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JOHAN LINÅKER

How to Identify and Avoid Cracks and Bumps in your Digital Infrastructure?

-> By Considering the Health of Open Source in your Intake Process

Open Source Software Health

- An Open Source Software project's capability to stay viable and maintained over time without interruption or weakening

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Open Source Software Health

- Productivity: There is an active development of the project
- Robustness: The development is open and spread out on several (independent) individuals
- Openness: Users of the project can influence and contribute to the development of the project

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Open Source Software and our Digital Infrastructure

- Open Source Software makes up a vitale building block in our digital infrastructure
- Needs maintenance as with physical infrastructure to stay secure and robust

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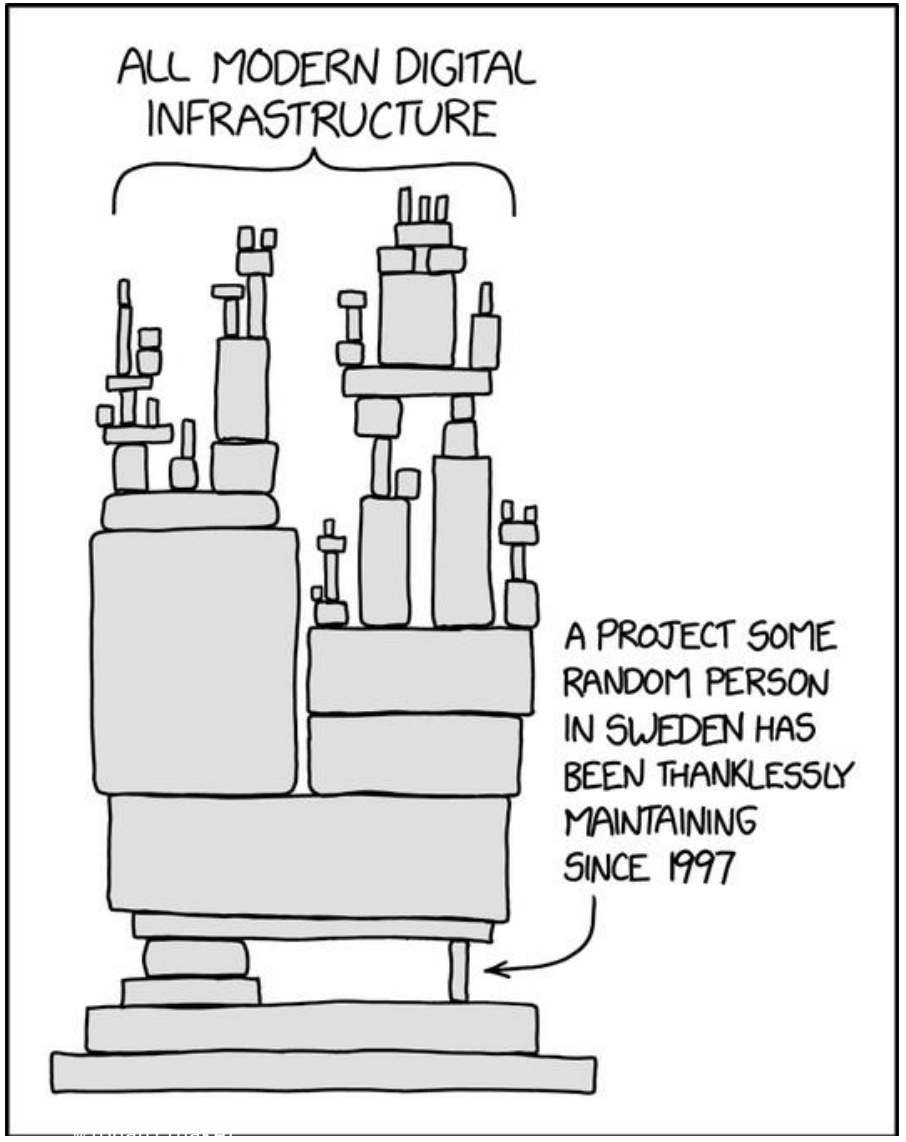

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Open Source Software and our Digital Infrastructure

