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Toward Open Governance in Research Software for Communication and Media Research: Principles, Dimensions, and Practices

Florian Hohmann, Andreas Hepp, and Karsten D. Wolf

Centre for Media, Communication and Information Research (ZeMKI), University of Bremen, Germany

Correspondence: Florian Hohmann (fhohmann@uni-bremen.de)

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Abstract

In recent years, communication and media studies have increasingly emphasized the need for open, transparent, and sustainable research infrastructures. Despite numerous calls for a cultural shift toward open science, the field continues to rely heavily on commercial and closed software environments that limit collaboration, reproducibility, and methodological innovation. This article responds to these challenges by examining two interconnected initiatives—MeTag/MeSort and OpenQDA—as examples of open, co-created research software developed at the University of Bremen. Building on the theoretical framing of research software as sociotechnical infrastructure, we introduce *open governance* as a conceptual framework for the sustainable management of research software. We argue that open governance is not merely a licensing issue but also a collaborative process of negotiating values, responsibilities, and practices among diverse stakeholders. Drawing insights from both case studies, we develop a conceptual model of open governance for research software that highlights the need for hybrid arrangements combining community-driven openness with structured coordination. In conclusion, we argue that such governance-oriented approaches represent a promising path toward sustainable, reusable, and equitable infrastructures for communication and media research.

Keywords

CAQDAS; co-creation; governance; open science; qualitative data analysis; research infrastructure; research software

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1. Introduction: Open and Sustainable Research Infrastructures in Communication and Media Research

Scholars and initiatives in communication and media research have repeatedly called for a cultural shift toward more open, reproducible, and replicable research practices (Bowman & Spence, 2020; Dienlin et al., 2021; Haim & Puschmann, 2023). At the heart of these appeals lies a recognition that open science is not only about making publications freely available but also about providing shared access to the infrastructures, e.g., software tools, datasets, archives, and analytical resources, that underpin the research process itself. Yet opportunities to share in-depth information about and experiences with such infrastructures remain limited. Relevant knowledge is typically confined to brief methodological references, scattered online documentation, and informal exchanges among colleagues.

A growing but still modest number of journals have begun to offer dedicated space for presenting or evaluating research tools, datasets, and other resources (e.g., Araujo et al., 2022; Haim et al., 2023; Musi et al., 2024; Ohme, 2023; Schoch & Chan, 2023; Shaw et al., 2021; Strippel et al., 2023). However, these contributions often remain at the level of software reviews or technical descriptions, with less attention paid to the social and organizational processes that shape how open research software is developed, maintained, and governed. This gap matters because, as we argue, the sustainability and impact of open infrastructures depend as much on their social organization as on their technical features.

The present article contributes to this emerging discourse by examining two interconnected open-source software initiatives developed at the Centre for Media, Communication and Information Research (ZeMKI), University of Bremen: MeTag/MeSort (https://mesoftware.org), a suite of tools for cross-media research comprising a mobile media diary application and a browser-based sorting environment, and OpenQDA (https://www.openqda.org), a web-based platform for collaborative qualitative data analysis. While these projects differ in scope and target audience, they share fundamental principles: participatory design through co-creation, open-source development, and a commitment to community-based sustainability.

Our central argument is that the successful development and long-term viability of open research software require an explicit commitment to *open governance*, which we understand as a formalized framework that mediates between stakeholder interests, ensures strategic coherence, and fosters accountability without undermining the openness that defines these projects. Within this overarching governance framework, we conceptualize *open cooperation* as the concrete, collaborative practice of integrating open science principles with co-creation methodologies. Rather than treating software development as a purely technical endeavor, open governance foregrounds the collaborative negotiation of values, responsibilities, and practices among diverse stakeholders, including researchers, developers, students, and research participants.

We develop this argument across seven sections, moving from theoretical background (Section 2) and methodological approach (Section 3) through two case studies, MeTag/MeSort (Section 4) and OpenQDA (Section 5), to the synthesis of governance patterns (Section 6) and the conclusion (Section 7).

2. Theoretical and Conceptual Background

2.1. Research Software as Sociotechnical Infrastructure

Research software in communication and media studies has evolved from a set of discrete, specialized tools into what can more accurately be described as sociotechnical infrastructure (Hepp et al., 2021, 2023). This shift is consequential: Whereas tools are instrumental means to an end, infrastructure implies complex assemblages of technical artifacts, human practices, institutional arrangements, and governance structures that together shape what can be researched, how, and by whom.

This understanding of research software as infrastructure draws on a rich tradition of infrastructure studies that has become increasingly relevant to communication and media research (Parks & Starosielski, 2015; Plantin & Punathambekar, 2019). A foundational contribution is Star's (1999) ethnography of infrastructure, in which she argues for a relational understanding: What constitutes infrastructure for one actor may be the very object of work for another. The classic example is a railway system: infrastructure for travelers, but the primary work object for those who build and maintain the tracks (Star & Ruhleder, 1994). In the context of research software for communication and media studies, this relational perspective reveals a characteristic dual role: Researchers who develop tools for studying digital communication are simultaneously infrastructure users and infrastructure workers (Hepp et al., 2023). They are, metaphorically speaking, both travelers and track builders at once, a situation arising because the computational turn (Berry, 2011) has coupled infrastructure work far more tightly with the research process than before.

