A Toolkit for Measuring the Impacts of Public Funding on Open Source Software Development

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Agenda

1. Guiding Questions
2. Prior Work
3. Fundamentals of the Toolkit
4. Next Steps

Guiding Questions

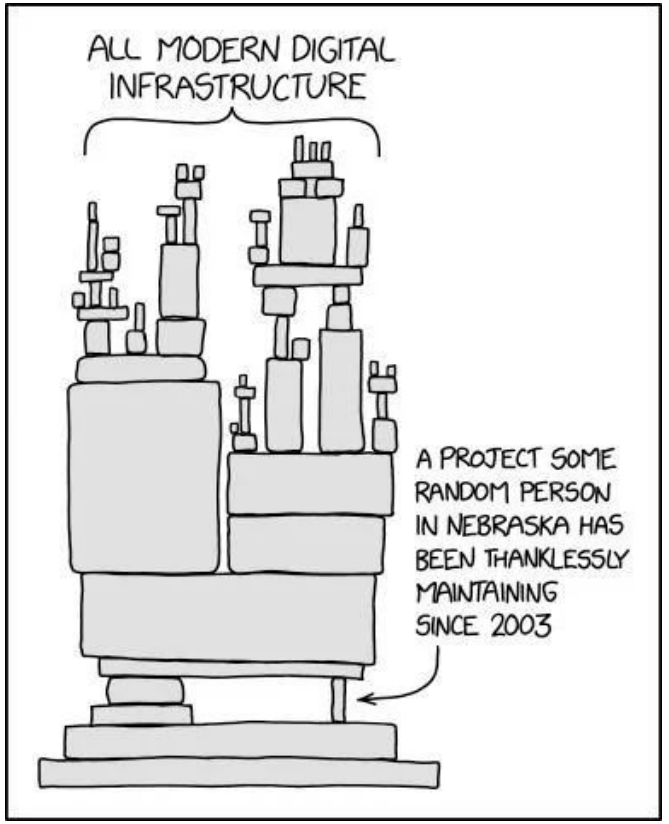
What are the different types of impacts of different types of funding?

How can / should we *meaningfully* measure the impacts of funding?

Prior Work

Prior Work

- **OSS = digital infrastructure** (Eghbal, 2016; Scott et al, 2023)
- **Funding supports OSS maintenance but does not solve all problems** (Eghbal, 2020; Linåker et al, 2024)
- **$$$ is least important motivator for contributors and changes social dynamics in OSS projects,** even prejudice against paid developers (Gerosa et al, 2021; Zhang et al, 2024)
- **Emerging funding approaches but limited understanding of impacts and their relative effectiveness and drawbacks**



Prior Work

- **Variety of valuation models: What value & for whom?** (Vargas, 2024)
- **Social models of open source**
  - Social model of OSS (Ferraioli, 2022)
  - Four social structures by growth ratio of contributors/users (Eghbal, 2020)
  - “All contributors” (Young et al, 2021)
- **Community health metrics**
  - CHAOSS metrics (Goggins et al, 2021)
  - Contextualise metrics to each project

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“A review of valuation models and their application to open source models” (Vargas, 2024)

“All models are wrong, but some are useful”

A Toolkit for Measuring the Impacts of Public Funding on OSS Development

Toolkit Fundamentals

- **Challenges:** No one-size-fits-all approach to funding impact measurement due to heterogeneity of projects & ecosystems, funding objectives & approaches, data availability, non-randomness, etc.
- **Start with Why:** Understanding the specific objectives of the funding helps to align impact measurements with the expected outcomes (e.g. prototype development, new features, or security)
- **Account for Project Life Stage and Social Structure:** Projects at different life stages with different contributor and user community sizes have vastly different needs, e.g. prototype vs mature project
- **Account for Cost Factors:** Regional and organisational cost factors play a crucial role. Similar budget allocations across different organisations and regions may result in different FTE personnel

Toolkit Fundamentals

- **Impacts on What, When, How, Where?**
  - Social, economic, and technological impacts
  - Direct or indirect impacts
  - Positive or negative (N.B. not linear/unidirectional)
  - Internal (i.e. in projects) or external (i.e. among ecosystems of dependents/users)
  - Vary over various time horizons

- **Methodological Considerations:**
  Pros and cons of qualitative, quantitative, and mixed-methods approaches, as well as data availability/quality considerations.

- **Multiplier Effect Estimation:**
  Multiplier effects are useful and clear quantitative evidence of return on public investment, but their measurement is fraught with methodological challenges and need to be adapted to OSS context.

- **Adapt Multiplier Effect to OSS Context:**
  - **Economic multiplier:** How much additional economic activity is generated for each euro spent on R&D?
  - **Knowledge spillovers**: When R&D by entity A creates value for other entities without compensation to entity A.
  - **Social rates of return:** Total benefits to society from R&D investment, including innovator returns and spillover benefits

	Internal impact (Project-level)	**External impact** (Ecosystem-level)
Direct impacts	• ***Social:*** Contributor retention, community engagement, community events, contributor diversity, work-life balance, reduced burnout, mentorship, etc • ***Economic:*** Paid developer time, paid support roles, infrastructure coverage, conference sponsorship, project-related revenue (donations, grants, contracts), etc • ***Technological:*** Maintainer responsiveness, commit velocity, code security, dependency management, documentation quality, consistent releases, etc	• ***Social:*** User trust, ecosystem expansion, community growth, ecosystem events, etc • ***Economic:*** Cost savings for adopters (e.g. integration and support cost savings), shared maintenance burden, etc • ***Technological:*** Stability of APIs, ecosystem-wide security updates, interoperability, etc
Indirect impacts	• ***Social:*** Leadership development, governance and decision-making processes, knowledge preservation, conflict resolution/prevention mechanisms, etc • ***Economic:*** Job market value for developers, partnership opportunities, academic collaborations, consulting opportunities, funding diversity, etc • ***Technological:*** Standardisation, interoperability, etc.	• ***Social:*** Cross-project collaboration, training and education resources, ecosystem community engagement, etc • ***Economic:*** Market growth, job creation, cost reductions, start-up creation, etc • ***Technological:*** Standardisation, patents, research papers, standards, ecosystem-wide security improvements, etc

Next Steps

Next Steps

- **Name of the game: Break the toolkit!** Or, rather, how can we make it more useful for various OSS funders and practitioners?
- We want your input! **What works, what doesn't?** How can we refine our approach to better measure useful and meaningful impacts?
- You can **read the pre-print** here:

Pre-print on arxiv.org

Next Steps

- We've started a new **CHAOSS WG on Funding Impact Measurements**! Join the fun here:

- The WG aims to **develop frameworks, metrics, and methodologies** for measuring and understanding the impacts of funding on open source software development.

- There's also the **"Funding the FOSS Ecosystem" devroom at FOSDEM** with Prototype Fund, NLNet, Probabl, FSFE, and others.

CHAOSS WG Funding Impacts on GH

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