

Automated Testing with the Blackbox Testing Method and Selenium WebDriver on the Learning Management System (LMS) Langsung Kerja

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Abstract—*Learning Management System (LMS) Langsung Kerja is one of the software owned by the company PT Edu Karir which was created to help people improve their skills so that they are ready to enter the world of work. This site has just finished at the Development stage and has already gone through the testing phase, but it is still being done manually (User Acceptance Testing), namely by testing all features one by one by the company's product team. As a web application, LMS also requires testing to ensure quality and reliability. In this case, automated testing can help increase the efficiency and effectiveness of testing, because testing is carried out automatically by tools or software. Selenium WebDriver is one such automated testing tool that can be used to test web applications, including LMS. Therefore, the author will create a script code for automatic testing using Selenium WebDriver Python with the Blackbox Testing method and creating test reports using PyTest. It can be concluded that the LMS Langsung Kerja site can run according to its functions.*

Keywords— *Testing, Automated Testing, Selenium WebDriver, Python, PyTest, LMS.*

I. INTRODUCTION

In today's digital era, the use of information and communication technology have become an integral of many sectors, including education. The use of technology in educations can help improve the efficiency and effectiveness of learning. One of the technologies used in education is the Learning Management System (LMS). [1], [2]

LMS is a web application that provide various features to help manage learning, including managing course material, assigning assignments, submitting work, and providing feedback. As a web application, LMS can be accessed by all users from various devices and locations. [3]

The *Langsung Kerja* Learning Management System (LMS) website is one of the software owned by the company PT Edu Karir which was created to help people improve their skills so that they are ready to enter the world of work. This site has just been completed at the Development stage and has already gone through the testing phase but is still being done manually (User Acceptance Testing), namely by testing all features one by one by the company's product team.

As a web application, LMS also requires testing to ensure quality and reliability. In this case, automated testing can help increase the efficiency and effectiveness of testing, because testing is carried out automatically by tools or software. Selenium WebDriver is one of automated testing tool that can be used to test web applications, including LMS.

Therefore, the author will create a script code for automated testing using Selenium WebDriver Python and creating test reports using PyTest. This research aims to do automated testing using the Blackbox testing method and Selenium WebDriver on the *Langsung Kerja* LMS website. And to test the functionality and performance of the LMS more efficiently, effectively, and find errors or bugs that may affect the user experience. The result of this research is expected to help improve the quality and reliability of LMS, so that it can provide greater benefits for its users.

II. RESEARCH METHOD

The first stage is data collection. The data used in this study was collected based on the identification of site specifications and requirements from the company's product team so that the author understands the flow and workings of the site. In addition, data collection in this research uses several techniques as follows:

A. Literature Study

Literature studies are used to understand theories related to Blackbox automated testing which are obtained through scientific journals, thesis, the internet, and related articles.

B. Observation

The author made direct observations on the LMS *Langsung Kerja* website by making test cases on certain pages that the author would test.

The second stage is research stages. In this stage the author concluded that the type of testing to be performed is functional testing using the Blackbox method. The LMS site has stages as a reference in the preparation and development of the test system to be carried out. These stages can be seen in Fig. 1.

The third stage is planning. The author plans by determining the object of research and testing time. The object that will be used as research material is an online course site. This research was conducted to analyze whether the LMS site owned by PT Edu Karir Indonesia is suitable for use and is following user requirements and whether there are no issues. The list of features to be tested can be seen in Table 1. The test tool used is Selenium WebDriver with the Python programming language. The type of testing performed is functional testing using the Blackbox method. Then test design is created by listing all the features to be tested before moving to the Testing stage.

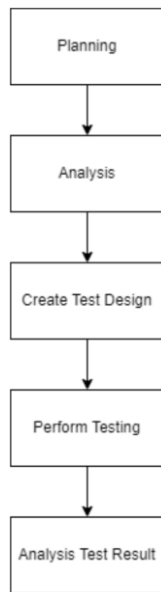


Fig. 1. Research Stages.

