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ANALYSIS OF QUALITY ASSURANCE PERFORMANCE IN THE APPLICATION OF MANUAL TESTING AND AUTOMATION TESTING FOR SOFTWARE PRODUCT TESTING

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Abstract

This paper aims to understand the influence of using the Katalon tool in application testing, comprehend the testing scenario process using Katalon, and compare it with manual testing. The testing process using Katalon Studio follows the design proposed by the author based on references from previous literature. The research method employed includes literature review, test case collection and analysis, implementation, test case testing, and evaluation of implementation results. Katalon can be utilized for testing using test cases. These test cases are recorded and replayed by capturing each response in a single event in the application. Both automated testing and manual testing were conducted using nine scenarios consisting of Crypto Asset Search, Limit Order Method for Buying and Selling Crypto Assets, Instant Order Method for Buying and Selling Crypto Assets, Crypto Asset Deposit and Withdrawal Address Method, Crypto Asset Username Deposit and Withdrawal Method, Failed Crypto Asset Purchase with Limit Order Method, Failed Crypto Asset Sale with Limit Order Method, Failed Crypto Asset Purchase with Instant Order Method, and Failed Crypto Asset Sale with Instant Order Method. The average comparison of the nine scenarios tested using manual and automated methods shows a difference of 11.04%. Therefore, automated testing is 11.04% faster than manual testing. The conclusion drawn from this research is that testing using Katalon is shorter compared to manual testing using the same test case.

Keywords: Software testing, Manual Testing, Automation Testing, Quality Assurance

INTRODUCTION

With the rapid advancement of technology, several companies continue to compete in creating and producing software that can meet customer needs. Customers are a crucial part of a company's survival. Quality control of the software product is essential to produce software that can meet customer needs. The quality control system for software products is Quality Assurance. Thus, with Quality Assurance, productivity can be enhanced, processes improved, and bugs in a software product reduced (Chiarini, 2020).

Many companies have used manual testing to test software products, while few have used automation testing. However, we know that automation testing requires less time trying a software product and can save time from the predetermined schedule in a software product development project. On the other hand, manual testing in software product testing requires more time to complete testing.

Testing is used to determine the differences between the required conditions and the existing conditions. Testing is crucial in the software development cycle (Kale et al., 2008). Developing test automation has become one of the most important things lately, and test automation is considered one of the most critical factors in improving software quality. The implementation of test automation is also required for various levels and types of testing (Williams, 2017). This research compares automation and manual testing in a crypto asset trading application.

REVIEW OF LITERATURE

Manual Testing

Manual testing is a technique where testers prepare test cases manually and execute them to identify defects in software. It is the strictest and oldest method of software testing. Manual testing requires testers to possess specific qualities: patience, speculative alertness, creativity, innovation, open-mindedness, and skillfulness. Manual testing may be challenging to perform repeatedly on large-sized software applications or applications with extensive dataset coverage (Sharma, 2014). Here are some constraints related to manual testing, as follows (Sharma, 2014): 1) Requires much time: The process is prolonged because human resources execute test cases; 2) Significant investment in human resources: Because test cases need to be executed manually, more testers are required for manual testing; 3) Manual

testing is less reliable because testing may only be done with precision sometimes due to human errors; 4. Not programmable: No programming can be done to write sophisticated tests that retrieve hidden information. Manual testing can be tedious and, therefore, error-prone.

Automation Testing

Automation testing in software testing involves developing testing scripts using scripting languages such as Python, JavaScript, or Tcl (Tool et al.) so that test cases can be executed by computers with minimal human intervention and attention. Testing design and development can be automated together to reduce human effort and save costs. Automation software can also input test data into the system under test, compare expected and actual results, and generate detailed test reports. Automation testing requires a significant investment of money and resources. Sequential development cycles require the repeated execution of a series of tests. It can record and replay this series of tests using automation testing tools as needed. After automated test sequences, no human intervention is required. Automation aims to reduce the number of test cases executed manually and not eliminate manual testing simultaneously (Sharma, 2014).

Here are some benefits of automation testing (Sharma, 2014): a) Faster; It is faster than manual testing; b) Cost-saving: Test cases are executed using automation tools, so fewer testers are needed in automation testing; c) Repeatable: The same test cases (record and playback) can be rerun using testing tools; d) Reusable: It can be reused in various software versions once tested; e) Programmable: Testers can program sophisticated tests that reveal hidden information; f) Comprehensive: Testers can create a series of tests covering every software application feature; g) More reliable; Automation tests perform the same operations every time they run; h) Wide test coverage; Wider application feature testing coverage.