This dual role is not inherently problematic; it enables a close coupling of software development with the specific needs of the discipline. However, it also creates what Star (1999) and Star and Strauss (1999) have described as invisible work: The labor invested in building and maintaining research infrastructure often remains hidden behind the research outputs it enables. This invisibility has consequences not only for the recognition and reward of infrastructure work (Hepp et al., 2021) but also for the reflexive scrutiny of how research tools shape the research process itself. What van Es et al. (2021) call tool criticism—systematic reflection on the affordances and constraints of computational research tools—demands that the invisible work inscribed in research software be made visible and open to scrutiny. In this vein, Haim (2021) has articulated nine quality criteria for research software in communication and media studies, arguing that such software should be accessible, connectable, comprehensible, traceable, autonomous, structured, verified, circumspect, and usable. These criteria extend beyond technical specifications to community engagement, documentation quality, and long-term sustainability. As Rieder et al. (2022) have observed, tool authorship is always bound to a network of actors and materialities; the sovereign, unrestrained creator is a fiction. This relational character of software development points toward the need for organized, transparent processes of collaboration and decision-making.

In the domain of qualitative data analysis, the sociotechnical character of research software is particularly evident. The field currently resembles quantitative data analysis in the early 2000s, when proprietary products such as SPSS and STATA dominated the market (Kuckartz & Rädiker, 2020). Today, commercial CAQDAS (computer-assisted qualitative data analysis software) products—notably MAXQDA, NVivo, ATLAS.ti, Dedoose, and f4analyse—require substantial licensing fees and operate with proprietary data formats that create data silos, making cross-team collaboration and long-term data reuse difficult (Evers

et al., 2020). Although the REFI (Rotterdam Exchange Format Initiative) standard was developed in 2016 to facilitate data exchange, switching between CAQDAS products remains difficult and fraught with data loss. A recent systematic review of 28 CAQDAS tools confirms this picture: Nearly half operate under proprietary licenses, only a minority support real-time collaboration, and interoperability via the REFI standard remains incomplete and loss-prone (Küster & Wolf, 2025).

Existing open-source alternatives—including TAMS, QCoder, RQDA, CATMA, QualCoder, and Taguette—typically offer reduced functionality, lack support for the REFI standard, and depend on individual developers or very small teams without broader community involvement. As Kuckartz and Rädiker (2020) have summarized, open-source software in the true sense of a development project carried by many, with openly available source code, does not yet exist in qualitative data analysis.

2.2. Open Governance: Conceptual Foundations of the Framework

To address these infrastructural challenges, we propose *open governance* as the central conceptual framework for the sustainable development of research software. In the broader open-source software ecosystem, open governance has emerged as a distinct concept, clearly separated from mere open-source licensing: While open-source refers to the accessibility of the code, open governance refers to the institutional structures, rules, and processes that determine how decisions are made, how authority is distributed, and how communities are managed (O'Mahony & Ferraro, 2007; Schneider et al., 2021).

As Dolan (2015) notes in the context of the Node.js Foundation, successful open governance relies on key features such as open participation, transparent technical decision-making, and open design. Empirically, the transition from founder-led projects to formalized community governance, often documented in standardized artifacts like a GOVERNANCE.md file, is crucial for scaling projects, retaining contributors, and ensuring long-term resilience (Oliveira et al., 2025). In scholarly communication, this aligns closely with the Principles of Open Scholarly Infrastructure (Bilder et al., 2015), which establish governance as a foundational pillar. By adopting open governance as our guiding concept, we distinguish it from *open government* (which refers to state administrative transparency) and establish a clear analytical hierarchy: Open governance provides the overarching institutional order, while specific collaborative practices operate within this framework.

To operationalize open governance for research software, we propose four concrete dimensions that specify *what* is actually being governed. Rather than relying on abstract governance types, these dimensions (Strategic Direction, Development, Community Building, and Claims of Use) capture the practical regulatory needs of academic software projects (see Table 1).

Table 1. Dimensions of open governance framework for research software.

Dimension	Stakeholders	Description
Strategic Direction	Coordinators, Core Team	Regulates how collaboration is organized: setting strategic priorities, allocating resources, managing funding, and defining the project's long-term direction.
Development	Developers, Contributors	Regulates how the software is technically built: ensuring architectural integrity, code quality, security standards, and interoperability.
Community Building	Users, Contributors, Maintainers	Regulates how the community is managed: organizing communication channels, ensuring inclusive access, providing recognition, and resolving conflicts.
Claims of Use	Researchers, Participants, Domain Experts	Regulates who may use the artifact, under what conditions, and with what methodological or epistemic claims: addressing data sovereignty, methodological assumptions, and licensing.

