

# A Survey of Awareness and Adoption of Automated Software Engineering Tools and Techniques

Dear developer,

Thank you for participating in this online survey. We are researchers at the Faculty of Information and Communication Technology, Mahidol University, Thailand and University College London, UK. This survey is part of the "Automated Software Engineering for Thailand Software Industry" project, where we aim to improve software development in Thailand by automated software engineering. You can find more information about this project at <https://muict-seru.github.io/ASETS/>.

You have been contacted and invited to participate because you are a Thai developer and you have experience of developing software in a team. In this survey, we would like to ask about your awareness of and experience with automated software engineering tools and techniques.

The survey is anonymous and has 55 questions and should only take about 30-45 minutes to complete.

We will record that you have participated and you may receive another invitation to participate in a second round. We will only use your information to identify the group of participants who have participated in both rounds. Your information is not used for anything else.

We hope that you will complete the entire form but if you do not wish to continue, you can just quit the session and your input will be discarded.

This survey is a part of the Industrial Academia Partnership Programme 18-19 (IAPP18-19\74) project funded by the Royal Academy of Engineering, UK and Thailand Science Research and Innovation (TSRI). The result from this survey will be analyzed and used for academic publications. The project has been approved by the Committee for Research Ethics (Social Science) of Mahidol University (certificate number 2019/200.1709) and by the UCL Research Ethics Committee (No. 6082/001).

If you have any questions, please feel free to contact us.

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Principal Investigators of the "Automated Software Engineering for Thailand Software Industry"

Industry Academia Partnership Programme - 18/19. Grant no. 74.

On the condition that you are not treated as indicated in this information sheet, you can contact the Chair of The Committee for Research Ethics (Social Sciences) at the office of

MUSSIRB, Office of Faculty of Social Sciences and Humanities, Mahidol University, Tel: 02 441 9180, Fax: 02 441 9181, E-mail: [musssirb310@gmail.com](mailto:musssirb310@gmail.com).

## Consent Form

I hereby express my consent to participate as a subject in the research project entitled "Automated Software Engineering for Thailand Software Industry".

In so doing, I am informed of the research project's origin and purposes; its procedural details to carry out or to be carried out; its expected benefits and risks that may occur to the subjects, including methods to prevent and handle harmful consequences; and remuneration, and expense. I have thoroughly read the detailed statements in the information sheet given to the research subjects. I was also given explanations and my questions were answered by the responsible researcher. I therefore consent to participate as a subject in this research project.

I am aware of my right to further information concerning benefits and risks from the participation in the research project and my right to withdraw or refrain from the participation at any time without any consequence on the service or health care I am to receive in the future.

I consent to the researchers' use of my private information obtained in this research, but do not consent to any individual disclosure of private information. The information must be presented as part of the research results as a whole.

On the condition that I have any questions about the research procedures, or on the condition that I suffer from an undesirable side effect from this research, I can contact Dr. Chaiyong Ragkhitwetsagul Tel. 089-1763372, E-mail [chaiyong.rag@mahidol.edu](mailto:chaiyong.rag@mahidol.edu)

On the condition that I am not treated as indicated in the information sheet distributed to the subjects, I can contact the Chair of The Committee for Research Ethics (Social Science) at the office of MUSSIRB, Office of Faculty of Social Sciences and Humanities, Mahidol University, Tel: 02- 441 9180, Fax: 02-441 9181, E-mail: [mussirb310@gmail.com](mailto:mussirb310@gmail.com)

1. I thoroughly understand the risks and the statements in the information sheet for the research subjects and in this consent form.

*Mark only one oval.*

I agree to give my consent

I disagree to give my consent

## Demographic Information

2. How many years of software development experience do you have?

*Mark only one oval.*

- Less than a year
- 1 to 2 years
- 3 to 5 years
- 6 to 10 years
- More than 10 years

3. How many years have you been working at your current company?

*Mark only one oval.*

- Less than a year
- 1 to 2 years
- 3 to 5 years
- 6 to 10 years
- More than 10 years

4. How long have you been working on your current software project(s)?

*Mark only one oval.*

- Less than a month
- 1 to 6 months
- 7 to 12 months
- 1 to 2 years
- More than 2 years

**5. What are your current roles in software development?**

*Check all that apply.*

- Developer
- QA Tester
- Designer
- Project manager
- Team leader
- Manager
- Researcher
- Student
- Other: \_\_\_\_\_

**6. What is the approximate size of the development team of the current project(s) you are contributing to? Please enter only the number.**

\_\_\_\_\_

**Awareness of Automated Software Engineering Tools**

Automated software engineering applies computation to software engineering activities. The goal is to partially or fully automate these activities, thereby significantly increasing both quality and productivity. Examples include code analysis tools, testing tools, code review tools, integration or deployment tools.)