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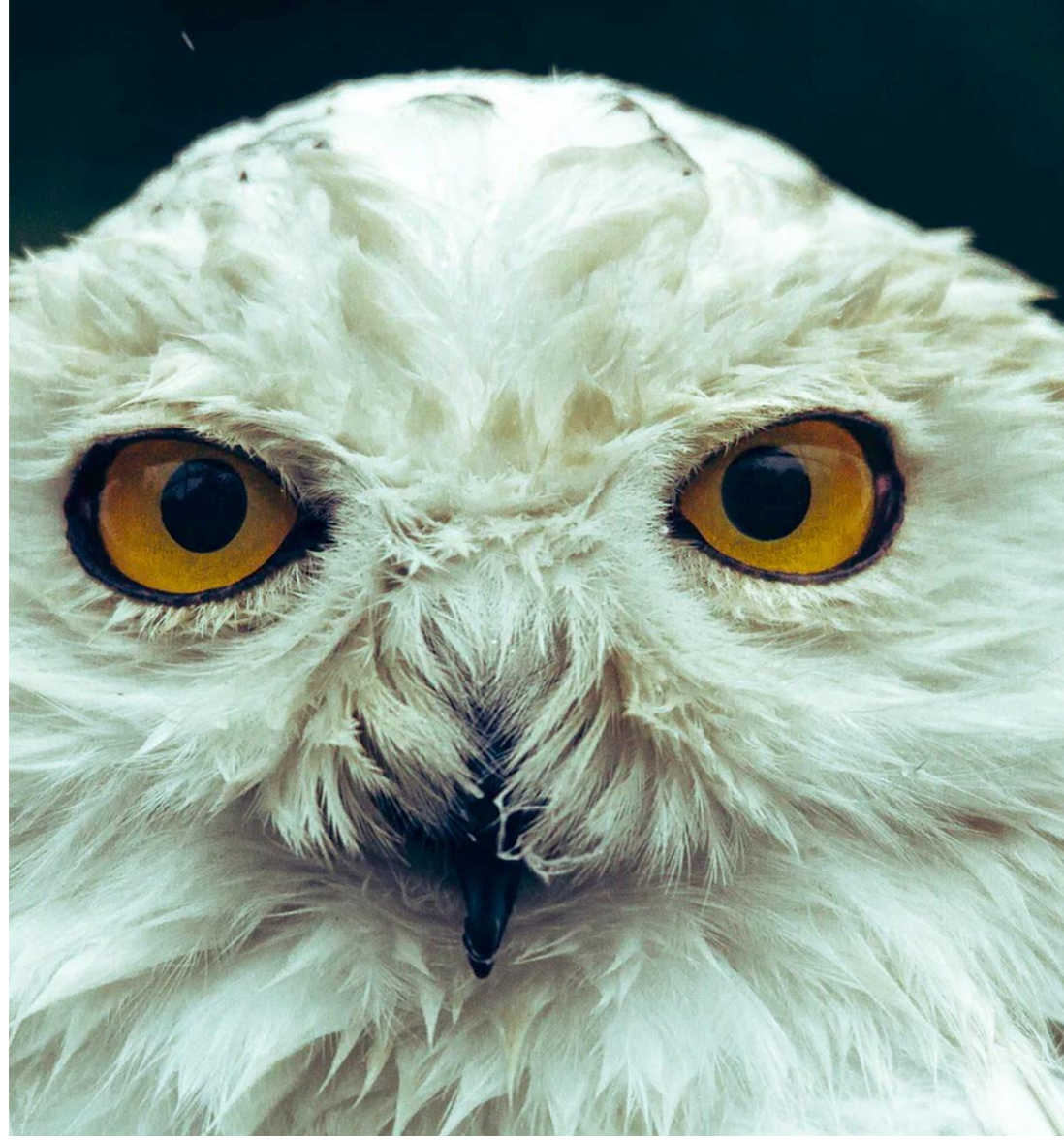
Linus' law

- ”Given enough eyeballs, all bugs are shallow”
- Requires that enough eyeballs actually reaches the codebase
- Free-riding, for both good and bad



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The Tragedy of the commons

- Commonly exemplified through Hardin's open pastures (Hardin, 1968)
- May be considered as a Common Pool Resource (CPR)
- A resource system that is non-exclusive, and subtractable (Ostrom, 1990)

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Brain-time as a Common Pool Resource

- “Brain-time” and maintenance effort is subtractable
- Maintainers are humans, not robots
  - Burnout, changed family or working conditions
- Companies must adapt to stay competitive
  - Refactorization, new products, changed business model

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How can we find the cracks and bumps before they appear?

