Assessing Developer Contribution with Repository Mining-Based Metrics

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Agenda

1. Introduction and Motivation
2. Repository Mining-based Metrics
3. Research Method
4. Preliminary Results
5. Discussion and Future Work
Introduction and Motivation

• Assessing developer’s contribution is a challenging task
  ◦ Many potential sources of contribution have to be considered

• Several metrics have been proposed
  ◦ Few have been evaluated by project leaders (potential users)

Our goal is to design a suite of developer contribution metrics based on empirical evidence obtained from project and team leaders
Repository Mining-based Metrics

- Code Contribution
- Average Complexity per Method
- Bug Fixing Contribution
- Introduced Bugs
Research Method

- **Location**: SINFO/Federal University of Rio Grande do Norte, Brazil

1. **Metrics Extraction**
   - 12 weeks
   - 4 development teams
   - Code repository
   - Issue tracking system

2. **Interviews**
   - Semi-structured
   - 20 main and 10 supporting questions
   - 7 team leaders

3. **Data Analysis**
   - Transcription
   - Based on Grounded Theory
Preliminary Results
Code Contribution

✅ Useful information

⚠️ “May be useful with the complexity metric” (PL1)

⛔ May penalize developers for using modern technologies or techniques
Preliminary Results
Average Complexity per Method

- “Allows to perform a technical analysis” (PL3)
- “Helps to identify a developer who needs training” (PL2)

⚠️ Should be followed with task list
Preliminary Results
Introduced Bugs

✅ Useful information

⚠️ Can’t be used in isolation

❌ May penalize developers who have been on the project for longer
Preliminary Results
Bug Fixing Contribution

❌ The metric only quantifies commits, however, some tasks don’t require coding

❌ The number of commits is not a reliable attribute to measure effort
Preliminary Results

Overall Benefits and Limitations

- Useful to perform a quantitative contribution assessment
- May reduce the amount of time to evaluate developers
- Technical and objective criteria to evaluate developers
- Can’t replace the subjective evaluation
Discussion and Future Work

- **Best evaluated metrics**
  - Code contribution
  - Average complexity per method

- **Worst evaluated metrics**
  - Introduced bugs
  - Bug fixing contribution
Discussion and Future Work

- Evaluate further metrics
  - Communication
  - Collaboration
  - Task distribution

- Interview developers about being evaluated by these metrics
  - Compare their answers with team leaders’ answers
Discussion and Future Work

- Investigate the impact of measuring contribution on developers’ behavior
  - Hawthorne effect

- Metrics-based reward mechanisms
  - Gamification
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