Project Title: System Verification and Validation Plan for Course Buddy

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Revision History

Date	Version	Notes
Date 1	1.0	Notes
Date 2	1.1	Notes

[The intention of the VnV plan is to increase confidence in the software. However, this does not mean listing every verification and validation technique that has ever been devised. The VnV plan should also be a **feasible** plan. Execution of the plan should be possible with the time and team available. If the full plan cannot be completed during the time available, it can either be modified to "fake it", or a better solution is to add a section describing what work has been completed and what work is still planned for the future. —SS]

[The VnV plan is typically started after the requirements stage, but before the design stage. This means that the sections related to unit testing cannot initially be completed. The sections will be filled in after the design stage is complete. the final version of the VnV plan should have all sections filled in. —SS]

Contents

List of Tables

[Remove this section if it isn't needed —SS]

List of Figures

[Remove this section if it isn't needed —SS]

1 Symbols, Abbreviations, and Acronyms

symbol	description
T	Test

[symbols, abbreviations, or acronyms — you can simply reference the SRS (Author, 2019) tables, if appropriate —SS]

[Remove this section if it isn't needed —SS]

This document ... [provide an introductory blurb and roadmap of the Verification and Validation plan —SS]

2 General Information

2.1 Summary

[Say what software is being tested. Give its name and a brief overview of its general functions. —SS]

2.2 Objectives

[State what is intended to be accomplished. The objective will be around the qualities that are most important for your project. You might have something like: "build confidence in the software correctness," "demonstrate adequate usability." etc. You won't list all of the qualities, just those that are most important. —SS]

[You should also list the objectives that are out of scope. You don't have the resources to do everything, so what will you be leaving out. For instance, if you are not going to verify the quality of usability, state this. It is also worthwhile to justify why the objectives are left out. —SS]

[The objectives are important because they highlight that you are aware of limitations in your resources for verification and validation. You can't do everything, so what are you going to prioritize? As an example, if your system depends on an external library, you can explicitly state that you will assume that external library has already been verified by its implementation team. —SS]

2.3 Relevant Documentation

[Reference relevant documentation. This will definitely include your SRS and your other project documents (design documents, like MG, MIS, etc). You can include these even before they are written, since by the time the project is done, they will be written. —SS]

Author (2019)

[Don't just list the other documents. You should explain why they are relevant and how they relate to your VnV efforts. —SS]

3 Plan

[Introduce this section. You can provide a roadmap of the sections to come. —SS]

3.1 Verification and Validation Team

[Your teammates. Maybe your supervisor. You should do more than list names. You should say what each person's role is for the project's verification. A table is a good way to summarize this information. —SS]

3.2 SRS Verification Plan

[List any approaches you intend to use for SRS verification. This may include ad hoc feedback from reviewers, like your classmates, or you may plan for something more rigorous/systematic. —SS]
  [Maybe create an SRS checklist? —SS]

3.3 Design Verification Plan

[Plans for design verification —SS]
  [The review will include reviews by your classmates —SS]
  [Create a checklists? —SS]

3.4 Verification and Validation Plan Verification Plan

[The verification and validation plan is an artifact that should also be verified. Techniques for this include review and mutation testing. —SS]
  [The review will include reviews by your classmates —SS]
  [Create a checklists? —SS]

3.5 Implementation Verification Plan

[You should at least point to the tests listed in this document and the unit testing plan. —SS]
  [In this section you would also give any details of any plans for static verification of the implementation. Potential techniques include code walkthroughs, code inspection, static analyzers, etc. —SS]

3.6 Automated Testing and Verification Tools

[What tools are you using for automated testing. Likely a unit testing framework and maybe a profiling tool, like ValGrind. Other possible tools include a static analyzer, make, continuous integration tools, test coverage tools, etc. Explain your plans for summarizing code coverage metrics. Linters are another important class of tools. For the programming language you select, you should look at the available linters. There may also be tools that verify that coding standards have been respected, like flake9 for Python. —SS]

[If you have already done this in the development plan, you can point to that document. —SS]

[The details of this section will likely evolve as you get closer to the implementation. —SS]

3.7 Software Validation Plan

[If there is any external data that can be used for validation, you should point to it here. If there are no plans for validation, you should state that here. —SS]

[You might want to use review sessions with the stakeholder to check that the requirements document captures the right requirements. Maybe task based inspection? —SS]

[For those capstone teams with an external supervisor, the Rev 0 demo should be used as an opportunity to validate the requirements. You should plan on demonstrating your project to your supervisor shortly after the scheduled Rev 0 demo. The feedback from your supervisor will be very useful for improving your project. —SS]

