

On The Gap Between Software Maintenance Theory and Practitioners' Approaches

Mívian Ferreira¹, Kécia Ferreira² and Mariza Bigonha¹

¹UFMG, Dept. of Computer Science, Minas Gerais (Brazil)

²CEFET-MG, Dept. of Computing, Minas Gerais (Brazil)

Practice

Academic



Practice

Research publications might not be accessible to the industry, and their results might not be easy implemented in the practice



Academic

Software engineering
researchers may face
challenges when
collaborating with
practitioners



Software Maintenance



All Around the World

**112 Software
Development
Professionals**

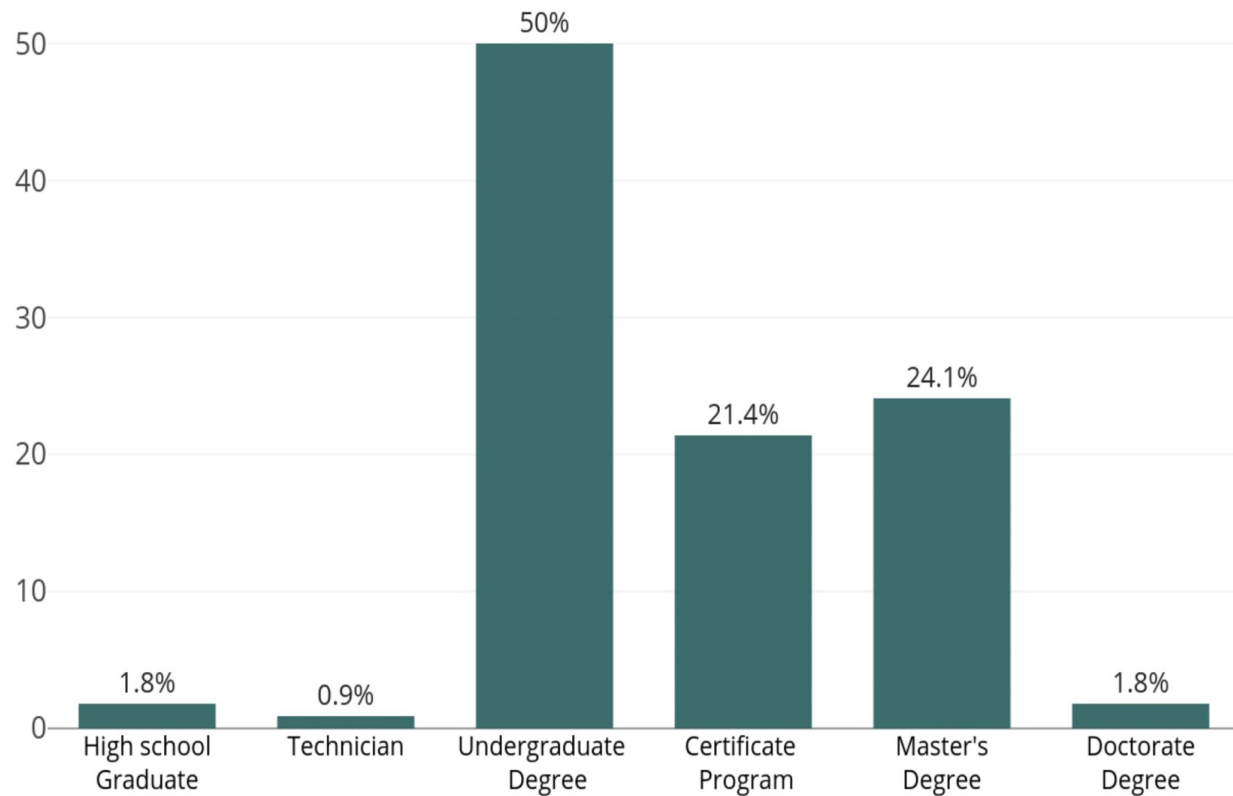
92 companies

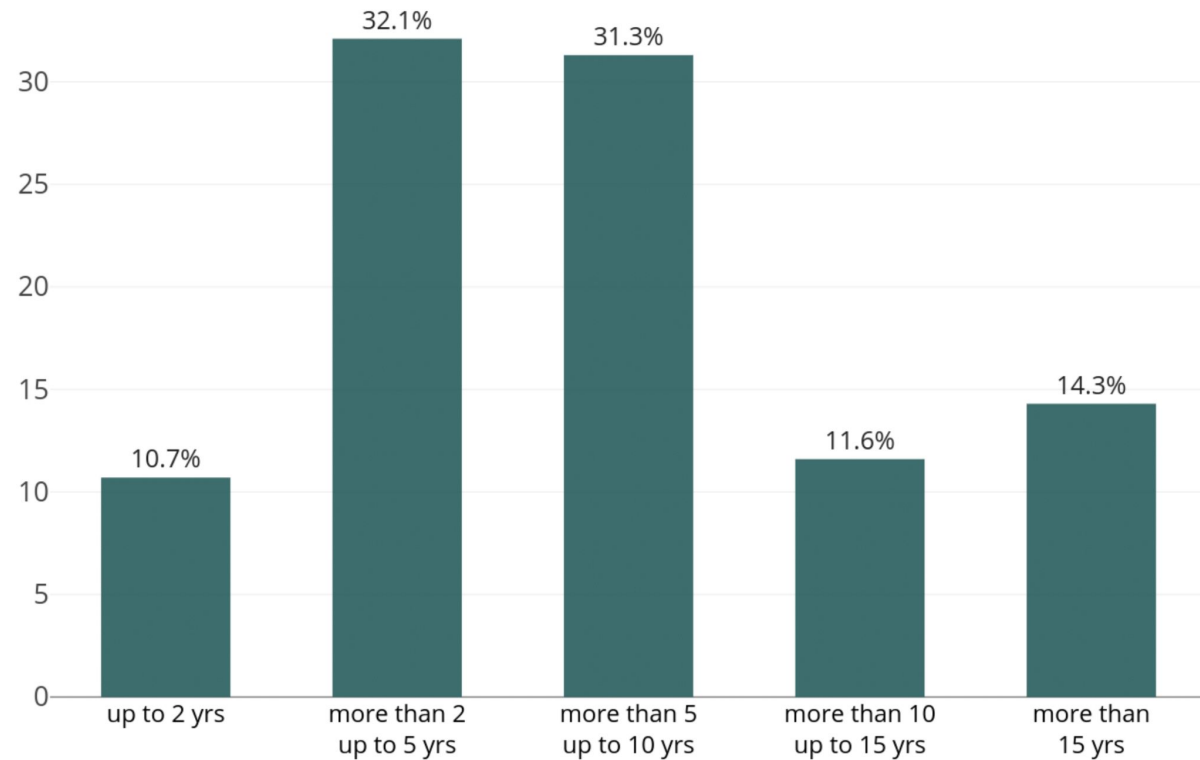
12 Countries



Participants' Characterization

Academic Background



