**Test Plan**

Workforce

Research

Guide

**Team: Group2**

Shin Yi Lin

Fenil Shah

Ramprasadh Srivathsa

Harshal Pawar

Mark Dwight

SE 6387.001

**ABSTRACT**

This document serves to outline the test plan which is used to test the Workforce Research application. We describe the techniques which are used to test the Workforce Research application and how using these tests we were able to cover all the scenarios of application. This will help us in producing a bug free code. This document also compares the two types of testing i.e. black box and white box testing from the perspective of our application. We will also describe the criteria used for measuring the quality of our tests.

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**1. INTRODUCTION**

In order to test the application thoroughly before rolling it out to the customer, a comprehensive test plan is very necessary. By writing a test plan it guides our thinking. Writing a test plan forces us to confront the challenges that await us and focus our thinking on important topics. Second, the test planning process and the plan itself serve as the means of communication with other members of the project team, testers, peers, managers and other stakeholders. In this document, we outline the test plan to be used in the Workforce Research application, first by detailing the tests intended to be done and then by describing the criteria used for measuring quality of our tests. We also describe the black box and white box testing from the perspective of our Workforce Research Guide desktop application.

**2. Requirements/Specifications-Based System Level Test Cases**

|  |  |  |  |
| --- | --- | --- | --- |
| **Test Case 1: Add Entity** | | | |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | User presses "Add Fact/Belief" Button |  | Add Entity Window appears |
| 2 | User enters a statement, geography, metric, and time period | (Employment Decreased 2%, USA, employment rate, 2014) | All required fields are now filled |
| 3 | User presses the save button |  | Entity has been added to the database and can now be searched for |
|  |  |  |  |
| **Test Case 2: Add Entity (statement field not filled)** | | | |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | User presses "Add Fact/Belief" Button |  | Add Entity Window appears |
| 2 | User enters a geography, metric, and time period but no statement | (<empty string>, USA, employment rate, 2014) | All but one required field are now filled |
| 3 | User presses the save button |  | Program alerts the user that one or more required fields are empty, fact/belief is not added |
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| --- | --- | --- | --- |
| **Test Case 3: Add Entity (geography field not filled)** | | | |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | User presses "Add Fact/Belief" Button |  | Add Entity Window appears |
| 2 | User enters a statement, metric, and time period but no geography | (Employment Decreased 2%, <no selection>, employment rate, 2014) | All but one required field are now filled |
| 3 | User presses the save button |  | Program alerts the user that one or more required fields are empty, fact/belief is not added |
|  |  |  |  |
| **Test Case 4: Add Entity (metric field not filled)** | | | |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | User presses "Add Fact/Belief" Button |  | Add Entity Window appears |
| 2 | User enters a statement, geography, and time period but no metric | (Employment Decreased 2%, USA, <no selection>, 2014) | All but one required field are now filled |
| 3 | User presses the save button |  | Program alerts the user that one or more required fields are empty, fact/belief is not added |
|  |  |  |  |
| **Test Case 5: Add Entity (time period field not filled)** | | | |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | User presses "Add Fact/Belief" Button |  | Add Entity Window appears |
| 2 | User enters a statement, geography, and metric but no time period | (Employment Decreased 2%, USA, employment rate, <no selection>) | All but one required field are now filled |
| 3 | User presses the save button |  | Program alerts the user that one or more required fields are empty, fact/belief is not added |
|  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Test Case 6: Canceling out of Adding an Entity** | | | |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | User presses "Add Fact/Belief" Button |  | Add Entity Window appears |
| 2 | User enters a statement, geography, metric, and time period | (Employment Decreased 2%, USA, employment rate, 2014) | All required fields are now filled |
| 3 | User exits the add entity window |  | Program does not add a fact/belief to the database |
|  |  |  |  |
| **Test Case 7: Batch Uploading Facts** | | | |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | User presses "Batch Upload" button |  | File selection window appears |
| 2 | User selects a .csv file | valid.csv | Program has uploaded a fact for each line in the .csv and has displayed the success message for each fact |
|  |  |  |  |
| **Test Case 8: Batch Uploading Facts (.csv file not formatted properly)** | | | |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | User presses "Batch Upload" button |  | File selection window appears |
| 2 | User selects a .csv file | invalid.csv | Program displays an error message for each incorrectly formatted row in the .csv |
|  |  |  |  |
| **Test Case 9: Folder Scan** | | | |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | User presses "Folder Scan" button |  | File selection window appears |
| 2 | User selects a folder | ../Test\_Folder | Program has uploaded a fact for each file found in the specified folder |
|  |  |  |  |
| **Test Case 10: Folder Scan (unreadable folder)** | | | |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | User presses "Folder Scan" button |  | File selection window appears |
| 2 | User selects a folder | ../Unreadable\_Folder | Program alerts the user that the folder is unreadable, no facts are added to the database |
|  |  |  |  |
| **Test Case 11: Folder Scan (empty folder)** | | | |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | User presses "Folder Scan" button |  | File selection window appears |
| 2 | User selects a folder | ../Empty\_Folder | Program alerts the user that the folder is unreadable, no facts are added to the database |
|  |  |  |  |
| **Test Case 12: Search Entity (Entities exist/match)** | | | |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | Type in search keywords in the text box | statement: Employment Increased | The matched entities are listed in the right panel. |
| 2 | Select geography, metric, and time period from three drop down lists | geography: USA metric: 1.12% time period: 2015 | The matched entities are listed in the right panel. |
|  |  |  |  |
| **Test Case 13: Search Entity (Entities don't exist/match)** | | |  |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | Type in search keywords in the text box | statement: relocate | Empty list in the right panel. |
| 2 | Select geography, metric, and time period from three drop down lists | geography: UK metric: 1% time period: 2014 | Empty list in the right panel. |
|  |  |  |  |