**7. How familiar are you with the concept of automated software engineering?**

*Mark only one oval.*

- Not familiar at all
- Slightly familiar
- Moderately familiar
- Very familiar
- Extremely familiar

8. To what extent are you adopting some of the automated software engineering tools in your work?

*Mark only one oval.*

- Not at all     *Skip to question 10*
- To some extent
- To a moderate extent
- To a good extent
- To a great extent

### Current benefits of automated software engineering

You have answered that you are adopting some of the automated software engineering tools in your work. This question asks about your the benefits from currently using automated software engineering in your work.

9. You have answered that you are adopting some of the automated software engineering tools in your work. Currently, the adoption of automated software engineering in my software development ...

*Mark only one oval per row.*

	Not at all	Slightly	Moderately	Very	Extremely
<b>helps me to maintain the software more easily</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>helps me to deliver the software faster</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>helps me to deliver high-quality software</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>is useful in overall</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### Future adoption of automated software engineering

You may currently be adopting some of the automated software engineering tools in your work or not at all. This question asks about the potential benefits that you think you will receive from adopting automated software engineering in the future.

## 10. Possible adoption of automated software engineering in the future ...

Mark only one oval per row.

	Not at all	Slightly	Moderately	Very	Extremely
<b>will help me to maintain the software more easily</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>will help me to deliver the software faster</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>will help me to deliver high-quality software</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>will become useful in overall</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### Adoption of different types of automated software engineering tools

In the following, we will focus on four areas in which tools for automated software engineering are used.

1. software measurement
2. static code analysis
3. software testing
4. continuous integration and continuous deployment.

### Software Measurements

The first is about Software Measurement, where quantifiable or countable software characteristics are measured, usually in the form of software metrics. Examples are lines of code (LOC), defects per LOC, team velocity, etc.

11. How familiar are you with automated tools used for measuring your software?

*Mark only one oval.*

- Not familiar at all
- Slightly familiar
- Moderately familiar
- Very familiar
- Extremely familiar

### Experience on Using Software Measurement Tools

Software measurement tools are automated tools that analyse a given software project and output quantified attribute of a characteristic of the given software. For example, tools that can measure code complexity, duplications, and size.

12. Have you used (or have been using) software measurement tools?

*Mark only one oval.*

- Yes     *Skip to question 15*
- No     *Skip to question 13*

13. If No, do you think a team could benefit from using software measurement tools during development?

*Mark only one oval.*

- Yes
- No

14. What prevented you from using software measurement tools?

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*Skip to question 22*

15. If Yes, did you find it useful or are you finding it useful?

*Mark only one oval.*

Yes

No

16. Currently, to what extent do you use software measurement tools during your activities?

*Mark only one oval.*

Not at all *Skip to question 18*

To some extent *Skip to question 18*

To a moderate extent *Skip to question 18*

To a good extent *Skip to question 18*

To a great extent *Skip to question 18*

17. What prevented you from using more software measurement tools?

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*Skip to question 21*

**List of software measurement tools**

18. Do you use software measurement tools that

*Check all that apply.*

- Run continuously in your editor/IDE
- Run in your editor/IDE when you tell them to run
- As a part of pre-commit/pre-push checks
- As a part of your build or continuous integration process
- As a part of your code review process
- Run in a non-integrated/separate way, i.e., standalone tools or command line tools
- Other: \_\_\_\_\_

19. If you have used software measurement tools, which one did you use and did you find them useful?

*Mark only one oval per row.*

	Not used	Used but not useful	Used an somewhat useful	Used an very useful
<b>JHawk</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>SonarQube</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Teamscale</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>JDepend</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>NDepend</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Analizo</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Other tools</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

20. If you use other tools besides the ones showing in the list, what are they?

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## Static Code Analysis

The second area is about Static Code Analysis where source code is examined and debugged without the software being run. Examples are checking for coding conventions or code smells.

