IN2030 WORK-BASED PROJECT

IMPLEMENTATION Document

HR TRACK SYSTEM

| Version | Primary Author(s) | Description of Version | Date Completed |
| --- | --- | --- | --- |
| First Draft | Mayur Patel | All sections being Filled.  Updated use-case descriptions and diagrams in appendix from requirements specification document. | 25/06/22 |

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# Compilation and Run time.

* The source files used here would be .html, .css, .js, and .php files. The main directory of it would be the Project directory. The project directory also contains image folder. This image folder contains of images used in the website.
* The programming language used here is vanilla JavaScript. There is also a markup language used in HTML. There is also stylesheet language used in CSS, and finally a server-side scripting language used in PHP.
* The project is built as a stand-alone prototype and can be used with cross-platform web server solution stack package. To run it use an open-source web server solution stack package to generate the project from your end.
* The compiler used here is the visual studio code (source-code editor).
* The files include are login.html (login page of the system), HR.html (homepage of the website), HRTrack.html (Headline review editing page- main page), logout.html (logging out of the system).
* Other files include styles1.css, styles2.css, and styles3.css. These stylesheet files are to be used alongside the above.html files combinedly.
* Also, includes connectdb.php, and form.php files. These are files used to connect to the database.
* And lastly javascript files, script.js, script2,js, and printthis,js files are used alongside .html, .css, and .php files.
* The printThis.js plugin is managed externally by its creators.
* printThis.js is a jquery plugin for print specific. Make sure to compile this file altogether with script2.js file.
* The database used is MySQL. It’s localserver database.
* The username and password to login are: Username: Test password: tester

## Component diagram

**Diagram

Description automatically generated**

# Unit Testing

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| --- | --- |
| **Use case ID:** 001 | **Use case name:** Login to HRTrack (System) |
| **Test number:** 1 | |
| **Objective:** Test the primary path | |
| **Set up:** A user should be available to login to the HRtrack system using a username, password and an OTP code sent to the phone. The user, when enters the correct and accurate data should be directed to the website. | |
| **Expected results:**   1. User should have a GUI to enter the data, and should be accurately labelled and accessible for both screen reader users and normal users. 2. Users should be able to enter the data securely and safely. 3. On correct and accurate data the user should be navigated to the HRTrack website. | |
| **Test:** Enter correct username, password and OTP code (Within 3 minutes or the code expires) and check if you are directed to the website and it’s home page. | |

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| **Test record:** | |
| **Date:** 14th June, 2022 | **Tester:** Mayur Patel |
| **Result:** Login system working effectively when correct data is entered. However, the user is currently transferred to a page which just says login successful. It is not connected to the original website. | |
| **Date:** 18th June, 2022 | **Tester:** Mayur Patel |
| **Result:** Login system working effectively. When a user enters the correct and accurate data, the user is correctly transferred to the HRTrack website. However, the OTP code functionality is missing. | |
| **Date:** 22nd June, 2022 | **Tester:** Mayur Patel |
| **Result:** Login system along with OTP verification is now working fully correctly. Test passed.  (During this testing the OTP verification was dropped due to the cost factor and accessibility factor of the OTP system. As such a newer MFA needs to be investigated, as such the OTP code input field stays(user can still navigate without it being filled). However, it will be looked as a priority in future expansion.) | |

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| **Use case ID:** 001 | **Use case name:** Login to HRTrack with wrong username. |
| **Test number:** 2 | |
| **Objective:** Test the alternative path | |
| **Set up:** A user when enters wrong username should be notified about its login being unsuccessful and also should be notified about wrong username. | |
| **Expected results:**   1. Users should have a GUI to enter the data, and should be accurately labelled and accessible for both screen reader users and normal users. 2. Users when enters the wrong username should be notified about wrong username and unsuccessful login attempt. | |
| **Test:** Enter incorrect username, but correct password and check if you are informed about a wrong login attempt. | |

