Evidence-based Insights about Issue Management Processes: An Exploratory Study

Vahid Garousi, PhD, PEng
Software Quality Engineering Research Group (SoftQual)
University of Calgary
http://www.ucalgary.ca/~vgarousi

Insights about Issue Management Processes

- Introduction
- Research Questions
- Design of the Case Study
- Analysis of Results
  - Research Question 1
  - Research Question 2
  - Research Question 3
- Conclusions

Introduction and Goals

- SOURCEFORGE.NET® is often referred to as the world's largest online repository for Open-Source Software (OSS).
- It provides the *tracker* system to manage four types of issues:
  - bugs, support requests, feature requests, and source code patches
- The goal of this study:
  - to analyze and mine OSS issue repositories
  - for the purpose of characterizing and getting insights into issue processing processes and their related collaborations
  - with respect to effectiveness, efficiency and also responsiveness in issue handling
  - from the viewpoint of process engineers and project

Research Questions

- Using the Goal-Question-Metric (GQM) approach

- Research Question (RQ) 1: What are the trends of submission and handling of different issue types?
- RQ 2: How responsive different teams are to different issue types? i.e., how many days does it take to address issues?
- RQ 3: How do different issue types pile up and what are the possible negative consequences of issue pile up on projects in the long run?

- How this study relates to the theme of the conference this year? Trust between the SW team and the client(s), trustworthy process/project/team, etc.
- Timely processing of the incoming issues

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Design of the Case Study

- As of May 2008, there were 152,489 projects hosted on SourceForge.
- The projects were filtered and 3 were selected as objects of this study. Criteria…

	jEdit	DrPython	FlasKMPEG
Programming language	Java	Python	C, C+
KLOC	71	15.4	78.5
Date of registration in SourceForge	Dec. 6, 1999	Jan. 1, 2005	Apr. 6, 2000
Number of project administrators (as of Sept. 2008)	9	2	2
Number of developers (as of Sept. 2008)	158	4	5
SourceForge activity percentile (as of the week of Sept. 1, 2008) :	99.98%	97.84%	91.42%
Avg. number of issues submitted (per month)	52.15	3.21	0.32
Avg. number of issues closed (per month)	46.28	3.14	0.02
Avg. number of downloads (per month)	45,112	2,171	58,563
Hits in Google (as of Sept. 2008)	820,000	38,900	164,000