[For teams without an external supervisor, user testing can serve the same purpose as a Rev 0 demo for the supervisor. —SS]

[This section might reference back to the SRS verification section. —SS]

4 System Test Description

4.1 Tests for Functional Requirements

[Subsets of the tests may be in related, so this section is divided into different areas. If there are no identifiable subsets for the tests, this level of document structure can be removed. —SS]

4.1.1 Authentication

1. TFR-UI1
   FR1

   Control: Functional, Manual, Dynamic

   Initial State: Sign-up page that is used to create an account with username and password

   Input: Valid username and password in string format (letters, numbers, etc)

   Output: A prompt saying that the account has been created successfully

   Test Case Derivation: If the username and password are provided in a valid format, the user should be able to create an account and should be notified that the account has been created

   How test will be performed: A list of string pairs with different combinations of letters, and numbers will be given to the function that handles creating an account and we can then check our database if the provided string pairs get saved and if the website is prompting the notification telling the account has been created.

2. TFR-UI2
   FR1

   Control: Functional, Manual, Dynamic

   Initial State: Sign-up page that is used to create an account with username and password

   Input: Invalid username or password (such as empty strings, too few characters, existing username etc.)

   Output: A prompt saying that the username or password is invalid with detailed information such as more characters are needed or username/password cannot be empty or the username already exists

   Test Case Derivation: If the username and password are provided in an invalid format, the user should be notified with more information

How test will be performed: Invalid usernames and passwords such as empty strings or strings with only a few letters or duplicated usernames will be given to the function that creates an account and we will check if the function throws an exception and if the website is notifying the user to provide valid inputs instead.

3. TFR-UI3
   FR2

   Control: Functional, Manual, Dynamic

   Initial State: Sign-in page that is used to sign in with an existing account that includes placeholders of username and password

   Input: Username and password in string format

   Output: If the username and password match user data stored in our database, the user should be able to log in and be redirected to the home page, otherwise the user should be prompted saying that the username and password provided do not match

   Test Case Derivation: If the username and password match, this means our user is authenticated and hence should be able to log in, authenticated users should be redirected to the home page once logged in for further actions. If the username and password do not match, the user should be prompted in some way to be notified and asked to try again

   How test will be performed: A list of usernames and passwords (some of them match mock data stored in our database and some of them are just random strings that are not in our database) should be given to the function that handles user login, and we will check for those that match the mock user data in our database if the website directs to the home page and for those that do not match if the website prompts saying that username and password do not match

4. TFR-UI4
   FR3

   Control: Functional, Manual, Dynamic

   Initial State: The user has logged in, and a drop-down menu is clicked and expanded

   Input: The option *log out* in the drop-down menu is selected and right-clicked

Output: The user should be able to log out of his/her account and prompted saying that you have logged out successfully

Test Case Derivation: If the option *log out* is selected and right-clicked, the user should be able to log out of his/her account and the user should be notified in some way so that he/she knows that the account has been logged out successfully

How test will be performed: Manually log in using a mock account using different browsers and then log out for each one of them and see if we can log out and receive notifications about logging out

5. TFR-UI5
   FR4

   Control: Functional, Manual, Dynamic

   Initial State: The user has logged in and in the home page

   Input: The tab to view the scheduling information on the home page is selected and right-clicked

   Output: The scheduling information (in list view, Kanban view or calendar view, by default is in list view) is displayed

   Test Case Derivation: The user should be able to view his/her scheduling information in a reasonable format such as list view, Kanban view or calendar view if the option to view the scheduling information is clicked on the home page

   How test will be performed: Manually log in using a list of mock accounts (the difference between these accounts would be the customized way of viewing the scheduling information such as by default using list view, using Kanban view, or using calendar view) using different browsers and then click the tab that is responsible for redirecting to the page viewing the scheduling information on the home page and check if we are able to be redirected to the page listing scheduling information and check if the information is displayed in the view that the account has been set

6. test-id1

   Control: Manual versus Automatic

Initial State:

Input:

Output: [The expected result for the given inputs —SS]

Test Case Derivation: [Justify the expected value given in the Output field —SS]

How test will be performed:

7. test-id2

   Control: Manual versus Automatic

   Initial State:

   Input:

   Output: [The expected result for the given inputs —SS]

   Test Case Derivation: [Justify the expected value given in the Output field —SS]

   How test will be performed:

4.1.2   Area of Testing2

...

