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Innovation and Creativity

A Critical Review of Software Engineering Research on Open Source Software Development

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Problem formulation

- A growing concern with the black-and-white portrayal of open source software development (OSSD) within software engineering (SE) research
- Recent empirical research observes how processes and practices differs across OSSD projects
- This has yet to materialize in published SE research on OSSD

Overview

- **Identification of symptoms**
 - In what ways does the SE research literature describe OSSD as a homogenous phenomenon?
- **Diagnosis**
 - Under what conditions can the view of OSSD as a homogenous phenomenon be made and maintained over time within the SE research field?
- **Proposed treatment**
 - What can be done to avoid researching OSSD as if it was a homogenous phenomenon?

Materials

- **Publication and paper selection**
 - Studied OSSD in the context of SE research
 - Searched with keyword ‘open source’ in 6 leading SE journals
 - Total papers found: 120
- **Refining paper selection**
 - Removed papers:
 - without the entire keyword ‘open source’
 - reporting from design research released as OSS
 - just use OSS datasets
 - opinion pieces
 - Total papers analyzed: 52

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Identification of symptoms₁

How is OSSD described as a homogenous phenomenon?

- **Statements about the OSSD model**
 - Overgeneralization of salient characteristics
 - Bazaar model / cycle / paradigm of software development
 - Geographically distributed software development
 - Work is not assigned but undertaken
 - There are no plans
 - Is developed by communities of volunteers
 - There being a particular social organization to OSSD

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Identification of symptoms₂

How is OSSD described as a homogenous phenomenon?

- **Statements that OSSD is different from SE**
 - OSSD different from industrial software development
 - (cathedral vs. bazaar, hacking vs. mechanical forms)
 - OSSD not an engineering method
 - Reversing characteristics of SE
 - SE work is assigned, there is explicit system-level design, there is a project plan, schedule or list of deliverables

Identification of symptoms₃

How is OSSD described as a homogenous phenomenon?

- **Study claims that OSSD produces superior software**
 - Compare OSSD with closed-source software development

Identification of symptoms₄

How is OSSD described as a homogenous phenomenon?

- **Study OSS adoption in commercial context**
 - Argue that OSSD is different from commercial OTS and therefore requires a unique approach for evaluation
 - These studies do not challenge the view of OSSD as completely different from SE

Diagnosis

- **Research question**
 - Under what conditions can the view of OSSD as a homogenous phenomenon be made and maintained over time within the SE research field?
- **Approach:**
 - Analysis of individual texts
 - Analysis of SE researchers' reflecting on what SE research is

Diagnosis: assumptions about SE research₁

- **Identity of SE**
 - *Goal*: To resolve the software crisis
 - Movement of industry and academic actors to professionalize software development
 - *Approach*: Through the application of systematic, disciplined, and quantifiable approaches to software development
- **OSSD vs. SE**
 - OSSD defies the central claim that professionalizing software development will resolve the software crisis
 - Important to marginalize OSSD to only working in a specific context: geographically distributed volunteers

Diagnosis: assumptions about SE research₂

- **Prescriptive models**

- *SE researchers' identity*: inform SE practitioners on ways to improve practice
- *SE research focus*: prescriptive models
- Compared to SE's prescriptive models, OSSD practice will inevitably seem different
- SE researchers bypassing the problematic issue that SE research discipline actually knows little about the field they are trying to address: SE in practice

Diagnosis: assumptions about how to do SE research₁

- **The SE research crisis in the 1990's**
 - Widening gap between SE research and practice
 - SE research lacking in quality and thereby credibility
 - Very little empirical evidence to support SE claims
- **Out of the crisis**
 - Increased scientific rigor to better validate research claims
 - Increased use of measurement theory and software metrics

Diagnosis: assumptions about how to do SE research₂

- **The problem of comparisons**
 - Draw implications across OSS projects
 - Little/no discussions on the comparability of findings
 - How comparable is the defect density of a single user application developed by two OSS developers with a large OSS project?
 - Call for increased multiplicity of research approach

Diagnosis: assumptions about the object of study₁

- **Case selection**

- Either study volunteer-based OSSD or adoption of OSSD in commercial context
- Early descriptions of OSSD turned to prescriptions for choosing instances to study
- Scientific rigor makes it important to pick “the right” case for validity reasons

Diagnosis: assumptions about the object of study₂

- **OSS v2.0**
 - Claim: Transformation of phenomenon to a more mainstream, commercially viable form – OSS v2.0
 - Researcher's focus on community-based OSSD has overshadowed the commercial-ties
 - OSS was conceived by the Linux industry in 1997 to de-politicize free software

Proposed treatment₁

- The only common characteristic of OSSD is that software product is released under an license compliant with the *Open Source Definition*.
- **Be more specific on salient characteristics of OSSD instances**
 - Size, community, product
 - Commercial vs. community
 - Geographical distribution
 - Developer demography

Proposed treatment₂

- **How to study OSSD? / implications for method**
 - Call for a diversity of approaches
 - In particular detailed studies of the diversity of development practice
- **What to study? / implications for case selection**
 - Explore the relationship between volunteers and commercial actors
 - Choice of case grounded in salient characteristics of the particular case, rather than as an instance of OSSD