21. How familiar are you with the static code analysis tools?

*Mark only one oval.*

- Not familiar at all
- Slightly familiar
- Moderately familiar
- Very familiar
- Extremely familiar

## Experience on Using Static Code Analysis Tools

22. Have you used or are you using static analysis tools?

*Mark only one oval.*

- Yes     *Skip to question 25*
- No     *Skip to question 23*

23. If No, do you think a team could benefit from using static analysis tools during development?

*Mark only one oval.*

- Yes
- No

24. What prevented you from using static analysis tools?

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*Skip to question 35*

25. If Yes, how much did you find it useful or are you finding it useful?

*Mark only one oval.*

- Not at all
- To some extent
- To a moderate extent
- To a good extent
- To a great extent

26. Currently, to what extent do you use static analysis tools during your activities?

*Mark only one oval.*

- Not at all     *Skip to question 28*
- To some extent     *Skip to question 28*
- To a moderate extent     *Skip to question 28*
- To a good extent     *Skip to question 28*
- To a great extent     *Skip to question 28*

27. What prevented you from using static analysis tools?

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*Skip to question 34*

**28. Do you use static analysis tools that**

*Check all that apply.*

- Run continuously in your editor/IDE
- Run in your editor/IDE when you tell them to run
- As a part of pre-commit/pre-push checks
- As a part of your build or continuous integration process
- As a part of your code review process
- Run in a non-integrated/separate way, e.g., standalone tools or command line tools
- Other: \_\_\_\_\_

29. Which of the following multi-language tools have you used to perform static code analysis?

Mark only one oval per row.

	Not used	Used but not useful	Used an somewhat useful	Used an very useful
<b>Axivion Suite</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Checkmarx</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Code Dx</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>CodeScene</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Coverity</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>GrammaTech CodeSonar</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>HCL Security AppScan</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Facebook Infer</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Imagix 4D</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Kiuwan</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Klocwork</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>LDRA Testbed</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>MALPAS</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Micro Focus</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Moose</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>PMD</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Polyspace</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Pretty Diff</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>PVS-Studio</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

PDFC

<del>RIPS</del> RIPS	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<del>Sider</del> Sider	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<del>AdaCore</del> AdaCore	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<del>SonarQube</del> SonarQube	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<del>Sotoarc-</del> <del>Sotograph</del> Sotograph	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<del>SourceMeter</del> SourceMeter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<del>SQuORE</del> SQuORE	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<del>Teamscale</del> Teamscale	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<del>Understand</del> Understand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<del>Yasca</del> Yasca	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<del>Other tools</del> Other tools	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

30. Which of the following tools have you used to perform static code analysis on Java programs?

Mark only one oval per row.

	Not used	Used but not useful	Used an somewhat useful	Used an very useful
<b>Checkstyle</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>FindBugs or SpotBugs</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>JArchitect</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Jtest</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Semmlle</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Squale</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>ThreadSafe</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Eclipse</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>IntelliJ IDEA</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Other tools</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

31. Which of the following tools have you used to perform static code analysis on Javascript programs?

*Mark only one oval per row.*

	Not used	Used but not useful	Used an somewhat useful	Used an very useful
<b>ESLint</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Google's Closure Compiler</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>JSHint</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>JSLint</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Standard JS</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>TSLint</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Other tools</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

32. Which of the following tools have you used to perform static code analysis on Python programs?

Mark only one oval per row.

	Not used	Used but not useful	Used an somewhat useful	Used an very useful
<b>PyDev</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Pylint</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Black</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Flake8</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>PyCharm</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Other tools</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

33. If you use other tools besides the ones showing in the list, what are they?

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## Software Testing

The third area is about Software Testing where the software is executed and the observed behaviour is compared to the expected behaviour. Examples are unit testing or capture and replay testing.

34. How familiar are you with the testing tools?

*Mark only one oval.*

- Not familiar at all
- Slightly familiar
- Moderately familiar
- Very familiar
- Extremely familiar

#### Experience on Using Testing Tools

35. Do you test the software that you develop?

*Mark only one oval.*

- Yes
- No     *Skip to question 49*

36. How do you test your software?

*Check all that apply.*

- Manually
- Use of automated testing tools
- Other: \_\_\_\_\_

## 37. What type of testing do you do on your programs?

*Check all that apply.*

- Unit testing
- Integration testing
- System testing
- Functional testing
- Regression testing
- Acceptance testing
- Load testing
- Performance testing
- Beta testing
- Other: \_\_\_\_\_

## 38. Have you ever used automated testing tools?

*Mark only one oval.*

- Yes
- No     *Skip to question 50*

## 39. If you use automated testing tools, what do you use such tools for?

*Check all that apply.*

- Generating test cases
- Executing test cases
- Managing test suites
- Evaluating test execution results
- Analysing code coverage
- Finding potential bugs
- Reporting bugs
- Performing load testing
- Other: \_\_\_\_\_

40. Do you face the following challenges during manual testing and how serious are they?

*Mark only one oval per row.*

	Very serious	Serious	Insignificant	Do not face	No opinion
<b>Time constraints</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Compatibility issues</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Emphasis on development rather than testing</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Lack of support from supervisors/organization</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Lack of software testing experience</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

41. Do you face the following challenges during testing using automated testing tools and how serious are they?

Mark only one oval per row.

