FOSD `24

Understanding the current state of replication packages and finding ways to improve their quality and availability

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Personal Motivation: Replication Study

- **Master thesis:** replication study
- **Negative results**: burden of proof
- **Considerable work**:
  - Tracking all deviations
  - Lack of guidelines
    - Replication package structure
    - Close vs. conceptual replications
    - Hard to find/apply
- **Discouraging context**
  - Replication crisis [1,3]: **Not alone!**
- **Motivation: How could I contribute to fixing this?**

Terminology

Repeatability, Reproducibility, Replicability

Repeatability	Reproducibility	Replicability
Original Team	Different Team	Different Team
Original Setup	Original Setup	Different Setup

https://www.acm.org/publications/policies/artifact-review-and-badging-current

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Source: https://benhermann.eu/talks/fse20-expectations-se23.pdf

Artifacts and Packages

- Today: broader term of “artifacts”
  - e.g., Artifacts evaluation, ACM badges
  - Any (digital) sumplementary material: (RAW) data, scripts, documentation, etc. [5]
- Contrast: basili 1999 [6]→ more than just supplementary material
  - Project website (“living document”)
  - Facilitate and track replication
  - Document changes
  - Link related studies

ACM Badges

A Retrospective Study of One Decade of Artifact Evaluations

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ABSTRACT

Most software-engineering research involves the development of a prototype, a proof of concept, or a measurement apparatus. Together with the data collected in the research process, they are collectively referred to as research artifacts and are subject to arti-

KEYWORDS

Research artifacts, Artifact evaluation, Open science, Reproduction, Reuse, Long-term availability of software and data

ACM Reference Format:

Stefan Winter, Christopher S. Timperley, Ben Hermann, Jürgen Cito, Jonathan

RESEARCH-ARTICLE OPEN ACCESS

A retrospective study of one decade of artifact evaluations

Authors: Stefan Winter, Christopher S. Timperley, Ben Hermann, Jürgen Cito, Jonathan Bell, Michael Hilton, Dirk Beyer Authors Info & Claims

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Related Artifact: Reproduction Package (Docker container) for the FSE 2022 Article `A Retrospective Study of one Decade of Artifact Evaluations` • November 2022 • data • https://doi.org/10.5281/zenodo.7082407

