**COMSATS University Islamabad,   
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SOFTWARE TEST PLAN   
(STP DOCUMENT)

for

**ATOM**  
Version 1.0

***By***

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**STP DOCUMENT REVSION HISTORY**

**Supervisor Signature**

**Date:**

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Revision History

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| **Name** | **Date** | **Reason for changes** | **Version** |
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**Application Evaluation History**

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| **Comments (by committee)**  **\*include the ones given at scope time both in doc and presentation** | **Action Taken** |
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Supervised by

Dr Yasir Faheem

Signature\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Introduction

Our project deals with the domain of Brain-Computer interface and Cognitive Electrophysiology. As the name suggests it uses brain to give input and reads its input by tapping into the electric mode pf communication that our neuron use to communicate all the thoughts and functionalities, we are able to perform. The field is growing, and the possibilities are endless. The fundamental idea is to use this EEG incorporated BCI to target issues relating to human activities, specifically enhancing the attention span to improve focus in daily activities such as reading and others with similar brain involvement. The methodology we’ve chosen to achieve said claim can be divided into two streams; entertainment incentivized training and specialized controlled training, achieved by mini-games and a book reader respectively, where-in both these utilities are taken use of by the BCI to be built

This document will specify the hardware and the software aspects while also discussing the compatibility of different platforms and the integration of different modules that come together to make the whole project.

## Purpose

This document is being made available so that everyone can get an idea what we are trying to achieve and the benefits of this product. To dive into the technical problems and how we are solving some of the hurdles to deliver this project. The main goal really is to improve the mental health of the general public and making them more productive and focused.

Making the world a better place one problem at a time. The issue we have chosen to raise is millennialism and the increasing patients of ADHD in the future generations. For single human being scrolling through their virtual-self on social networks and getting entertained, in the background, the sense of pride and happier mood is because of the drug dopamine which for many complex anatomical reasons and signs implies happiness, comfort and pleasure in general. To keep a dopamine cycle going, the “scrolling” or the “scrubbing” takes up most of the social networking quota allocated per hour for every individual. On the other hand, whilst reading to a book or focusing on a task which in effect releases this sweet pleasured drug, the user desserts the activity entirely. This in nutshell deductively follows to the conclusion that it’ll lead to a population whose daily completion of any set of tasks relies on self-appraisal and dopamine cycles.

To remove this plague, it is necessary to take action and improve our health and keep our mind from wandering to focus more on productive things. Our application equips u with just what u need to beat this problem. Social media apps have engulfed our generation keeping us hooked on them so much that we can’t survive without them. As the world grew the need to become fast-paced and constantly connected felt important but it is also important sometimes to sit back, take a breath and see life in a new perspective to yield better results and to make new discoveries. The notification bell from our mobile apps keeps us on our toes depriving us of the pleasure to really enjoy a book. Our intention with this project is to tap into your brain and slowly divert u away from the toxic habits that rule your brain.

## Scope

So, in nutshell, our system is a BCI that detects the mental state of the user while he or she is using the provided utilities e.g. the reading exercise and the mini-games ,` from the detected mental state makes the prediction with some confidence that whether the user is paying attention or has lost focus. The BCI will achieve this using the hardware provisions of an EEG system, a headset, to gather brain wave readings and judge the state by using pre-programmed experience and a learnt model from previous examples. EEG defines its readings to be of five types of waves; namely the following:

• Alpha: graphing the occipital lobe’s specifics regarding the visual stimuli,

• Beta: graphing the fontal lobe’s specifics regarding the conscious thought and movement,

• Theta: graphing sleep pertinent specifics and apparent in children,

• Delta: partially sleep relevant specifics, while apparent in infants,

• and Gamma: highest frequency waves ending spectral range,

and if a specific part or cortex of the human brain is targeted, depending on the requirement and the nature of the part of brain, then while performing the activity any change in the mental state can be detected by different fluctuations in all these different types of waves. The command center is located in the frontal lobe which is also responsible for the conscious thought and voluntary movement. Although targeting one cortex limits us from the other aspects of the mental state detection such as emotion recognition, social involvement, the human vision. This also limits the overall accuracy due to lower spatial averaging, upon which the entire system is based.

