsheet:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **TestCase\_ID (Unique & specific)** | **Description: (System/Test Level/Test Method/Transaction or Function/Condition (s) /Fields/Field values ...)** | **Pre-Condition (if any)** | **Expected Result (on screen)** | **Actual Result (on screen)** | **Expected Post Condition (Database, files, etc.)** | **Actual Post Condition (Database, files, etc.)** | **Pass/**  **Fail?** | **Severity** |
|  |  |  |  |  |  |  |  |  |

### Escalation of Issues for resolution

During test execution if there is any challenge or issues faced. Those issues will be logged in our IAD log report. While our weekly status report meeting, we will discuss the issues and possible resolutions. Each issue will have a particular owner who is best suited to resolve it. The issue will be owned by them and will have a particular timeline to resolve them. If the problem is beyond our scope, it will be escalated to the development team.

### Test Execution Roles

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Activity** | **Project Manager** | **Test Lead** | **Tech Support** | **Build Manager** | **Test Engineer** |
| Test Environment and setup |  | ✓ | ✓ | ✓ |  |
| Test Preparation and Execution | ✓ | ✓ |  |  | ✓ |
| Preparation of test cases |  | ✓ |  |  | ✓ |
| Performing manual testing |  | ✓ |  |  | ✓ |
| Setting up automation tools |  |  | ✓ | ✓ | ✓ |
| Performing automation and developing the test scripts |  |  |  | ✓ | ✓ |
| Ongoing reporting of the test activities | ✓ | ✓ | ✓ | ✓ | ✓ |
| Reviewing and managing the test procedures | ✓ | ✓ |  |  |  |

## Entry & Exit Criteria

**ENTRY CRITERIA**

The core high level requirements for entry into the project is getting the approval from the product owner.

**EXIT CRITERIA**

* Each and every risk, defects must be fixed and closed.
* All the test cases that were initially planned must be successfully completed.
* All of the acceptance criteria should be met.

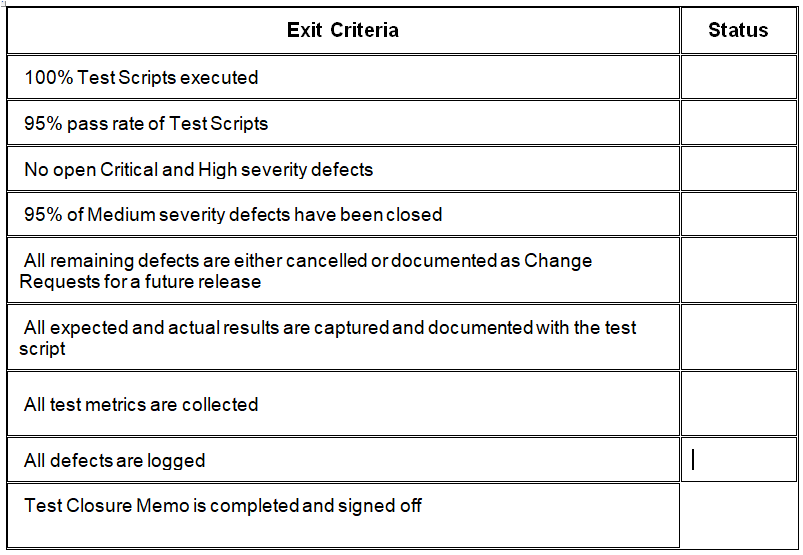
### Table of Entry and Exit Criteria

|  |  |  |
| --- | --- | --- |
| **Test Phases** | **Entry Criteria** | **Exit Criteria** |
| *Test Strategy* | The requirement document and other supported documents should be available. | Completion of the document and approval from the Sponsor. |
| *Test Plan* | Understanding of the project and the application is required. All the project initial requirements are met. | Completion of the test plan document and approval from the Sponsor. |
| *Test Case Development* | Approved Test Strategy and Test Plan documents. | Completion of test cases with input test data, and submission of the document for the review. |
| *Test Environment* | All the hardware and software configuration and tools have been met. | Execution of smoke test successfully done. |
| *Test Execution* | Approved Test case document with verified test environment. | Execution of all test cases and capturing of results, and the deliverables are met for execution stage. |
| *Final Test Report* | All the test status reports and bug reports of the execution phase are documented and approved. | Submission of the test report and closing the project. |

**Exit Criteria Checklist**

According to this checklist each testing phase/cycle should be stopped or continued.

Since it is not possible to test exhaustedly or to create a defect-free product , still we can ensure maximum product quality by using the checklist below.



## Test Results Capture

* The test results will be documented with the test cases in the excel or word document in tabular format for better understanding and later, it will be added into the test report.
* The test results will include TestCase\_ID, TestCase\_Description, FieldValues, Pass/Fail criteria and Severity in excel document. Video recordings will be enabled to record the results of the test runs.
* Also, the screenshots of the outputs would be taken so that team can note down the errors in each test phase. Selenium IDE has recording/ playback feature that is helpful to capture the recordings of the tests and playback those at any time.
* The test result documents will be shared among the team members to understand the application under test.
* The test report will be maintained for any divergence between the expected and the actual results with the indication of high severity level. The report will be shared with the Project Manager for the review of the execution of tests. After any modifications, the tests will be executed again for the results and will be noted in the report.