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| --- | --- | --- | --- |
| **Test Case 14: Edit Entity** | |  |  |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | Search Entity | statement: environment  geography: Canada metric: 12% time period: 2017 | The matched entities are listed in the right panel. |
| 2 | Select Entity |  | The values of the selected entity are automatically filled in the blanks in the window. |
| 3 | Edit Entity by filling text boxes, selecting from drop down lists, and selecting the associated entities. | statement: environmental issue  geography: USA metric: 15% time period: 2013 Person: Tom is Belief: yes | The values of the edited entity are changed in the fields in the window. |
| 4 | Press Update Entity button |  | (1) The Entity is updated into the database. (2) Update successful message is displayed. |
|  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Test Case 15: Cancel Out of Edit Entity** | | | |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | Search Entity | statement: environment  geography: Canada metric: 12% time period: 2017 | The matched entities are listed in the right panel. |
| 2 | Select Entity |  | The values of the selected entity are automatically filled in the blanks in the window. |
| 3 | Edit Entity by filling text boxes, selecting from drop down lists, and selecting the associated entities. | statement: environmental issue  geography: USA metric: 15% time period: 2013 Person: Tom is Belief: yes | The edited entity changes values in the attribute fields in the window. |
| 4 | Press Cancel Button |  | The Entity fields in the window become empty. |
|  |  |  |  |
| **Test Case 16: Edit Entity (without required fields)** | | |  |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | Search Entity | statement: environment  geography: Canada metric: 12% time period: 2017 | The matched entities are listed in the right panel. |
| 2 | Select Entity |  | The selected entity automatically fills the attribute fields in the window. |
| 3 | Edit Entity by filling text boxes, selecting from drop down lists, and selecting the associated entities. | statement:   geography:  metric:  time period: | Error message: "Missing statement, geography, metric, and time period. They are required." |
|  |  |  |  |