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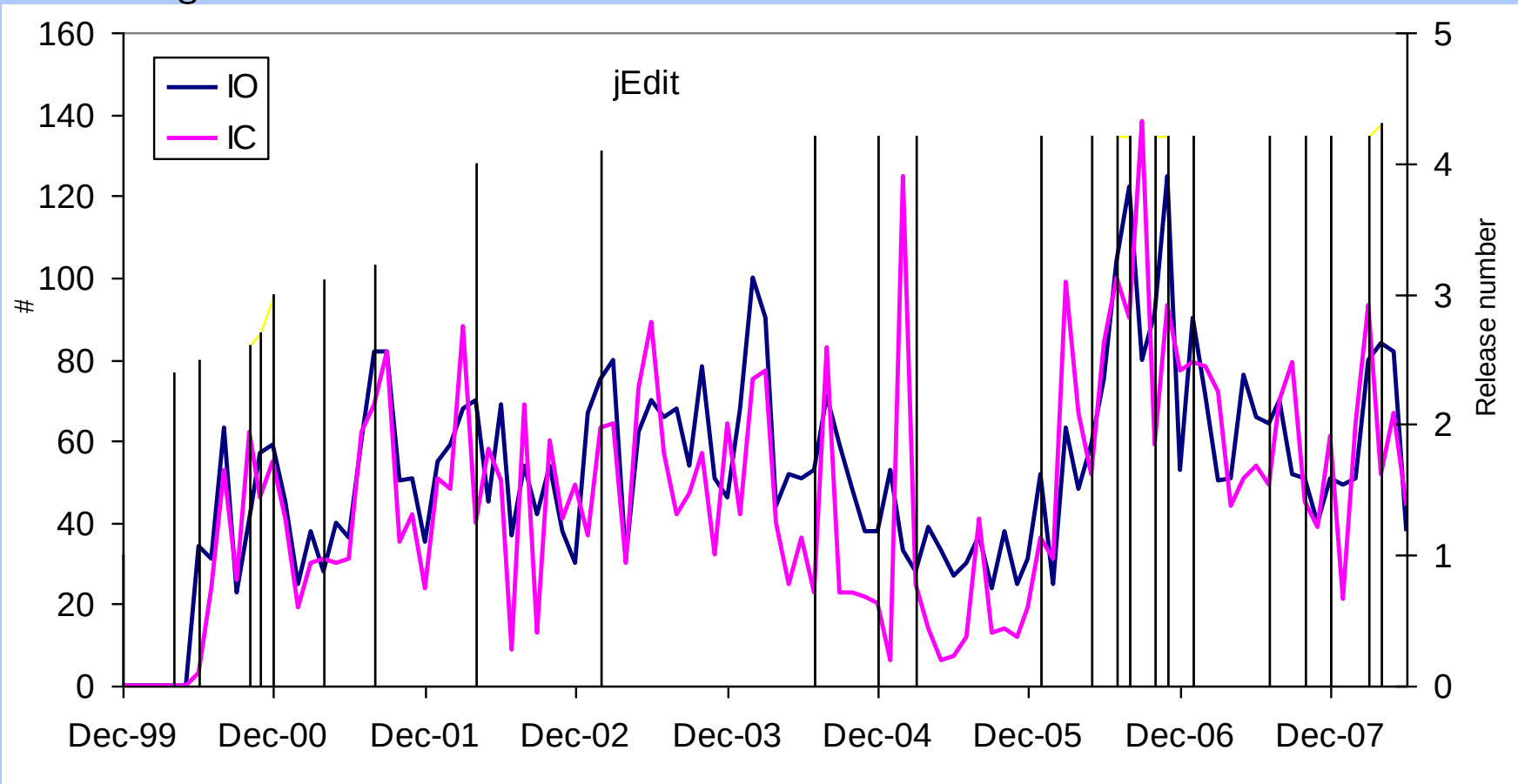