TABLE 1. List of Features to Be Tested

No.	Feature Name	Used For
1	Register	Testing the registration form where the email column must match the correct format and the password confirmation column is filled in according to the password column
2	Course	Testing course buttons (such as Start Learning, Continue Learning, and View Certificate), grouping courses based on the course's completion progress, as well as calculating the number of courses in the menu grouping in each course tab (Active Courses, Enrolled Courses, and Completed Courses).

Then test design is created by listing all the features to be tested before moving to the Testing stage. Then the testing stage where testing is carried out on the features that have been planned in in Create Test Design stage. The tester creates a test script first using Selenium WebDriver with Python and Chrome as tools. After creating a script, the tester will run the program on these features and the results will be made in the form of a report.

The last stage is Analysis Test Result. After the report containing the status of the features that have been tested is still failed, the tester will provide the report to the company's product team for repairs. If the repair has been made, the tester will re-test the feature to ensure that the feature runs as expected. If there is no failed status in the next test result report, then the feature can be confirmed that there are no problems or issues and is running as expected.

III. RESULT AND ANALYSIS

A. Features to Be Tested

Testing was conducted on the registration and course features on the LMS website.

B. Test Plan

Automated testing on the LMS website using Selenium WebDriver as an automation tool with Python as the

programming language. The browser used in this test is Chrome.

C. Test Case Design

A Test Case is a design action that will be carried out by a tester (Quality Assurance) to verify certain features or functions of the program that has been made. [4]

In this research, designing the test case will first describe the use case and use case description. This use case is a design activity or interaction between the user and the system (consisting of the design of managing functions in the system) from the Black Box Testing method in test cases designed to execute user scenarios. While the use case description is an elaboration of the function steps to be tested in detail. [4], [5]

Of all the features available on the *Langsung Kerja* LMS website, not all of them will be tested in this research. As with the existing problem limitations, testing will be carried out on 2 existing features, namely the Register and Course features.

- Register Test Case Matrix

Id	Scenario	First Name	Last Name	User Name	E-mail	Pass-word	Pass-word Confirmation	Expected Output	Explanation
TC1	Scenario 1: BF	valid	valid	Valid	valid	valid	valid	User successfully created an account	Directed to Dashboard
TC2	Scenario 2: BF A1	valid	valid	Valid	invalid	valid	valid	User unsuccessfully created an account	Warning displayed "Maaf, alamat email tersebut sudah digunakan!"
TC3	Scenario 3: BF A2	valid	valid	Valid	invalid	valid	valid	User unsuccessfully	Warning displayed "Valid E-

Fig. 2. Register Test Case Matrix (a)

Id	Scenario	First Name	Last Name	User Name	E-mail	Pass-word	Pass-word Confirmation	Expected Output	Explanation
								created an account	Mail is required"
TC4	Scenario 4: BF A3	valid	valid	Valid	valid	valid	invalid	User unsuccessfully created an account	Warning displayed "Your passwords should match each other. Please recheck."
TC5	Scenario 5: BF A1 A3	valid	valid	Valid	invalid	valid	invalid	User unsuccessfully created an account	Warning displayed "Your passwords should match each other. Please recheck."
TC6	Scenario 6: BF A2 A3	valid	valid	Valid	invalid	valid	invalid	User unsuccessfully created an account	Warning displayed "Your passwords should match each other. Please recheck."

Fig. 3. Register Test Case Matrix (b)