2.3. Open Cooperation and Co-Creation as Practice

Within the institutional framework of open governance, we locate open cooperation as the concrete, day-to-day practice of collaborative software development. Open cooperation integrates two methodological traditions: open science and co-creation.

The open science dimension draws on well-established calls for transparency, reproducibility, and shared access to research materials (Bowman & Spence, 2020; Dienlin et al., 2021). In software development, this translates into commitments to open data formats, transparent documentation, and the provision of audit trails. Crucially, as Dutta et al. (2021) have emphasized, openness must also attend to structural inequalities, including language barriers and resource disparities between the Global North and Global South.

The co-creation dimension builds on participatory design traditions originating in Scandinavian workplace democracy movements (Ehn, 1988; Sanders & Stappers, 2008) and their adaptation for research software (Hepp et al., 2023; Hohmann, 2021). Co-creation refers to the systematic involvement of future users, researchers, students, and study participants in all phases of software design. As Hepp et al. (2023) have argued, this approach offers three key advantages: It aligns software development with existing research practices; it produces tools that remain close to the everyday practices of those being studied; and it builds a research community around the software that supports its long-term sustainability. The adoption of co-creation requires critical awareness. First, it must guard against a naive user orientation. As design justice scholars emphasize, participatory design risks reproducing structural inequalities if it ignores power dynamics (Costanza-Chock, 2020). Second, co-creation must resist the unreflective adoption of agile methodologies borrowed from commercial contexts, which can introduce regimes of micro-control that conflict with sustained, critical knowledge production (Voorberg et al., 2015).

In academic contexts, the software under development functions as a "boundary object" (Star, 2010), an artifact around which different stakeholder groups negotiate not only the technical architecture of the tool but also the social architecture of the research process. This dual negotiation is a defining characteristic of

co-creation in research software contexts (Hepp et al., 2023; Hohmann, 2021) and the practical foundation on which open governance structures must be built.

3. Methodological Grounding: Data Collection and Analytical Strategy

The empirical basis of this article spans three co-creation contexts conducted between 2018 and 2024 as part of an ongoing research software development program at ZeMKI, University of Bremen, which produced MeTag/MeSort and OpenQDA. Across these contexts, 10 workshops and group discussion sessions were conducted, involving three different user groups: established researchers as co-designers of MeTag and MeSort (Hohmann, 2021), study participants as end-users of the MeTag app, and students as co-creators of tutorial materials for OpenQDA. These structured co-creation activities are complemented by the development team's accumulated practitioner knowledge, drawn from over six years of iterative software development, ongoing project documentation, and reflexive engagement with the challenges of building and sustaining research software in an academic context, which Schön (2009) describes as the "reflection-in-action" characteristic of design-oriented practice. Each context produced a distinct type of empirical material, which, together with these broader developmental experiences, forms the data corpus for this analysis.

The first context comprises three co-creation workshops conducted with an international community of researchers between 2018 and 2019: a group discussion workshop at the ECREA annual conference (November 2, 2018, Lugano, $n = 12$), a community-focused presentation session at the ICA annual conference (May 25, 2019, Washington, DC), and a design-focused workshop at ZeMKI (August 5, 2019, Bremen, $n = 8$) combining think-aloud testing and creative prototyping tasks. All sessions were audio-recorded with participants' consent. These data are fully reported in Hohmann (2021) and inform the comparative framing of the present article.

The second context consists of two group discussion sessions held with study participants following a one-week media diary study conducted using the MeTag app (three participants per session, both held via Zoom). These sessions explored usability challenges and interface issues encountered during naturalistic app use.

The third context comprises five sessions conducted between May and July 2024 as part of the English-language practical seminar "Media Ethnography and Qualitative Data Analysis" at the University of Bremen. Three consecutive co-creation workshops (Workshop I: May 28; Workshop II: June 4; Workshop III: June 11, 2024; 90 minutes each) were held with six enrolled students, all audio-recorded and transcribed. The workshops produced collaborative mind maps (Workshop I), first-iteration paper prototypes of OpenQDA tutorial overlays (Workshop II), and revised second-iteration prototypes (Workshop III). Two additional feedback sessions extended these prototypes to other student cohorts: a Zoom session with master's students (June 14, 2024) and an in-person session with bachelor's students (July 2, 2024), both documented through post-session field notes.

Methodologically, this study follows a retrospective comparative case study design (Runeson & Höst, 2009) within the tradition of design science research (Hevner et al., 2004). A distinctive feature of all three contexts is the authors' dual role as researchers and members of the software development team. This insider position affords close access to development decisions but requires an explicit distinction between

empirical documentation and interpretive reflection on governance implications, maintained throughout the results section. The analysis draws on thematic synthesis (Thomas & Harden, 2008) across the heterogeneous corpus of transcripts, field notes, and workshop artifacts. The cases are presented chronologically: MeTag/MeSort (2018–2022) is examined first because it precedes OpenQDA and because its co-creation experiences and governance challenges directly informed the architectural and organizational choices of the subsequent project.