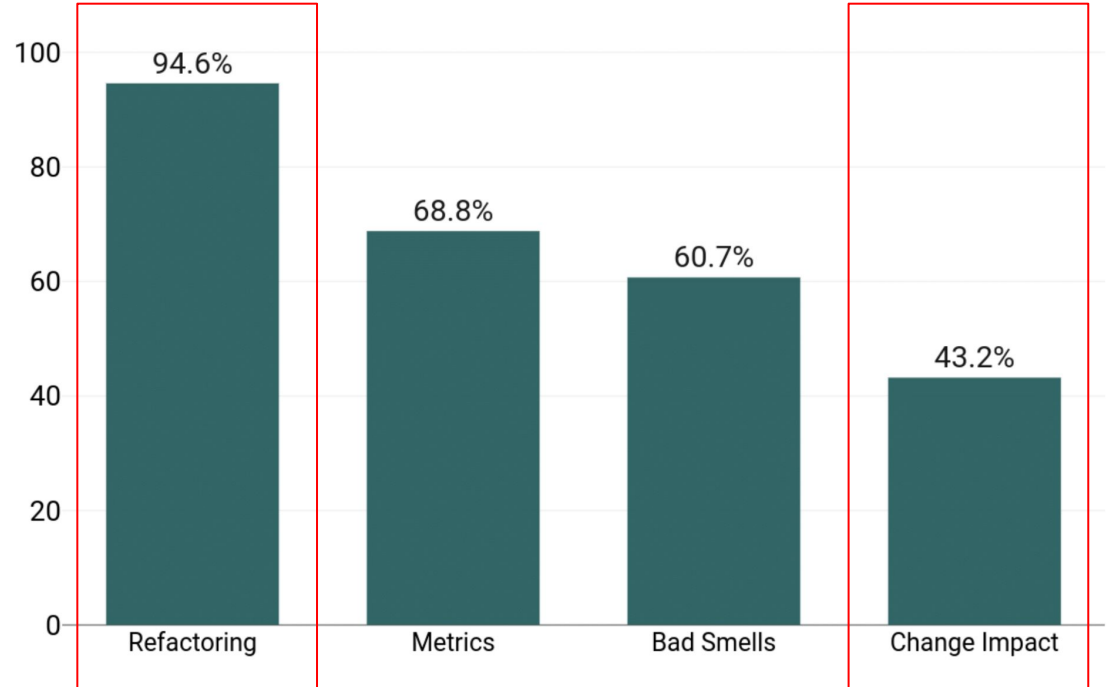


Professional Experience

Research Questions & Results

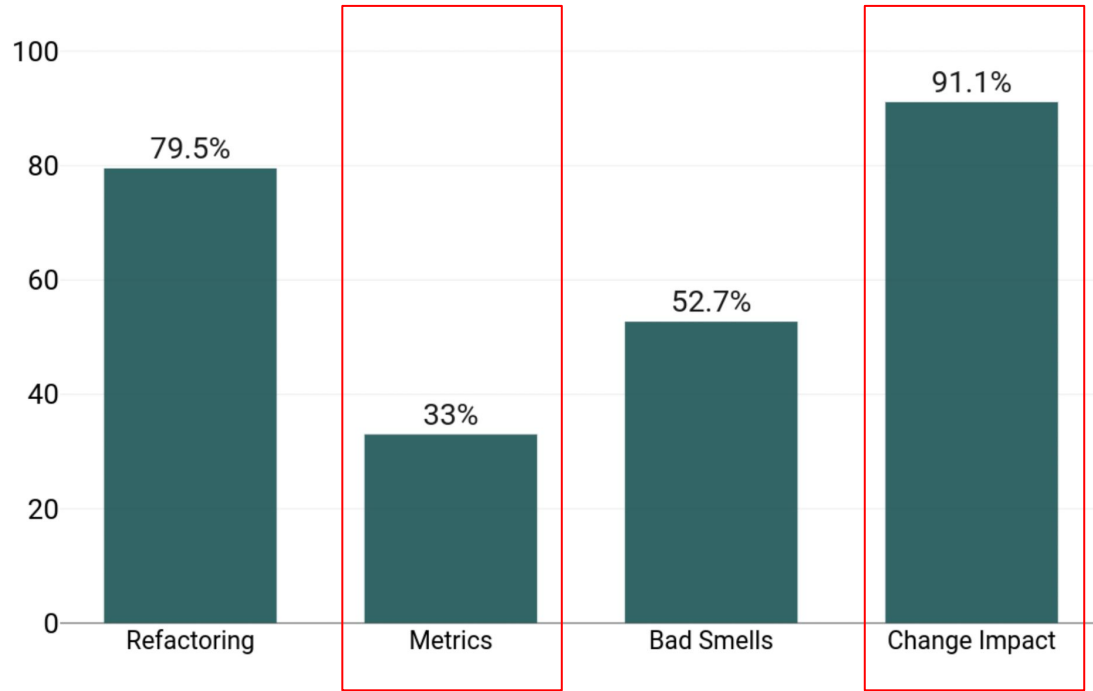
RQ1. Are developers familiar with the concepts of software metrics, bad smells, refactoring, and change impact analysis?

Familiarity with Researched Subjects



RQ2. Do practitioners apply software metrics, refactoring, bad smells, and change impact analysis in practice?