How can we avoid them?

How can we mitigate them?

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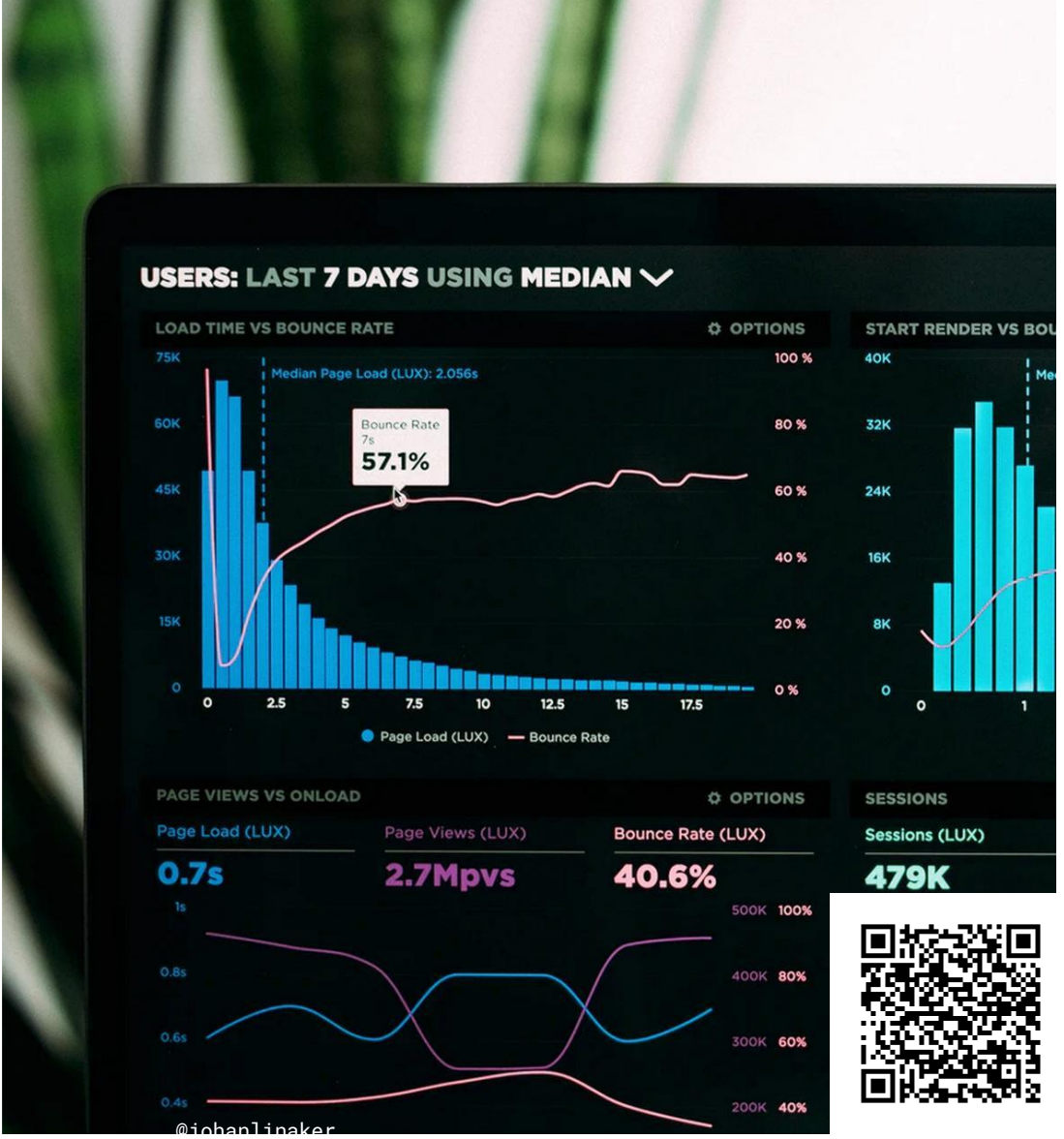

By Considering the Health of Open Source in your Intake Process

- First part of a longer design science research project*
- Goals:
  - Enable health analysis at intake and acquisition of OSS, and ongoing consumption
  - Enable sourcing decisions and proactive health improving measures

* https://bit.ly/3AM5NR8

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What can we find in literature?

