

## **Breakout\_B-2: How can we/funding agencies better incentivize code authors to invest in code dissemination? How can we/funding agencies better incentivize data producers to invest in data sharing? How can the institute support modern software practices and sharing for CFD? What obstacles and disincentives in the community are prohibiting investigators from investing in open code and data sharing**

Issue: [https://github.com/CFDSI/Kickoff\\_Workshop/issues/#8](https://github.com/CFDSI/Kickoff_Workshop/issues/#8), 9, 27, 30

Related Issues:

Issue Statement:

Discussion topic:

Moderator: Charles Meneveau

Note taker: Matt Churchfield

Reporter: Matt Churchfield

Group Members:

- Bob Moser
- Charles Meneveau
- Federico Toschi
- Ellen Longmire
- Shawn Shadden
- Colin Towery
- Matt Churchfield
- Javier Jimenez

Please address these topics in your discussion (moderators please make sure that there is enough time to cover all three before the session ends).

1. Describe the problem:

- **Lack of resources:** It costs money to share/maintain shared code. Bob Moser:

His group developed software for Sandia National Laboratories, and Sandia wanted the software to be supported, so they paid for it. How do you do this more broadly? It takes significant extra effort to write software to be user-friendly and understandable for others, and to document it, which costs money.

- **Non-supportive culture:** There are not good mechanisms for recognizing and rewarding for sharing community-useful software. Lack of culture to support developing user-friendly, sustainable software and then citing that software when others use it.
- **Lack of training:** Lack of training for researchers and students in how to develop sustainable software (modern software practices).

## 2. What are potential solutions?

- **Incentives:**
  - **Publications:** Advances in Engineering Software (Elsevier), SoftwareX (Elsevier), ACM TOMS, JOSS are journals for publishing about software advances in engineering, and publishing here gives incentive to develop better code and share it.
  - **Supplemental funding:** If you are successful in creating open-source software/data that is demonstrated as useful to the community as part of your grant work, the funding agency could give supplemental funds to properly share and maintain software/data.
  - **Need for appreciation of technology transfer:** Often national labs have technology transfer offices who track development of community useful software, and that leads to recognition.
- **Cultural shift:**
  - In research funding proposals, **ask people to list open source software/data developed during previous grant work.**
  - There needs to be a culture change such that we **cite shared software.** We cite our referenced papers, but software is not treated the same, even though it should be.
  - There also needs to be a culture change so that when we develop data analysis software, **we ask for adequate time (money) up front to make the code user-friendly and sustainable, and spend time to do this. Hopefully this would snowball and less time would be spent later.**
- **Dedicated Help:**
  - Have an organized entity (like CFDSI) to **collect community-useful software** that comes out of research grants and **provide the creators with help in sharing/maintaining the software.**
  - More emphasis on **training in modern software practices.**

### 3. What can CFDSI do to help?

- CFDSI can:
  - **recommend that NSF start asking people to list open-source software/data** developed during previous grant work in proposals.
  - **provide courses/training** in modern software practices.
  - **collect community-useful software and provide creators with free help in sharing/maintaining software.**

### 4. Misc ideas so they don't get lost (e.g., Did you find new issues? If yes, create the issues on GitHub!):

- Does the requirement for reproducibility of results lead to development of better, more user-friendly codes?

### 5. Summary for report-back (Alternatively, just bold the key points above):