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| **Test record:** | |
| **Date:** 16th June, 2022 | **Tester:** Mayur Patel |
| **Result:** When entered a wrong username, the user cannot proceed ahead to the website. However, the message that login attempt is unsuccessful is not displayed or informed to the user. | |
| **Date:** 20th June, 2022 | **Tester:** Mayur Patel |
| **Result:** The user when fills the login form with incorrect username is informed about the error. Test passed.  (During this testing the OTP verification was dropped due to the cost factor and accessibility factor of the OTP system. As such a newer MFA needs to be investigated, as such the OTP code input field stays(user can still navigate without it being filled). However, it will be looked as a priority in future expansion.) | |

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| **Use case ID:** 001 | **Use case name:** Login to HRTrack with wrong password. |
| **Test number:** 3 | |
| **Objective:** Test the alternative path | |
| **Set up:** A user when enters wrong password should be notified about its login being unsuccessful and also should be notified about wrong password. | |
| **Expected results:**   1. Users should have a GUI to enter the data, and should be accurately labelled and accessible for both screen reader users and normal users. 2. Users when enters the wrong password should be notified about wrong password and unsuccessful login attempt. | |
| **Test:** Enter incorrect password, but correct username and check if you are informed about a wrong login attempt. | |

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| **Test record:** | |
| **Date:** 16th June, 2022 | **Tester:** Mayur Patel |
| **Result:** When entered a wrong password, the user cannot proceed ahead to the website. However, the message that login attempt is unsuccessful is not displayed or informed to the user. | |
| **Date:** 20th June, 2022 | **Tester:** Mayur Patel |
| **Result:** The user when fills the login form with incorrect password is informed about the error. Test passed.  (During this testing the OTP verification was dropped due to the cost factor and accessibility factor of the OTP system. As such a newer MFA needs to be investigated, as such the OTP code input field stays(user can still navigate without it being filled). However, it will be looked as a priority in future expansion.) | |

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| **Use case ID:** 001 | **Use case name:** Login to HRTrack with missing username or password, or both. |
| **Test number: 4** | |
| **Objective:** Test the alternative path | |
| **Set up:** A user when does not enter username or password, or both and just navigates to the login button. The user should be appropriately informed that what data/information is exactly missing. If both are missing it should also appropriately converse this message. | |
| **Expected results:**   1. Users should have a GUI to enter the data, and should be accurately labelled and accessible for both screen reader users and normal users. 2. Users when does not enter username, password, or both information. The system should appropriate converse whether username, password, or both is missing. | |
| **Test:** Enter incorrect username, then check if an appropriate | |

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| **Test record:** | |
| **Date:** 16th June, 2022 | **Tester:** Mayur Patel |
| **Result:** When activated the login button without entering either username or password, or both. The login page does not navigate to the website. However, no information is displayed on which field(s) is missing. | |
| **Date:** 20th June, 2022 | **Tester:** Mayur Patel |
| **Result:** The user when fills the login form without entering any information in one or all input fields. The user is informed appropriately about which field(s) is missing. Test passed.  (During this testing the OTP verification was dropped due to the cost factor and accessibility factor of the OTP system. As such a newer MFA needs to be investigated, as such the OTP code input field stays(user can still navigate without it being filled). However, it will be looked as a priority in future expansion.) | |

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| **Use case ID:** 002 | **Use case name:** Create Headline Review and enter and edit the project. |
| **Test number:** 5 | |
| **Objective:** Test the normal path | |
| **Set up:** A user should be able to create a Headline Review project and should be able to work on the project and complete it effectively. The form fields should be labelled accurately and should be easy and efficient to use. | |
| **Expected results:**   1. Users should have an input fields to enter the data. 2. Users should be able to enter the data in input fields and easily able to change the data as and when required. | |
| **Test:** Create a Headline Review project, try to navigate to the input fields and check you enter and edit the information and the input fields are correctly labelled for all the different types of users. | |

