

SOFTWARE TESTING IN INDUSTRY

BACHELOR THESIS – MARKUS EGGIMANN

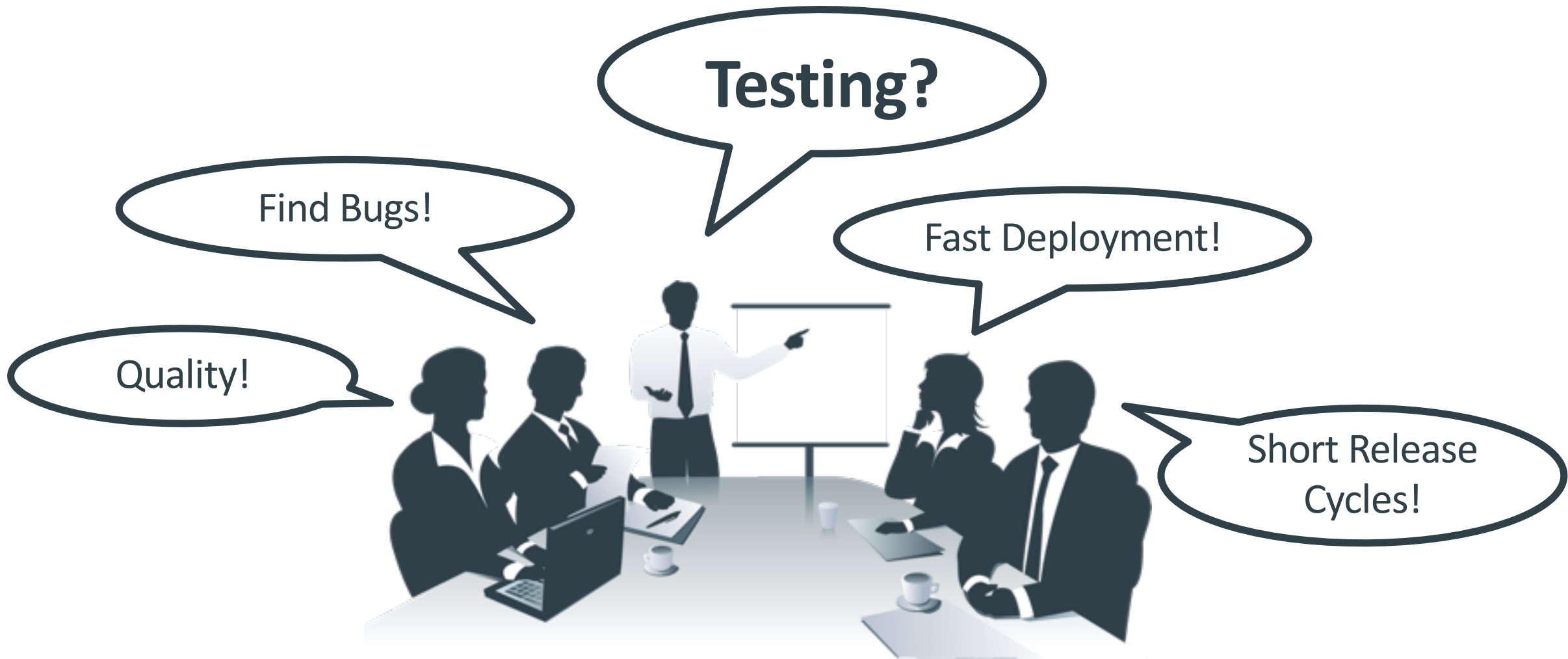
1ST PRESENTATION



CONTENT

- Motivation
- Research questions
- Research objects
- Research methods
- Intermediate results
- Discussion

MOTIVATION



MOTIVATION

Test Cases?



RESEARCH QUESTIONS

Relation between bugs and unit tests

- Does the discovery of bugs push the writing of tests?
- How many files need to be changed to fix a bug?
- Is it easy to write new tests?

Quality of unit tests

- Do existing tests prevent the occurrence of bugs?
- Are there bugs which occurred again after they were fixed?

RESEARCH OBJECTS



Project ePostOffice

- Digital platform for receiving and sending physical and electronic mail
- Mixed technologies
- Ongoing for 6 years