4. Case Study I: MeTag and MeSort

We begin with the MeSoftware suite, consisting of MeTag and MeSort (Belli et al., 2024, 2025a, 2025b). Developed to address specific methodological challenges in cross-media research, this project provided our initial experiences with co-creation and revealed critical governance challenges that shaped our subsequent work.

4.1. Origins and Objectives

MeTag and MeSort were developed at ZeMKI as part of a German Research Foundation (DFG)-funded project on sustainable research software for cross-media research (Hepp et al., 2023, 2025; Hohmann, 2021). Both evolved from pre-existing prototypes (MedTag and qResearch, respectively) to address specific methodological problems in communication studies: the need to capture complex, multimedia practices from both process-oriented and structural perspectives.

Traditional media diaries often suffer from recall bias and high participant burden, while standard survey tools cannot capture the situated nature of media use. MeTag addresses this by offering a mobile media diary application for research participants and a web-based backend (MeTag Analyze) for researchers, enabling the collection of longitudinal, in-situ data on media practices in everyday life. MeSort responds to the challenge of mapping complex media repertoires with a browser-based sorting application supporting circle sorting for media repertoire research (Hasebrink & Hepp, 2017), network mapping (Merten, 2020), and Q-methodology (Michelle & Davis, 2013). The objective was to provide flexible data collection formats that integrate seamlessly with analytical backends (Hohmann et al., 2022).

Both tools are openly accessible and released under the GNU Affero General Public License v3.0 (AGPL-3.0). All research data are stored exclusively on servers of the University of Bremen's own IT infrastructure (Zentrum für Netze [ZfN]), in compliance with GDPR; responsibility for data protection within individual studies rests with the respective researchers, who are advised to obtain separate informed consent from participants. Researchers outside the EU benefit from the same EU-standard protections, while those requiring full data sovereignty may self-host both tools, as the source code is openly available.

4.2. Core Design Principles

MeTag and MeSort are guided by three core design principles that reflect open cooperation commitments.

First, methodological flexibility: The tools are designed not to prescribe a single analytical framework but to support a range of sorting and diary-keeping methodologies, allowing researchers to adapt the software to

their theoretical and empirical needs. This flexibility speaks to Haim's (2021) criterion of connectivity, which in his account concerns orientation toward established norms and standards; here, we read it more broadly as compatibility across diverse research traditions.

Second, participant-centric design: Acknowledging that the quality of diary data depends on participant compliance, MeTag's mobile interfaces minimize friction in everyday life, balancing detailed data capture with low cognitive load. Applied here to research participants as a distinct user group, this extends Haim's (2021) framework beyond its original scope: Whereas his usability criterion centers on licensing, versioning, and maintainability, participant-centric design foregrounds end-user experience, a dimension not typically emphasized in research software development.

Third, integrated analysis pipelines: MeTag Analyze provides immediate visual feedback and basic analytical capabilities directly within the backend, reducing the need to export data for preliminary analysis. This design supports Haim's (2021) criteria for autonomy (self-contained processing) and structure (organized research workflow).

4.3. Co-Creation Practices and Governance Lessons

The development of MeTag and MeSort relied on two distinct levels of co-creation, revealing valuable governance lessons. On the level of *co-creation with researchers*, development followed the workshop-based approach described in Section 3. A foundational workshop at the ECREA annual conference in 2018 (Lugano, $n = 12$) established the project's community and development priorities through open group discussion with European scholars, demonstrating characteristic co-creation strengths: grounding priorities in concrete research needs, surfacing previously underemphasized considerations such as research ethics and data security, and establishing an engaged community of researchers who subsequently served as beta testers (Hohmann, 2021). A subsequent design workshop at ZeMKI in 2019 ($n = 8$) employed more structured methods like think-aloud testing and creative prototyping to refine both tools' user interfaces. Participants produced paper prototypes for sorting interfaces across different screen sizes, directly informing design decisions such as the option to divide sorting processes into distinct phases. These sessions also revealed the practical limits of co-creation: the difficulty of addressing multiple software products in single, time-constrained sessions, and of balancing the competing methodological needs of researchers from heterogeneous traditions.

A distinctive feature of the MeTag development was that it extended co-creation to the *research participants* themselves, i.e., those whose data are collected through the software. This second level of co-creation goes beyond the researcher community. Recognizing that MeTag must function autonomously in participants' everyday lives, the development team conducted a hybrid research-and-design project termed Projekt Elisabeth. Drawing on scenario-based design methods (Carroll, 2000; Rosson & Carroll, 2002) and the concept of user personas (Cooper, 2004), the team created a fictional early-career researcher persona, then recruited a diverse sample of participants to use MeTag for one week under naturalistic conditions. Subsequent workshop discussions with participants yielded insights into usability, trust, and onboarding barriers that standard usability testing would have missed, including inconsistent language switching between English and German interface elements, inflexible login procedures, and the tension between data security and user convenience. This approach produced what might be called a "living scenario" (Jarke & Maaß, 2018), moving beyond hypothetical persona-based reasoning to empirically grounded design insights.