4.2   Tests for Nonfunctional Requirements

[The nonfunctional requirements for accuracy will likely just reference the appropriate functional tests from above. The test cases should mention reporting the relative error for these tests. Not all projects will necessarily have nonfunctional requirements related to accuracy —SS]

[Tests related to usability could include conducting a usability test and survey. The survey will be in the Appendix. —SS]

[Static tests, review, inspections, and walkthroughs, will not follow the format for the tests given below. —SS]

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4.2.1 Area of Testing1

Title for Test

1. test-id1

   Type: Functional, Dynamic, Manual, Static etc.

   Initial State:

   Input/Condition:

   Output/Result:

   How test will be performed:

2. test-id2

   Type: Functional, Dynamic, Manual, Static etc.

   Initial State:

   Input:

   Output:

   How test will be performed:

4.2.2 Area of Testing2

...

4.3 Traceability Between Test Cases and Requirements

[Provide a table that shows which test cases are supporting which requirements. —SS]

5 Unit Test Description

[This section should not be filled in until after the MIS (detailed design document) has been completed. —SS]

[Reference your MIS (detailed design document) and explain your overall philosophy for test case selection. —SS]

[To save space and time, it may be an option to provide less detail in this section. For the unit tests you can potentially layout your testing strategy here. That is, you can explain how tests will be selected for each module. For instance, your test building approach could be test cases for each access program, including one test for normal behaviour and as many tests as needed for edge cases. Rather than create the details of the input and output here, you could point to the unit testing code. For this to work, you code needs to be well-documented, with meaningful names for all of the tests. —SS]

5.1 Unit Testing Scope

[What modules are outside of the scope. If there are modules that are developed by someone else, then you would say here if you aren't planning on verifying them. There may also be modules that are part of your software, but have a lower priority for verification than others. If this is the case, explain your rationale for the ranking of module importance. —SS]

5.2 Tests for Functional Requirements

[Most of the verification will be through automated unit testing. If appropriate specific modules can be verified by a non-testing based technique. That can also be documented in this section. —SS]

5.2.1 Module 1

[Include a blurb here to explain why the subsections below cover the module. References to the MIS would be good. You will want tests from a black box perspective and from a white box perspective. Explain to the reader how the tests were selected. —SS]

1. test-id1

   Type: [Functional, Dynamic, Manual, Automatic, Static etc. Most will be automatic —SS]

   Initial State:

   Input:

   Output: [The expected result for the given inputs —SS]

Test Case Derivation: [Justify the expected value given in the Output field —SS]

How test will be performed:

2. test-id2

   Type: [Functional, Dynamic, Manual, Automatic, Static etc. Most will be automatic —SS]

   Initial State:

   Input:

   Output: [The expected result for the given inputs —SS]

   Test Case Derivation: [Justify the expected value given in the Output field —SS]

   How test will be performed:

3. ...

5.2.2   Module 2

...

5.3   Tests for Nonfunctional Requirements

[If there is a module that needs to be independently assessed for performance, those test cases can go here. In some projects, planning for nonfunctional tests of units will not be that relevant. —SS]

[These tests may involve collecting performance data from previously mentioned functional tests. —SS]

5.3.1   Module ?

1. test-id1

   Type: [Functional, Dynamic, Manual, Automatic, Static etc. Most will be automatic —SS]

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Initial State:

Input/Condition:

Output/Result:

How test will be performed:

2. test-id2

    Type: Functional, Dynamic, Manual, Static etc.

    Initial State:

    Input:

    Output:

    How test will be performed:

5.3.2 Module ?

...

5.4 Traceability Between Test Cases and Modules

[Provide evidence that all of the modules have been considered. —SS]

References

Author Author. System requirements specification. https://github.com/...,
    2019.

6 Appendix

This is where you can place additional information.

6.1 Symbolic Parameters

The definition of the test cases will call for SYMBOLIC_CONSTANTS. Their values are defined in this section for easy maintenance.

6.2 Usability Survey Questions?

[This is a section that would be appropriate for some projects. —SS]

Appendix — Reflection

The information in this section will be used to evaluate the team members on the graduate attribute of Lifelong Learning. Please answer the following questions:

Appendix — Reflection

The information in this section will be used to evaluate the team members on the graduate attribute of Lifelong Learning. Please answer the following questions:

1. What knowledge and skills will the team collectively need to acquire to successfully complete the verification and validation of your project? Examples of possible knowledge and skills include dynamic testing knowledge, static testing knowledge, specific tool usage etc. You should look to identify at least one item for each team member.

2. For each of the knowledge areas and skills identified in the previous question, what are at least two approaches to acquiring the knowledge or mastering the skill? Of the identified approaches, which will each team member pursue, and why did they make this choice?

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