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| --- | --- | --- | --- |
| **Test Case 17: Delete Entity** | |  |  |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | Search Entity | statement: environment  geography: Canada metric: 12% time period: 2017 | The matched entities are listed in the right panel. |
| 2 | Select Entity |  | The selected entity automatically fills the attribute fields in the window. |
| 3 | Press Delete Button |  | Pop up a window message: "Are you sure to delete this XXX Fact/Belief?" |
| 4 | Press Yes |  | (1) The Entity fields in the window become empty. (2) The Entity disappears in the right panel list. |
|  |  |  |  |
| **Test Case 18: Cancel Out of Delete Entity** | | |  |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | Search Entity | statement: environment  geography: Canada metric: 12% time period: 2017 | The matched entities are listed in the right panel. |
| 2 | Select Entity |  | The selected entity automatically fills the attribute fields in the window. |
| 3 | Press Delete Button |  | Pop up a window message: "Are you sure to delete this XXX Fact/Belief?" |
| 4 | Press No |  | Cancel delete |
|  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Test Case 19: View Fact/Belief** | |  |  |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | Search Entity | statement: environment  geography: Canada metric: 12% time period: 2017 | The matched entities are listed in the right panel. |
| 2 | Select Entity |  | The selected entity automatically fills the attribute fields in the window. |
|  |  |  |  |
| **Test Case 20: Add Region** | |  |  |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | Enter the region to be added | Region: Dallas | The entered region is added to the database and displayed. |
|  |  |  |  |
| **Test Case 21 : Cancel out of adding Region** | | |  |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | Enter the region to be added | Region: Dallas |  |
| 2 | Press Cancel button |  | The entered data will not be added. The data will be cleared. |
|  |  |  |  |
| **Test Case 22: Add Metric** | |  |  |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | Enter the metric to be added | Metric: Employee quit rate | The entered metric is added to the database and displayed. |
|  |  |  |  |
| **Test Case 23: Cancel out of adding Metric** | | |  |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | Enter the metric to be added | Metric: Employee quit rate |  |
| 2 | Press Cancel button |  | The entered data will not be added. The data will be cleared. |
|  |  |  |  |

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| --- | --- | --- | --- |
| **Test Case 24: Add Timeperiod** | |  |  |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | Enter the Timeperiod to be added | Timeperiod: 2015 | The entered timeperiod is added to the database and displayed. |
|  |  |  |  |
| **Test Case 25: Cancel out of adding Timeperiod** | | |  |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | Enter the Timeperiod to be added | Timeperiod: 2015 |  |
| 2 | Press Cancel button |  | The entered data will not be added. The data will be cleared. |
|  |  |  |  |
| **Test Case 26: Add Strength** | |  |  |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | Enter the strength to be added | Strength: high | The entered strength is added to the database and displayed. |
|  |  |  |  |
| **Test Case 27: Cancel out of adding Strength** | | |  |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | Enter the strength to be added | Strength: high |  |
| 2 | Press Cancel button |  | The entered data will not be added. The data will be cleared. |
|  |  |  |  |
| **Test Case 28: Disable Region** | |  |  |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | Select the region to be disabled | Region: Dallas | The selected data is disabled and will not be displayed in the future selections. |
|  |  |  |  |
| **Test Case 29: Cancel out of disabling Region** | | |  |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | Select the region to be disabled | Region: Dallas |  |
| 2 | Press Cancel button |  | The data will not be disabled. |
|  |  |  |  |
| **Test Case 30: Disable Metric** | |  |  |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | Select the metric to be disabled | Metric: Employee quit rate | The selected data is disabled and will not be displayed in the future selections. |
|  |  |  |  |
| **Test Case 31: Cancel out of disabling Metric** | | |  |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | Select the metric to be disabled | Metric: Employee quit rate |  |
| 2 | Press Cancel button |  | The data will not be disabled. |
|  |  |  |  |
| **Test Case 32: Disable Timeperiod** | |  |  |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | Select the timeperiod to be disabled | Timeperiod: 2016 | The selected data is disabled and will not be displayed in the future selections. |
|  |  |  |  |
| **Test Case 33: Cancel out of disabling timeperiod** | | |  |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | Select the timeperiod to be disabled | Timeperiod: 2016 |  |
| 2 | Press Cancel button |  | The data will not be disabled. |
|  |  |  |  |
| **Test Case 34: Disable Strength** | |  |  |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | Select the strength to be disabled | Strength: high | The selected data is disabled and will not be displayed in the future selections. |
|  |  |  |  |
| **Test Case 35: Cancel out of disabling Strength** | | |  |
| **Step** | **Test Steps** | **Test Data** | **Expected Result** |
| 1 | Select the strength to be disabled | Strength: high |  |
| 2 | Press Cancel button |  | The data will not be disabled. |