- 146 studies
- 107 characteristics (+associated metrics
- Divided over 15 themes
- Supplementary material: https://doi.org/10.6084/m9.figshare.20137175
- Paper: https://www.ri.se/sites/default/files/2022-09/opensym2022-6%20%281%29.pdf

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Framework structure

- Level of abstraction
  - Network-level
    Characteristics related to the Overarching software ecosystem or network that the OSS project is part
  - Project-level
- Socio-technical dimension
  - Actors
    Human and Community-related characteristics
  - Software
    Technical and project-related characteristics
  - Orchestration
    Governance-related characteristics

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Actor-related characteristics (1/4)

- Communication (4)
  - *how productive an OSS project is in planning and discussing the evolution and development of its technical and non-technical deliverables*
  - E.g., response time & quality, social activity, visibility
- Culture (6)
  - *how able a community is to facilitate a positive and inclusive collaboration and dialogue among existing and potential actors*
  - E.g., conflicts, openness, sentiment, recognition

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Actor-related characteristics (2/4)

- Diversity (5)
  - how able a community is to accommodate and attract a diverse community of actors, while enabling existing and new use cases of the OSS project
  - E.g., application, demographic, & organization diversity, technical knowledge
- Finance (2)
  - *how financially viable actors are in an OSS community in terms of being able to dedicate their time and resources to the long-term maintenance of the OSS project*
  - E.g., financial stability & support

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Actor-related characteristics (3/4)

- Popularity (5)
  - *how popular and well-adopted an OSS project is among existing and potential end-users and contributors*
  - E.g., competing projects, external interest, adoption
- Stability (12)
  - *how capable the OSS project is in terms of preserving a critical population of actors with the capability to maintain the OSS project long-term*
  - E.g., predicted evolution, knowledge concentration, retention

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Actor-related characteristics (4/4)

- Technical activity (5)
  - *how productive an OSS project is in evolving and developing its technical and non-technical deliverables*
  - E.g., development activity (community, maintainers, overall)

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Software-related characteristics (1/4)

- Development process (7)
  - *how capable a community is in terms of its development process to maintain the OSS project to a high quality long-term*
  - E.g., contribution process, onboarding, quality assurance
- Documentation (6)
  - *how capable a community is to develop, persist, and disseminate knowledge among current and future actors engaged in the project*
  - E.g., completeness, complexity, currentness

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Software-related characteristics (2/4)

- General characteristics (7)
  - *how attractive an OSS project is based on its general technical features*
  - E.g., application domain, project complexity, type of technologies
- License (4)
  - *how license choices and related practices may affect the popularity and attractiveness of an OSS project, both for commercial actors and individuals*
  - E.g., flexibility, implications, jargon, management

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Software-related characteristics (3/4)

- Scaffolding (10)
  - *how robust and accessible the development and communication infrastructure used in the OSS project is in terms of enabling a collaborative and high quality maintenance of the project*
  - E.g., build environment, infrastructure availability and accessibility
- Security (10)
  - *how robust an OSS project is in terms of mitigating and managing vulnerabilities and security-related aspects in the current and future maintenance of the project*
  - E.g., vulnerability persistence & presence, dependency, management, security practices

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Software-related characteristics (4/4)

- Technical quality (10)
  - *how robust an OSS project is in terms of its technical quality, considering both a user and developer perspective*
  - E.g., source code quality & complexity, maintainability, product quality

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Orchestration-related characteristics

- Orchestration (9)
  - *how mature and open the orchestration is in the OSS project or its overarching ecosystem in terms of enabling an open and inclusive collaboration and long-term maintenance of the OSS project*
  - E.g., community and ecosystem structure, governance, processes

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Limitations and threats to validity

- Not a systematic overview of literature
- Limited coverage of the network-level
- Did we really characterize the health of OSS projects?