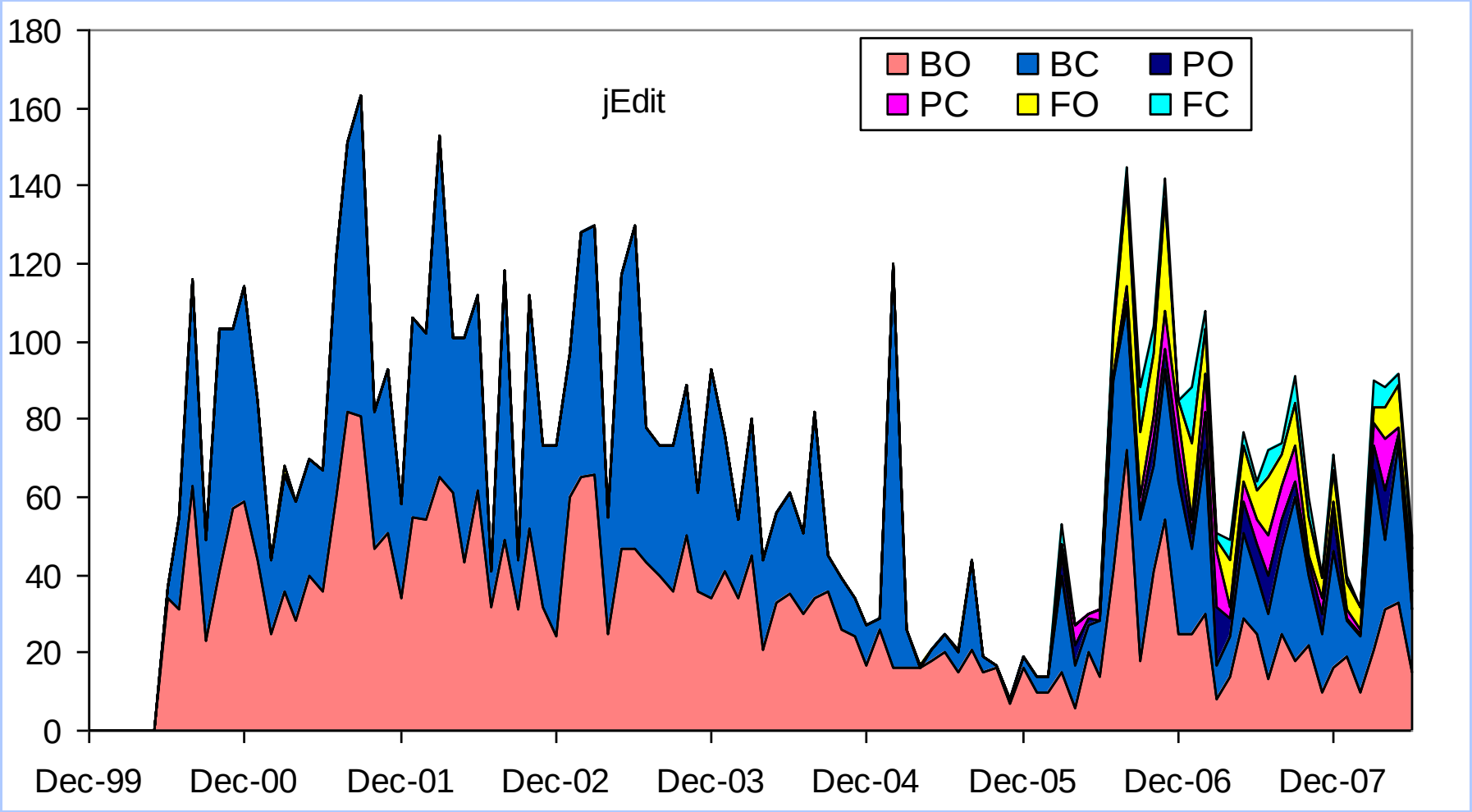
Analysis of Results