**3. Traceability of Test Cases To Use Cases**

|  |  |
| --- | --- |
| **Testing Plan – Test Case** | **Requirements – Use Case** |
| Test Case 1: Add Entity | UC1: Add Entity |
| Test Case 2: Add Entity (statement field not filled) | UC1: Add Entity |
| Test Case 3: Add Entity (geography field not filled) | UC1: Add Entity |
| Test Case 4: Add Entity (metric field not filled) | UC1: Add Entity |
| Test Case 5: Add Entity (time period field not filled) | UC1: Add Entity |
| Test Case 6: Canceling out of Adding an Entity | UC1: Add Entity |
| Test Case 7: Batch Uploading Facts | UC2: Batch Adding of Facts |
| Test Case 8: Batch Uploading Facts (.csv file not formatted properly) | UC2: Batch Adding of Facts |
| Test Case 9: Folder Scan | UC3: Adding Facts via Folder Scan |
| Test Case 10: Folder Scan (unreadable folder) | UC3: Adding Facts via Folder Scan |
| Test Case 11: Folder Scan (empty folder) | UC3: Adding Facts via Folder Scan |
| Test Case 12: Search Entity (Entities exist/match) | UC4: Search Entity |
| Test Case 13: Search Entity (Entities don't exist/match) | UC4: Search Entity |
| Test Case 14: Edit Entity | UC7: Edit Entity |
| Test Case 15: Cancel Out of Edit Entity | UC7: Edit Entity |
| Test Case 16: Edit Entity (without required fields) | UC7: Edit Entity |
| Test Case 17: Delete Entity | UC6: Delete Entity |
| Test Case 18: Cancel Out of Delete Entity | UC6: Delete Entity |
| Test Case 19: View Fact/Belief | UC5: View Entity |
| Test Case 20: Add Region | UC8: Add Metadata Item |
| Test Case 21 : Cancel out of adding Region | UC8: Add Metadata Item |
| Test Case 22: Add Metric | UC8: Add Metadata Item |
| Test Case 23: Cancel out of adding Metric | UC8: Add Metadata Item |
| Test Case 24: Add Timeperiod | UC8: Add Metadata Item |
| Test Case 25: Cancel out of adding Timeperiod | UC8: Add Metadata Item |
| Test Case 26: Add Strength | UC8: Add Metadata Item |
| Test Case 27: Cancel out of adding Strength | UC8: Add Metadata Item |
| Test Case 28: Disable Region | UC9: Delete Metadata Item |
| Test Case 29: Cancel out of disabling Region | UC9: Delete Metadata Item |
| Test Case 30: Disable Metric | UC9: Delete Metadata Item |
| Test Case 31: Cancel out of disabling Metric | UC9: Delete Metadata Item |
| Test Case 32: Disable Timeperiod | UC9: Delete Metadata Item |
| Test Case 33: Cancel out of disabling timeperiod | UC9: Delete Metadata Item |
| Test Case 34: Disable Strength | UC9: Delete Metadata Item |
| Test Case 35: Cancel out of disabling Strength | UC9: Delete Metadata Item |

**4. TECHNIQUES FOR TEST GENERATION**

**4.1 Techniques used for Test Generation**

We followed the two standard techniques used for Test Generation viz. Static Testing and Dynamic testing as shown in the below diagram.

Static Testing – By using this technique we tested the software without executing the code. We followed two ways for the same as listed below:

1) Review - Typically to find and eliminate errors or ambiguities in documents such as requirements, design, test cases, etc.

2) Static analysis - The code written was analyzed (by tools) for structural defects that may lead to defects. Following kinds of defects were found by the tools during static analysis - Syntax violations, Variables that are declared but never used, Unreachable code (or) Dead Code, good code practice violations.

