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# Appropriation Infrastructures for Research Communities of Practice

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**Abstract**

Researchers in the social sciences and humanities utilize a multitude of specialized tools in their everyday research practice. These niche research tools face challenges in their uptake and sustainability. We propose to support communities of practice around diverse sets of research tools with infrastructures for appropriation support. In our vision, a central knowledge exchange hub about tool usages embedded in a social network of researchers supports continuous learning and collaborative appropriation of new and old research tools and processes. With this approach, we seek to support the dynamic and flexible assemblage of heterogeneous sets of tools by researchers rather than the tools' tight integration into standardized e-infrastructures.

**Author Keywords**

e-infrastructures, social sciences and humanities, infrastructures for appropriation support.

**ACM Classification Keywords**

H.5.3. [Information Interfaces and Presentation]: Group and Organization Interfaces—Computer-Supported Cooperative Work.

## Introduction

We witness an increasing use and development of research software in the social sciences and humanities. Computational social sciences, digital humanities, media studies, and others are fields where advances in bespoke research software play a central role. Bespoke software tools are developed for a particular purpose, often located in a specific research project, helping to answer a specific set of research questions.

Few of these bespoke tools are used beyond the projects for which they were developed or by more than one research team. This has reasons on at least two fronts. Tool developers—i.e., disciplinary researchers or, in the best case, scientific programmers—face challenges in adapting tools for different purposes, in hosting and scaling backend infrastructures, in supporting potential users, and in maintaining tools and infrastructures over time. These challenges lie outside their core interests and expertise.

Tool users, on the other hand, have limited access to resources for them to appropriate novel tools for their purposes. Research software often exhibits high complexity, limited usability, a steep learning curve, and lack of documentation and support. In researchers' daily practices, a number of tools may need to be combined or used in parallel in order to achieve desired outcomes. Structures for the sustainability of research software and questions around collaborative appropriation of tools have been recognized as central concerns in e-research (e.g., [1, 2, 13]).

In order to help research tools that gained initial traction to spread to new domains, projects, and

research teams, we propose an infrastructuring approach that focuses on fostering communities of practice around digital research tools and platforms [3, 4, 12]. Research communities of practice (R-CoPs) may deal with a coherent set of problems or questions, a shared field or application domain, similar methods, and/or similar types of data. They may consequently employ or benefit from employing some of the same tools.

We propose to infrastructure R-CoPs by means of supporting collaborative appropriation among users and with developers in the form of communication, demonstration, and negotiation facilities that allow researchers to share knowledge about tool usage [11, 13]. We envision to develop appropriation infrastructures that (1) go beyond individual tools, taking the dynamic assemblages of tools in everyday research practice into account; and (2) put the user/researcher with expertise around specialized tool usage in the center, recognizing the need for further communication beyond the sharing of appropriations in order for knowledge exchange to be effective and sustainable.

We position our strategy of a loosely coupled central knowledge exchange hub about tool usage as supplementary to efforts of standardizing and integrating tools into larger tool suites, platforms, or e-infrastructures (see also [9, 10]). We believe that fostering exchange within communities of users *and* developers supports the community in growing and sustaining research software over time.

### **State of the Art: E-infrastructures and Appropriation Support**

With a focus on appropriation support, we want to add to current cyber- and e-infrastructure research, pushing it into new directions when attending to the practices of scholars in the social sciences and humanities. We observe that much of recent research aims to align and standardize the collaborative practices that make up everyday work in large, distributed, inter-disciplinary research collaborations (e.g., [7, 8]). Efforts of standardization are accompanied by strategies to pool resources, integrating a multitude of tools for data storage, computation, and communication into shared, centralized e-infrastructures.

Appropriation support, instead, assumes dynamic and flexible assemblages of tools and processes that researchers employ in practice to achieve desired outcomes [11]. Appropriation as a collective activity focuses on learning in CoPs. Supporting appropriation means enabling conversations about usages among users and with developers, providing channels for communication and giving users a vocabulary to talk [11, 13].