These experiences demonstrated that while open co-creation generates vital insights, it also produces conflicting demands, for instance between researchers wanting richer data collection and participants wanting greater privacy and convenience. Resolving such conflicts requires more than goodwill: It requires formalized governance structures with explicit criteria for prioritization, transparent communication about which suggestions are incorporated, deferred, or declined, and principled mechanisms for mediating between stakeholder interests. This realization directly informed our second case study.

5. Case Study II: OpenQDA

Building on the lessons learned from MeTag and MeSort, OpenQDA was initiated with an explicit focus on scalable architecture and formalized governance from the outset.

5.1. Origins and Objectives

OpenQDA (Küster et al., 2026) was conceived in January 2023 at ZeMKI, University of Bremen, driven by the developers' own research needs for collaborative qualitative analysis, methodological flexibility, and a cost-free alternative to commercial CAQDAS tools. The development of OpenQDA responds to five converging challenges in the field: (a) the dominance of expensive commercial CAQDAS products with proprietary data formats; (b) the absence of genuinely community-driven open-source alternatives; (c) the increasing importance of collaborative analysis in qualitative research; (d) a growing methodological diversity that commercial software cannot adequately accommodate; and (e) the rapid development of AI technologies whose integration into commercial CAQDAS has thus far been opaque, uncritical, and often problematic with respect to data protection (Gao et al., 2024; Tai et al., 2024). The first version was tested with students during the winter semester 2023/2024, presented as a pre-release at the annual conference of the German Communication Association (DGPuK) in March 2024, and subsequently refined. Version 1.0 was released in January 2025. Beyond the University of Bremen, OpenQDA is now used or tested at more than 200 research institutions worldwide, including Hasselt University, Université de Fribourg, University of Connecticut, University of Liverpool, University of Nantes, Princeton University, Queensland University of Technology, and University of Texas. A close cooperation on use and further development exists with the Weizenbaum Institute in Berlin.

With respect to data governance, OpenQDA operates under a clearly defined institutional framework: The University of Bremen acts as the controller pursuant to Art. 4 No. 7 GDPR, with a designated data protection officer, and all data are stored exclusively on servers of the university's own IT infrastructure (ZfN) in Germany. No project data are transmitted to third-party servers; all connections are SSL-encrypted; and users retain full GDPR rights, including erasure and data portability. For researchers outside the EU, EU-based processing means research data benefit from GDPR protections regardless of national context, a higher standard than commercially hosted alternatives typically provide. As with MeSoftware (see above), researchers requiring full data sovereignty may alternatively deploy OpenQDA on their own institutional servers; the institution then assumes the role of controller. Data processing agreements for institutional use are available through the university's legal department on request.

Long-term operational sustainability is addressed through two complementary mechanisms. First, third-party funding is being pursued, including an application to the DFG. In parallel, ZeMKI is committed to

maintaining at least the university-hosted instance as part of its own research infrastructure, given the tool's integration into regular teaching and research practice. The AGPL-3.0 license additionally ensures that the software itself remains freely available and forkable by the community regardless of the original team's continued involvement.

5.2. Core Design Principles

OpenQDA is built around five interconnected design principles that together embody its open cooperative model.

First, web-based collaborative coding: As a browser-based application, OpenQDA aims to enable real-time collaborative work on documents, similar to Google Docs. Researchers can invite collaborators into their projects, share codebooks, conduct joint coding sessions, and maintain a detailed audit trail of all edits. This collaborative architecture addresses a fundamental limitation of existing commercial tools, where collaboration is typically restricted to version-based merging (as in MAXQDA) or parallel but uncoordinated coding (as in Dedoose). By preserving a record of every coding decision, this architecture directly serves Haim's (2021) criterion of traceability, which calls for a gapless, externally reconstructable account of the analytical process.

Second, a lean, process-oriented interface: OpenQDA is structured around the research workflow—project creation, data preparation, step-by-step coding, analysis, and visualization. It deliberately avoids the complexity and feature bloat that characterizes many established CAQDAS tools (O'Kane, 2020; Wolski, 2018). This streamlined design is particularly beneficial for novice users and students who are new to qualitative data analysis. In organizing the interface along the research workflow rather than around an exhaustive feature set, this principle extends Haim's (2021) criterion of comprehensibility, which he frames in terms of self-explanatory code and documentation, to the comprehensibility of the analytical interface.