# Executive Summary

To achieve self-awareness, the above proposed BCI can be used to make any user of the complementary application aware of the fact that he or she has lost focus during the indulgence of this certain task. Technically, this will be achieved by identification of a pattern difference in the Electroencephalograph of the user, which our system will learn by gathering experience and learning from previous examples to build and develop. A state in which the user has lost the focus, reinforcement of attention can be achieved in a multitude of ways.

* We lose our focus doing certain tasks, so if there’s monitor and check on this, we can bring forth a targeted solution
* Amongst all the victims of this mind wandering dilemma, the task of book reading is the most popular one. Almost all readers face this problem, and we can design our system to monitor our users and train them to pay more attention to this task at hand
* For the other population, which did not even get into reading, a more suitable way is to use entertainment in form games.

## Test Items

In this plan we aim to test the various components of this system (ATOM) in order to detect as many defects as possible which will be later removed to increase efficiency of ATOM.

* **Unit Testing:** Each unit of ATOM will be tested to its core in order to ensure efficient working of each and every unit, make sure there are no hurdles or hiccups in the units
* **Functional Testing:** Each and every single requirement will be tested against that specified in the Requirement document, end to end delivery will be ensured.
* **Interface Testing:** The interface of ATOM will be tested in order to ensure that it is speedy and it doesn’t produce any hiccups so that the users can see the application and user it effectively.

## Features to be tested

|  |  |
| --- | --- |
| **Module** | **Features** |
| Account Handling | Sign up |
| Sign in |
| Sign out |
| Edit profile |
| View personal information |
| Already exists check |
| Contact validation |
| Sign in(admin) |
| Sign out(admin) |
| Entertainment Incentivized Training | Choose a game |
| View games-list |
| Start game |
| Quit game |
| Exit games-screen |
| View scores |
| Pause game |
| Resume game |
| EEG Feature Extraction | Run model |
| Fetch command |
| Save model |
| Load model |
| Send data |
| Database Handling | View data(admin) |
| Edit data(admin) |
| Delete data(admin) |
| Fetch data(admin) |
| User Analytics and Statistics | View report |
| Graph of one report |
| Graph progress |
| View best report |
| View worst report |
| Average of reports |
| Start recording |
| Save csv |
| Display one channel |
| Display all channels |
| Display wavelet transform |
| Display table |
| End recording |
| Specialized Control Training | Upload pdf |
| View pdf |
| Start monitor |
| Connect headset |
| Generate quiz |
| Solve quiz |

.

## Item Pass/Fail criteria

**Unit Level:**

* If 70% of the cases are completed with less than 5% of defects, then declare test pass
* If 70% of the cases are completed but the defects composed are greater than 5% or the critical level to be specified, then test is declared failed.

**Application Level**

* The application will receive a pass status if it successfully receives the data form the headset and sends the data to the cortex, receives the commands from the cortex and sends that to the unity games.
* The application will receive a fail status if it fails to either receive the data properly or fails to sends the commands properly to the games.

# Testing

The different levels at which testing should be imposed for Atom.

## Verification:

All the functionalities that have been described or tested in this document will be cross referenced and checked with those mentioned or required in the Software requirement document.

## Validation:

All the defects that will be detected during the tests will be evaluated and further removed/mitigated in the debugging phase.

## Usability Testing:

ATOM will be tested to ensure that it is usable by the audience that it has been made for and that it runs properly and effectively.

## Module / Unit Testing:

Each unit of each function/module of ATOM will undergo vigorous testing to identify as many defects as possible which will be removed in the debugging phase.