## Progress Reporting

### Test Report

* A test status report will be reviewed by the Project Manager on daily basis that will contain all the test cases with their results for that day. This document will be submitted in excel format.
* On addition, screenshots will be mentioned to clearly show the steps taken during the test with the recorded results. Also, a test report will be submitted to the Project Manager on weekly basis that will contain enhanced information of the performed tests with the output results. The final report will consist of all these reports to be submitted to the upper-level management for the project closure.

# Test Data

Test Lead(s) will define high level data requirements as needed for testing for the key areas. Identify unique data required by the application such as User Ids and Passwords.

|  |  |
| --- | --- |
| **Test Type** | **Source of Test Data** |
| Smoke Testing | * EWheelz database accessed through MySQL. * Application URL * Tomcat server settings for web server connectivity |
| Component Testing | Manual user data including a series of valid and invalid input in Administrator, Reservations and Testimonials module. It will be recorded in Excel for mapping the test data for regressions. |
| Integration Testing | Randomly generating data from MySQL will be used to verify the synchronized integrations of the Travel and Route modules. |
| Acceptance Testing | Specific test data with respect to the user needs, requirements and business processes. |
| System Testing | Data from the Stakeholders’ requirements |
| Regression Testing | Existing data being re-used reports |
| Usability Testing | * EWheelz database accessed through MySQL. * Data can also be created by Admin to validate the travel, route and reservation module. |
| Installation testing | * Tomcat server installation and configuration settings through Capstone project instructions in FOL * MySQL server installation and configuration settings through Capstone project instructions in FOL |
| Reliability Testing | It will be assessed using the test-retest method i.e., same environment, same amount of sample data and same amount of people working on it. |
| Efficiency Testing | It will be assessed using three manual user data: Valid, Invalid and Extreme. |
| Documentation Testing | It will be assessed using the Requirements Traceability Matrix (RTM) which will contain all the possible test scenarios and the test cases with their current status i.e. pass / fail |

# Testing Environments

## Specification

The specifications required for testing the application are as follows:

**Technology:** Java, J2ee, JRE   
**Web Technologies:** Html, JavaScript, CSS  
**Web Server:** Apache Tomcat5.5  
**Database:** MySql5.0

### Identification of the physical components, the communications, the system and middleware necessary

* A laptop or a desktop computer
* Windows 2010, Mac OS or Linux for the operating system
* Chrome, Edge or Firefox for the browser
* Internet access with greater bandwidth and speed

### Other software or supplies needed to support testing

* MySQL for the database.
* Apache Tomcat for web server environment.
* Selenium IDE for automated testing.
* MS Office for documentation purposes.
* Eclipse IDE to test the code.
* Screen Recorder to record the steps of testing.

### Security and access requirements to the test area and equipment

* Scuba software for database security.
* Gretel tool for access test coverage monitoring.
* Apache HTTP Server

### Test tools and utilities required

* JMeter for measuring the performance of the application.
* Selenium IDE, which includes a recording and playback feature for automated testing.
* Microsoft Azure environment for using the test tools- Jira

### Any other testing needs

* Snipping tool to take screenshots of the tests.

## Relationship between Testing and Test Environment

The test environment is a very important part of the testing process. Successful testing depends on appropriate test environment. In real life, the application may have different kinds of set up in different environment. All possible variation of installation, configuration, set up and product performance in different environment is also considered in our testing process.

**5.2.1 Installation Testing**:

Our test execution will be performed in multiple types of testing environment through different team members. Different types of hardware configuration, operating system etc. used for installation and setup. The specification, performance, issues etc. will be recorded for installation testing purpose.

**5.2.2 Non-functional testing:**

We will also observe how different test environment plays different performance for some nonfunctional testing.

Multiple test environments will be applied in a planned way and specific test results in specific environment will be observed and recorded to improve product quality and to create specification recommended for this application.

# Testing Tools

## Test Management Tools

**MS Project:** A management software tool to develop schedules, assigning resources to different tasks, track the progress of the project and helps to examine the amount of work to be done or required.

**qTest:** A software management tool which is easy to use and learn. It helps to organize the tasks and improves the speed of the test management process.

**MS Office- MS Word and Excel:** It will be used for common tasks to be performed during the project. Documents and presentations can be made and maintained for future record and to submit to the upper level management or sponsor.

**Git**: Will be used to keep track of the versions of developed components, and GitHub will be utilised to save the different versions of the components.

## Test Automation Tools

**Junit:** A tool that will perform the functions where we need to execute the tests repetitively. It is an important tool in development or execution phase.

**Selenium IDE:** It is a web testing tool which is an open source that can record and execute the automated testing with different browsers. It also has feature to record and playback to enhance the automated testing.

**Gridlastic: It helps to run the testing on different browsers to get better results for automated testing. All the information can be seen with the just one click for different browsers.**

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