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| **Test record:** | |
| **Date:** 15th June, 2022 | **Tester:** Mayur Patel |
| **Result:** Input fields for entering the data. However, dropdown would be a better option for fixed answers. Input fields for entering page number and page name should be reflected in bold. So that the data enter is bold in font. | |
| **Date:** 18th June, 2022 | **Tester:** Mayur Patel |
| **Result:** Dropdown asserted for fixed answers checkpoints. User can select the dropdown and dropdown accurately descripts the correct answer and the table is clearly labelled as well as the input field. The input fields text type is now in bold. Both the native app and responsive web checks option are there. In total there are 10 options. There is also clear dropdowns of scores and an editable text area. | |

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| **Use case ID:** 002 | **Use case name:** Delete the Headline Review project created or is abandoned. |
| **Test number:** 5 | |
| **Objective:** Test the alternative path | |
| **Set up:** A user when instructed to abandon the project or delete the project in extremely small case, should be able to delete it easily. | |
| **Expected results:**   1. Users should have a way to easily delete the report, on which they are currently working on. | |
| **Test:** Activate the delete button and check if the input field return to normal (empty). | |

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| **Test record:** | |
| **Date:** 16th June, 2022 | **Tester:** Mayur Patel |
| **Result:** No option for delete available. | |
| **Date:** 19th June, 2022 | **Tester:** Mayur Patel |
| **Result:** A consensus agreed that there is unlikely a need for deletion and user can literally close the window to delete the project. Test passed. | |

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| **Use case ID:** 003 | **Use case name:** Generate an average score in percentage by just typing the total score of each page . |
| **Test number:** 6 | |
| **Objective:** Test the normal path | |
| **Set up:** A user after completing the headline review should be able to generate an average score across the 5 pages of a website. | |
| **Expected results:**   1. Users should have a GUI and input field to enter the data, and should be accurately labelled and accessible for both screen reader users and normal users. 2. Users when enters the data of score out of 24 for each page for 5 pages. An accurate average percentage score should be given to the nearest digit., | |
| **Test:** Activate the calculate button and check if there is an input to enter data and is clearly labelled and it generates an average score correctly and accurately to the nearest digit. | |

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| **Test record:** | |
| **Date:** 17th June, 2022 | **Tester:** Mayur Patel |
| **Result:**  Average score generated. However, it is not accurate to the nearest digit. | |
| **Date:** 19th June, 2022 | **Tester:** Mayur Patel |
| **Result:** Average score accurately generated to the nearest digit. Test passed. | |

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| **Use case ID:** 004 | **Use case name:** Generate a pdf of the report after both the Headline Review and score is completed and generated respectively. |
| **Test number:** 7 | |
| **Objective:** Test the normal path | |
| **Set up:** A user when just activates the generate pdf button should able to generate a pdf which is both accessible and editable. | |
| **Expected results:**   1. Users should have an option to generate pdf of the report completed and score generated. 2. When activating the “generate pdf” button, the user should be able to download the completed report as a pdf. | |
| **Test:** Activate the “generate pdf” button and check if you are able to download the pdf.  Also check if the pdf is accurate to the report i.e., nothing is missed out or is visually cluttered.  Finally, also check for if the pdf is editable and can be converted in editable version into different document types such as csv, json, word, and html. | |

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| **Test record:** | |
| **Date:** 17th June, 2022 | **Tester:** Mayur Patel |
| **Result:** Pdf generated accurately. However, the stylings are not applied. | |
| **Date:** 20th June, 2022 | **Tester:** Mayur Patel |
| **Result:** Pdf generated accurately with stylings and perfect synthesis. However, it is missing the company trademark, document title, time, and header. | |
| **Date:** 22nd June, 2022 | **Tester:** Mayur Patel |
| **Result:** Pdf generated with stylings and with company trademark, header, title, time, date, and in editable format. Test passed | |