## Integration Testing:

All the modules/functions of ATOM will be inter-tested meaning that inter-compatibility of the modules will be tested in order to ensure that each modules works with the other modules effectively and that there arise no clashes between the inter working of the modules of ATOM.

## System Testing:

After the successful completion of the integration testing the overall system of ATOM will be tested, meaning overall system which includes all the modules, the interface and the server.

## Acceptance Testing:

We will go into the environment of the client and test out the system keeping in mind how the client would use it and what the client would do with the system and what kind of errors might be generated from the end of the client.

# Test Cases

Write the test cases of your project as per module wise. A sample test cases with format is mentioned:

## Sign up

**Testing Objective:** To ensure the Sign up form is working properly.

**Test Case Id:** TC\_01

**Test Case Description:** Test the Sign up functionality.

**Test Scenario:**

**Table 1: Test Cases for Sign up form**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **No.** | **Test Case/Test Script** | **Test Data** | **Expected Result** | **Actual Result** | **Pass/Fail/Not Executed/ Suspended** |
| 1. | Verify user Sign up after click on the ‘Sign up’ button on Sign up form with correct input data | Username:  03321576652  Password:  Stark506 | Successfully Account is created into the android application | Account is created successfully | Pass |
| 2. | Verify user Sign up after click on the ‘Sign up’ button on Sign up form with correct input data | Username:  0332157665245  Password:  123456 | Account not created in ATOM | Contact must be valid. | Fail |

## Sign in

**Testing Objective:** To ensure the Sign In form is working properly.

**Test Case Id:** TC\_02

**Test Case Description:** Test the Sign in functionality.

**Test Scenario:**

**Table 2: Test Cases for Sign In form**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **No.** | **Test Case/Test Script** | **Test Data** | **Expected Result** | **Actual Result** | **Pass/Fail/Not Executed/ Suspended** |
| 1. | Verify user Sign in after click on the ‘Sign in’ button on Sign in form with correct input data | Contact :  03321576652  Password:  Stark506 | Successfully Account is signed-in into the ARTINK website. | Sign in into the website successfully | Pass |
| 2. | Verify user Sign in after click on the ‘Sign in’ button on Sign in form with correct input data | Contact :  03321576652  Password:  1234 | Account is not signed-in. | Password incorrect | Fail |
| 3. | Verify user Sign in after click on the ‘Sign in’ button on Sign in form with correct input data | Contact:  03235065035  Password:  Ansa | Account not signed-in . | Contact not registered. | Fail |

## Sign out

**Testing Objective:** To ensure the Sign out is working properly.

**Test Case Id:** TC\_03

**Test Case Description:** Test the Sign out functionality.

**Test Scenario:**

**Table 3: Test Cases for Sign out**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **No.** | **Test Case/Test Script** | **Test Data** | **Expected Result** | **Actual Result** | **Pass/Fail/Not Executed/ Suspended** |
| 1. | Verify user Sign out after click on the ‘Sign out’ button | User clicks on the Sign out button | Successfully Signed out . | Signed out successfully | Pass |

## Edit profile

**Testing Objective:** To ensure the Edit profile form is working properly.

**Test Case Id:** TC\_04

**Test Case Description:** Test the Edit profile functionality.

**Test Scenario:**

**Table 4: Test Cases for Edit profile form**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **No.** | **Test Case/Test Script** | **Test Data** | **Expected Result** | **Actual Result** | **Pass/Fail/Not Executed/ Suspended** |
| 1. | Verify user Edit profile after click on the ‘Edit profile’ button on Edit profile form with correct input data | Contact :  03321576652  Username:  kinza  Password:  Stark506  Gender:  Female  Age :  21 | Successfully Profile is Edited . | Account is Edited successfully | Pass |
| 2. | Verify user Edit profile after click on the ‘Edit profile’ button on Edit profile form with correct input data | Contact :  Username:  kinza  Password:  Stark506  Gender:  Female  Age :  21 | Profile is not Edited | Contact is empty. | Fail |
| 4. | Verify user Edit profile after click on the ‘Edit profile’ button. | Contact :  03321576652  Username:  Password:  Stark506  Gender:  Female  Age :  21 | Profile is not Edited | Invalid username | Fail |

