

# Are You Still Working on This? An Empirical Study on Pull Request Abandonment

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## ABSTRACT

The great success of numerous community-based open source software (OSS) is based on volunteers continuously submitting contributions, but ensuring sustainability is a persistent challenge in OSS communities. Although the motivations behind and barriers to OSS contributors' joining and retention have been extensively studied, the impacts of, reasons for and solutions to contribution abandonment at the individual level have not been well studied, especially for pull-based development. To bridge this gap, we present an empirical study on pull request abandonment based on a sizable dataset. We manually examine 321 abandoned pull requests on GitHub and then quantify the manual observations by surveying 710 OSS developers. In this paper, we address the following three research questions:

### *RQ1. Why do contributors abandon their pull requests?*

We have identified 12 main reasons for pull request abandonment related to the limitations of the collaboration process, personal issues of contributors, and implementations of pull requests *per se*. In addition to the lack of responsiveness from integrators and lack of time from contributors, we observed surprising reasons concerning the pull request updating process, consensus-reaching discussion, and effort investment. Our findings can help OSS communities clarify responsibility, optimize the collaboration process, and focus their efforts on avoidable reasons to prevent abandonment.

### *RQ2. What are the impacts of pull request abandonment?*

We found that the top-ranked impacts primarily introduce extra maintenance burden on integrators, *e.g.*, cluttering pull request list. Abandonment can also have cascading effects on the community due to technical dependencies among artifacts and common interests among developers. By learning the specific impacts, new mechanisms and tools can be developed to mitigate the undesirable impacts.

### *RQ3. How do integrators cope with abandoned pull requests?*

We have found several strategies integrators used to promote the completion of abandoned pull requests. However, we also uncovered a novel need for a handover mechanism in social coding platforms, since approximately two-thirds of integrators simply

closed abandoned pull requests although most contributors expressed that they were willing to pick up pull requests abandoned by others. Based on our findings, tool builders can be informed to better fulfill developers' information needs and functionality requirements, which are not currently met.

The contributions of the paper are summarized as follows:

- To the best of our knowledge, this is the first in-depth study that systematically explores the phenomenon of pull request abandonment in OSS projects.
- We provide qualitative information and quantitative assessment about the reasons, impacts, and coping strategies for pull request abandonment based on manual observation and surveys.
- We propose actionable recommendations and implications that OSS practitioners and tool builders can take to increase the potential to prevent contributors' abandonment and foster the completion of abandoned pull requests, thus improving the overall development efficiency.

## KEYWORDS

Pull Request Abandonment, Pull-based Development, Open Source Software

**Pointer to The Original Journal Paper.** The original journal paper can be found at <https://ieeexplore.ieee.org/document/9332267>

**Statement on Satisfaction for Journal First Criteria.** The journal paper was accepted by IEEE Transaction of Software Engineering (TSE) at 17-Jan-2021, and is not an extensions of previous conference papers. The paper reports completely new results regarding the reasons, impacts, and coping strategies of pull request abandonment. The work has not been previously reported in our prior publications, and the paper has not been presented at, and is not under consideration for, journal-first programs of other conferences.