Here are some factors that influence automation testing performance (Rodrigues & Dias-Neto, 2016): 1) Feasibility assessment: Indicates beforehand whether the automation project is technically and economically feasible; 2) SUT Testability Level: Indicates whether the software has been designed to facilitate testing. Testing capability enhances testing design efficiency and facilitates automation; 3) Resource availability: Indicates that all necessary resources for automating testing have been or will be available. Knowing there are insufficient resources to continue the project amid difficulties is tragic; 4) Management:

Indicates setting performance indicators, monitoring techniques, and analysis of reports established to ensure they achieve goals and meet quality standards; 5) Well-defined Test Process: Indicates that testing activities are structured and well-organized; 6) Scalability: It makes sense that testing artifacts increase in number and complexity over time, which may require more resources (hardware and personnel) to support new demands; 7) Maintenance: Automation testing often requires significant maintenance; testing artifacts may change during development. Choosing easy-to-maintain and upgradeable testing tools can save money and time; 8) Automation Tool Acquisition Criteria: Tool vendors usually present their solutions as the best solution for all situations. However, literature shows that everyday scenarios in many cases are very different. Issues like learning curve, maintenance effort, and customization should be considered to avoid future disappointments; 9) Quality Control: Identifying early whether automation positively impacts the testing process is essential. Therefore, this means monitoring results and making adjustments to meet expectations. Quality control means determining performance metrics, setting reference values, and monitoring whether the metrics are achieved; 10) Reusable Resources: Indicates that steps and practices are adopted to encourage the reuse of test artifacts in multiple automation projects; 11) Dedicated and Skilled Team: Indicates that the automation team is recognized as a separate group from the testing team and has all the skills required for the automation project; 12) Planning or Automation Strategy: Researchers and practitioners agree that automation testing requires mature planning. It should include but include more than goal definition, economic study (ROI), and resource acquisition processes.

Difference between Manual Testing and Automation

Manual testing is a technique in which testers manually prepare test cases and execute them to identify defects in software. Generally, manual testing involves running tests by executing software according to written test scenarios. Then, compare the output generated by the application with the expected output from each test case (Min et al., 2020).

Meanwhile, automation testing involves developing testing scripts using scripting languages such as Python, JavaScript, or Tool Command Language (TCL) so that computers can execute test cases with minimal human intervention. Additionally, automation testing creates programs (test scripts) that simulate the manual testing steps in any programming language with the help of other external automation tools. End-to-end testing execution using

automation testing requires converting test cases into test scripts, which are then executed on automation tools (Min et al., 2020).

Quality Assurance

Quality Assurance is a planned and systematic activity within a quality system to ensure the fulfillment of quality requirements for goods and services (Lunarto & Sugiarti, 2014). Some objectives of implementing quality assurance are: 1) Assisting continuous improvement and improvement through best practices and innovative willingness ; 2) Provide information to the public according to targets and consistently compare achieved and competitor standards; 3) Ensuring unwanted events do not occur (Toha & Habibah, 2023). Furthermore, the purpose of implementing quality assurance is to satisfy various parties involved, thereby achieving their respective goals (Toha & Supriyanto, 2023).

Software Development

Software is one form of non-physical structure. Software development or building software means constructing non-physical entities. Nothing physical is formed from software development. However, software unity is formed due to the work and effort of building software. Software cannot stand alone; it must be related to hardware, and hardware that can be used by software always has requirements. These requirements make software compatible with the available hardware environment (Rochmadi, 2013).

Types of Software Testing

Software testing is analyzing software items to detect whether the developed software functions correctly and meets specified requirements, as well as identifying defects to ensure the tested product is free from defects, thereby producing a quality product.

User Acceptance Testing

User Acceptance Testing (UAT) is a crucial aspect of software testing because once it passes the UAT stage, the system will be accepted by users. Users, assisted by the development team, develop products based on testing scenarios to validate the developed system's consistency with the required system, thus providing users with comfort in using the system. In principle, testing scenarios should cover all critical scenarios. An automated testing plan will be beneficial in reducing UAT's development time (Munthe et al., 2015).

Smoke Testing

Smoke testing is a system test usually performed daily or several times a week. Build and smoke testing are crucial as they provide quick feedback on important issues.

RESEARCH METHOD

Research Steps

In this research, the author will apply manual and automation testing with Katalon for functional testing of a Crypto buying and selling application. The steps used in this research are as follows: 1) Preparation: The preparation phase begins with reading and analyzing the application manual guide. This guide contains provisions for each feature in the application, details of each action performed, and the expected outcomes; 2) Data Binding: The next step is creating data binding or files in Microsoft Excel. *Data files* are the data used during testing; 3) Test Cases: The next step is the creation of test cases. *Test cases* are documents that contain the sequence flow of testing; 4) Test Suite: The next step is the creation of a test suite. A test suite is a set of test cases ready to be tested together with data binding or data files. 5) Testing: The research continues by performing automation testing using two methods: manual testing and automation testing; 6) Reporting: This stage aims to document the manual and automation testing results; 7) Proposed Design: Katalon Studio is used for automation testing. The automated testing design using Katalon is shown in Figure 1.