- Research Question (RQ) 1: What are the trends of submission and handling of different issue types?
- Findings are discussed next…

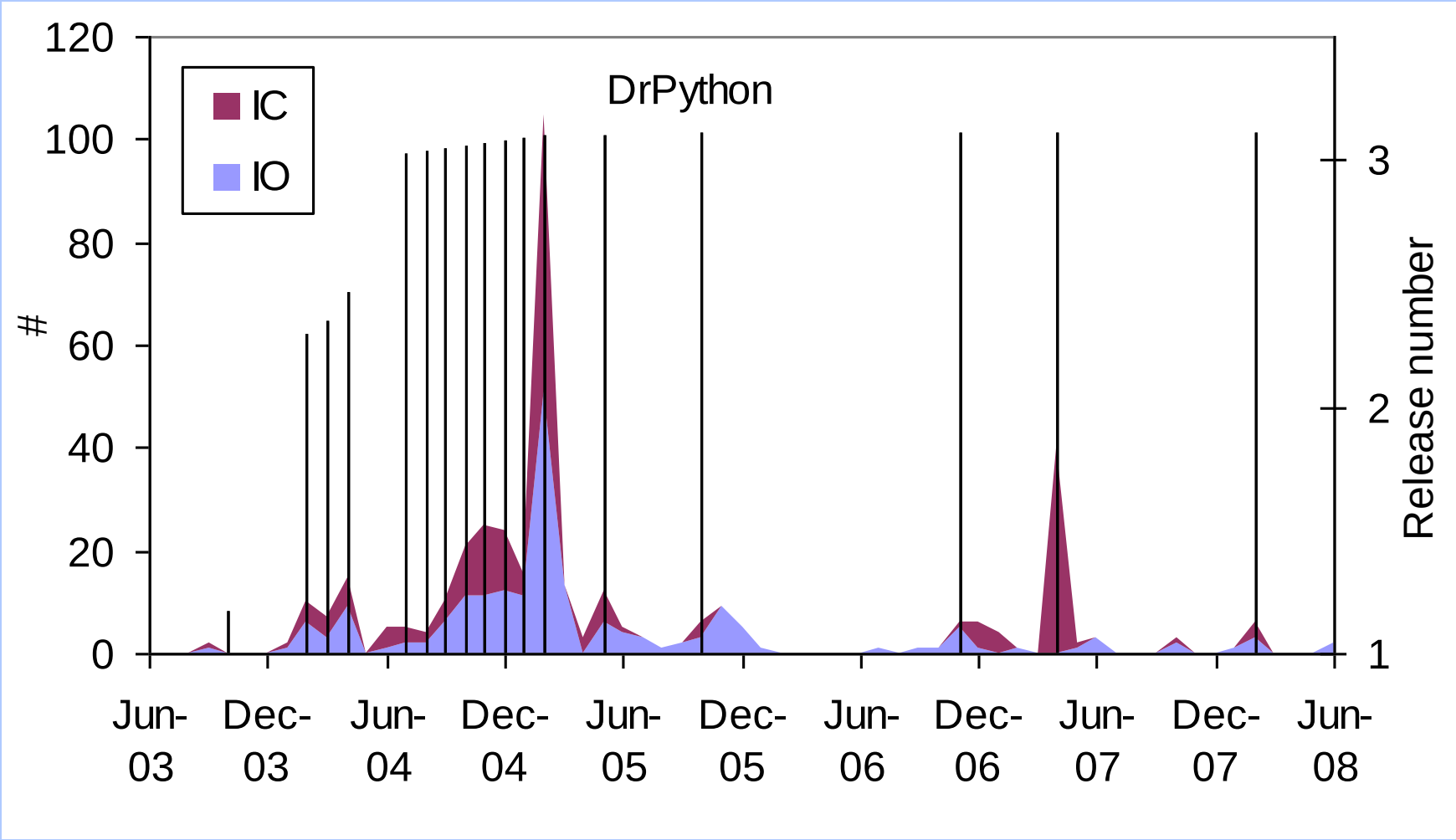


Analysis of Results

- Findings are discussed next…



Analysis of Results



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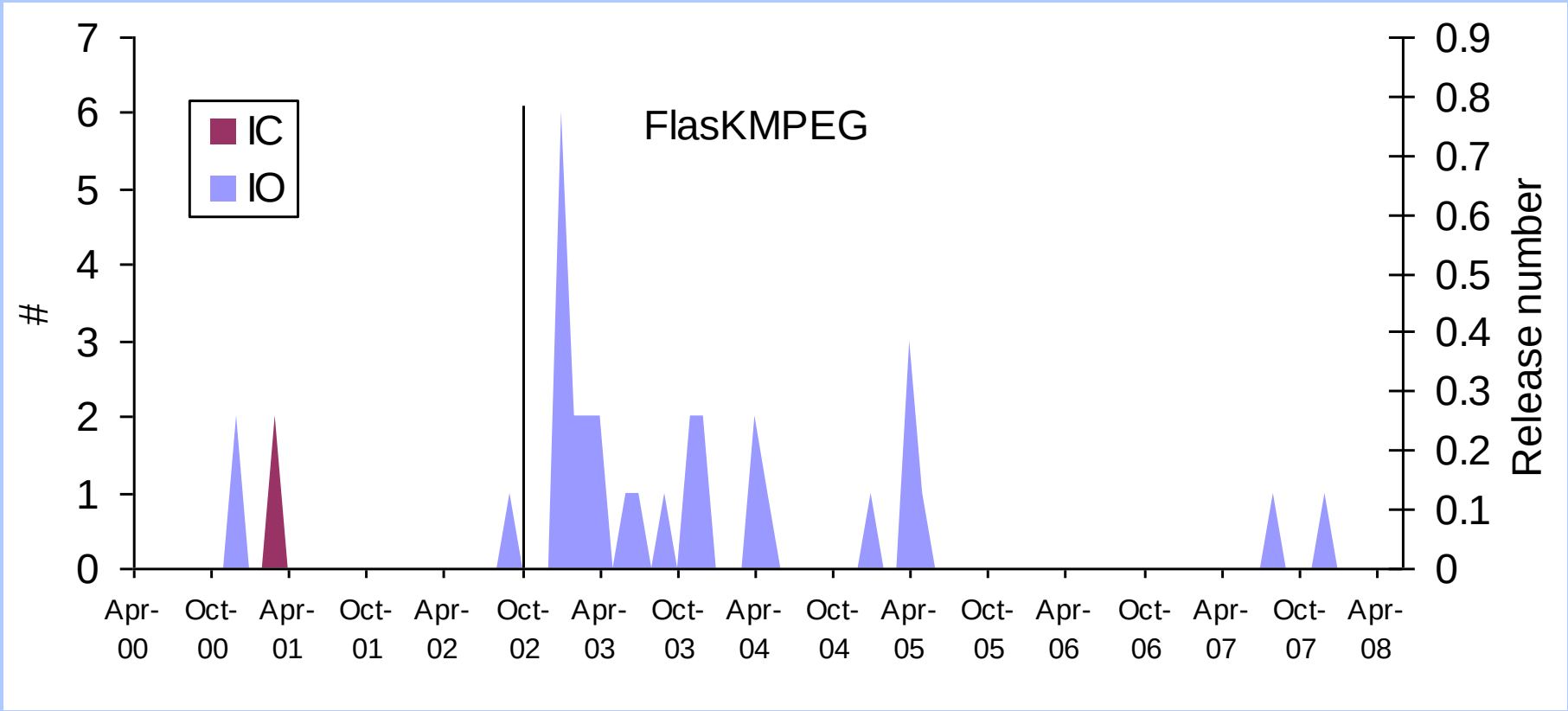


Analysis of Results

- Coefficient of variations in IO and IC (variance would not be a meaningful/useful measure since the scales are different):

Coefficient of variation	Projects under study		
	jEdit	DrPython	FlasKMPEG
The number of issues opened	46%	222%	322%
The number of issues closed	62%	278%	1260%

- It thus seems that the developers of jEdit have actively submitted and closed the issues more consistently.

Research Question 1-Findings

- Continuous flow of issues
- Different Scale of issues
- Issues in and around releases
- Continuous efforts on opening and closing issues
- Bugs dominate the issue
- The trend of closing bugs has some delay after they are opened
- Sharp rises in closed bugs (i.e., bugs are somewhat closed in bulks/batches)

- Process engineers and project managers of closed sources (commercial) SW projects can perform similar evaluations of their issue handling processes