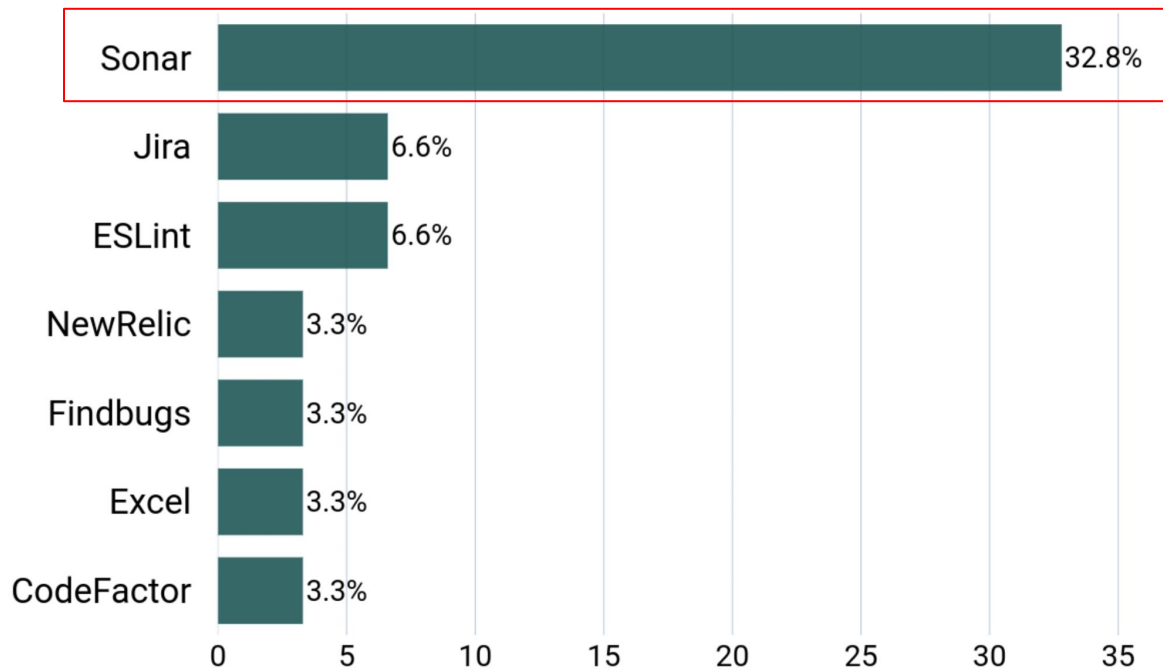
Practical Use of Researched Subjects



RQ3. Which are the tools most used by practitioners in software maintenance?

