**Ein Bild, das Text enthält.

Automatisch generierte Beschreibung**

**[Implement Automation testing framework & calculate the return on Investment for Software Automation Testing]**

**Exposé for the Master Thesis**

Technical University of Brandenburg

Study Program Business Information Systems

Presented by:

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**Versions**

|  |  |  |  |
| --- | --- | --- | --- |
| **Version** | **Date** | **Changes made** | **Author** |
| 1.0 | 01.04.2023 | Initial | K.Elhosseny |
| 1.1 | 14.04.2023 | - Added Version section - Answer question from Prof. Levina | K.Elhosseny |
| 1.2 | 26.04.2023 | - Answer question from Prof. Levina on V1.0  - Insert footnotes. | K.Elhosseny |

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# Introduction

The concept of testing or quality, in general, is very important in any industry domain such as banking, the car industry, and even food. It is crucial to gain customer satisfaction and to keep the company's share in the market. It directly affects the business, the company's reputation, and future sales. Therefore, the importance of software testing cannot be overlooked. Just like any other industry, the software industry requires quality control and testing. Software testing is a critical stage in the software development life cycle (SDLC). Imagine using a self-driving car or an e-commerce system without the concept of testing; it may affect your life, cause injury, or result in a significant financial loss. Testing these products can help avoid troubles and reduce the risks of software failure or crashes. Moreover, it saves time and costs. Software testing is a complex process that includes a wide range of tasks and activities such as test planning, test analysis, test design, test strategy, reporting, and test execution. In test execution, we have two common types of execution: manual execution and automation execution.

(ISTQB, 1 July 2021)

Manual Testing, as the name suggests, is done manually by a person, such as a "Tester" or "QA Engineer," who executes and runs the software. They interact with the software as an end-user, clicking and navigating through it and filling in fields. The purpose is to validate and verify that the software functions as expected and that there are no failures or bugs included. However, this is an expensive process that requires time and cost since it demands attention to details and analytical skills.(Hamilton, 2023)

Automation Testing is not just a process or a set of testing tasks and activities. It includes a separate software that requires architectural and programming skills, in addition to manual tester skills like analytical skills and creativity. Automation Testing includes tools and scripts to perform testing activities and improve testing efficiency and effectiveness by automating repetitive and time-consuming tasks, such as regression tests. Automation Testing provides fast feedback on software quality, shares digital reports with all stakeholders, and reduces the time and cost of manual testing. Moreover, Automation Testing improves accuracy, increases test coverage, and is helpful for continuous integration and continuous delivery (CI/CD) pipelines. Furthermore, Automation Testing reduces human errors caused by manual testers. However, all these advantages do not necessarily prove that Automation Testing can positively reflect and return on investment since Automation Testing can be expensive and requires extra resources.(Sambamurthy, January 2023)

# Research Questions

Accordingly, the research questions of the master thesis are:

1. How does Automation Testing differ from Manual testing?
2. How did Automation Testing framework develop from a theoretical and practical perspective? \*[[1]](#footnote-2)
3. What are the benefits of Automation Testing?
4. How to calculate the result of ROI in Automation Testing? \*[[2]](#footnote-3)
5. How does Automation Testing change and accelerate the software development life cycle?
6. How does Automation Testing work in Agile framework?
7. How does Continuous Integration and Continuous Delivery (CI/CD) pipelines change and effect the results of ROI? \*[[3]](#footnote-4)
8. What are the possibilities and limitations of Automation Testing and Continuous Integration and Continuous Delivery (CI/CD) pipelines from a theoretical and practical perspective?
9. Can Automation Testing displace manual testing?

The research question can be decreased to only 3 question “question with red astric” and the rest of the questions will be answered implicitly in the study.

1. Which concepts enable to implement Automation testing?

# Objective of the Work

The main objective of this study is to compare between the manual testing and the automation testing in all testing process and calculate the ROI for the automation testing, the case study is a specific software project, that should be fully featured and during the study should cover all the research questions:

Comparing the differences between Automation Testing and Manual test-ing in terms of effectiveness, efficiency, accuracy, and cost. Implement an automation test environment “Framework” to explore and analyze the benefits of Automation Testing in terms of time savings, improved accuracy, reduced costs, and increased test coverage. To prove the advantage of Automation testing.

Then determining the factors that affect the ROI in Automation Testing. The study will also cover the working environment and examine how Automation Testing impacts the software development life cycle, and how it can be used to accelerate the development process in Agile environments. The study will also address to investigate how Automation Testing is integrated and utilized in Agile frameworks and identify the best practices for its implementation. Regarding CI/CD the study will evaluate the impact of Continuous Integration and Continuous Delivery (CI/CD) pipelines on Automation Testing and analyze how they contribute to the overall ROI. Also, trying to analyze the possibilities and limitations of Automation Testing and CI/CD pipelines from both theoretical and practical perspectives and develop recommendations for their effective use.