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| **Use case ID:** 005 | **Use case name:** Logout of the HRTrack system. |
| **Test number:** 8 | |
| **Objective:** Test the normal path | |
| **Set up:** A user when hits the logout button is able to logout of the system effectively and efficiently to the login screen page. | |
| **Expected results:**   1. Users should have a button, which user when activates should be transferred efficiently back to the login screen. 2. When activating the logout button the user should be directly transferred to the login screen within 3 seconds. | |
| **Test:** Activate the logout button and check if you are transferred to the login screen and note down the time it takes. To make it more accurate do the process five times and carry out a hypothesis testing with a 5% significance level. | |

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| **Test record:** | |
| **Date:** 18th June, 2022 | **Tester:** Mayur Patel |
| **Result:** Logout system is activated. However, the logout button does not direct user to the main page(login page). It directs them to page saying “you have logged out”. | |
| **Date:** 20th June, 2022 | **Tester:** Mayur Patel |
| **Result:** Logout system now functioning perfectly and directs user to the main login page. Test passed. | |

# System Testing

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| --- | --- | --- | --- |
| **Use-case ID** | **Parameter 1** | **Parameter 2** | **Parameter 3** |
| UC1 |  |  |  |
| -Primary path | Integer (0 -1000) | Integer (0 – 1000)  String (0-20 chars) | Varchar (255) |
| -Alternative course 1 | Integer (0 -1000) | Integer (0 – 1000)  String (0-20 chars) | Varchar (255) |
| -Alternative course 2 | Integer (0 -1000) | Integer (0 – 1000)  String (0-20 chars) | Varchar (255) |
| **-**Alternative course 3 | Integer (0 -1000) | Integer (0 – 1000)  String (0-20 chars) | Varchar (255) |
| UC2 |  |  |  |
| -Primary path | Varchar (800) | Varchar (800) | Varchar (800) |
| **-**Alternative course | Varchar (800) | Varchar (800) | Varchar (800) |
| UC3 |  |  |  |
| **-**Primary path | Integer (0 -24) | Integer (0 -24) | Integer (0 -24) |
| UC4 |  |  |  |
| **-**Primary path | Download pdf | Download pdf and save | Download pdf and save it in SharePoint folder |
| UC5 |  |  |  |
| **-**primary path | Activate the logout button | Activate the logout button | Activate the logout button |
|  |  |  |  |

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| --- | --- | --- | --- |
| **Use-case ID** | **No. of times used within a month** | **Ratio of primary vs alternative** | **Ratio of alternative course.** |
| UC1 | 200 | 12:1 | 3:1:1 |
| UC2 | 80 | 6:1 | NA |
| UC3 | 100 | NA | NA |
| UC4 | 100 | NA | NA |
| UC5 | 50 | NA | NA |

**Probability distribution**

|  |  |  |
| --- | --- | --- |
| **UC1** | **200** | **0.9** |
| **-**PRIMARY | **170** | **0.8** |
| **-**Alternative | **10** | **0.06** |
| **-**Alternative | **10** | **0.02** |
| **-**Alternative | **10** | **0.02** |
| **UC2** | **80** | **0.86** |
| **-**PRIMARY | **70** | **0.8** |
| **-**Alternative | **10** | **0.06** |
| **UC3** | **100** | **0.7** |
| **UC4** | **100** | **0.9** |
| **UC5** | **50** | **0.9** |

Populate the forms using the 3 parameters in that order. For use-case 1, as it is varchar in database, so testing with three different combinations of data types. Use-case 2. As it is just going to be character + numbers, so only varchar parameters.

Use-case 3 – 5 are just buttons and functionality that needs to be activated. So parameters are same.

In this order, after probability generation after random number generator for a test suite.

UC1

UC1 – Alternative

UC2

UC2 – Alternative

UC3

UC4

UC5

# Non – functional testing

1. **Security:** Through dynamic analysis (Penetration testing) and through brute force. The brute force technic useful here would be DHCP rogue server, as there is a database likely involved.

* Also check for if the password stored are encrypted, also if an option for MFA is available and check how accurate it is.
* Check for timing of the session cookie. If the session cookie is longer then 2 minutes. It is more likely to be prone to hack attacks.