	Very serious	Serious	Insignificant	Do not face	No opinion
<b>Time constraints</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Compatibility issues</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Lack of exposure to tools</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Unclear benefits of tools</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Poor documentation</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Steep learning curve of automated testing tools</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Lack of support from supervisors/organization</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Emphasis on development rather than testing</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Lack of software testing experience</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

42. In your opinion what are the top 2 things you need from an automated testing tool?

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## 43. How important are these different software testing activities to you?

Mark only one oval per row.

	Not important at all	Slightly important	Moderately important	Very important	Extremely important
<b>Manual testing</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Unit testing</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Integration testing</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>System testing</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Acceptance testing</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## 44. Are you using any tool for automatic generation of test cases? For example, UniqueSoft Test Architect, Evosuite, Pynguin, or AgitarOne JUnit Generator?

Mark only one oval.

Yes

No

## 45. How do you measure the quality of the test cases?

Check all that apply.

Statement coverage

Instruction coverage

Branch coverage

Mutation coverage

Other: \_\_\_\_\_

46. Have you ever experienced flaky tests? Flaky test is a test that both passes and fails periodically without any code changes.

*Mark only one oval.*

- Yes, they are a problem for us
- Yes, they are not a problem for us
- No
- I don't know what flaky tests are

## 47. Which of the following software testing tools have you used?

Mark only one oval per row.

	Not used	Used but not useful	Used an somewhat useful	Used an very useful
<b>Selenium</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Squish</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Watir</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Katalon Studio</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Telerik Studio</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Unified Functional Testing (UFT One)</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>TestComplete</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>IBM Rational Functional Tester (RFT)</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Ranorex</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Postman</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Apache JMeter</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>JUnit</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Other unit test framework (e.g., NUnit)</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Other tools</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

48. If you use other tools besides the ones showing in the list, what are they?

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### Continuous integration and continuous delivery

The fourth area is about Continuous Integration (CI) and Continuous Delivery (CD) where CI means the code of the software under construction is frequently merged into a central repository where automated builds and tests run and CD means an automatic deployment of code changes to a testing and/or production environment after the build stage.

49. How familiar are you with the CI/CD tools?

*Mark only one oval.*

- Not familiar at all
- Slightly familiar
- Moderately familiar
- Very familiar
- Extremely familiar

### Experience on Using CI/CD Tools

50. Do you currently use CI/CD?

*Mark only one oval.*

- Yes     *Skip to question 52*
- No, but I've used CI/CD in the past     *Skip to question 52*
- No, and I've never used CI/CD     *Skip to question 51*

**51. Why do you not use Continuous Integration CI/CD?**

*Check all that apply.*

- Maintenance costs are too high for CI/CD systems
- My project(s) don't have enough automated tests
- The developers on my project(s) are not familiar with CI/CD
- I don't currently use CI/CD, but I would like to in the future
- CI/CD doesn't bring value because we already do enough testing
- Setup costs are too high for CI/CD systems
- Automating builds for my project(s) is not worth it
- Other: \_\_\_\_\_

*Skip to question 56*

**52. Why do you use Continuous Integration CI/CD?**

*Check all that apply.*

- CI/CD makes integration easier
- CI/CD allows testing across multiple platforms
- CI/CD helps us deploy more often
- CI/CD can enforce a specific workflow
- CI/CD allows faster iterations
- CI/CD provides a common build environment
- CI/CD helps us catch errors earlier
- CI/CD helps us fix breaking builds sooner
- CI/CD lets us spend less time debugging
- CI/CD allows running tests on more powerful hardware
- Other: \_\_\_\_\_

## 53. How frequent have you experienced the problems below when trying to use CI/CD?

Mark only one oval per row.

	Not at all	Slightly frequent	Moderately frequent	Very frequent	Extremely frequent
<b>Troubleshooting a CI build failure</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Lack of support for the desired workflow</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Maintaining a CI server or service</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Lack of tool integration</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Security and access controls</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Automating the build process</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Setting up a CI server or service</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Overly long build times</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## 54. Which of the following CI/CD tools have you used?

Mark only one oval per row.

	Not used	Used but not useful	Used an somewhat useful	Used an very useful
<b>AppVeyor</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Bamboo</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>BuildBot</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>CircleCI</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Cloudbees CodeShip</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>CruiseControl</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Jenkins</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Azure DevOps Server</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>TeamCity</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Travis CI</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Wercker</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Other tools</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## 55. If you use other tools besides the ones showing in the list, what are they?

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56. Please enter the current year to show that you are not a bot

*Mark only one oval.*

2019

2020

2021

2022

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