- Course Test Case

TABLE 2. Course Test Case

Id	Testing Description	Expected Result
TC1	Check if the “Download Certificate” button displayed if the completion progress is 100% on Enrolled Courses menu	“Download Certificate” Button displayed if completion progress is 100%
TC2	Check if the “Start Learning” button displayed if the completion progress is 0% on Enrolled Courses menu	“Start Learning” button displayed if completion progress is 0%
TC3	Check if the “Continue Learning” button displayed if the completion progress is 0% on Enrolled Courses menu	“Continue Learning” button displayed if completion progress is more than 0% and less than 100%
TC4	Check if the “Download Certificate” button displayed if the completion progress is 100% on Active Courses menu	“Download Certificate” button displayed if completion progress is 100%
TC5	Check if the “Start Learning” button displayed if the Completion progress is 0% on Active Courses menu	“Start Learning” button displayed if completion progress is 0%
TC6	Check if the “Continue Learning” button displayed if the completion progress is 0% on Active Courses menu	“Continue Learning” button displayed if completion progress is more than 0% and less than 100%
TC7	Check if the total of courses match with the amount shown on the Enrolled Courses menu	The amount is as shown on the tab title
TC8	Check if the total of courses match with the amount shown on the Active Courses menu	The amount is as shown on the tab title
TC9	Check if the total of courses match with the amount shown on the Completed Courses menu	The amount is as shown on the tab title
TC10	Check if the “Start Learning” directed to the correct page with completion progress 0%	“Start Learning” button redirected to correct page with completion progress 0%
TC11	Check if the “Continue Learning” directed to the correct page with completion progress more than 0%	“Continue Learning” button redirected to correct page with completion progress more than 0%
TC12	Check if the “Download Certificate” directed to the correct page with completion progress 100%	“Download Certificate” button redirected to correct page with completion progress 100%
TC13	Check if the button courses in Enrolled Courses menu are correct (Start Learning, Continue Learning, dan Download Certificate)	Courses shown are correct
TC14	Check if the button courses in Active Courses menu are correct (Start Learning dan Continue Learning)	Courses shown are correct
TC15	Check if the button courses in Completed Courses menu are correct (Download Certificate)	Courses shown are correct

D. Analysis of Test Result

Testing is carried out manually and automatically to see a comparison of the required test duration. In automatic testing, values are obtained from data binding using Excel which will be entered into the function for testing in accordance with the

test cases that have been designed. The following is a discussion of testing for each function using Selenium WebDriver.

- Manual Testing on Register Feature

The test is carried out manually starting on the Chrome landing page using 5 data with a mobile timer to check the duration taken for the test. Result can be seen in Table 3.

TABLE 3. Manual Testing Result on Register Feature

Test Case	Status	Duration
test_register	PASS	1 minute 44.52 seconds

- Automated Testing on Register Feature

The results of testing the Register feature after being developed by the Edukarir programmer are PASS with a running time of 23.34 seconds. This can be interpreted that this feature is running according to expectations. Result can be seen in Table 4 below.

TABLE 4. Automated Testing Result on Register Feature

Suite	Test Case	Status	Duration
test_register.py	test_register	PASS	23.34 seconds

- Manual Testing on Course Feature

Testing is done manually, each test case starts after opening Chrome with a timer to check the duration taken for the test. More detailed test results can be seen in Table 5. Manual testing requires an average duration of 39.726 seconds with 15 PASSED.

TABLE 5. Manual Testing Result on Course Feature

Test Case	Status	Duration
test_start_learning_enrolled_courses	PASS	44.44 seconds
test_continue_enrolled_courses	PASS	36.96 seconds
test_enrolled_courses_card_button_0	PASS	48.01 seconds
test_active_courses_0	PASS	41.41 seconds
test_active_courses_less_than_100	PASS	38.21 seconds
test_buttons_in_completed_courses_page	PASS	38.69 seconds
test_count_completed_courses	PASS	37.57 seconds
Test enrolled courses card button less than 100	PASS	41.52 seconds
test_enrolled_courses_card_button_100	PASS	34.35 seconds
test_download_certificate_enrolled_courses	PASS	35.21 seconds
test_active_courses_100	PASS	43.61 seconds
test_buttons_in_active_courses_page	PASS	37.56 seconds
test_count_active_courses	PASS	35.86 seconds
test_buttons_in_enrolled_courses_page	PASS	43.94 seconds
test_count_enrolled_courses	PASS	38.55 seconds

- Automated Testing on Course Feature

The results of testing the course features after being developed by the Edukarir programmer were 14 PASS and 1 xPASS with an average running time of 38,407 seconds. For a more detailed explanation of the test case results, it can be seen in Table 6 as follows.