## View Personal Information

**Testing Objective:** To ensure the personal information Dashboard is working properly.

**Test Case Id:** TC\_05

**Test Case Description:** Test the personal information Dashboard functionality.

**Test Scenario:**

Table 5: Test Cases for Customer Dashboard

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No. | Test Case/Test Script | Test Data | Expected Result | Actual Result | Pass/Fail/Not Executed/ Suspended |
| 1. | Verify personal information Dashboard is getting all the user information . | User slides the dashboard out . | Successfully personal information is retrieved from the cloud real-time. | Information is correct. | Pass |

## Already exists check

**Testing Objective:** To ensure if the contact is already present.

**Test Case Id:** TC\_06

**Test Case Description:** Test the contact already exists check works.

**Test Scenario:**

Table 6: Test Cases for Customer Dashboard

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No. | Test Case/Test Script | Test Data | Expected Result | Actual Result | Pass/Fail/Not Executed/ Suspended |
| 1. | Verify that profile is not created if the contact already exists. | Username:  03321576652 | Account not created. | Contact already exists. | Pass |

## Contact Validation

**Testing Objective:** check if the contact validation from firebase works.

**Test Case Id:** TC\_07

**Test Case Description:** check if the code is generated to the contact number and checked properly.

**Test Scenario:**

**Table 7: Test Cases for Customer Dashboard**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **No.** | **Test Case/Test Script** | **Test Data** | **Expected Result** | **Actual Result** | **Pass/Fail/Not Executed/ Suspended** |
| 1. | Verify contact number with code generated | Code received on the message. | Successfully code verified and contact validated | Information is correct. | Pass |

## Sign In (Admin)

**Testing Objective:** To ensure the Sign In form is working properly.

**Test Case Id:** TC\_08

**Test Case Description:** Test the Sign in functionality.

**Test Scenario:**

Table 8: Test Cases for Sign In form

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No. | Test Case/Test Script | Test Data | Expected Result | Actual Result | Pass/Fail/Not Executed/ Suspended |
| 1. | Verify user Sign in after click on the ‘Sign in’ button on Sign in form with correct input data | Contact :  03321576652  Password:  Stark506 | Successfully Account is signed-in into the ARTINK website. | Sign in into the website successfully | Pass |
| 2. | Verify user Sign in after click on the ‘Sign in’ button on Sign in form with correct input data | Contact :  03321576652  Password:  1234 | Account is not signed-in. | Password incorrect | Fail |
| 3. | Verify user Sign in after click on the ‘Sign in’ button on Sign in form with correct input data | Contact:  03235065035  Password:  Ansa | Account not signed-in . | Contact not registered. | Fail |

## Sign out (Admin)

**Testing Objective:** To ensure the Sign out is working properly.

**Test Case Id:** TC\_9

**Test Case Description:** Test the Sign out functionality.

**Test Scenario:**

Table 9: Test Cases for Sign out

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No. | Test Case/Test Script | Test Data | Expected Result | Actual Result | Pass/Fail/Not Executed/ Suspended |
| 1. | Verify user Sign out after click on the ‘Sign out’ button | User clicks on the Sign out button | Successfully Signed out . | Signed out successfully | Pass |

## Choose a Game

**Testing Objective:** To ensure that all the games are in the list.

**Test Case Id:** TC\_10

**Test Case Description:** Test the buttons functionality in the list.

**Test Scenario:**

Table 10: Test Cases for Sign out

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No. | Test Case/Test Script | Test Data | Expected Result | Actual Result | Pass/Fail/Not Executed/ Suspended |
| 1. | Verify all the buttons take to the corresponding games . | User clicks on the start buttons against different games. | Successfully opened the game and phone locked in landscape mode. | Game opens and phone locks in landscape mode | Pass |