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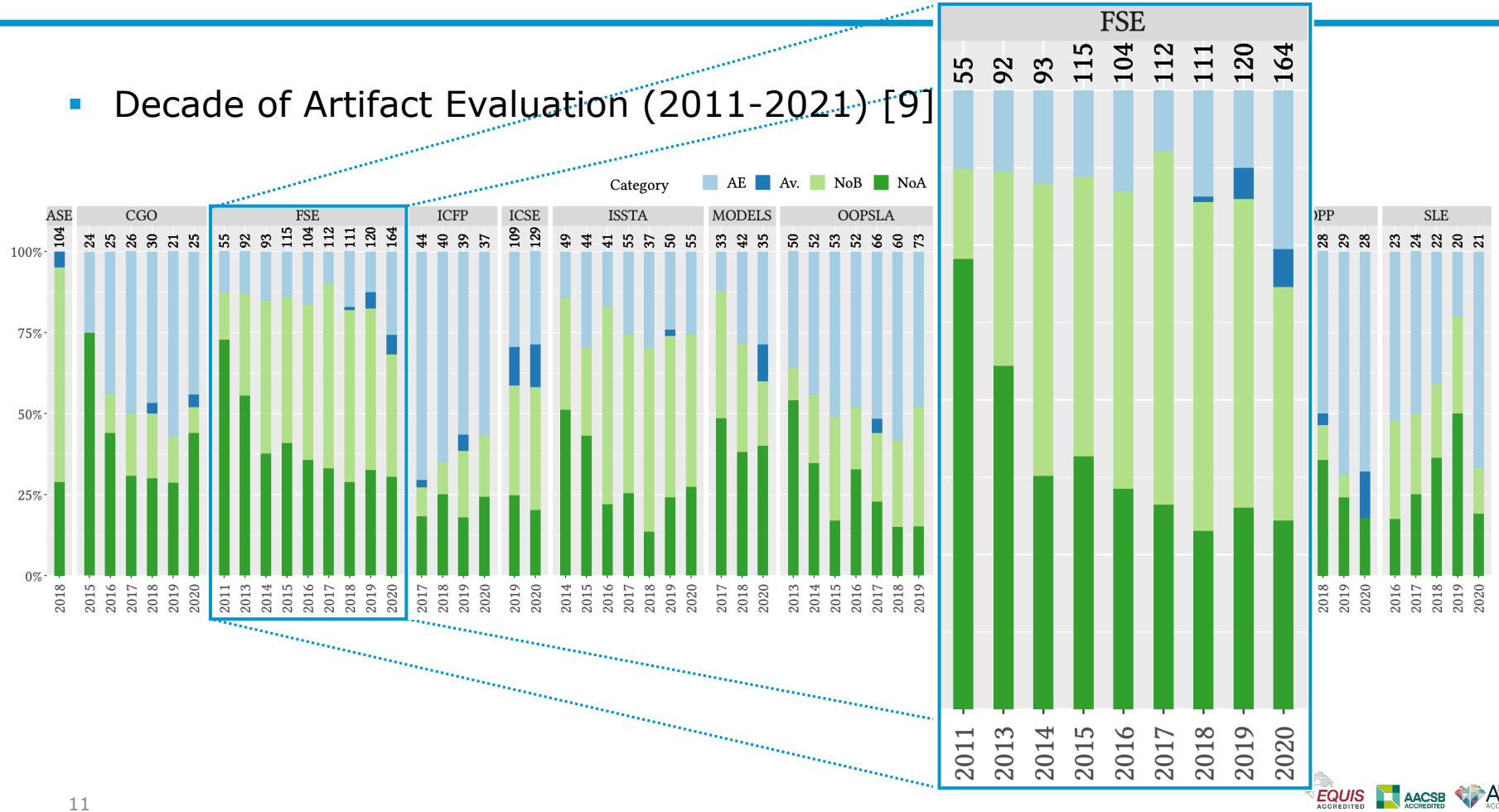
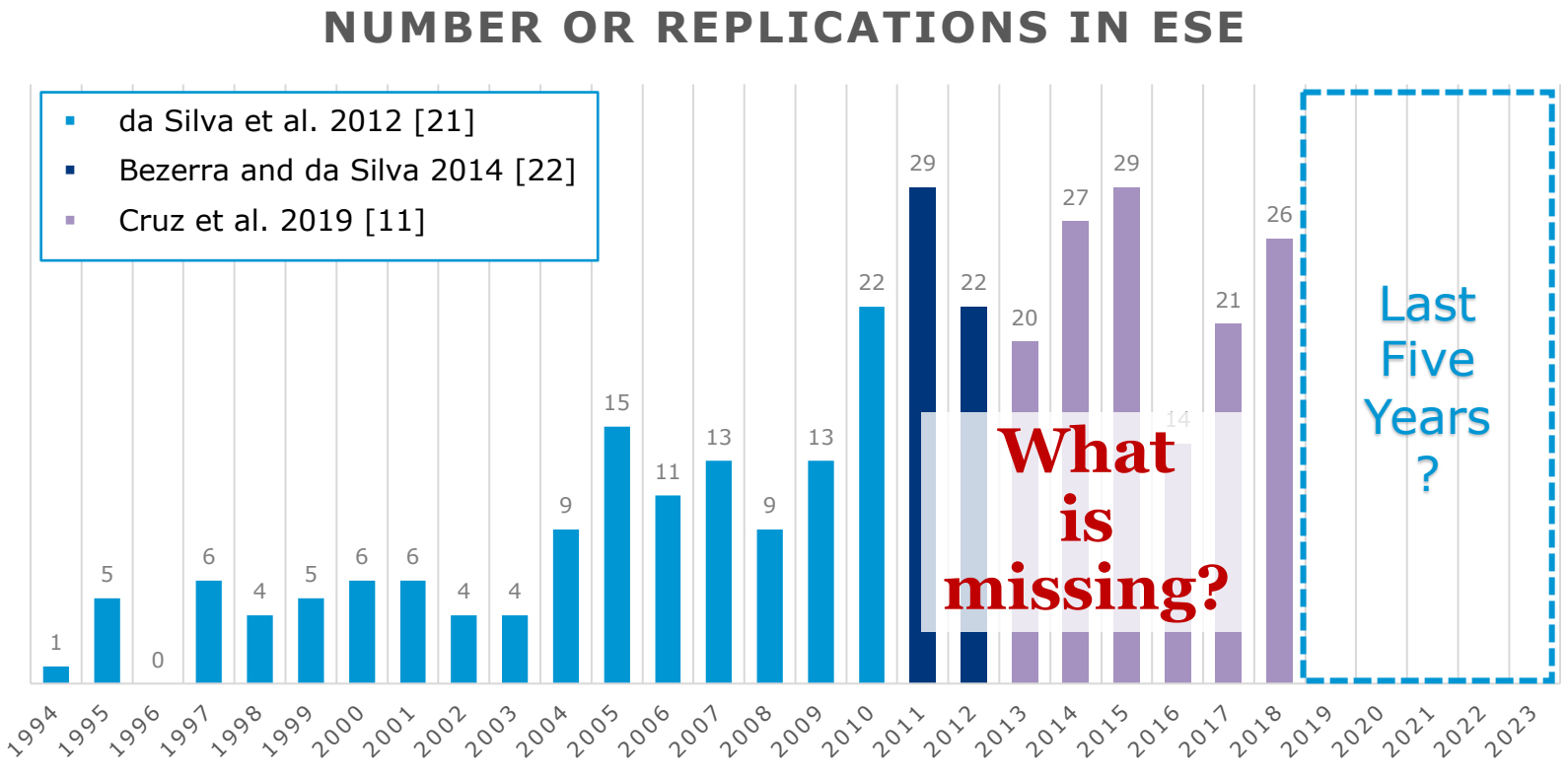
eReader

