

# Skills for dealing with research software as an element of open science

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Software plays a crucial role in the research lifecycle. Moreover, software is, alongside text and data, an essential element of open science. In this sense, the FAIR (findable, accessible, interoperable, and reusable) principles apply not only to data but also to research software. In conjunction with text and data, making research software FAIR contributes to making research output comprehensible, verifiable, reproducible, and reusable.

The process of making research software FAIR involves many aspects ranging from software development issues and documentation to legal aspects like licensing. The skills of all those involved play a major role here.

Developing, expanding and contextualising skills for dealing with research software is an important contribution to increase awareness for the importance of software in the research process and to establish research software as an element of open science.

**Developing** IT skills in higher education is important across disciplines. For qualification works (Bachelor, Master, PhD thesis) where research software development plays a role, integrating expertise from scientific disciplines and the field of computer science need to go hand in hand. Moreover, cooperation between higher education bodies, such as between universities and research institutions, makes education paths more interoperable. Especially for researchers who develop software as part of their research activity but have no IT background, providing introductory courses to software development and dealing with research software throughout the research life cycle is an important starting point. Formats include, for instance, seminars, workshops, phd schools as well as online courses.

**Expanding** skills concerns both expert scientists in order to deepen their knowledge about dealing with research software and IT specialists in order to master the state-of-the-art techniques and tools as well as to gain a better understanding of discipline specific knowledge. Formats include workshops, hacky hours, hackathons and software carpentry.

**Contextualising** the skills by means of a technical and human infrastructure is vital. By providing a technical infrastructure to (collaboratively) develop, test, review, publish and archive research software, research institutions and universities can create an environment that encourages researchers to apply FAIR principles to research software. By fostering professional networks and communities of practice the formal acquisition of skills is complemented by a practice-based exchange of knowledge and experiences. Finally, providing career opportunities that take the multifaceted skills needed for dealing with research software into account are a means to increase incentives and rewards for efforts put into dealing with research software.

In this presentation we want to discuss approaches that can foster open science with a focus on skills for dealing with research software. We want to provide general arguments and give specific examples from initiatives in the Helmholtz Association in Germany.

## Type of abstract

Presentation

## Summary

This presentation focuses on skills for dealing with research software as an element of open science.

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