## View Game List

**Testing Objective:** To ensure that all the games are in the list.

**Test Case Id:** TC\_11

**Test Case Description:** Test the scrollable functionality in the list.

**Test Scenario:**

**Table 11: Test Cases for Sign out**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No. | Test Case/Test Script | Test Data | Expected Result | Actual Result | Pass/Fail/Not Executed/ Suspended |
| 1. | Verify the scrollable functionality in the list | User drags his/her finger on the screen to scroll through the list. | Successfully scrolled through the list | Scroll works and all the games are accessible. | Pass |

## Start a game

**Testing Objective:** To ensure that the game starts properly

**Test Case Id:** TC\_12

**Test Case Description:** game starts and scores are updated periodically

**Test Scenario:**

Table 12: Test Cases for Sign out

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No. | Test Case/Test Script | Test Data | Expected Result | Actual Result | Pass/Fail/Not Executed/ Suspended |
| 1. | Verify that the game starts properly | User clicks on the start buttons against different games. | Successfully opened the game and phone locked in landscape mode. | Game opens and phone locks in landscape mode | Pass |

## Quit Game

**Testing Objective:** To ensure that the game quits properly

**Test Case Id:** TC\_13

**Test Case Description:** game quits and takes the user back to the games-list

**Test Scenario:**

**Table 13: Test Cases for Sign out**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **No.** | **Test Case/Test Script** | **Test Data** | **Expected Result** | **Actual Result** | **Pass/Fail/Not Executed/ Suspended** |
| 1. | Verify that the game quits properly | User clicks on the back button. | Successfully quits the game and takes the user back to the games-list. | Game quits and games-list is opened. | Pass |

## Exit Game Screen

**Testing Objective:** To ensure that the games/unity screen quits and takes us back to home page.

**Test Case Id:** TC\_14

**Test Case Description:** game-screen/unity quits and takes us to the home screen.

**Test Scenario:**

Table 14: Test Cases for Sign out

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No. | Test Case/Test Script | Test Data | Expected Result | Actual Result | Pass/Fail/Not Executed/ Suspended |
| 1. | Verify that the game-screen quits properly | User clicks on the back button. | Successfully quits the game and takes the user back to the home screen | Game quits and home-screen is opened. | Pass |

## View Scores

**Testing Objective:** To ensure that the game-score updates periodically.

**Test Case Id:** TC\_15

**Test Case Description:** score is visible and updates periodically.

**Test Scenario:**

Table 15: Test Cases for Sign out

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No. | Test Case/Test Script | Test Data | Expected Result | Actual Result | Pass/Fail/Not Executed/ Suspended |
| 1. | Verify that the score updates properly. | User stays on the game and score is updated periodically. | Successfully updates the game score. | Updates the score periodically. | Pass |

## Pause Game

**Testing Objective:** To ensure that the game pauses properly.

**Test Case Id:** TC\_16

**Test Case Description:** game screen pauses and a smaller menu is opened.

**Test Scenario:**

Table 16: Test Cases for Sign out

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No. | Test Case/Test Script | Test Data | Expected Result | Actual Result | Pass/Fail/Not Executed/ Suspended |
| 1. | Verify that the game pauses properly. | User clicks on the pause button. | Successfully pauses the game and a smaller menu is opened. | Game pauses and a smaller menu is opened. | Pass |

## Resume Game

**Testing Objective:** To ensure that the game resumes properly.

**Test Case Id:** TC\_17

**Test Case Description:** game screen resumes.

**Test Scenario:**

**Table 17: Test Cases for Sign out**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **No.** | **Test Case/Test Script** | **Test Data** | **Expected Result** | **Actual Result** | **Pass/Fail/Not Executed/ Suspended** |
| 1. | Verify that the game resumes properly. | User clicks on the resume button from the smaller menu. | Successfully resumes the game. | Game resumes. | Pass |

