

Chapter 6 System Testing

6.1 Introduction to System Testing

Testing is very important to make sure a system executes free of error and display the desired output. Early detection of error will ensure less effort to detect in the later part. Since, CTutorial4u developed phase by phase, so each phase especially the links were tested.

Once it is determined that all the section or pages are error free, all these sections are combined to test the interaction with each other. This is to ensure the navigation between these sections will be error free. Periodic testing was done with the project supervisor to determine that the system is user friendly and attractive. Furthermore, this ensures that the system fulfils the required scope. Lastly, the system was tested among the students and colleagues for further improvement.

6.2 Testing Phase

The testing strategies are imperative to test the CTutorial4u works as required by the users and eliminate any unwanted bugs during the quiz session or tutorial session. Testing phases includes unit testing, sub-system or module testing and overall system testing.

6.2.1 Unit Testing

Unit testing is the process of testing smaller building blocks which means individual programs or subroutines is tested while the code is being written. It is important to test the program even a simple if-then-else rule before proceeding to another step or code. Incremental testing is being used to test the every single sub routines and functions.

6.2.2 Module Testing

Module testing is testing every function in a module or a page to identify any errors within that module. Every form or page of the CTutorial4u is tested until there are no bugs in terms of its functionalities. The testing approach used in this system 'Bottom Up' approach where the system was tested from small module and when there was no error then only the whole system was tested.

6.2.3 Overall system Testing

Overall system testing is full blonde test of the system to measure its full capabilities and to uncover its limitations. The system testing is done via integration testing which uses 'Sandwich Technique' that is a combination of 'Top-Down' approach and 'Bottom-Up' approach. This way is a more effective way where a single function is tested through both directions through main function to smaller blocks of units and from smaller units of function to main functions. The technique of 'Bottom Up' testing is illustrated in Figure 6.1 where each one of the function is tested individually before combining them to become a working system. The CTutorial4u was installed in one of the laboratories of FCSIT, UM for the tutors and the students to test. The test script was used to derive the user acceptance of the system.

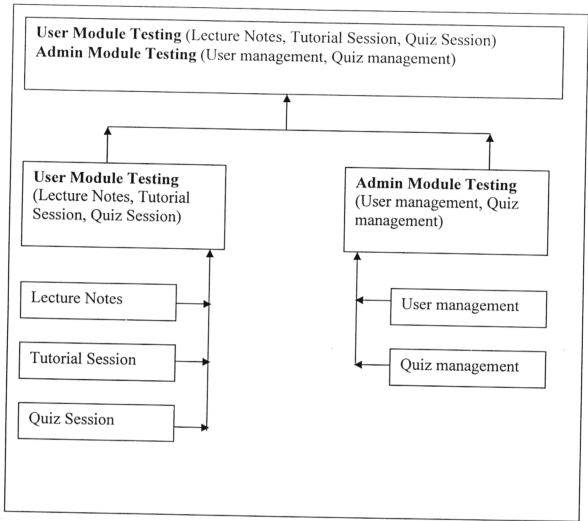


Figure 6.1: Bottom up Testing

6.2.4 Test Case

User Acceptance Test (UAT) is the most essential part in the project hand over phase. In large commercial system developments once UAT is being signed by the users then it means the system has been tested and accepted. Firstly the proper test scenarios or cases will be identified. Then there are many stages in conducting UAT as well where there will be first round of UAT to identify the errors or bugs and the comments given will be reviewed to modify the system accordingly. The second UAT is to verify by the users that the comments given in the first UAT has been adjusted and amended in the system.

This CTutorial4u system did go through the UAT phase where the test procedures are as follows:

Users (Students)

1. Logging in
2. View the Lecture Notes
3. View the Tutorial Session
4. View the Quiz Session
5. Logging out

Administrator

1. Logging in
2. New User registration
3. Edit user details
4. Delete users
5. Add new questions
6. Modify questions
7. Delete questions
8. Logging out

6.2.4.1 User Module Test Case

Table 6.1: Logon page test case

Test #	Scenario	Procedure	Expected output	Actual Output / Remarks
1.	Authorized User login to the system	Enter : Thava Password:** Click [OK]	Display the menu page	OK. √
2.	Unauthorized user login to the system	Enter : user Password: password Click [OK]	Message: Incorrect logon. Please enter correct username & password	OK. √

Table 6.2: Menu page test case

Test #	Scenario	Procedure	Expected output	Actual Output / Remarks
1.	View Lecture notes page.	1. Click [Lecture Notes] button. 2. Double click on the box after the chapter 1 information is displayed.	Display Lecture notes page.	OK. √
2.	View Tutorial session page.	Click [Tutorial session] button.	Display Tutorial Session page.	OK. √
3.	View Quiz session page.	Click [Quiz session] button.	Display Quiz Session page.	OK. √
4.	View the Admin page.	Click [Administration] button.	Display Administration page.	OK. √

