

NII Shonan Meeting Report

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Towards Engineering Free/Libre Open Source Software (FLOSS) Ecosystems for Impact and Sustainability

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1 Description of the Meeting

Free/libre open source ecosystems such as the Linux kernel, have had a tremendous impact on computing and society and have captured the attention of businesses, researchers, and policy makers. Millions of participants, from independent volunteers to those representing companies or government organizations, have created and maintain massive numbers of software projects, ranging from individual scratch space or classroom assignments, to critical infrastructure projects such as the Linux Kernel, OpenStack, Docker or Android.

The spectrum and scale of FLOSS has substantially expanded in recent years, as has its popularity. The combination of distributed version control and social media features have created “transparent” environments that facilitate the scaling up of the ecosystems to millions of repositories and developers [1]. Despite the substantial amount of research on FLOSS in disciplines such as software development, organizational science, management, and social sciences, it remains unclear how and why FLOSS ecosystems form, how they achieve their impact, or how they sustain themselves. The open nature of these communities and the associated vast collections of operational data represent a tantalizing possibility to discover the mechanisms by which such ecosystems form and operate. Achieving such understanding would inform approaches to structuring future open source communities, and could reveal ways to nudge the behavior of individuals and groups involved towards greater sustainability of FLOSS ecosystems.

Research on FLOSS phenomena has been ongoing for almost two decades. From an economic perspective, the most common topics involve motivation and organization: Why do the participants in FLOSS contribute without material compensation usually, and how do such apparently unstructured and distributed organizations survive and succeed? Early research focused on understanding the nature of FLOSS development practice and the reasons underpinning FLOSS success [2], the study of user innovation [3], and the motivation of participants [4, 5]. A great deal of effort has been devoted to investigating communities, e.g., the strategies and processes by which newcomers join [6].

The nature of group and ecosystem sustainability has also been investigated. For example, how a sustainable group evolves [7], how online communities should

encourage commitment [8], how successful FLOSS project participants progressively enroll a network of human and material allies to support their efforts [9], how the congruence of values between the individual and their organization affects turnover [10], and what impact the initial willingness and project environment have on newcomers' long term participation [11, 12].

As commercial participation in FLOSS has become common, the question of how to combine FLOSS practice with commercial practice has received more attention. For example, how the new phenomenon (OSS 2.0) is significantly different from its FLOSS antecedent is discussed in [13]. Borrowing FLOSS style project structure, many organizations are embracing a global sourcing strategy which has been termed opensourcing [14]. Successful hybrid projects have been studied to help understand how to improve upon existing software development practice. The motivation of commercial participation has also been extensively studied, see, *e.g.*, [15, 16, 17, 18]. Various business strategies have been identified and analyzed in, *e.g.*, [19, 20, 21, 22]. The study of the impact that commercial participation has on communities is also being studied currently [23, 24]. The FLOSS phenomenon has also served as a proof-of-concept which has led to interest in initiatives such as inner source [25] and crowdsourcing [26].

This proposed Shonan meeting will bring together a blend of established and young researchers involved in studying the FLOSS phenomenon from software engineering, human computer interaction, computer-supported cooperative work, data mining, cognitive science, psychology, operations research, organization management, and complex systems domains. Industry practitioners with experience in various FLOSS aspects will also be included. The participants will discuss fundamental questions that are related to the impact and sustainability of FLOSS ecosystems. More specifically, the meeting will have the following sessions:

1. How does an ecosystem form? How do different stakeholders work together to form a community that develop and maintain valuable and freely available software, and how does an ecosystem with millions of repositories and developers operate given the lack of centralized planning.
2. How is the ecosystem organized? How do the teams cooperate to resolve the issues (workflow), and what are the typical relationships between the code and the team.
3. How does the ecosystem evolve in response to the environment as technology and needs evolve over time?
4. What distinguishes ecosystems that sustain themselves from ecosystems that disappear? How can an ecosystem be sustained? Under what circumstances should it be sustained?
5. How do the newcomers learn the protocols and practices of an ecosystem? How would they sustain the ecosystem? What is the relationship between people sustainability and ecosystem sustainability?
6. What kinds of research methods might be utilized (*e.g.*, what qualitative and quantitative methods) to achieve research goals?

2 The program of the meeting

The program of the meeting (shown in Figure 1) included five mini-workshops each focused on a separate aspect of FLOSS ecosystems.

	Day 0 Jun 25	Day 1 Jun 26	Day 2 Jun 27	Day 3 Jun 28	Day 4 Jun 29
0700		Breakfast	Breakfast	Breakfast	Breakfast
0730					
0800					
0830			Opening Day 2	Opening Day 3	Opening Day 4
0900		Introduction to Shonan Workshop	Workshop 3: Data and Measurement (Barbara Russo/Georgios Gousos)	Workshop 5: Leveraging the FLOSS Ecosystem (Brian Fitzgerald/Klaas-Jan Stol)	Workshop 8: Book Planning
0930		Schedule overview			
1000		Participant Introductions			
1030		Break	Break	Break	Break
1100		Participant Introductions cont'd	Workshop 4: Sustainability and Scalability (Minghui Zhou/Nicolas Jullien)	Workshop 6: Emerging Topics	Workshop 9: Summary & Workshop Close
1130					
1200		Lunch	Lunch	Lunch	Lunch
1230					
1300		Workshop 1: Coordination in FLOSS Ecosystems (James Herbsleb/Danese Cooper)	Excursion 1	Workshop 7: Putting it all together	Excursion 2
1330					
1400					
1430					
1500	Check in				
1530		Break		Break	
1600		Workshop 2: Governance in FLOSS Ecosystems (Dirk Riehle/Matti Rossi)			
1630					
1700		Summary of Day 1		Summary of Day 2	
1730		End of Day 1		End of Day 2	
1800		Dinner		Dinner	
1830			Main banquet		
1900	Welcome Banquet				
1930		Free time		Free time	

Figure 1: Seminar schedule

2.1 Coordination in FLOSS Ecosystems

The mini-workshop was led by Danese Cooper and James Herbsleb. The presentations introducing the topic were followed by four breakout sessions:

- Empirical studies (census) of Opensource Coordination
- Theory of coordination
- Measures of sustainability
- Inclusion in FLOSS ecosystems

2.2 Governance in FLOSS Ecosystems

The mini-workshop was led by Dirk Riehle and Matti Rossi. The presentations introducing the topic was followed by a discussion.