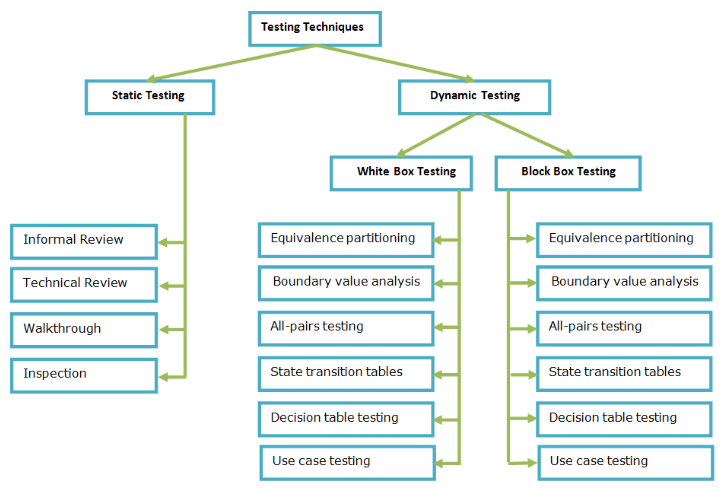


Figure 1 Techniques used for Test Generation

Dynamic Testing is a kind of software testing technique using which the dynamic behavior of the code is analyzed. These can be classified broadly as Unit Testing, Integration Testing, System Testing, and Acceptance Testing. These tests use the techniques like Boundary Value analysis, Equivalence partitioning, use case testing etc.

**4.2 Black Box versus White Box testing**

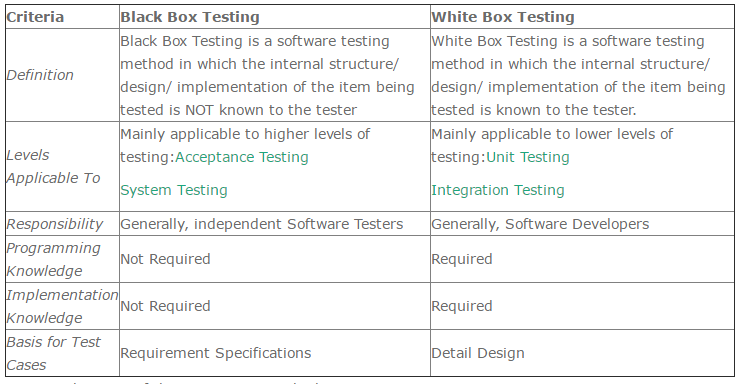


Figure 2 Differences between Black Box and White Box Testing

Black-box testing is a way of testing software without having much knowledge of the internal workings of the software itself. Black box testing is often referred to as behavioral testing, in the sense that you want to test how the software behaves as a whole. It is usually done with the actual users of the software in mind, who usually have no knowledge of the actual code itself. To achieve this we plan to test the overall functionality from use case perspective.

White box, on the other hand, is testing of the structural internals of the code - it gets down to the loops, if statements, etc. It allows one to peek inside the ‘box’. Tasks that are typical of white box testing include boundary tests, use of assertions, and logging. For this we are using techniques like unit tests, integration tests etc.

**4.3 Criteria used for measuring quality of tests**

We evaluated the quality of our test by seeking answers to the below questions-

1. How many test cases are passed/failed/blocked?  
2. How many defects are identified & what is the severity of those defects?  
3. How many test cases are failed due to one particular defect?

4. After the defect is resolved, need to re-test the defect & re-execute the corresponding failed test case.

Based on the above metrics, we got an understanding of the below mentioned key points.  
a) Percentage of work completed  
b) Percentage of work yet to be completed  
c) Time that would be needed to complete the remaining work  
d) Whether the project is going as per the schedule or lagging?

**5. EVIDENCE THE DOCUMENT HAS BEEN PLACED UNDER CONFIGURATION MANAGEMENT**

GitHub Repository:

<https://github.com/WorkforceResearchGuide/WorkforceResearchGuideApp/tree/master/Deliverables>

**6. REFERENCES**

[1] http://www.cs.unh.edu/~it666/reading\_list/Defense/blackbox\_vs\_whitebox\_testing.pdf