Current State of Artifacts

- Decade of Artifact Evaluation (2011-2021) [9]



Current State of Replications



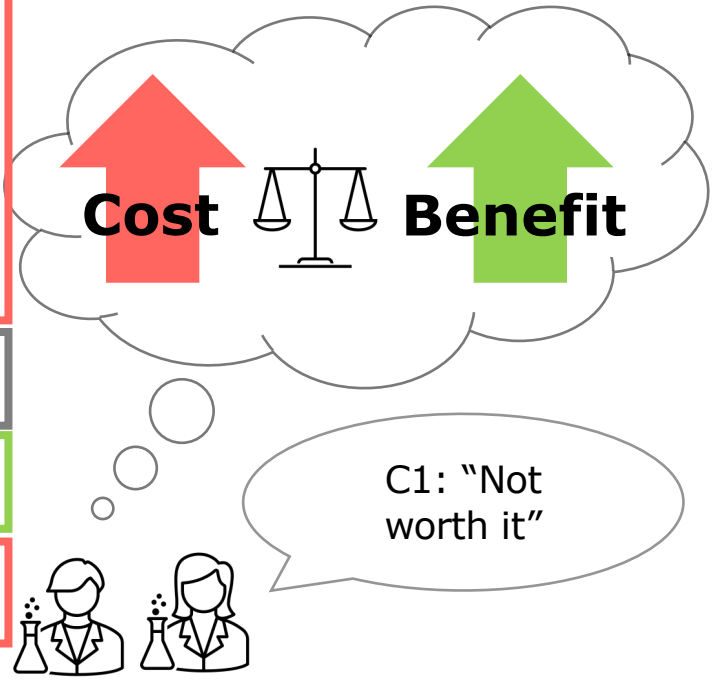
Challenges in Artifact Creation

- Understanding and improving artifact sharing in software engineering research [14]
- 2014-2018: Research Papers at four SE Venues
- Survey of authors
- Three Perspectives
  - Author
  - Reviewer
  - (Re-)User

- C1: Not worth it
- C2: Portability
- C3: Maintenance
- C4: Tacit knowledge
- C5: Artifact does not fit purpose
- C6: Lack of standards and guidelines
- C7: Hosting
- C8: Double-blind review
- C9: External constraints
- C10: Lack of reviewer incentives
- C11: Technical obstacles
- C12: Limited communication

Recommendations

- R1: Describe the Contents, Structure, and Purpose of Artifacts
- R2: Create a Self-Contained Artifact
- R3: Establish a Plan for Creating and Sharing Artifacts
- R4: Obtain and Use a Clear Rubric to Evaluate Artifacts
- R5: Align Author and Reviewer Expectations
- R6: Reduce the Opportunity Cost of Reviewing
- R7: Recognise and Fund Artifact-Related Activities
- R8: Establish a Long-Term Strategy for Artifact Sharing and Evaluation



Past and Current Efforts (non exhaustive)

- Artifact Evaluation (Tracks)
- ACM Badges [5]
- Graph of Re(Use) [15]
- Tool Support
  - TIRA.io [16]
  - SureSoft [10]
  - eXemplar and SEDL (Inactive) [17]
  - CÆSAR (Proof of Concept) [18]
  - Reproducible and Reusable Artifacts (FOSD 2023 – Alina Mailach)
- Zenodo & Figshare Archival (incl. Double-Blind Tutorial [19])

Research Area - Step I: Identifying Status Quo

- SLR Update: How did the number of replications change in the last 5 years?
- SLR: What does the typical replication package look like?
  - Structure?
  - Content?
  - Tools?
  - Standards?
- In what ways are current replication packages still lacking?
  - Challenges and recommendations of Timpreley et al. (see Slides 9&10)
  - Are there other qualities which differentiate „good“ and „bad“ packages?
  - Do the replication packages of replications look different?
    - Gut Feeling: “I wish the replication packages I used looked like this, during my replication”

Research Area - Step II: Support Researchers

- Based on Challenges (C1-C12) and Recommendations (R1-R8) by Timperley et al. [14]
- How can we support researchers?
  - Tools
  - Processes
  - Learning Ressources
  - Communities
  - Incentives / Recognition
- Inspiration from Software Development
  - DevOps
  - Test-Driven Software Development
  - Open Source Maintenance Life Cycles

Questions for the FOSD ‘24 Forum

- Have you noticed any blind spots from my intial investigation?
- What are your experiences on
  - Challenges replicating other work
  - Challenges sharing artifacts
  - Artifact availability and quality
- What are your thoughts on supporting
  - Artifact creation/sharing/maintenance
  - Creating, documenting, maintaining families of experiments
- What are your thoughts on the cost/benefits of artifact sharing?

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Thank you for your attention!

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