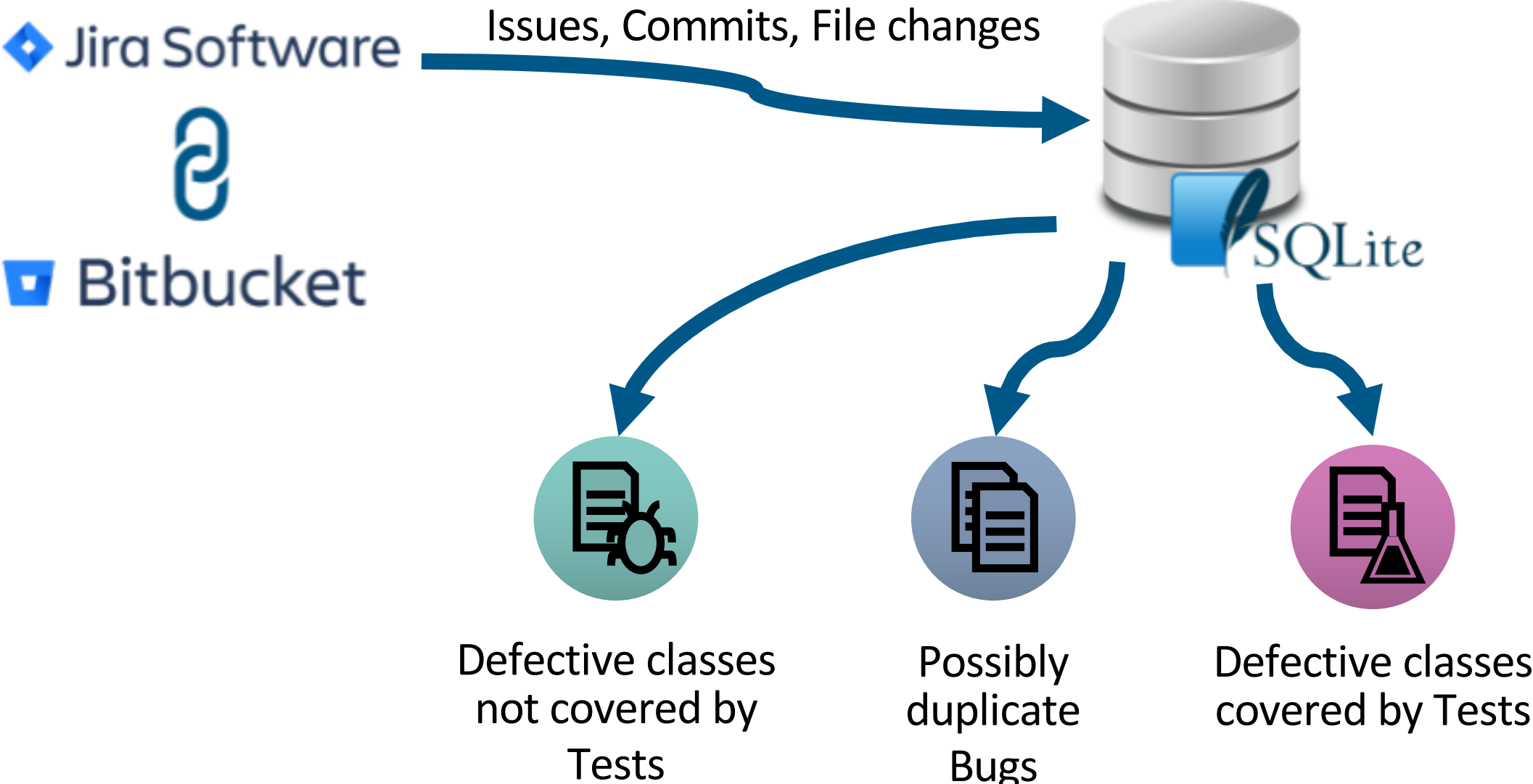
Project PostApp

- *App of the Swiss Post (Opening hours, location services, parcel tracking, ...)*
- *Xamarin Mobile App*
- *New release few weeks ago*

DEVELOPER TOOLS

- Confluence (Wiki, Requirements)
- Jira (Issue-Tracker, SCRUM)
- Git (Version control)
- *Subversion (Version control)*

RESEARCH METHODS 1/2



RESEARCH METHODS 2/2



Defective classes not covered by Tests

- Why are they not covered by tests? => Assess testability of code
- How could we test them? => Suggest improvements



Possibly duplicate Bugs

- Which ones are really duplicate bugs? => Manual inspection
- Why did they occur again? => Study history