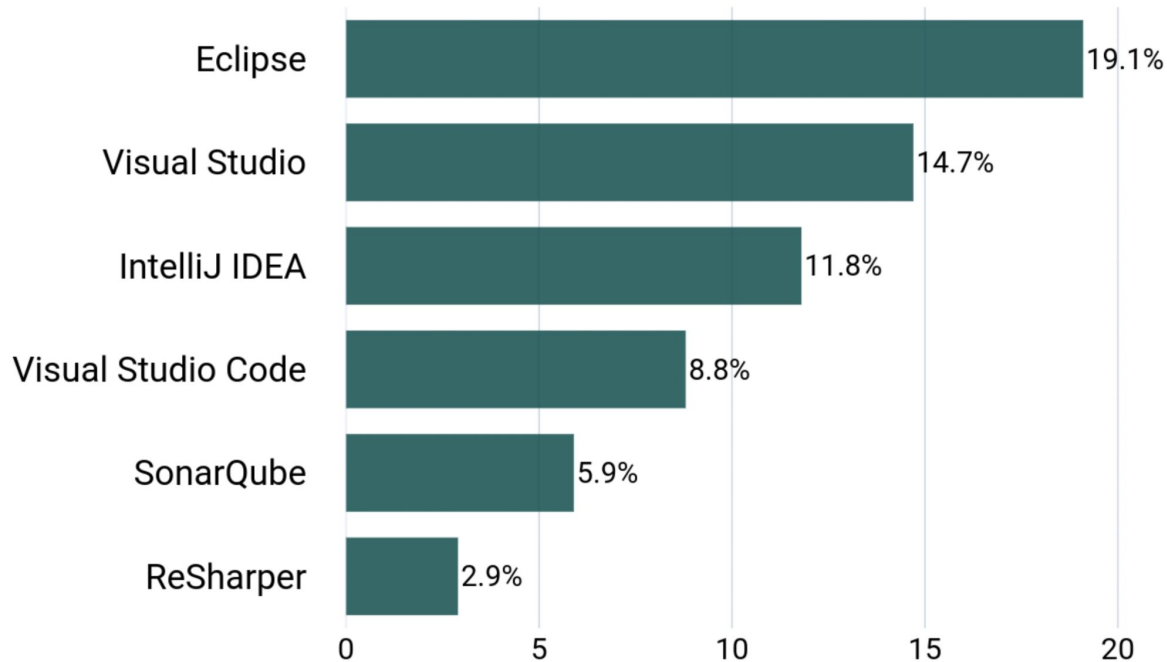
Software Metrics Tools

33%

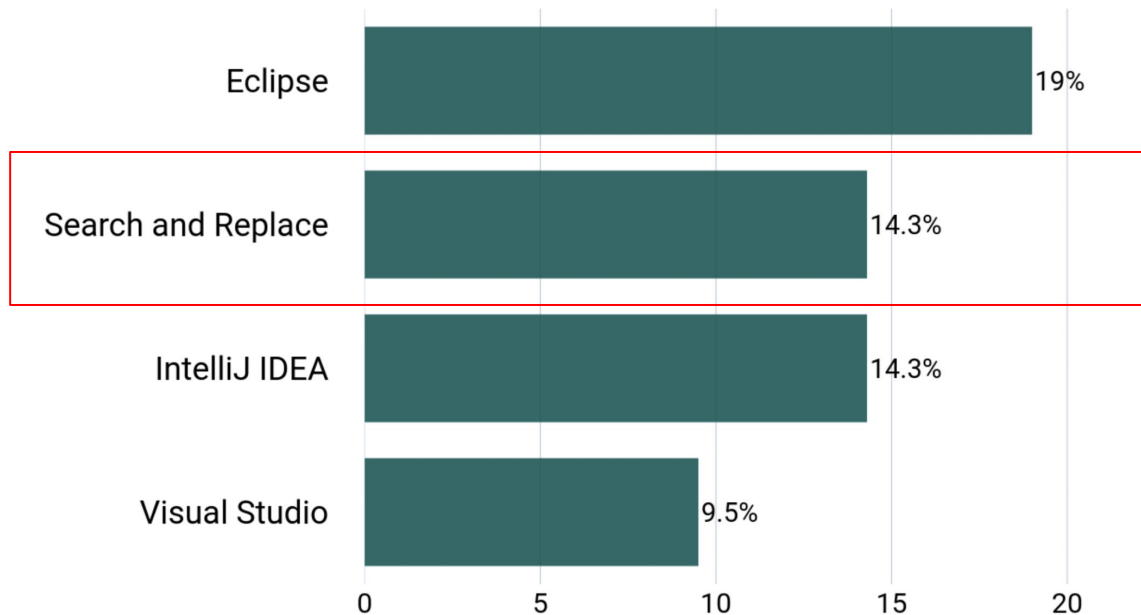


Refactoring Tools

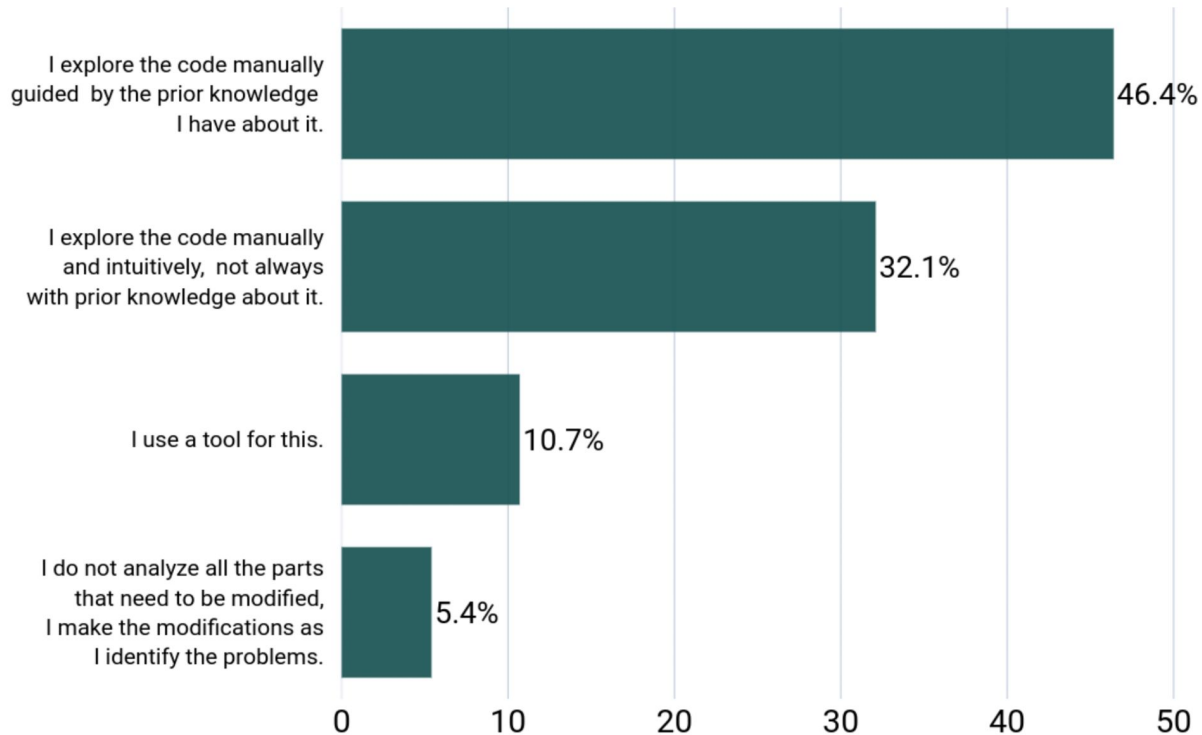
36%



Change Impact Analysis Tools



**RQ4. How do practitioners perform
change impact analysis?**



Performing Change impact Analysis

