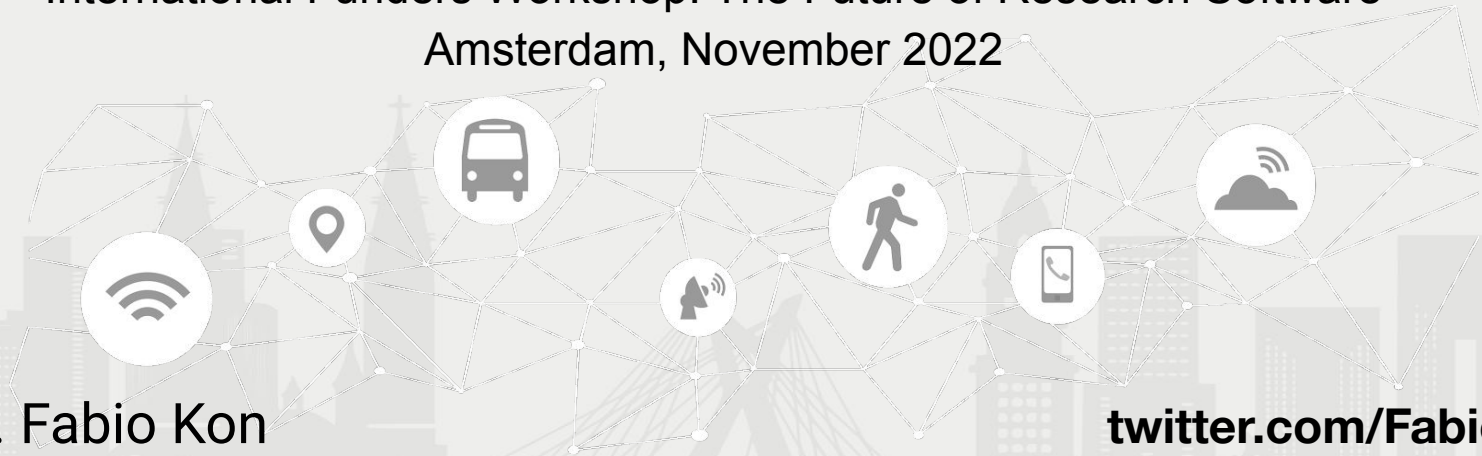


How can funders contribute to making research software sustainable? The funder's perspective.

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Prof. Fabio Kon
São Paulo Research Foundation (FAPESP)
University of São Paulo, Brazil

twitter.com/FabioKon

Software is everywhere in Science

- Software is the most ubiquitous tool in contemporary science
- Software in Research (e.g., Linux, spreadsheets)

vs.

- Research Software
 - Established in Biology, Medicine, Physics, Chemistry, Engineering, Economics, Mathematics, Environment, ...
 - Growing in Social Sciences, Humanities, Arts, ...

However

- Most software produced by scientists is very bad!
- A lot of Research Software is written by physicists, biologists, mathematicians, economists, etc.
 - With no or very little training in Software Engineering and Computer Science
- A lot of research software is written by graduate students.
 - Whose goal is to get their degree, not to produce robust software to be used by other scientists
- Thus, most Research Software nowadays is not well architected, not well documented, hard to use => not sustainable, not reused

Software is infrastructure

- However, funding agencies tradition:
 - a. Innovative projects, producing new science
 - b. Infrastructure (meaning hardware)
- Most research software came from *item a*.
- Little tradition of seeing software as a kind of infrastructure
- But, *item a*. alone is not enough to produce robust, sustainable software

What is missing?

Funders must think about novel mechanisms to fund

- Robust
- Sustainable
- Useful

Research Software

Otherwise, we'll be wasting our own resources with inefficient projects

What makes software sustainable in general?

- **Useful** to a reasonable number of people
- Good external quality
 - Usability, correct, user documentation
- Good internal quality
 - Clean code, good software architecture, automated tests, developer's documentation
- Community of developers
 - Proprietary: paid by a company
 - Open source: paid staff and/or volunteers

What makes Research Software sustainable?

1. Useful for a wide range of scientists
 - a. or essential to a niche area
2. Good internal and external quality
3. Long-lasting supporting team/community
 - a. To update the software with new features
 - b. To deal with changes in the surrounding environment

Thus, funding agencies must require 1 and 2 and fund 3.

The Role of Funding Agencies

Funding agencies can help

- a. Issuing specific calls for Research Software R&D
 - Focus is not on highly innovative ideas, but on
 - Making existing ideas available to a large number of scientists via robust, easy-to-use software.
- b. Valuing robust, sustainable software as a desirable outcome of research projects
 - Investing \$ on activities related to making the software robust and long-living

Two ideas for funding agencies

1. For funded projects that produce software as an output, consider providing an additional grant at the end of the project specifically to invest in sustainability.
 - a. Example: 3 year research project + 1 to 3 year extension
2. New FAPESP call (November/2022):
 - a. Projects can request up to 10% of the budget for making the software robust, reusable, well documented, thus sustainable.

Software Management Plan

Document describing how a project will manage the software it'll create.



SOFTWARE MANAGEMENT PLAN

1) Project information

Title:

Grant #:

Principal Investigator:

Researcher responsible for software management:

2) Software development team and its organization.

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3) Main software features to be developed.

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Practical guide to Software Management Plans



Funding needs

- Graduate students, undergraduate students
- Research Software Engineers
- Research Software Product Owners
- Community Management
- Small businesses specialized in
 - High-quality documentation
 - Automated Testing / Assessment / Quality assurance
- Training
 - Software Engineering for scientists
 - Research Software Engineering for Software Engineers

Multilateral, international call for Research Software Funding

Interested in joining the call? Let us know!

Help us distributing this survey in your country:

bit.ly/rs-funding-survey

Prof. Fabio Kon - kon@fapesp.br - twitter.com/FabioKon