Previous research has, e.g., integrated community help, feedback, and communication facilities into individual tools and platforms such as shared workspaces and software development ecosystems [6, 13, 14]. Following this research trend, major software companies have introduced feedback systems, crash reporting, and other communication channels into their commercial products (including Microsoft Office, Apple Mac OS, Google Android, etc.).

Yet, for the heterogeneous and dynamic tool use of researchers in the social sciences and humanities, integrating appropriation support into individual tools is not enough. Many researchers employ a multitude of standard and specialized tools that may further need to be used together within a single research workflow. While tight integration into individual tools is desirable [13], these types of usages require communication channels for appropriation that span a set of tools or are tool-independent. They demand an infrastructure for appropriation support that loosely ties arbitrary tools and processes together.

### **Infrastructure for Appropriation Support**

We argue for providing appropriation infrastructures to enable researchers in a CoP to share knowledge, skills, and experience about tool usages. We hypothesize that these CoPs likely cut across individual research fields. While they may answer to slightly different (disciplinary) research questions, R-CoPs exhibit similarities in the types of data being generated and/or analyzed (e.g., social media research, text research, qualitative research, design research, ...). Hence, they exhibit similarities in the tools they utilize. That is, researchers in a CoP have expertise in a set of related tools, data, and processes that they may benefit from sharing with others.

With appropriation infrastructures, then, we refer to technical platforms that “provide[] communication and collaboration support to stimulate knowledge sharing among users and between users and developers” ([13]: 50). Infrastructures for appropriation are the kind of support structures that enable exchange about tool use, providing a language to talk and rich facilities for

sharing. For collaborative research, they need to reach beyond individual tools (cf. [11]).

Three principles guide our conceptualization of appropriation infrastructures for R-CoPs in the social sciences and humanities: a knowledge exchange hub/assemblage support, actor-centricity, and multi-modal sharing facilities.

*Knowledge exchange hub, assemblage support*

First, we suggest a shift from tight integrations into individual tools toward a more loosely connected knowledge exchange hub that allows researchers to bring together knowledge and experience about assemblages of different tools and processes. In a heterogeneous and dynamic tool landscape, this allows researchers to collaboratively identify best practices, common usages, and imaginative workarounds in assembling the tools for specific purposes at hand.

The infrastructure should facilitate the rich sharing of appropriations (see below), but also feed together researchers' existing venues for sharing appropriations, integrating sources of knowledge and discourses on tools and processes that already take place elsewhere (e.g., on blogs, video platforms, tutorial websites, Q&A sites, in method papers/chapters and presentations, etc.). On top of this, facilities for communication and collaboration about appropriations are required to facilitate collective learning.

*Actor-centricity*

Second, we suggest to put the actor, the individual researchers in the center—much like on a social network platform, with a (dynamic) user profile and an activity stream/timeline of appropriations. We suggest

that the sharing of individual appropriations should not stand alone, but only gives meaning and provides insight when seen together with other (related) appropriations by the same user. We further suggest that shared appropriations in itself are not enough, but that further dialogue and conversations should take place that take the sharing of appropriations as starting point. The individual researcher possesses further expertise than what is shared and may benefit from discussing and negotiating alternative usages brought forward by others.

*Multi-modal sharing facilities*

Third, we consider that an appropriation infrastructure requires rich and multi-modal facilities for recording, annotating, and sharing appropriations across tools. We consider, in particular, facilities to create annotated screenshots and screencasts, tutorials (video, image, text, and otherwise), structure and workflow diagrams, automated scripts, etc. (see, e.g., [5]). Such facilities are preferably integrated into operating systems or the platform of choice so as to be low effort to administer and share.

**Conclusion**

With our proposal for infrastructures for appropriation support in R-CoPs, we suggest a shift from e-infrastructures *for* collaborative research practices to infrastructures *about* collaborative research practices. And with an infrastructuring approach, rather than focusing on interoperability and integration of tools and processes, we focus on capacity building, supporting researchers in identifying and improving the tools and processes they need. We foster learning and continuous appropriation of heterogeneous, tool-related practices toward a collaborative production of common usages,

best practices, and the discovery of new tools and processes, usages and techniques. Developers and maintainers of tools and platforms will also benefit from the knowledge and conversations about real-world usages and the problems faced within R-CoPs.

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