Extant work

- Community Health Analytics for Open Source Software (CHAOSS)
  - Framework with metrics for health analysis and assessments
- Open Software Security Foundation (OpenSSF)
  - Industry foundation focused on raising security of critical OSS
- SustainOSS
  - Community focused on sustainability and health topics

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Adapting the intake process

- Pre-trial on a large international software-producing organization
- Process initiated, owned and managed by enterprise architects
- Objective:
  - Lower risk of OSS used and considered in the intake process
- Goals:
  - Decentralized, self-managed process
  - Enable but don’t overburden developers
  - Enable follow-up and actionable insights

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Design approach

- Questionnaire developed through iterations based on CHAOSS metrics
- Main concerns and risks, as well as types of OSS projects identified through group discussions and interviews
- Observed developers as they walked through the questionnaire
- Went from 2h to <15 min evaluation
- Considered to raise awareness and decrease overall risk in the intake process from both engineers and process owners

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Things to consider (1/3)

- Interview and map up main concerns from internal stakeholders
- Consider types of projects used and need for tailoring
- Lightweight questionnaire/checklist designed for developers
- Needs simple answers (Yes/No) or clear categories (1-5, 6-10…)

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Things to consider (2/3)

- Must be easy to find and process the data needed
- Remove thresholds and be inclusive
- Automate where possible
- Add screening functionality in intake and build pipelines to flag projects of concern
- Provide support for yellow and red flags

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Things to consider (3/3)

- There’s no one model or number to measure the health of OSS projects
- Different characteristics can help guide you in painting the picture and how to view it

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Sourcing and acquisition

- Pre-trial at large Swedish national agency
- Workshop format with internal stakeholders
- Goal was to evaluate health of to OSS e-archival solutions
- Questionnaire developed through iterations based on CHAOSS metrics
- Enable comparison between open and closed alternatives in an acquisition
- Evaluation needs to be thorough and detailed

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Future work

- Validate, prioritize and further characterize characteristics through an interview survey with a general and a case-specific sample (ongoing)
- Gather metrics and data sources from practitioners through observations, and contrast to what we've found in literature
- Investigate applicability and possibility to automate and quantify characteristics with industry partner (ongoing)

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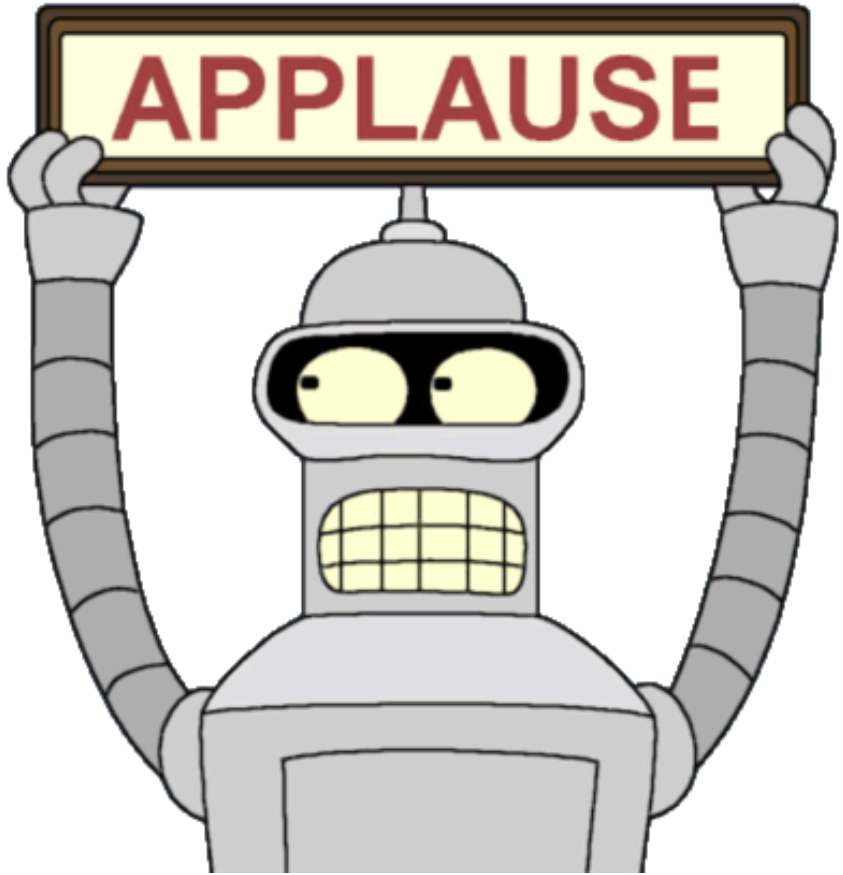
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