

# SWORDS: A framework for the Scan and review of Open Research Data and Software

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## Software

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## Summary

SWORDS (Scan and review of Open Research Data and Software) is a framework designed to provide insights into an organization's, as well as their members open-source activities, through a structured approach. The framework focuses on organizations within the research domain by taking academic publishing principles into account. A big challenge for such a framework lies in the decentralization of open-source activities. It is divided into three core stages that can be executed independently:

1. Finding GitHub user profiles associated with an organization.

### Phase 1: Finding GitHub user profiles associated with an organization

Gather GitHub user profiles from data sources

Merge users to CSV file

Enrich users with GitHub data

Prepare filtering

Filter users

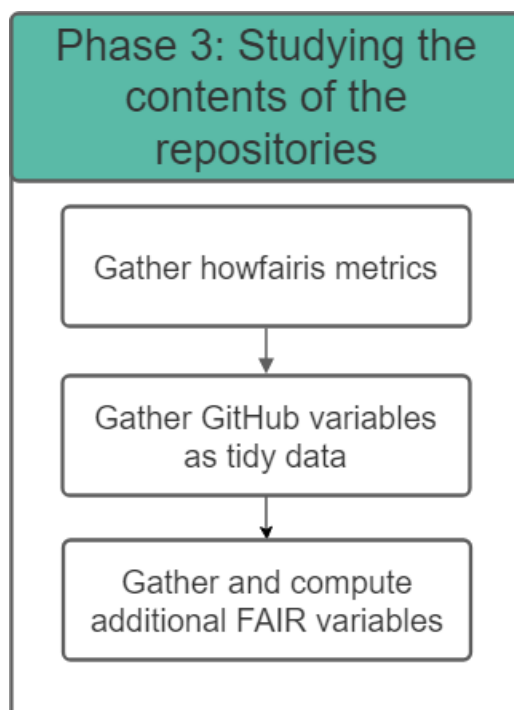
### 2. Extracting relevant repositories.

### Phase 2: Extracting relevant repositories

Retrieve repositories of filtered users

Filter repositories

### 3. Studying the contents of the repositories. Content evaluation includes aspects of quality assessment, documentation availability, and FAIRness (Wilkinson et al., 2016) scores (Spaaks et al., 2022) (Findability, Accessibility, Interoperability, and Reusability).



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21 To illustrate, an organization that already has collected the GitHub user profiles does not  
22 need to execute phase 1. An organization that is only interested in collecting the GitHub  
23 user profiles does not need to execute the following phases. An organization that has already  
24 collected relevant repositories does not need to execute phases 1 and 2.

25 In the past, research organizations had insufficient tooling for the analysis of research output  
26 like software and data. Over the years, many initiatives were introduced and especially the  
27 introduction of the FAIR principles contributed to an improvement of available tools (Barker  
28 et al., 2022). This enabled us to have a better understanding of the publication principles for  
29 transparent and reproducible publication of data and software that is also quantifiable through  
30 monitoring and evaluation. These insights can be useful as described in the statement of need.

31 Written in Python, SWORDS provides a template for easy implementation within any organi-  
32 zation and focuses on GitHub, which is the go-to reference for mining open-source repositories  
33 (Cosentino et al., 2017). It is designed to be extensible and flexible, which allows to evaluate  
34 repositories on custom-defined metrics and collect users according to different strategies. The  
35 framework was applied to Utrecht University as part of a research project (Quach, 2022). The  
36 results of the aforementioned research project were presented at a conference (Quach et al.,  
37 2023). Ongoing research projects are currently being conducted at the University of Potsdam.  
38 There are also related open source program office (OSPO) tools, which do not fit the academic  
39 use-case yet.

## 40 Statement of need

41 Open Science, promoting transparency in academic publications, data, software, and other  
42 types of output, is crucial for enhancing scientific and societal impact in today's research  
43 climate. The application of Open Science principles to research data and software is vital for  
44 ensuring scientific integrity and reproducibility, which can sometimes be lackluster (Allison et  
45 al., 2016). However, substantial challenges persist in tracking, managing, and understanding  
46 open-source research software due to the scattered and fragmented nature of these activities  
47 across multiple platforms (Lamprecht et al., 2020).

48 The SWORDS framework addresses this need by providing a systematic approach to collating,

analyzing, and understanding an organization's open-source research software. The insights gained from implementing SWORDS can help organizations connect initiatives, improve quality, reward and recognize contributions, and foster a collaborative and open research environment. Thus, SWORDS presents an invaluable tool for any research organization aiming to improve and better understand its open-source activities and drive forward Open Science.

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