Third, an open plug-in architecture: Following a microkernel pattern (Richards, 2022), OpenQDA provides extensible interfaces across the full data analysis pipeline—import, transformation, storage, preparation, coding (including AI-assisted coding), analysis, visualization, and distribution (e.g., data export or reporting). This modular design enables other research groups to independently develop and provide plug-ins, as demonstrated by the aTrain transcription plug-in developed at the University of Graz. Distributed contribution is regulated through documented contribution guidelines, a mandatory pull request and code review process conducted by the core team, and automated continuous integration workflows that enforce code quality standards, test coverage, and formatting conventions before any review is initiated. This governance structure ensures that external contributions meet the project's quality and security requirements without requiring the core team to manage every development process directly. In structuring the system into clearly delimited, independently maintainable modules, this architecture embodies Haim's (2021) criterion of structure, which calls for software to be modularized by task and organized by function.

Fourth, REFI standard compatibility: OpenQDA's database structure is natively based on the REFI standard, ensuring data compatibility with other CAQDAS products for both import and export of codebooks and data. This commitment to interoperability stands in contrast to commercial products where, despite nominal support for REFI, practical data exchange remains difficult (Evers et al., 2020). Building natively on a shared exchange standard fulfills Haim's (2021) criterion of connectivity.

Fifth, transparent and privacy-compliant AI integration: Unlike commercial products that integrate AI capabilities in opaque and often data-protection-problematic ways, OpenQDA aims to provide transparent, traceable, and GDPR-compliant AI support through open-source large language models (e.g., from the LLaMA family) that can be hosted on local or institutional servers. This design choice enables systematic evaluation of AI-assisted coding through controlled repetition, comparison with human codings, and the documentation of AI usage through audit logging. A recent systematic review of the CAQDAS landscape underscores the urgency of this approach: Among 28 reviewed tools with AI integration, none disclosed or allowed modification of system prompts, and no proprietary vendor permitted AI analysis to be conducted on-premise (Küster & Wolf, 2025). This opacity is particularly problematic given that AI-generated codings require systematic validation, which demands direct control over model parameters, prompt design, and data processing locations. By keeping model parameters, prompt design, and data processing under local or institutional control, this principle reflects Haim's (2021) criterion of circumspection, which foregrounds security, research ethics, and the protection of personal data; the accompanying audit logging of AI usage further supports the criterion of traceability.

5.3. Co-Creation and Emerging Governance Needs

With OpenQDA, co-creation was extended to another stakeholder group: students. The five sessions described in Section 3 engaged students as active co-creators of tutorial and learning materials, following an iterative design process of collaborative mind-mapping, paper prototyping of tutorial overlays, and peer critique. The sessions revealed that students preferred flexible, modular learning resources over static tutorials, emphasized the importance of realistic example datasets and multilingual support, and repeatedly incorporated the software's owl mascot, Qudi, as a pedagogical guide. Co-creation with students thus serves a dual function: It produces better-adapted onboarding materials informed by novice users' actual needs (Bovill, 2020; Cook-Sather, 2020), while also building long-term community sustainability by introducing students to open-source research tools early in their academic careers.

These experiences confirmed and deepened the governance lessons of the MeTag/MeSort project, while introducing challenges specific to OpenQDA's larger scale and broader ambition. Where MeTag/MeSort revealed the need for governance structures to resolve conflicts between stakeholder groups, OpenQDA's development surfaced additional tensions. The rapid accumulation of community feature requests (generated precisely *because* co-creation was working) created pressure toward feature bloat and scope creep, requiring explicit prioritization criteria and a publicly documented development roadmap. The openness of the plug-in architecture, while enabling distributed contribution, raises new questions about quality assurance and architectural coherence that cannot be resolved through informal coordination alone. And the software's integration into teaching at the University of Bremen introduced a responsibility for long-term stability that sits in tension with the experimental agility that early-stage open-source development typically requires.

Taken together, the two case studies demonstrate that co-creation and open-source licensing are necessary but not sufficient conditions for sustainable research software. We now turn to the formalization of governance structures capable of managing these tensions.

6. Formalizing Open Governance: Empirical Patterns

6.1. Synthesizing Insights From the Presented Cases

The experiences of OpenQDA and MeTag/MeSort, while differing in scope, audience, and developmental stage, converge on several key insights about the conditions under which open cooperation can succeed.

First, both cases demonstrate that co-creation with multiple stakeholder groups—established researchers, research participants, and students—produces qualitatively different kinds of input. Researchers contribute methodological expertise and concrete use cases; participants reveal real-world integration challenges that neither researchers nor developers can fully anticipate; and students offer fresh perspectives on usability, onboarding, and pedagogical design. These contributions constitute different epistemic registers that together strengthen both the software and the community around it.

Second, openness alone is insufficient for sustainability. Open-source licensing, publicly available code repositories, and transparent documentation are necessary but not sufficient conditions. What is additionally required are governance structures capable of managing the inherent tensions of collaborative development: between inclusivity and strategic focus, between distributed contribution and quality assurance, and between flexibility and coherence. These tensions surfaced clearly in the MeTag/MeSort project and are actively addressed in OpenQDA's governance design.