In the end, to assess whether Automation Testing can replace manual testing completely or partially and identify the scenarios where Automation Testing is most effective.

All the above is my research objective but there is another business objective which is convent the client to use Automation testing if the ROI is positive, and the other objective is to master the role of Senior Automation tester Engineer in Endava GmBh.

# Project description

1. Fully understand the software during the documentation and the confluence.
2. Map of functionality for the software.
3. Doing a risk-based analysis to priorities the functionality and select the most important features to the business.
4. Doing the fully manual testing for the high priority features and repeat the process at least 3 times.
5. Writing manual test reports.
6. Implement an automation testing framework.
7. Execute automation test scripts for the high priority features and repeat the process for at least 3 times.
8. Generate automation testing reports.
9. Generate a pipeline for continuous integration and continuous delivery (CI/CD)
10. Compare the results between the Manual testing and Automation testing.
11. Calculate the ROI of the automation testing.

# Methodologies

This study will focus on three aspects: the theoretical side, the technical execution side, and a quantitative comparison between manual testing and automation testing to calculate the ROI for the automation testing. And the research method will be the mixed between experiment and case study.

1. On the theoretical side[[4]](#footnote-5), the study will cover the concepts of software testing, defining them and clarifying the methods and techniques that will be used during the project.
2. In the technical execution ”practical perspective”, the study will implement the automation testing framework and explain how to do so. It will describe the tools used, their purpose, and their importance. It will serve as a guide for those who want to use the framework and practice automation testing. This may include troubleshooting, setup, notes, code snippets, and screenshots. In addition, the implementation of CI/CD will be here in this section also.
3. The present study utilized a mixed research method to investigate a specific case study in-depth. The focus of the investigation was to understand and analyze the current project, and to test it both manually and automatically. The goal was to gather qualitative data on the experience of using the new method of automation and compare the results with the old manual method.

In addition to the investigation of the case study, several variables were identified that required further research, with the aim of measuring their impact on the results obtained. Therefore, this study was designed as an experiment. One such variable that was explored was the impact of implementing continuous integration and continuous deployment (CI/CD) on the return on investment (ROI) of the project.

Overall, this mixed research method enabled a thorough and comprehensive investigation of the case study and the variables at play, providing valuable insights into the efficacy of automation testing and the impact of implementing CI/CD.

# Time Schedule

|  |  |  |
| --- | --- | --- |
| **Activity** | **Start date** | **End date** |
| Writing of an exposé | 01.03.2023 | 01.04.2023 |
| Literature research | 01.04.2023 | 07.04.2023 |
| Project implementation | 07.4.2023 | 15.05.2023 |
| Writing of the theoretical part | 16.05.2023 | 25.06.2023 |
| Revision and Proofreading | 25.06.2023 | 07.07.2023 |
| Reworking and enhancement | 08.07.2023 | 21.07.2023 |
| Print or Submission | 22.07.2023 | 28.07.2023 |
| **Duration** | ~ 5 months | |

Table 1: Time Schedule

# Structure

1. Introduction

2. Basics

3. Related works

4. Comparison Criteria

5. Implementation of the sample project

6. Evaluation of the implementation according to the issued criteria

7. Results and Evaluation

8. Outlook/ Conclusion

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**Appendix**

**Mind map at Miro board**

<https://miro.com/app/board/uXjVPuNPCLw=/?share_link_id=124042848617>

Please access my mind map, it’s for anyone on the internet, No sign up required.

1. The framework which’ll develop and implement during the study, it’s also by the client recommendation and using the stack of [ WebdriverIO , Cucumber, Typescript, Jenkens as CI/CD]. [↑](#footnote-ref-2)
2. This topic is not new, but it differs from project to project. In some cases, the return on investment (ROI) of automation testing is low, so the recommendation is to perform only manual testing. In other cases, the ROI of automation testing is high, and in such cases, we should implement automation testing. Additionally, the factors used to calculate the ROI may vary from project to project. The focus of my study is a specific use case involving an existing website project in my company. The client is interested in determining whether automation testing will provide value or not. My subject is the process of calculating ROI and implementing the automation testing framework and the research also includes a comparison between the manual test and the automatic test, and the practical implementation of them, and the time differences between each stage and the other. [↑](#footnote-ref-3)
3. The results are the execution time for manual testing and automation testing, saving time and cost for more references https://www.browserstack.com/guide/calculate-test-automation-roi

   https://testsigma.com/blog/roi-test-automation/ [↑](#footnote-ref-4)
4. fundamentals topics in software testing like user stories, test cases , test reports, advanced topics like Test plan, Test strategy , Risk based testing , Regression test , smoke test. [↑](#footnote-ref-5)