RQ5. Which metrics, refactoring techniques, and bad smells practitioners apply in their activities?

Metrics

Number of Bugs
(9.9%)

Test Coverage
(8.91%)

Cyclomatic
Complexity (7.92%).

Refactoring

Extract Method
(21.43%)

Rename Method
(13.39%)

Extract Class
(12.5%)

Bad Smell

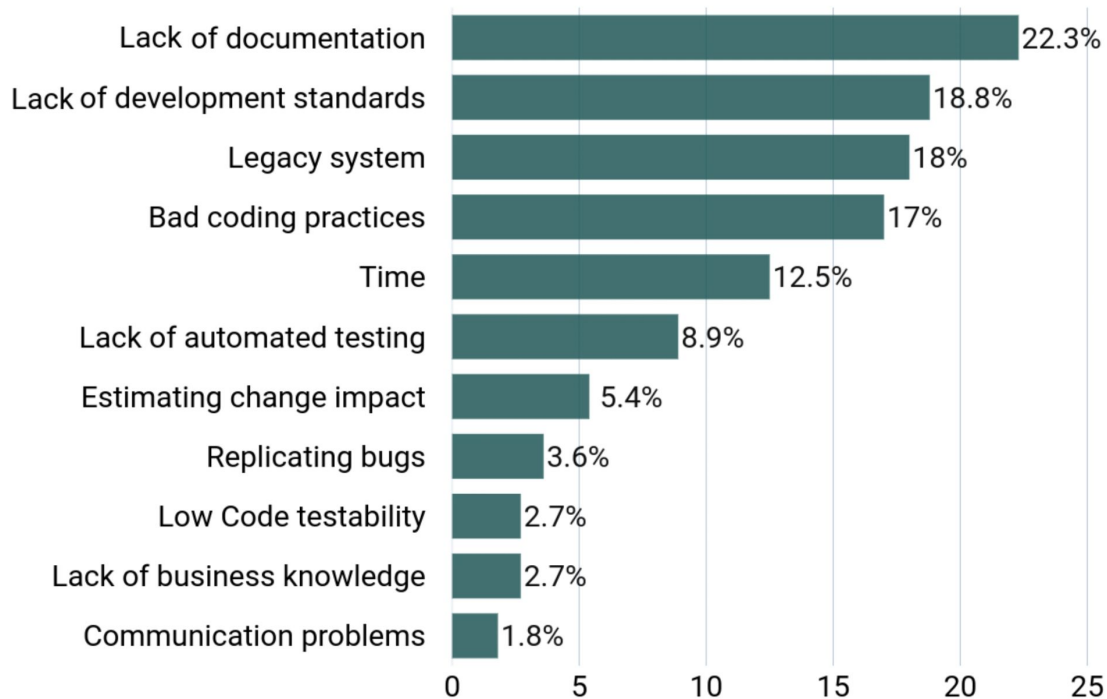
Duplicate Code
(23.21%)