6.2. Dimensions of Open Governance

Building on the conceptual framework introduced in Section 2.2 and the empirical insights from both cases, we now introduce a Derived Patterns column to Table 1 (and remove Stakeholders and Description), transforming it into the full governance framework presented in Table 2.

Strategic Direction concerns the mechanisms through which development priorities are set, resources are allocated, and long-term direction is determined. In our cases, strategic direction governance operates through project leadership providing strategic continuity, structured co-creation workshops providing community input, and public roadmaps on GitHub providing transparency. The central governance pattern is *managing adaptability versus stability*: The software must remain responsive to community needs without succumbing to feature bloat or the regime of micro-control that Voorberg et al. (2015) identify as a hazard of unreflective agile adaptation in non-commercial contexts. This requires explicit prioritization criteria and transparent communication about which community requests are incorporated, deferred, or declined, practices OpenQDA has addressed through structured roadmap documentation.

Development addresses how the software is technically built, ensuring architectural integrity, security, and interoperability. The central governance pattern is *modular decoupling*: For OpenQDA, the plug-in architecture and standardized interface protocols enable external research groups to contribute independently without compromising core system reliability. This pattern is a direct empirical lesson from MeTag/MeSort, where the absence of such structures created coordination bottlenecks. Development governance also explicitly addresses quality criteria from Haim (2021): traceability through audit logging, verifiability through open-source code and code review, automated continuous integration testing, and connectivity through REFI standard compliance.

Community Building refers to how relationships among developers, users, and other stakeholders (like students) are organized and maintained. The central governance pattern is *active inclusivity management*: both projects demonstrate that community governance requires sustained effort beyond merely hosting code on public platforms. It demands deliberately addressing structural inequalities (Costanza-Chock, 2020), ensuring that researchers from diverse backgrounds can meaningfully participate rather than merely consume. Engaging students as co-creators in OpenQDA is a concrete pattern for building future maintainer communities, introducing researchers to open-source tools early in their careers. The transition from passive code availability to active community building is particularly consequential for the goal of global equity in research infrastructure. It must be acknowledged, however, that the co-creation processes reported here do not meet this standard. While workshops involved participants diverse in age, career stage, and gender, geographic diversity remained limited to European contexts, with no deliberate efforts to involve researchers from the Global South or Eastern Europe in the design and development of either tool. The current international user base of OpenQDA, which includes institutions in Africa, Latin America, and Asia, represents adoption rather than co-creation, and we do not conflate the two. Addressing this gap (through multilingual documentation, localized hosting, and partnership structures that lower barriers to meaningful participation) constitutes a priority for the next phase of governance development.

Claims of Use addresses the regulatory decisions regarding who may use the software, under what conditions, and with what methodological and epistemic claims, a dimension specific to research software governance that distinguishes it from general open-source governance. The central pattern is *methodological and data sovereignty*: Design decisions about coding interfaces and data structures inevitably embed methodological assumptions, and governance must ensure these are made transparent and contestable. OpenQDA's involvement of experts from diverse qualitative traditions (grounded theory, discourse analysis, content analysis) in co-creation processes aims to ensure methodological pluralism. Furthermore, as AI is integrated into research workflows, governing Claims of Use becomes critical: OpenQDA's planned on-premise AI hosting ensures that researchers maintain both data sovereignty and methodological control, a claim of use that commercial vendors currently deny (Küster & Wolf, 2025). The governance implications

Table 2. Open governance framework for research software: Dimensions and derived patterns.

Dimension	Derived Patterns
Strategic Direction	Managing adaptability vs. stability: Using public GitHub roadmaps and explicit prioritization criteria in co-creation workshops to balance community requests with architectural coherence; guarding against micro-control (Voorberg et al., 2015).
Development	Modular decoupling: Utilizing plug-in architectures (microkernel pattern) and standardized protocols (REFI standard) to allow distributed contributions without compromising core reliability; addressing Haim's (2021) criteria for traceability, verifiability, and connectivity.
Community Building	Active inclusivity management: Moving beyond passive code hosting toward deliberate co-creation with diverse stakeholder groups (researchers, participants, students); actively addressing structural inequalities (Costanza-Chock, 2020); building future maintainer communities through student engagement.
Claims of Use	Methodological and data sovereignty: Ensuring methodological pluralism through involvement of experts from diverse qualitative traditions; guaranteeing on-premise, privacy-compliant AI integration to secure data sovereignty and analytical validity; governing GDPR compliance across national contexts.

extend to questions of transparency and reproducibility: Design choices regarding the degree of AI initiative have been shown to significantly affect users' sense of creative control (Liu et al., 2024), underlining that these are not merely technical but fundamentally epistemic governance decisions.

6.3. Implications for Broader Research Infrastructure Development and Transferability

A legitimate concern is whether a governance model derived from two projects within a single institutional context can claim broader relevance. We address this by distinguishing between the analytical dimensions of the model, which we argue are generalizable, and the specific organizational patterns that operationalize them, which vary by context.