1. **Scalability:** Increase the number of users using the system 20 fold and then check if the response time is still accurate and is still within the acceptable range as needed.

* Create repeatable test scenarios for each of the scalability test. The scalability test over here would include the response time, throughput, and network(internet usage).
* Test on different internet speed and calculate a regression analysis. This would be the best way to calculate it’s accurate load and response time.
* Also, test the loading time across multiple users (virtual users as well). Also test across different IP addresses using VPN. This would also help in effectively analysing the data and any improvement, if any is needed.

1. **Reliability and availability:**
2. **Reliability:** The system reliability could be checked using accessibility WCAG audit and usability testing through user testing report. An accessible and usable (inclusive) way is one of the most important aspect for testing the reliability of the system.

* To test reliability accurately, perform each operation in the system at least once in order. Repeat the operation 5 more time. Note down any inaccurate functionality, which occurred during test. Also investigate further, if the inaccuracy was due to network error, or system error. Also analyse the result and work to curb inaccuracies in system.
* The another reliability testing would be a regression/ recheck testing. Once the above inaccuracies are fixed. Check again for any new inaccuracies which now occurs due to introduction of fixing the previous inaccuracies. Continue this process until all the inaccuracies and inaccuracies introduced by fixing the inaccuracies are fixed.
* Rollout the system for more than 20 users in test environment. Also ask them to perform to exhibit the maximum work load that it could give to the system. Note for any degrading of the system which happens over time.

Again, note down the degrading and work to fix the mentioned degrading, so maximum load and it’s reliability at that particular time is maintained as smoothly and swiftly as during minimum load.

1. **Availability:** The system availability can be checked using testing the upper limit of the system.

* Note down how longer if system crashes for and how long it takes to recover. Also note down how system behaves under heavy load and its response and it’s changing functionality under maximum load.
* Also conduct testing for the main use-cases where something is generated such as “generating average score”, and “generating pdf report”. Generate the above use cases for a maximum of 10 times, and note down the timing to generate. This would allow us to evaluate the time taken to process main requests and check if they are within an acceptable minimum length.

**Traceability**

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| --- | --- | --- | --- | --- | --- |
| **Implementation** | | | **Design** | | |
| **Class Name** | **Package Name** | **Language** | **Class Name** | **Package Name** | **Comment** |
| loginform | Login.html | HTML, CSS, and javascript | GUI\_Login | GUI |  |
| logout | Logout.html | HTML, CSS, and javascript | GUI\_Login | GUI |  |
| loginform | Login.html | HTML, CSS, and Javascript | GUI\_Menu | GUI |  |
|  |  |  |  |  |  |

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| --- | --- | --- | --- | --- | --- |
| **Implementation** | | | **Design** | | |
| **Class Name** | **Package Name** | **Language** | **Class Name** | **Package Name** | **Comment** |
| HRtrack | HRTRack.html | HTML, CSS, and javascript | Report | Report |  |
| HRTrack | HRTrack.html | HTML, CSS, and javascript | GUI\_HeadlineReviewProject | GUI |  |
| score | HRTrack.html | HTML, CSS, and javascript | Control | Report |  |
| Btn btn-info (Button to generate pdf – report) | HRTrack.html | HTML, CSS, and javascript | Control | Report |  |
| Footer section | HRTrack.html | HTML, CSS, and javascript | NetSuite | Report, user |  |
| Footer section | HRTrack.html | HTML, CSS, and javascript | SharePoint | Report |  |

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| --- | --- | --- | --- | --- | --- |
| **Implementation** | | | **Design** | | |
| **Class Name** | **Package Name** | **Language** | **Class Name** | **Package Name** | **Comment** |
| Connectdb.php | Connectdb.php | PHP | DB\_Connectivity | Report, user |  |
| Form.php | Form.php | PHP | SQL Helper | User |  |
| Form. php | Form.php | PHP | Consultant | user |  |