## Run Model

**Testing Objective:** To ensure EEG classification works properly.

**Test Case Id:** TC\_18

**Test Case Description:** EEG classification works and sends the commands to server.

**Test Scenario:**

Table 18: Test Cases for Sign out

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No. | Test Case/Test Script | Test Data | Expected Result | Actual Result | Pass/Fail/Not Executed/ Suspended |
| 1. | Verify that the EEG classification properly. | server calls the model periodically. | Successfully returns the commands. | Commands are returned to server. | Pass |

## Fetch Command

**Testing Objective:** To ensure unity gets the command.

**Test Case Id:** TC\_19

**Test Case Description:** unity fetches the commands from the server 50 times per second.

**Test Scenario:**

Table 19: Test Cases for Sign out

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No. | Test Case/Test Script | Test Data | Expected Result | Actual Result | Pass/Fail/Not Executed/ Suspended |
| 1. | Verify that the unity fetches commands periodically. | Unity calls the model 50 times per second. | Successfully fetches the commands from the server. | Commands are fetched from the server. | Pass |

## Save Model

**Testing Objective:** To ensure model is updated periodically.

**Test Case Id:** TC\_20

**Test Case Description:** EEG classification model is updated periodically.

**Test Scenario:**

Table 20: Test Cases for Sign out

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No. | Test Case/Test Script | Test Data | Expected Result | Actual Result | Pass/Fail/Not Executed/ Suspended |
| 1. | Verify that the EEG classification model works properly. | Unity updates the model. | Successfully updates the model. | model is updated to cortex profile | Pass |

## Load Model

**Testing Objective:** To ensure that the model is loaded from the cortex.

**Test Case Id:** TC\_21

**Test Case Description:** model loads , takes the EEG data from the headset and sends the classified command back to the server.

**Test Scenario:**

Table 21: Test Cases for Sign out

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No. | Test Case/Test Script | Test Data | Expected Result | Actual Result | Pass/Fail/Not Executed/ Suspended |
| 1. | Verify that the model loads properly. | Server loads the model periodically. | Successfully loads the model on cortex. | Model is loaded successfully. | Pass |

## Send Data

**Testing Objective:** To ensure the data from the headset is sent to cortex properly.

**Test Case Id:** TC\_22

**Test Case Description:** EEG data is sent from the headset to the cortex.

**Test Scenario:**

Table 22: Test Cases for Sign out

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No. | Test Case/Test Script | Test Data | Expected Result | Actual Result | Pass/Fail/Not Executed/ Suspended |
| 1. | Verify that the EEG data from the headset is sent properly. | Server send the data to the cortex from the headset. | Successfully sends the data to the cortex. | Data is sent to the cortex from the headset. | Pass |

# Task Deliverables

The general purpose of the 70% implementation circumvent this Test Plan and 70% of the implementation.

## Test Tasks

* Test plan

Tasks to be done are as following:

* Compile information regarding testing criteria and methodology
* Create test cases
* Tabularize test cases
* Organize a plan in which tests can be conducted

* Test case specifications
* Use functional and non-functional requirements to create criteria on which test case output can be judged
* Use a sprint sheet to coordinate use cases and appropriate test cases
* Test Incident reports
* Create reports based on results of test cases

## Environmental Needs

* A working emotive headset.
* A working internet connection.
* 4GB or above RAM to run the app smoothly.

## Responsibilities

Both team members are responsible for performing test cases.

# Conclusion

The testing of this System has to be conducted in order to ensure the correct working of the system and optimize the system as much as possible, testing also ensure the identification of as much defects as possible (depending on how much testing has been conducted). Testing ensures maximization of efficiency and effectiveness of any system. So vigorous testing of every good system has to be conducted and that too in a proper manner which is mentioned and described in the test document.