Any open research software project scaling beyond its founders must address all four governance dimensions: how collaboration is organized (Strategic Direction), how the software is built (Development), how the community is managed (Community Building), and who may use the artifact and how (Claims of Use). What differs across contexts is the relative weight of each dimension and the concrete mechanisms employed. Projects embedded in well-resourced research institutions may initially rely on Strategic Direction through established hierarchies and existing funding structures, whereas freestanding community projects without institutional backing must formalize Community Building governance from the outset. The transition to open governance (Oliveira et al., 2025) represents a necessary evolution from mere organized openness toward sustainable, community-owned infrastructure.

Our analysis further highlights the global equity dimensions of open research infrastructure. OpenQDA's broad international adoption demonstrates significant interest beyond Europe and North America; however, availability does not equal meaningful participation. True open governance requires active strategies to lower barriers to participation, including multilingual interfaces and documentation, localized hosting options that comply with regional data protection requirements, and deliberate outreach to researchers in underrepresented institutional contexts. As Dutta et al. (2021) have argued, open science initiatives risk reproducing existing inequalities if they do not actively address barriers related to language, institutional resources, and geographic location. The governance dimension of Community Building is precisely where these equity commitments must be operationalized.

7. Conclusion and Outlook

We introduced open governance as the overarching institutional framework required for sustainable infrastructure, within which open cooperation and co-creation operate as collaborative practices.

Three principal contributions emerge from our analysis. First, by adopting open governance as our guiding concept and locating open cooperation as the collaborative practice operating within it, we provide a structured analytical vocabulary that moves beyond binary notions of open versus closed or commercial versus free. The framework foregrounds the institutional mechanisms necessary for sustainable software: not only technical openness but the deliberate governance of how collaboration is organized, how code is developed and maintained, how communities are built and sustained, and who may use the artifact under what conditions. Second, we demonstrated that co-creation with three distinct stakeholder groups—researchers, research participants, and students—produces complementary forms of knowledge essential for

robust tool development. The systematic consolidation of lessons across both projects makes these insights transferable to others developing open research software. Third, we argue that the Claims of Use dimension represents a contribution specific to research software governance that has no direct equivalent in general open-source governance frameworks. By foregrounding the methodological and epistemic commitments inscribed in software design choices, from coding interfaces to AI integration, and demanding that these be made transparent and contestable, this dimension connects governance to the epistemic values of the research process itself, closing the loop between infrastructure and inquiry.

Several limitations should be acknowledged. Our analysis is based on two cases from a single institutional context, ZeMKI at the University of Bremen. While both projects involve international collaborators and users, the governance challenges and opportunities may differ in other institutional, disciplinary, or cultural settings. Furthermore, OpenQDA is still in a relatively early stage of development, and the long-term viability of its governance model remains to be demonstrated. The co-creation experiences reported here are necessarily selective and cannot capture the full complexity of the development processes involved.

Looking ahead, several developments appear promising. The continued scaling of OpenQDA to additional institutions and research communities will test the robustness and transferability of the open governance model. The planned integration of AI-supported coding through open-source language models will raise new governance questions regarding transparency, reproducibility, and methodological validity that will need to be addressed through community deliberation. And the ongoing involvement of students in co-creation processes may eventually yield a new generation of researchers who are not merely users of research software but active contributors to its development and governance.

Ultimately, the vision that animates both OpenQDA and MeTag/MeSort is one in which the tools through which communication and media research is conducted are themselves objects of collective creation and collective responsibility. In this vision, open governance is not merely an efficiency strategy or a funding-era imperative, but an expression of the same epistemic values—transparency, accountability, participation, and pluralism—that define good research practice.

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Conflict of Interests

The authors declare no conflict of interests.

Data Availability

The data supporting the findings of this study consist of transcripts from qualitative workshops conducted with research participants. Due to the sensitive nature of this material and considerations of participant confidentiality, these data are not publicly available.

LLMs Disclosure

Anthropic's Claude (Opus 4.6 and 4.8) was used to check and improve the German-to-English translation of this manuscript. All output was reviewed by the authors, who take full responsibility for the final text.

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About the Authors

Florian Hohmann is a researcher at the Centre for Media, Communication and Information Research (ZeMKI), University of Bremen, Germany, where he coordinates the DFG research group Communicative AI – ComAI and previously worked on the development of research software. His research focuses on co-creation approaches in research software development, qualitative methods, digital games, and media education.

Andreas Hepp is professor of media and communications and head of the Centre for Media, Communication and Information Research (ZeMKI), University of Bremen, Germany. His research focuses on mediatization, datafication, and communicative AI. His books include *The Mediated Construction of Reality* (with Nick Couldry, 2017) and *Deep Mediatization* (2020).

Karsten D. Wolf is professor of media education and didactic design at the Centre for Media, Communication and Information Research (ZeMKI), University of Bremen, Germany, where he heads the lab Media Education & Educational Media. His research focuses on audiovisual educational spaces such as YouTube and TikTok, explanatory videos, informal learning, and digital learning environments.