

No Need to Fear, a New Maintainer is Here! Understanding Motivations Behind Open Source Maintenance Work

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Introduction

Open source software (OSS) is crucial for society with many software systems depending on open source frameworks and libraries. A recent empirical investigation found that nearly two-thirds of Github projects depend on one or two core developers to survive, with only 41% surviving when maintainers stop contributing [1]. It is important to understand motivations of maintainers for the retention of core developers and survival of projects.

Research Questions

- RQ1:** What motivates people to maintain open source projects?
RQ2: Are motivations different for creating and maintaining projects?
RQ3: What motivates people to take over the maintenance of projects they didn't create?

Methodology

Literature Analysis → Find Maintainers → Survey/Interview

A. Literature Analysis

- Find motivations from previous literature, both OSS & non-OSS
- non-OSS volunteering domains: trails, hospitals, community service
- Qualitative coding

B. Find Maintainers

- GHTorrent database with commit data of top 30,000 npm repositories
- Look into a 5 year period (2015-2020)
- Deduplicate data: merge commit author aliases together
- Defined maintainers as contributors responsible for top 80% of total project commits in a year
- Aggregate maintainers from deduplicated data
- Determine maintainers who join project after creation



Preliminary Results

- Motivations between OSS and non-OSS domains are similar with distinct specifics linked to their domain
- Deduplicated ~5.6 million rows of contributor commit data
- Aggregated 60 months of commit data into yearly data
- Identified ~584,000 distinct contributors

OSS Motivations

- User**
- Using the software themselves
 - Improve skills
 - Fun writing programs
- Social**
- Friendly/organized community
 - Be apart of team
- Beliefs**
- Help contribute to project
 - Want code to be free/open
- Career**
- Resume/portfolio building
 - Improve opportunities

[1-3]

Outside OSS Motivations

- User**
- Using hiking trails themselves
 - Learn skills
 - Express own abilities
- Social**
- Organized project
 - Meet like-minded individuals
- Beliefs**
- Help environment/others
 - Religion
- Career**
- Resume building
 - Explore opportunities

[4-6]

Conclusion

- Collected potential motivations from OSS and from non-OSS domains
- Developed Python script that successfully deduplicates monthly commit data from a database
- Developed Python script that identifies maintainers of projects based on yearly top 80% of total project commits
- Maintainer commit table provides insight on who are top maintainers for projects
- Visualize how top maintainers change over time, new & less-active maintainers

01org/iot-rest-api-server 2016		01org/iot-rest-api-server 2017		01org/iot-rest-api-server 2018	
Name	Number of Commits	Name	Number of Commits	Name	Number of Commits
Clark Kent	53	Bruce Wayne	23	Bruce Wayne	8
Bruce Wayne	23	Clark Kent	13		
T'Challa	1	Natasha Romanoff	2		

Example of yearly maintainers of a project repository

Example data table indicates yearly core maintainers shifting between 2016 and 2018

Future Work

- Using our data, we can sample contributors and projects
- Identify people who swooped in after creation of project to save it
- Conduct surveys with identified maintainers
- Conduct interviews to further investigate motivation behind saving/maintaining projects

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References

- [1] G. Avelino, E. Constantinou, M. T. Valente and A. Serebrenik, "On the abandonment and survival of open source projects: An empirical investigation," *2019 ACM/IEEE International Symposium on Empirical Software Engineering and Measurement (ESEM)*, 2019, pp. 1-12, doi: 10.1109/ESEM.2019.8870181.
- [2] J. Coelho, M. T. Valente, L. L. Silva and A. Hora, "Why We Engage in FLOSS: Answers from Core Developers," *2018 IEEE/ACM 11th International Workshop on Cooperative and Human Aspects of Software Engineering (CHASE)*, 2018, pp. 114-121.
- [3] M. Gerosa et al., "The Shifting Sands of Motivation: Revisiting What Drives Contributors in Open Source," *2021 IEEE/ACM 43rd International Conference on Software Engineering (ICSE)*, 2021, pp. 1046-1058, doi: 10.1109/ICSE43902.2021.00098.
- [4] Brett Bruyere & Silas Rappe, "Identifying the motivations of environmental volunteers," *Journal of Environmental Planning and Management*, 2011, 50:4, 503-516, doi: 10.1080/09640560701402034.
- [5] Richard L. Zweigenhaft, Jo Armstrong, Frances Quintis & Annie Riddick, "The Motivations and Effectiveness of Hospital Volunteers," *The Journal of Social Psychology*, 1996, 136:1, 25-34, doi: 10.1080/00224545.1996.9923026.
- [6] Ferreira, Marisa R., Teresa Proença, and João F. Proença, "An empirical analysis about motivations among hospital volunteers," *10th International Congress of the International Association on Public and Nonprofit Marketing, FEP Working Papers*, 2011.



Support Information

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