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Deciphering the Dynamics: Social Structures and Collaboration Patterns in Open-Source Software Projects

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Abstract

Social coding platforms (e.g., GitHub) enable extensive collaboration in virtual and distributed online communities (Dong & Götz, 2020). Social coding transforms individual coding efforts into collective successes (Hukal et al., 2019). Related research has been focused on governance structure in open-source projects, developer social networks, and evaluation of pull requests. Yet, the coordination and decision-making process within open-source projects remains unclear on the issue level. Within a project, different groups of members collaborate on different tasks (e.g., issues and pull requests). Not all of these members should be considered connected because they do not necessarily collaborate on the same task ever. While measured on the project level, a connection only guarantees that two members have contributed to the same project. This diminishes our understanding of the actual collaboration patterns and their impacts.

In this study, we will investigate projects on GitHub to discover and categorize the evolution patterns of the project team structures. We will also examine the impact of structure change on the popularity of the projects, measured by the number of project stars. Our analysis of the evolution of interaction patterns within the projects will focus on evaluating five network parameters: degree distribution, diameter, clustering coefficient, density, and centralization degree (Wasserman & Faust, 1994).

We make contributions by uncovering the multifaceted nature of open-source project evolution, demonstrating no singular trajectory but a diversity that speaks to the inherent complexity of these collaborative environments. Our findings will also provide insights into what structural factors affect project popularity, thus offering the project manager support on how to maintain or improve the project performance, as well as how to prevent the project team structure from evolving into a low-performance pattern. Overall, this research enriches our understanding of collective collaboration within OSS projects, offering valuable insights into effective project management and the fostering of robust, adaptive communities.

References

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