Long Method
(19.64%)

Long Class (9.82%)

RQ6. What are the biggest challenges faced by practitioners when carrying out software maintenance?

Biggest Challenges



Conclusion

- **Software metrics are not fully applied in practice**
- **Refactoring is a popular concept, but only the simple refactoring techniques are used**
- **Change impact analysis is not adequately performed in practice**
- **Practitioners still face difficult to source code maintenance**
- **We still have many challenges to bring theoretical knowledge into practice**

Future Works

Search the differences in how practitioners' approach software maintenance depending on their academic background and professional experience

Replicate this study with other software engineering techniques, investigate how agile methodologies

Questions?



Feel free to contact any of us:

Mívian Ferreira - mivian.ferreira@dcc.ufmg.br

Kecia A. M. Ferreira - kecia@decom.cefetmg.br

Mariza Bigonha - mariza@dcc.ufmg.br

Subject	Question		Reply Options
Challenges to Perform Maintenance	1	Describe the main difficulties you face when performing maintenance on software.	Open Field
Software Metrics	2	Are you familiar with software metrics concept?	Yes or No
	3	What is your opinion about the use of software metrics to ensure the quality of the source code?	'Very important', 'Important', 'Little important', 'Unnecessary' or 'I don't have background to give an opinion.'
	4	Do you use software metrics to evaluate the quality of the source code at your work?	Yes or No
	5	If you use software metrics to evaluate the quality of the source code at your work, please name them.	Open Field
	6	If you use metrics to evaluate the quality of the source code at your work, which measurement tool(s) do you use?	Open Field
Refactoring	7	Are you familiar with the concept of refactoring ?	Yes or No
	8	Have you ever applied code refactoring at your work?	Yes or No
	9	If you have ever used code refactoring at your work, what kind (s) of refactoring did you use?	Open Field
	10	If you have ever used code refactoring at your work, have you used a tool for this?	Yes or No
	11	If you have ever used code refactoring at your work and have used a tool to do so, which tool (s) did you use?	Open Field
Bad Smell	12	Are you familiar with the concept of bad smell?	Yes or No
	13	When developing or maintaining a system at work, do you usually check bad smells in the source code?	Yes or No
	14	If you answered 'yes' to the previous question, what are the bad smells most commonly detected by you?	Open Field
Change Impact	15	Have you ever noticed whether a change performed in a software system by you had caused the need to make other changes not initially foreseen?	'Never', 'Few times', 'Oftentimes' or 'Always'
	16	Are you familiar with the term "Change Impact Analysis"?	Yes or No
	17	When correcting a bug (error or failure), performing a change or creating a new functionality in the system, do you usually analyze the impact of the change in the rest of software system?	Yes or No
	18	What kind of technique do you apply to analyze parts of the software that need to be modified?	'I explore the code manually and intuitively, not always with prior knowledge about it.', 'I explore the code manually guided by the prior knowledge I have about it.', 'I use a tool for this.', or 'I do not analyze all the parts that need to be modified, I make the modifications as I identify the problems.'
	19	If you use a tool to analyze which parts of the software need to be modified, please name them.	Open Field