Defective classes covered by Tests

- How good are those tests? => Apply mutation testing to them

INTERMEDIATE RESULTS 1/4

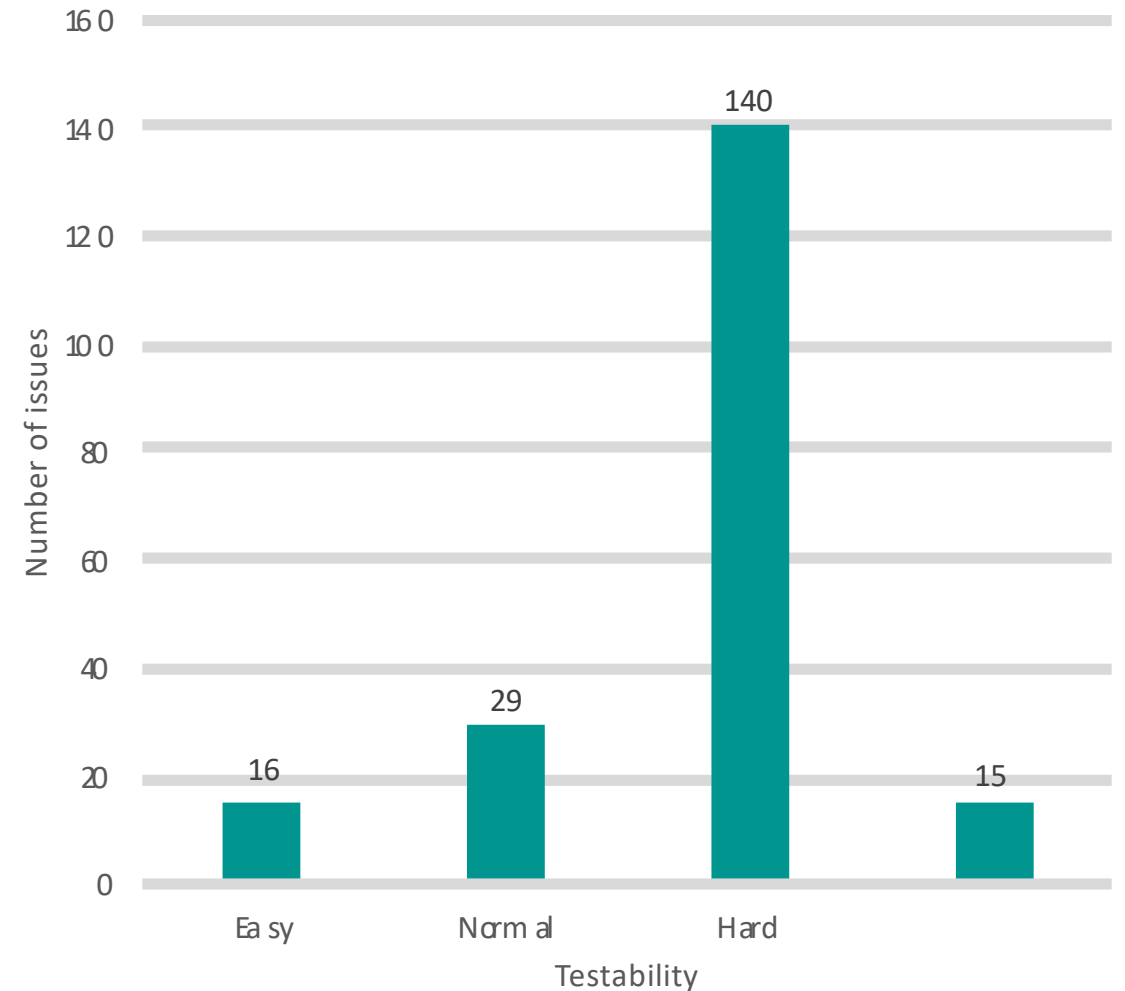
TESTABILITY OF CODE AFFECTED BY BUGS

Method

- Manual inspection of 200 issues/bugfixes
- Classification of Testability

Results

- Testability is hard in most cases
- Reasons:
 - GUI components involved
 - Violation of Single Responsibility Principle