Table 6.3: Lecture Notes page test case




Test #	Scenario	Procedure	Expected output	Actual Output / Remarks
1.	View chapter 1 slide show.	Click [Chapter 1: Introduction]. 2. Double click on the box after the chapter 1 information is displayed.	Power point show starts when double click on the box where the first page of chapter 1 is displayed.	OK. ✓
2.	Stop the slide show	Click [ESC] on the keyboard.	Power point show stops and back to the lecture notes page.	OK. ✓
3.	Go back	Click  navigation button.	Redirect to Menu page	OK. ✓
4.	Go next	Click  navigation button.	Display Tutorial session page.	OK. ✓
5.	Go Home /Menu	Click  navigation button.	Display Menu page.	OK. ✓

Table 6.4: Tutorial Session page test case







Test #	Scenario	Procedure	Expected output	Actual Output / Remarks
1.	Choose Arithmetic chapter.	1. Click [Arithmetic].	Arithmetic screen appears	OK. ✓
2.	Display Code	1. Choose Arithmetic type as multiplication. 2. Choose variable types as integer. 3. Variable A: 3 Variable B: 4	# include <stdio.h> main(){ int a, b, ans; a=3; b=4; ans=3*4; printf("Here is the answer"); printf ("%d",ans);}	OK. ✓
3.	Execute the code	Click [Execute] button	Execution result: 12	OK. ✓
4.	Go back	Click  navigation button.	Redirect to Menu page	OK. ✓
5.	Go next	Click  navigation button.	Display Quiz session page.	OK. ✓
6.	Go Home /Menu	Click  navigation button.	Display Menu page.	OK. ✓

Table 6.5: Quiz Session page test case

Test #	Scenario	Procedure	Expected output	Actual Output / Remarks
1.	Choose Arithmetic chapter.	1. Choose [Arithmetic] topic and 4 as the number of questions to answer.	Display Quiz page	OK. ✓
2.	Starts to attempt the quiz within 4 minutes.	1. Answer all the questions correctly.	1. Display the previous question and answers at the bottom with the correct. 2. Image ✓ displayed for correct answer. 3. Display total number of correct and wrong answers and percentage of the results.	OK. ✓
3	Timer	2. Timer is to 4 minutes. Wait for 4 minutes to elapse to test whether the timer works or not.	Exceeding 4 minutes will prompt timed out and exit form the page	OK. ✓
4.	Go back	Click  navigation button.	Redirect to Tutorial session page	OK. ✓
5.	Go next	Click  navigation button.	Display Administration page.	OK. ✓
6.	Go Home /Menu	Click  navigation button.	Display Menu page.	OK. ✓

6.2.4.2 Admin Module Test Case

Table 6.6: Administration page test case

Test #	Scenario	Procedure	Expected output	Actual Output / Remarks
1.	Add User	1. Choose [Add User] from the menu bar. 2. Enter Username: Aini Password: ** User type: student	Message: User created successfully	OK. √
2.	Add Question	1. Choose [Add Question] from the menu bar. 2. Enter: Question: trial A:a, B:b, C:c, D:d Ans:A	Message : Question added successfully	OK. √

6.3 Compliance of the system to its scope and requirements

The example of test scenarios tested by ten of the FCSIT's student is listed in the table 6.1 until table 6.6. Based on the test results, it is concluded that the system meets the expected output and ready to be delivered. At the same time, the system meets the system requirements and scope of the system specified in the earlier stage of requirement analysis. A study, consisting of 1-hour lab session has been performed with ten computer science students. There were problems to get students to test the system and evaluate the functionality they are not willing to spend time to test the system. Despite this, there were ten students gathered to perform the testing. Three of the FCSIT's tutors, Miss Wan Hasnira Wan Husin, Mr. Yeong Pong Meau and Miss Noor Aziamh Hassan were merely involved in testing the system as well. The students' test results were recorded and the students filled out a questionnaire at the end of the

session. The users were welcomed to give comments about the system and suggestions to improve the systems. The suggestion will be rectified whether to be included in the system or not together with the project supervisor and if the more research required to include that functions then it will be added in the future enhancement. The subjective responses from the questionnaire revealed that the students enjoyed learning C programming with CTutorial4u and appreciated its adaptive features. The next chapter, System Evaluation will describe further regarding the evaluation of CTutorial4u using the evaluation form. The comparison between before and after using CTutorial4u is also evaluated in next chapter.