

# Novelty Statement

We would like to clarify that the paper, titled "Companies' Participation in OSS Development - An Empirical Study of OpenStack", satisfies the novelty criteria of journal-first submissions: This paper reports completely new research results. It has no previously published work.

The spectrum and scale of commercial participation in open source software (OSS) ecosystems have substantially expanded in recent years. Despite extensive research on commercial participation, it remains unclear to what extent companies contribute to OSS development and how this engagement impacts the community. To bridge the gap, this submission investigates OpenStack: a large OSS ecosystem with intense commercial participation. We quantify companies' contributions via the developers that they provide and the commits made by those developers. The major contributions of this paper lie in the metrics we used and the findings we obtained:

(1) We find that companies made far more contributions (measured by developers and commits) than volunteers and the distribution of the contributions made by different companies is highly unbalanced.

(2) We observe eight unique contribution models based on companies' commercial objectives and propose three dimensions to characterize the performance of the models: contribution intensity, extent, and focus. Each mode is unique.

(3) We design a metric to describe the diversity of companies and find that the increased diversity has a strong positive association with the number of volunteers.