INTERMEDIATE RESULTS 2/4

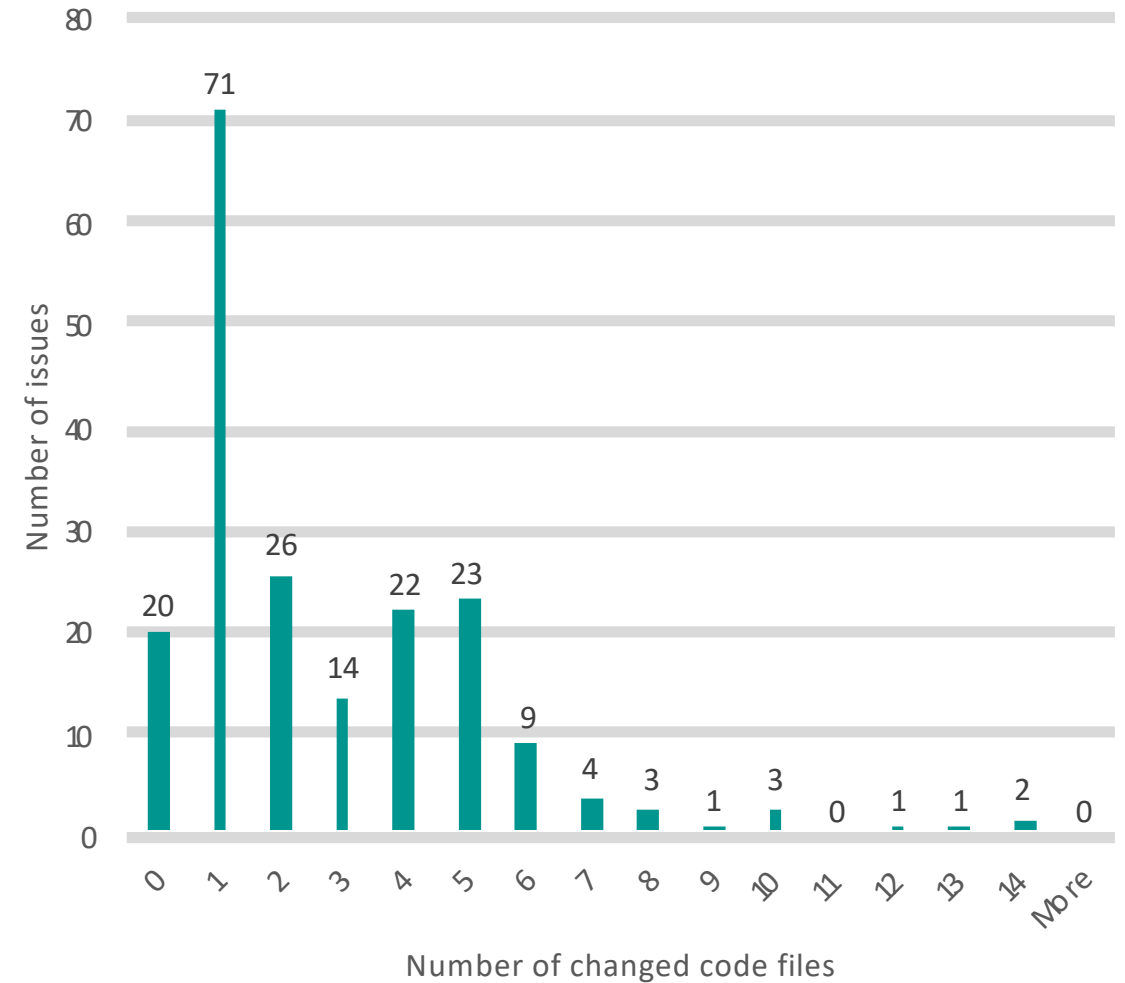
NUMBER OF FILES CHANGED DURING BUGFIX

Method

- Same 200 issues as before
- Retrieve number of affected **code** files from Database

Results

- In 35% of the cases only one file changed
- In 54% more than one file changed



INTERMEDIATE RESULTS 3/4

DUPLICATE BUGS

Method

- Tool to compare diffs on method level
- List of commits which changed same method
- Manual inspection of suggestions to find real duplicate bugs

Results

- C# files: 20 possibly duplicate bugs, no similar bugs
- Java files: 135 possibly duplicate bugs, 7 similar bugs

INTERMEDIATE RESULTS 4/4

MUTATION TESTING

Method

- Apply mutation testing to bugs which are possibly covered by tests
- Use VisualMutator plugin from Warsaw university

Results

- Tool very unstable and slow
- No results yet



DISCUSSION

REFERENCES 1/2

Literature

- A. Derezińska, P. Trzpil, «Mutation Testing Process Combined with Test-Driven Development in .NET Environment»

Tools

- SQLite: <https://sqlite.org/index.html> (2018-06-10 20:18)
- Jira: <https://www.atlassian.com/software/jira> (2018-06-10 20:19)
- Bitbucket: <https://www.atlassian.com/software/bitbucket> (2018-06-10 20:20)
- VisualMutator: <https://visualmutator.github.io/web/> (2018-06-10 20:17)

REFERENCES 2/2

Images

- https://img.clipartxtras.com/b5fd04d8b609240d4a9a06a3c9cfcc6b_business-presentation-information-clip-art-vector-business-meeting-clipart-transparent_2694-1293.png (2018-06-09 15:35)
- https://upload.wikimedia.org/wikipedia/commons/thumb/3/3e/Chain_link_icon.svg/200px-Chain_link_icon.svg.png (2018-06-09 17:03)
- http://www.publicdomainfiles.com/show_file.php?id=13921641621986 (2018-06-09 17:04)
- <https://www.atlassian.com/company/news/press-kit> (2018-06-09 17:05)
- <https://commons.wikimedia.org/wiki/File:SOlite370.svg> (2018-06-09 17:05)
- https://commons.wikimedia.org/wiki/File:Logo_Universit%C3%A4t_Bern.svg (2018-06-09 19:15)
- App Icons from the ePof and PostApp project taken from their code repositories