2.3 Data and Measurement

The mini-workshop was led by Barbara Russo, Georgios Gausios, and Mei Nagappan. The presentations introducing the topic were followed by two breakout sessions:

- Types of data in Software Ecosystems
- Data quality

2.4 Sustainability and Scalability

The mini-workshop was led by Minghui Zhou and Nicholas Julian. The presentations introducing the topic were followed by two breakout sessions:

- Scalability
- Sustainability

2.5 Leveraging the FLOSS Ecosystem: InnerSource, Open Source, and Crowd Source

The mini-workshop was led by Brian Fitzgerald and Klaas-Jan Stol. The presentations introducing the topic was followed by a discussion.

The mini-workshops were followed by the effort to organize the findings into a book.

3 Key outcomes

The outcomes of the meeting include the following:

- a The meeting has framed the most critical research questions related to FLOSS ecosystem sustainability and impact.
- b The meeting has brought together an exciting combination of established and upcoming researchers and practitioners to define most important agenda in FLOSS sustainability.
- c The meeting determined the most relevant theoretical frameworks and methodological approaches to achieve research goals.
- d The meeting has made substantial progress towards identifying actions that would help sustain FLOSS ecosystems and reduce risks to the critical FLOSS infrastructure.

4 Cultural program

In addition to the technical program, research issues were discussed during a rich cultural program conducted throughout the meeting. In particular, two excursions to temples (see Figure 2) in Kamakura were augmented with a walk to Tateishi Park on the coast (see Figure 3) and a very intense table tennis tournament with the results shown in Figure 4.

5 The artwork for the workshop

Barbara Russo has kindly provided us with exquisite artwork on our Japanese paper memento to be hung at Shonan Village Center (see Figure 5)

6 List of Participants

First Name	Last Name	Affiliation	Country	Background	Email
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Figure 2: Great Buddha



Figure 3: Walk to the beach

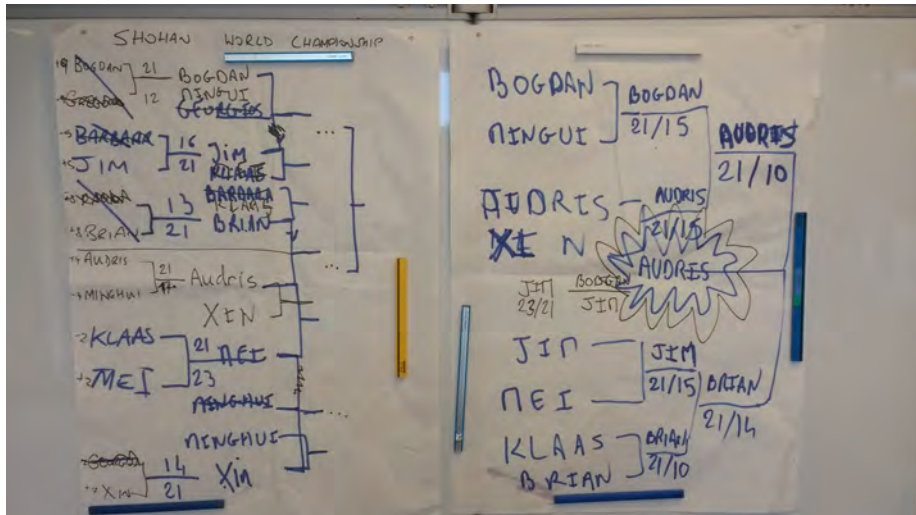


Figure 4: Table tennis tournament

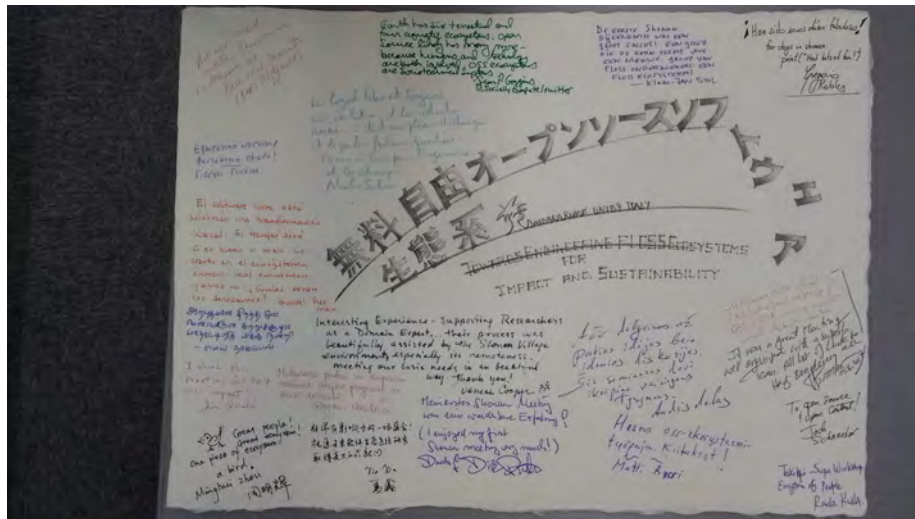


Figure 5: Artwork and signatures