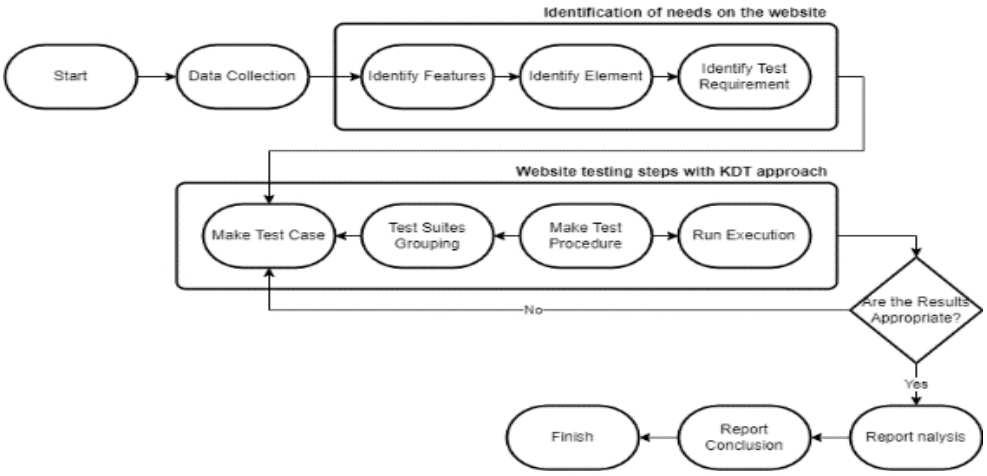

Figure 1
Automation Testing Design (Octavially et al., 2022)

Here is the explanation: a) Feature Identification; b) Identify the Crypto buying and selling application features that will be tested based on the previously created documents. In this stage, testers will note down the features in the Crypto buying and selling application and pass the testing stage; c) Element Identification; d) A set of specific constraints containing functionalities such as transaction features, functions, or structural elements present in the Crypto buying and selling application. In this stage, testers will note the elements present in the Crypto buying and selling application to be processed in the testing stage; e) Test Requirements Identification; f) Explain test requirements at least once. What qualifies to be met depends on the interpretation of each team. In this step, testers will note down the test conditions deemed successful or not.

Data Collection

The data collection method to obtain information related to the implementation of manual and automatic testing with Catalon on functional testing of crypto asset buying and selling applications is carried out using the observation method. These test cases are obtained from previous manual testing documentation, which can be learned from the system flow and output.

RESULTS AND DISCUSSION

Manual Testing

Manual test case testing can be done sequentially or randomly, depending on the testing needs. Manual testing is performed by following the steps outlined in the test cases and ensuring whether the expected test results in the test cases are met or not. If achieved, the tester must update the testing documents according to the test results. However, if they do not match and bugs are found, they must be reported to the developers for code fixes.

Automation Testing

Automation testing using Katalon Studio requires extracting spy objects from the cryptocurrency buying and selling website you want to test automatically. After the spy object results are inputted into the test case, the test case created in the studio will be used in the automation testing process. Test cases that can be executed in Katalon Studio will display the application website in the browser of our choice.

Results of Manual Testing and Automation Testing

Implementing Automation Testing using Katalon Studio begins with learning the test cases and the cryptocurrency buying and selling application to be implemented. This cryptocurrency buying and selling application is web-based and has a business flow run by the company. Test case testing scenarios are conducted manually and automatically. Humans perform manual testing, and automation testing is done using the studio. The implementation and testing results of the testing scenarios are as follows:

Table 1
Summary of Testing Scenario Results

Number	Scenario	Number of Steps	Number of Line Codes	Guide (Second)	Automation (Second)
1	Search for Crypto Assets	14	139	415	382
2	Limit Order Method for Buying and Selling Crypto Assets	15	249	673	634
3	Buy and Sell Crypto Assets Instant Order Method	9	516	512	463
4	Crypto Asset Deposit and Withdrawal address methods	15	608	587	521
5	Crypto Asset Deposit and Withdrawal username method	15	674	617	593
6	Failed to Buy Crypto Asset Limit Order Method	3	63	164	138
7	Failed to Sell Crypto Assets Using the Limit Order Method	3	68	159	128
8	Failed to Purchase Crypto Assets Instant Order Method	2	61	176	159
9	Failed to Sell Crypto Assets Using the Instant Order Method	2	71	189	159
Number of Manual and Automated Tests				3.492	3.177

The results of running automatic testing using the studio catalog and manual testing are added up for each testing process to obtain an automatic testing time of 3.177 seconds, while manual testing lasts 3.492 seconds. The amount of time obtained from the results of automatic testing and manual testing will be considered by a tester when carrying out testing and choosing the test method that will be used by the tester in testing an application.

CONCLUSION

Implementation of automation testing using Katalon Studio on the stock buying and selling website application with 9 test scenarios. Created as a test case in Katalon Studio, which will be tested when the test case is run in Katalon Studio, and there is a log of test results from the test case run. Humans carry out manual testing by screenshotting or recording each step in the scenario and creating test documentation. After that, compare the results of manual testing and automatic testing of the test results that have been obtained. A comparison of manual and automatic testing can be obtained from the test results data. Automatic testing results can be obtained faster than manual testing. Also, the comparison of testing time for automatic and manual testing is 3.177 seconds for automatic testing and 3.492 seconds for manual testing. Hence, testing is faster when automatic testing is used.

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