TABLE 6. Automated Testing Result on Course Feature

Suite	Test Case	Status	Duration
test_course.py	test_enrolled_courses_card_button_0	PASS	26.35 seconds
test_course.py	test_active_courses_0	xPASS	25.86 seconds
test_course.py	test_active_courses_less_than_100	PASS	25.21 seconds
test_course.py	test_enrolled_courses_	PASS	22.13 seconds

	card_button_less_than_100		
test_course.py	test_start_learning_enrolled_courses	PASS	17.71 seconds
test_course.py	test_buttons_in_completed_courses_page	PASS	17.68 seconds
test_course.py	test_continue_enrolled_courses	PASS	17.62 seconds
test_course.py	test_enrolled_courses_card_button_100	PASS	17.55 seconds
test_course.py	test_buttons_in_active_courses_page	PASS	17.36 seconds
test_course.py	test_count_active_courses	PASS	16.6 seconds

E. Improvement of Functions in Course Features Based on The First Test Result

After testing the course feature, the results require the programmer to make improvements to the test case test_active_courses_0, where this test case expects that if the course completion progress is 0%, the button that appears is "Start Learning". But the result of this Selenium Webdriver is that a course is found with completion progress of 0% but the button that appears is "Download Certificate".

- **Testing Result After Fixing**

After giving the report of test results to the Edukarir programmer, it's said that the issue occurred because the account used had old data and the issue would not recur with a new account. The author conducted another test with a new account that had courses inside the account to ensure that the issues described previously did not recur. The results of the second test can be seen in Table 7 below.

TABLE 7. Automated Testing Fixing Result on Course Feature

Suite	Test Case	Status	Duration
test_course.py	test_enrolled_courses_card_button_0	PASS	85.98 seconds
test_course.py	test_active_courses_0	PASS	70.36 seconds
test_course.py	test_active_courses_less_than_100	PASS	62.3 seconds
test_course.py	test_enrolled_courses_card_button_less_than_100	PASS	49.53 seconds
test_course.py	test_start_learning_enrolled_courses	PASS	34.52 seconds
test_course.py	test_buttons_in_completed_courses_page	PASS	33.48 seconds
test_course.py	test_continue_enrolled_courses	PASS	32.49 seconds
test_course.py	test_enrolled_courses_card_button_100	PASS	26.83 seconds
test_course.py	test_buttons_in_active_courses_page	PASS	26.58 seconds
test_course.py	test_count_active_courses	PASS	23.15 seconds

The result is 15 PASS with an average running time of 36,088 seconds. It was concluded that the issue is true, because the data is old, so it doesn't recur on new accounts with new data.

F. Comparison of Manual Testing and Automated Testing Result

In terms of execution results, manual and automated tests produce the same status: 1 PASS on the Register feature and 15 PASS on the Course feature. When running the test, we can find out the duration of each test case that is run. The duration of one test case varies if it is ran several times. The total automatic testing execution time for the total feature Register is 23.34 seconds, and 1 minute 44.52 seconds for manual testing. Then the total automatic testing execution time for the total course features is 36,088 seconds, and 39,726 seconds for manual testing. Thus there is an increase in speed in automated testing.

TABLE 8. Comparison of Manual and Automated Testing Result

Feature	Manual	Automated
Register	1 minute 44.52 seconds	23.34 seconds
Course	39.726 seconds	36.088 seconds

IV. CONCLUSION AND SUGGESTION

The test results of the 5 test cases on the "Register" page are as expected with 4 negative test cases and 1 positive test case, which means that this page can run according to its function.

Then the test results of the 13 test cases on the "Course" feature are as expected, by testing the course buttons (Start Learning if the course progress is still 0% or has not started, Continue Learning if the course progress is more than 0% and less than 100 %, and View Certificate if the course progress is 100%), check the grouping of course cards based on their progress on the Enrolled Course, Active Course, and Completed Course tabs, and check the number of courses on each of these tabs. All test cases are successful which means that all functions are working properly.

It can be concluded that the Langsung Kerja LMS site can run according to its functions. In addition, this Black Box test with Selenium Webdriver can be run repeatedly and can be modified as needed, which allows testers to retest additional modules or new features in the future. In Testing can also be carried out in a very short time, so that it can make it easier for the company's Product and Web Developer teams to carry out repeated tests.

Responding to the existing weaknesses, further development in this research can be refined by testing all the features on the Langsung Kerja LMS site to ensure that all the features are running properly. Testing is expected not only to use Chrome as a testing tool, but to use other browsers, such as Safari, Firefox, Internet Explorer, and so on. Besides that, the automated Black Box test script can be further developed to be more detailed in the future.

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