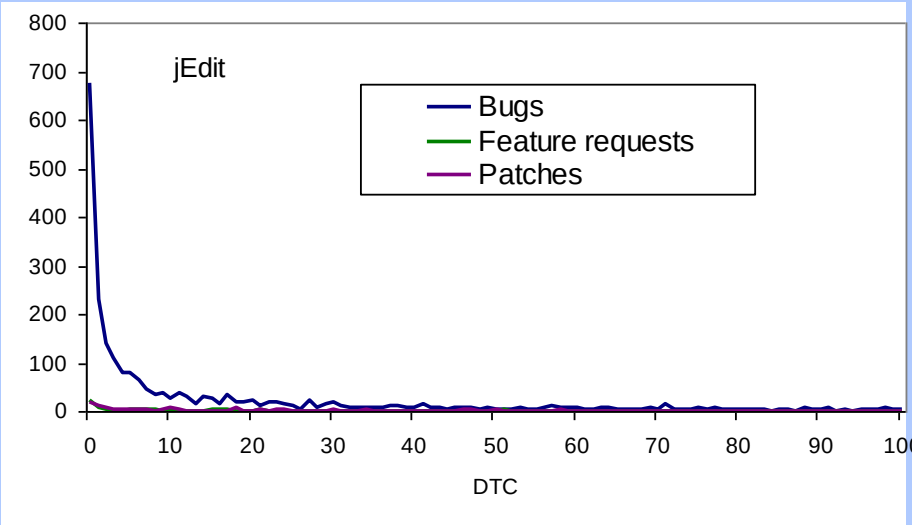
Analysis of Results

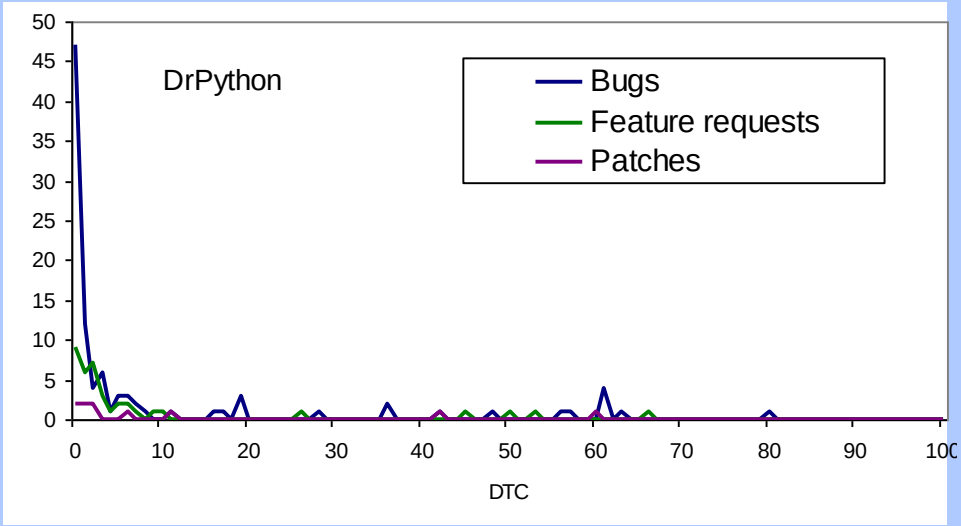
- RQ 2: How responsive different teams are to different issue types? i.e., how many days does it take to address issues?

- A metric was defined for this purpose:
- *Days To Close (DTC)=The closing date of a closed issue - Its opening date*.

- For example, if a bug is opened on Jan. 1, 2005 and is closed on Feb. 1, 2006, its DTC would be 396 days.

Research Question 2-Findings





- Findings…
- Bugs are handled faster than the other issue types
- Critical issues are handled faster
- 23% of jEdit bugs are closed in the same day
- 42% of DrPython bugs are closed in the same day

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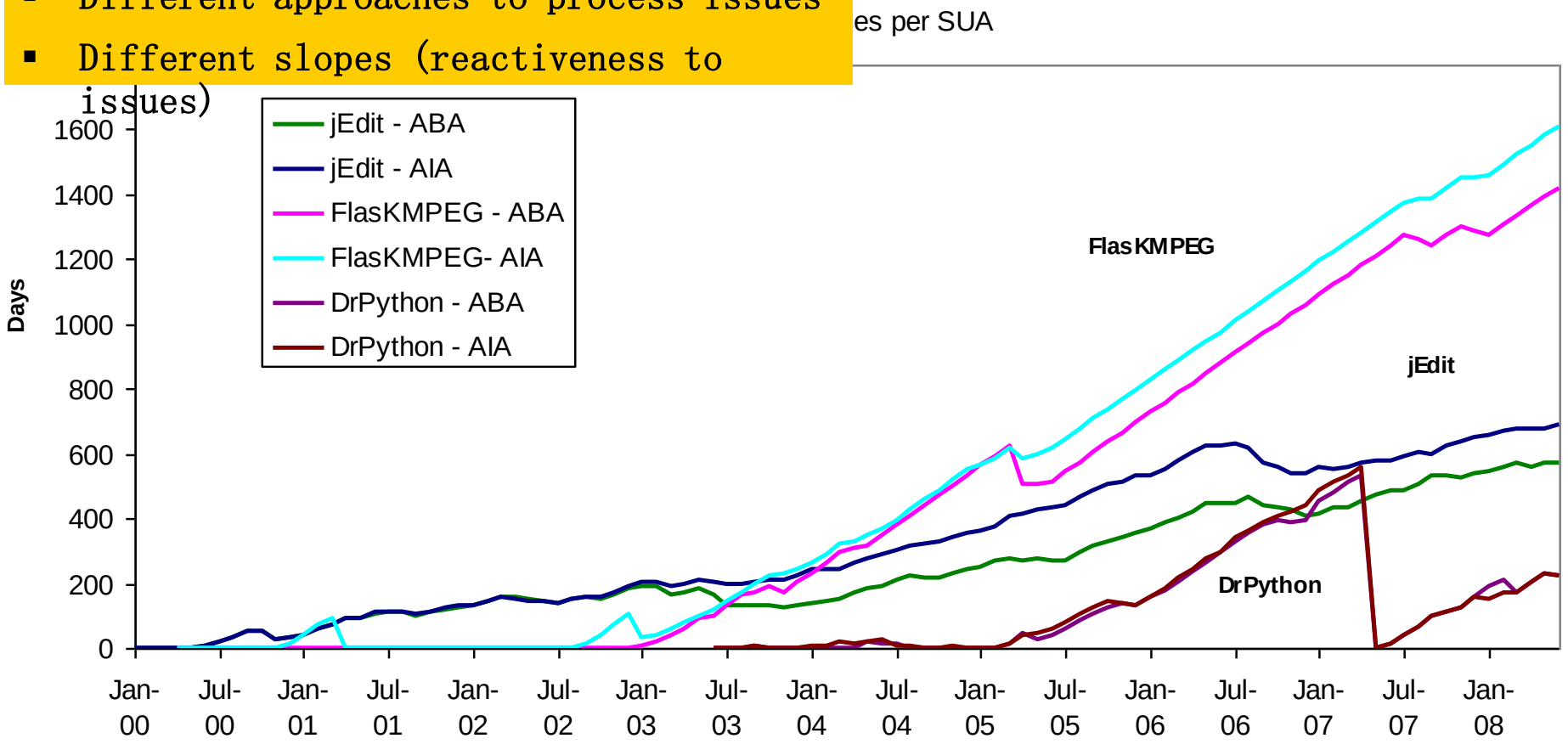
Analysis of Results

- RQ 3: How do different issue types pile up and what are the possible negative consequences of issue pile up on projects in the long run?
- Four metrics were defined:
  - ABA: Average Bug Age
  - APA: Average Patch Age
  - AFA: Average Feature request Age
  - AIA: Average Issue Age (an issue can be either a bug, a patch, or a feature request)
- For example, if the first issue is submitted on July 1st, and the second one on August 1st of the same year, the AIA on September 1st will be: (31+62)/2=46.5 days

RQ 3 - Responsiveness to Issues

- ABA follows AIA trend
- ABA is usually less than AIA
- Different scales
- Different approaches to process issues
- Different slopes (reactiveness to issues)



Research Question 3-Findings

- Low responsiveness to issues can be a process smell (symptom)

- It might lead to many negative results in the long run for a project, e.g.:
  - users (clients) will find their issues not addressed on-time and might lose interest in the project, or
  - (in the case of industrial projects), they may decide to cancel their contract with the software company altogether.

Conclusions

- This study provided the evidence on a few typical beliefs on the topic in the community, e.g.:
  - (1) Bugs dominate the issues,
  - (2) More bugs are usually submitted in the beginning of a project, and
  - (3) Depending on other success or activity factors, different projects show different responsiveness to bugs and other issue types.

- A current research is underway in which we are using the data mined in this work to systematically identify process *smells* (symptoms) in issue handling processes.

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Questions?